Boral Resources (NSW) Pty Limited
ABN: 51 000 756 507

ENVIRONMENTAL IMPACT STATEMENT

for the proposed

DUNMORE QUARRY PRODUCTION INCREASE

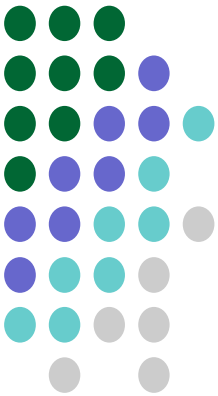
Prepared by:

R. W. CORKERY & CO. PTY. LIMITED

Boral Resources (NSW) Pty Limited

ABN: 51 000 756 507





ENVIRONMENTAL IMPACT STATEMENT

for the proposed

DUNMORE QUARRY PRODUCTION INCREASE

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November 2003

Ref No. 605/02

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FORM 2

Submission of
Environmental Impact Statement (EIS)
prepared under the Environmental Planning and Assessment Act, 1979
Section 78A

EIS prepared by:

name:	Robert William Corkery
qualifications:	M.Appl.Sc, B.Appl.Sc(Hons)
address:	75 Kite Street ORANGE N.S.W. 2800
in respect of:	Boral is proposing to progressively increase production at the Dunmore Quarry to 2.5 million tonnes per annum (Mtpa) from the existing levels of 1.2Mtpa. The progressive increase would take place over a period of approximately 2 years and would be achieved by a combination of increased operating hours, minor changes to equipment types and configuration, mainly within the crushing and conveying circuit, and an increase in rail and road transportation of product.

development application:

applicant name:	Boral Resources (NSW) Pty Limited
applicant address:	Unit 4, 3-5 Gibbon Road BAULKHAM HILLS NSW 2153
land to be developed:	Tabbita Road Dunmore 2529
lot no., DP/MPS, vol/fol etc proposed development	Lot 1 DP 213575, Lots 3 and 4 DP 1030504, Lot 4 DP 227046, Lot 1 DP 1002951 and Lots 1 and 2 DP 224597.

Environmental Impact Statement: ☑ an Environmental Impact Statement (EIS) is attached

certificate

I, Robert William Corkery, of 75 Kite Street, Orange, N.S.W., hereby certify that I have prepared the contents of this Statement and to the best of my knowledge

- it is in accordance with clauses 72 and 73 of the Environmental Planning and Assessment Regulation, 2000; and
- it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.

signature:

name: Robert W Corkery

date:

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Summary

INTRODUCTION

This Environmental Impact Statement (EIS) has been prepared to accompany a Development Application by Boral Resources (NSW) Pty Ltd (hereafter "Boral") for a proposal to increase production at Dunmore Quarry to 2.5 million tonnes per annum (Mtpa).

Dunmore Quarry is located immediately west of Dunmore Railway Station and the Princes Highway at Dunmore (see **Figure A**). It is located within the elevated hills formed by the hard, resistant volcanic rock called latite which is the rock type being extracted at Dunmore Quarry.

The proposed development is recognised as a State significant development as defined in the *Environmental Planning and Assessment Act 1979* given the substantial hard rock resource (31 million tonnes) and the planned 2.5Mpta production. The proposed development is also identified as integrated development as two approvals are required in addition to Development Consent. The Minister for Infrastructure, Planning and Natural Resources is the consent authority for the proposed development.

This Summary presents an overview of the proposal to increase production at Dunmore Quarry, the features of the local environment and the predicted environmental impacts following the adoption of a series of best-practice controls and mitigation measures. Emphasis has been placed upon designing the proposed development in such a way that recognises sustainable development principles and avoids or minimises adverse environmental impacts upon the local environment and local community.

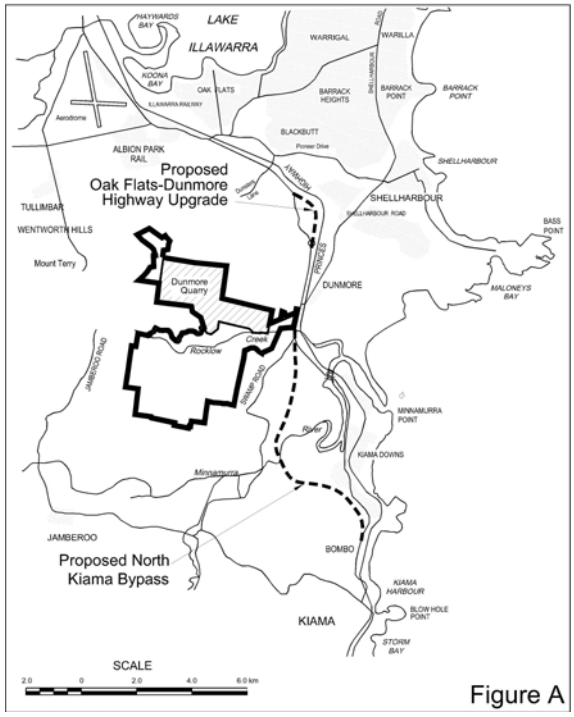


Figure A

The design of the proposed development and the assessment of its environmental impact has been undertaken with a team of five experienced specialist consultants managed by R.W. Corkery & Co. Pty. Limited. Boral personnel have assisted in the design of the proposed development.

BORAL - THE APPLICANT

Boral Resources (NSW) Pty Ltd is a subsidiary of the publicly listed Company, Boral Limited, one of Australia's largest construction materials and building products companies. Boral operates over 100 quarries across Australia producing a range of natural aggregates. More recently, Boral has placed greater emphasis upon the production of raw materials using waste products (e.g. blast furnace slag) and recycled construction and demolition materials. Greater emphasis is also placed on maximising the production of useful by-products such as Nusoil™ and manufactured sand.

BACKGROUND AND EXISTING APPROVALS

Quarrying first commenced at Dunmore Quarry in 1921. Since that time, Boral and its pre-decessor companies have progressively expanded the area of extraction operations. The existing operations are undertaken in accordance with three Development Consents issued by Shellharbour City Council with reliance also placed upon existing use rights over the original Dunmore Quarry and the related infrastructure. Dunmore Quarry is also operated in accordance with an Environment Protection Licence issued by the Department of Environment and Conservation.

It is noted that the conditional requirements of the three Development Consents are not consistent with respect to hours of operation. It is Boral's intention, if an acceptable Development Consent is granted to increase production to 2.5Mtpa, to surrender the three Development Consents and existing use rights to enable the quarry to be managed through a single consolidated Development Consent.

THE NEED TO INCREASE PRODUCTION

For many years, Boral has obtained the bulk of its high quality coarse aggregates for concrete and asphalt production in Sydney from Penrith Lakes and Prospect Quarries and to a lesser extent, from Peats Ridge Quarry. Production of high quality aggregates for concrete production at Prospect Quarry has recently ceased and the supply of high quality coarse aggregates from Penrith Lakes is forecast to begin to decline in 2004 until extraction finally ceases by the end of the decade. As a consequence of this decline in available resources, Boral has identified that part of the shortfall can be supplied from Dunmore Quarry, principally because of the high quality of the aggregates and the ability to readily increase production from the existing level of 1.2Mtpa to the proposed level of 2.5Mtpa with minimal changes in impacts.

Dunmore Quarry also offers the unique opportunity for Boral to continue to take advantage of existing rail infrastructure to transport approximately 60% of quarry production to Sydney by rail.

It is also noted that Boral is currently approaching a period of substantial sales, given their involvement with various large civil projects in the Illawarra area (e.g. the North Kiama Bypass) and in Sydney (e.g. the Western Sydney Orbital).

THE EXISTING OPERATIONS

The existing operations at Dunmore Quarry are shown in **Figure B** and comprise two extraction areas referred to as Croome Farm and Rail Infrastructure Corporation (RIC), a processing plant and product stockpile and despatch area. The rock being extracted within the Croome Farm and RIC extraction areas occurs within the upper and middle latite flows.

Dunmore Quarry is currently involved in a 9 month trial to enable Boral to assess the environmental impacts of its operation during extended hours. At present, extraction and processing is carried out between 6.00am and 10.00pm with sales between 5.00am and midnight (Monday to Saturday). Approximately 60% of the production from Dunmore Quarry is despatched by rail with the remainder despatched by truck. Almost 90% of the products despatched by truck are delivered to destinations in Sydney without rail access.

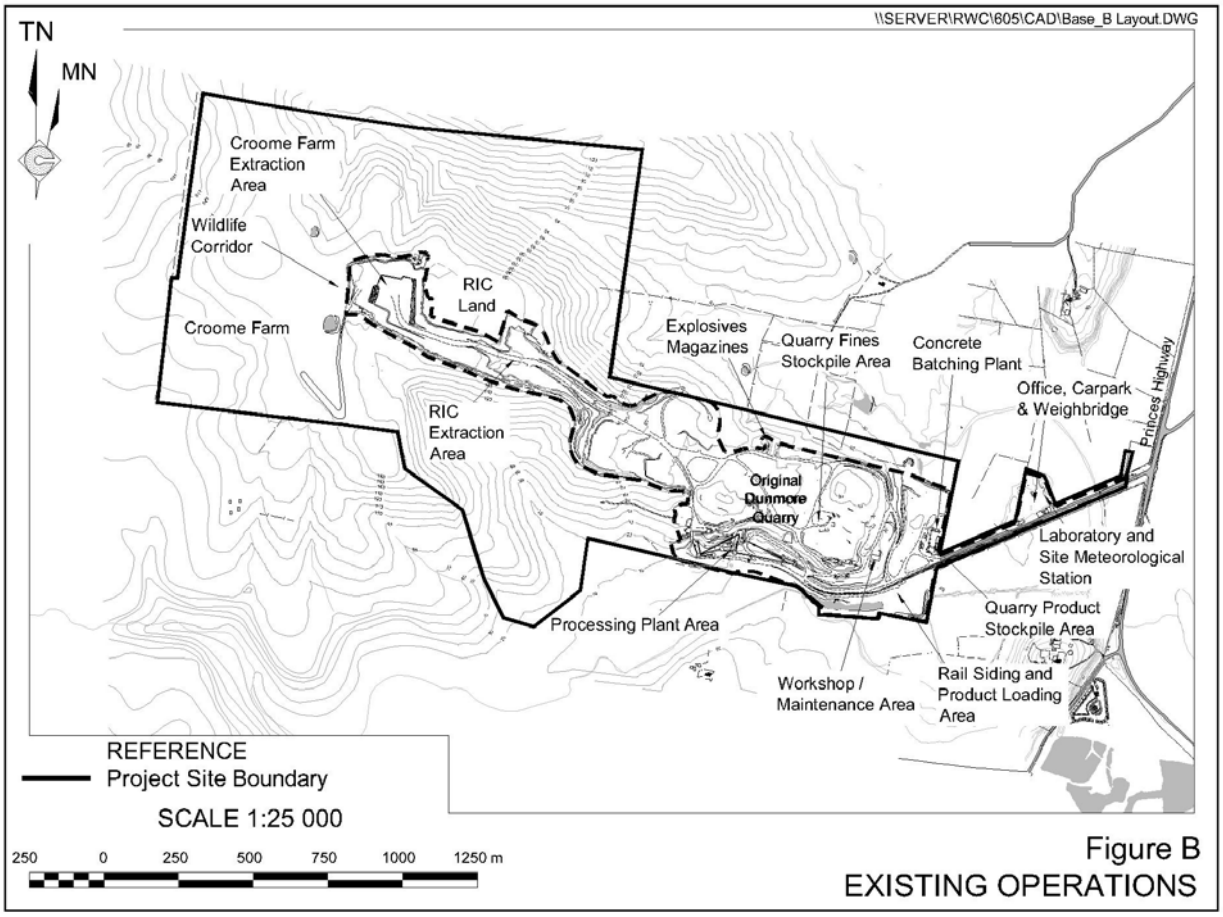


Figure B
EXISTING OPERATIONS

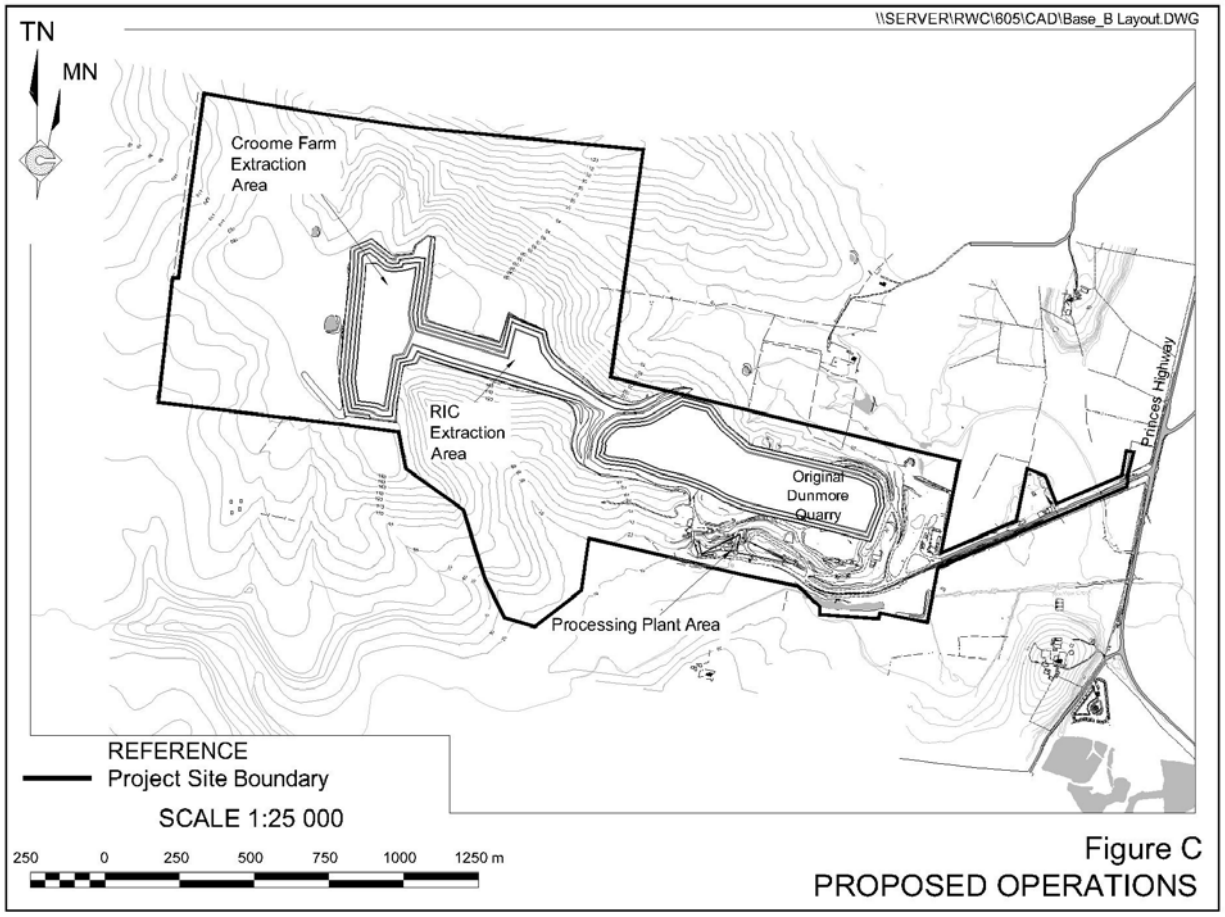
THE PROPOSED OPERATIONS

Boral proposes to increase production at Dunmore Quarry to 2.5Mtpa by 2005. The proposed increase in production would be achieved by:

- permanently extending the hours of operation for extraction and processing (to those currently adopted for the trial period);
- increasing the throughput of the processing plant (from 500tph to 750tph) by undertaking a range of minor plant modifications; and
- using additional mobile equipment such as a haul truck.

Figure C shows the proposed areas of extraction, namely Croome Farm, RIC and the original Dunmore Quarry. The extraction within the Croome Farm and RIC extraction areas will continue to target the upper and middle latite flows whereas extraction in the original Dunmore Quarry would involve the progressive removal of a breccia-agglomerate (likely to be suitable for production of road pavement materials) and the eventual recovery of high quality latite from the lower flow. Boral's proposed development does not involve any extension to the areas currently approved for extraction, rather Boral simply plans to increase the rate of production. All extraction would involve blasting and the haulage of broken rock to the processing plant.

The proposed processing plant upgrade would involve minor modifications to the tertiary crusher building and various components within the building, together with the construction of new conveyors and the replacement of a Barmac crusher with a larger unit.



Approximately 1.5 million tonnes of products would ultimately be despatched annually by rail in two-45 wagon trains per day. The remaining 1.0 million tonnes of products would be despatched by road with an average of 123 loads per day, increasing to 144 loads per day on a busy day. Boral is seeking to despatch products 24 hours per day Monday to Saturday and from 6.00am to 10.00pm on Sundays.

A total of 46 people would be employed on site including 15 persons recently hired at the commencement of the trial period.

THE EXISTING ENVIRONMENT

Dunmore Quarry is located in hilly terrain west of the Princes Highway where many of the outer exposed slopes are vegetated. Runoff from the extraction areas, processing plant and product stockpiles is collected in a stormwater dam which is able to overflow via a swampy area into Rocklow Creek. For most of the year, Rocklow Creek is dry near the Project Site.

Dunmore Quarry is located in an area where most of the surrounding land is owned by Boral and two other quarry companies, namely Readymix and Dunmore Sand & Soil Pty Ltd. A number of rural properties adjoin Boral's 8.5km^2 landholding at Dunmore. Boral holds negotiated agreements with most of its surrounding neighbours which enables the residences on those properties to be considered as project-related. Boral maintains periodic contact with its neighbours and the surrounding local community.

Access to Dunmore Quarry is achieved directly off the Princes Highway via Tabbita Road, a road used solely for access to the quarry.

The highway in the vicinity of Tabbita Road will be upgraded by the RTA in two stages during the period 2004 to 2010. The existing level-crossing for the rail siding to Dunmore Quarry will be replaced by a rail overpass as part of the new four-lane Princes Highway.

The current extraction and processing activities are partially visible from a range of areas on the eastern side of the quarry, although the vegetated rims of the extraction areas and green enclosures of the processing plant assist in reducing the visual impact.

The noise environment around Dunmore Quarry varies from comparatively quiet rural areas west of the Project Site, to the comparatively noisy Princes Highway. Air quality similarly reflects the nature of the surrounding land uses, although measurements over the past 7 years suggest that Dunmore Quarry is only a small contributor to overall local dust levels.

SAFEGUARDS AND IMPACTS

Boral has undertaken a range of improvements within the Project Site, particularly over the past 12 months, to improve the environmental performance of the quarry. All existing and planned improvements are designed to ensure the various activities at the quarry are carried out on site within the proposed hours of operation, in compliance with relevant goals or guidelines. The trial period has enabled Boral to carefully evaluate the effectiveness of the various improvements and to determine the need for any other controls or mitigation measures. The principal controls and mitigation measures that would be in place for the period of increased production, along with the assessment of impacts is set out below. These have been categorised in terms of biophysical, economic and social/cultural considerations.

Biophysical Considerations

Noise:

Safeguards to control noise include partial or full enclosures around various processing plant components, noise controls on mobile equipment, construction of acoustic bund walls and a range of operational procedures to reduce specific individual noises.

During the trial period, extensive monitoring established that noise levels at surrounding residences either complied with the relevant noise goals, or were within 2dB(A) of the goals which achieves compliance as stated in the Industrial Noise Policy.

Predicted noise levels at surrounding non-project-related residences would comply with the relevant noise goals for the proposed increased level of production under calm weather conditions during all times of the day. Compliance is also predicted under most adverse weather conditions, except for a 1dB(A) exceedance during autumn and winter evenings at the closest residence southeast of the Project Site. It is noteworthy that such an exceedance is deemed to be compliant under the Industrial Noise Policy as it would be less than 2dB(A) above the relevant noise goal.

Predicted night-time noise levels confirm that sleep disturbance criteria would be satisfied at all non-project-related residences at night.

The predicted cumulative noise levels arising from quarry-related activities, the on-site concrete batching plant and the proposed nearby sand extraction and processing operation would comply with all relevant noise goals.

Blasting:
The controls on blasting focus upon the use of appropriate blast designs for which Boral has considerable experience.

Monitoring of previous blasts and predictions for future blasts confirm that future airblast overpressure and ground vibration levels would comply with all relevant goals at surrounding residences.

Air Quality:
Existing dust levels in the area surrounding Dunmore Quarry are typical of a semi-rural environment with the added presence of the Princes Highway. Measurements of deposited dust and an evaluation of wind data indicate Dunmore Quarry is not a major contributor to local deposited dust levels. The high density of the latite extracted and processed ($2.7t/m^3$) means that dust settles out quickly near its source.

Boral has been working progressively towards the reduction of visible dust on the Project Site, particularly around the processing plant. The main engineering controls to reduce visible dust include enclosure of components of the processing plant, use of water sprays and dust extraction. A water truck is used to suppress dust on haul roads and around stockpile areas.

Boral proposes to progressively upgrade controls to further limit visible dust as production increases. A detailed assessment of future dust levels involving the compilation of an inventory of dust sources and quantities of dust generated and detailed modelling has established that the predicted levels of fine dust (<10µm), total suspended particulates and deposited dust would all comply with air quality goals at all residences surrounding the Project Site.

Transport:
Safeguards to be adopted to limit impacts on the Princes Highway and other motorists relate to maintaining legal loads and ensuring appropriate driver behaviour. The despatch of 1.5Mtpa of products by rail would have a beneficial impact on the road network as this equates to 52 000 product truck loads per year. Once full production is reached, total truck movements from Dunmore Quarry would represent approximately 1% of total daily traffic and approximately 2% during the busy 6.00am to 7.00am period on the Princes Highway. The trucks travelling on the Princes Highway further north at Mt Ousley would represent approximately 3% of daily truck movements at that location.

It is noteworthy that the predicted level of truck traffic (at 1Mtpa) would be slightly less than the highest level of previous truck traffic from Boral's Dunmore and Kiama Quarries – i.e. before the recommencement of rail traffic.

The use of rail to transport a large proportion of products to Sydney would substantially reduce diesel use and greenhouse gas emissions.

Ecology:
No further clearing is proposed beyond the area already approved for extraction. Hence, there would be virtually no impacts upon the flora and fauna beyond the approved areas, particularly upon threatened species.

Social and Cultural Considerations

Aboriginal Heritage:
Boral is seeking approval to relocate a scarred tree from within the Croome Farm extraction area to a site nominated by the

local Aboriginal community. The relocation of the scarred tree has the full support of the local Wodi Wodi Elders Corporation. No other Aboriginal heritage site has been identified within the Project Site.

Employment Opportunities:
The production increase at the Dunmore Quarry would ensure those employment positions recently created for the trial period would be sustained long term, thereby underpinning the social benefits of full-time and indirect employment.

Economic Considerations

Building Industry:
The building industry and its consumers would benefit from the increase in production at Dunmore Quarry through the cost effective delivery of high quality materials, the continuity of supply for many years and improved hours for delivery. The flexibility of rail and road deliveries would be of great assistance to industry.

Boral Employees and Local Community
The continued employment of 46 people (including 15 people continuing on following the trial period) would assist in sustaining local economic growth. Increased Company spending, including the processing plant upgrade ($3 million), would benefit local suppliers and contractors.

CONCLUSION

The proposal to increase production at Dunmore Quarry to 2.5Mtpa has been designed with an emphasis on demonstrating that changes to the noise levels, air quality and product transportation satisfy relevant goals and/or realistic community expectations. The substantial investigations undertaken prior to and during the current 9 month trial have enabled Boral to progressively implement a range of controls consistent with best environmental practice to achieve a high standard of environmental performance. An important component of the proposed development would be the emphasis upon maximising the use of rail for the transportation of products.

The Environmental Impact Statement and the range of specialist consultant studies undertaken have identified that the proposed development could proceed because it would:

(i) responsibly satisfy part of the shortfall that will arise as other quarries decrease production and close;

(ii) have an acceptable impact on the biophysical environment with respect to noise, blasting, air quality, transportation and water quality; and

(iii) satisfy sustainable development principles.

GLOSSARY OF COMMONLY USED TERMS, ACRONYMS AND SYMBOLS

Please note this list provides the most commonly used terms, acronyms and symbols throughout the document. A full list of technical terms, symbols and acronyms is provided in Section 8 of this document.

TERMS

Project Site – the area of land covered by the existing approved development and the current Development Application

Extraction – the recovery of rock from its in-situ location by drilling and blasting and loading/hauling to the processing plant.

Processing – the size reduction of rock delivered from the extraction area and size separation into final products.

Sales – sales-related activities comprise loading products from the product stockpiles areas into train wagons or onto trucks, weighing/documentation and despatch from site.

ACRONYMS

AHD Australian Height Datum; generally equivalent to mean sea level.
AS Australian Standard
BMG Blue Metal & Gravel Pty Ltd (now owned by Boral)
DEC Department of Environment and Conservation
DIPNR Department of Infrastructure, Planning and Natural Resources
DSRLEP Draft Shellharbour Rural Local Environmental Plan
EIS Environmental Impact Statement
EPA Environment Protection Authority (NSW)
ESD Ecologically Sustainable Development
IREP Illawarra Regional Environmental Plan
INP Industrial Noise Policy
LEP Local Environmental Plan
RBL Rating background level
SEPP State Environmental Planning Policy
RIC Rail Infrastructure Corporation
RTA Roads and Traffic Authority

SYMBOLS

ha hectare

km kilometre

km^2 square kilometres
L litre

m metre

mAHD metres of elevation relative to the Australian Height Datum

m^2 square metre

m^3 cubic metre

ML megalitres

mm millimetre

Mtpa million tonnes per annum

PM_{10} particulate matter <10μm in diameter

t tonnes

tpa tonnes per annum

tph tonnes per hour

TSP total suspended particulate

$\mu g/m^3$ micrograms per cubic metre

vkt vehicle kilometres travelled

vph vehicles per hou

Section 1
Introduction

PREAMBLE

This section introduces Boral's proposal to increase production to 2.5Mtpa at the Dunmore Quarry, Dunmore. This section:

- *outlines the format of the document;*
- *introduces Boral;*
- *reviews the background to the proposed development;*
- *presents the relevant planning issues influencing the proposed development;*
- *outlines the consultation undertaken with Government agencies and the local community;*
- *reviews the sustainable development principles relevant to the proposed development;*
- *discusses the proposed ongoing documentation; and*
- *records the personnel involved in the project design, document preparation and specialist consultant investigations.*

1.1 SCOPE

This Environmental Impact Statement (EIS) has been prepared by R.W. Corkery & Co. Pty. Limited in conjunction with Boral Resources (NSW) Pty Limited (Boral) to accompany a Development Application (**Appendix 1**) to the Department of Infrastructure, Planning and Natural Resources to increase the annual production rate at the Dunmore Quarry to 2.5Mtpa. It is also Boral's intention that the application results in a single Development Consent to cover the increase in production and all other activities within the Dunmore Quarry.

For the purposes of this document, the area which is subject of the Development Application is referred to as the "Project Site". The Project Site, illustrated in **Figure 1.1**, lies west of the Princes Highway, Dunmore covering an area of approximately 246ha.

The proposed development is "State significant" as the quantity of the hard rock resource and the proposed rate of production exceed the threshold levels specified in a Ministerial Declaration dated 3 August 1999 relating to Section 76A(7) of the *Environmental Planning and Assessment Act 1979*. The proposed development is also "designated development" in accordance with the provisions of Schedule 3 (Part 1) of the *Environmental Planning and Assessment Regulation 2000*, thus requiring the preparation of an Environmental Impact Statement to accompany the Development Application. The proposed development is also recognised under Section 91 of the same Act to be "integrated development" as more than one approval is required for the increased production to commence. Therefore, this document will also serve to support the applications to vary existing approvals and licences (see Section 3.3).

This document focuses upon the activities required to achieve the increased level of production, namely the rate of extraction, processing and product despatch together with increased operating hours. The increased production would be achieved through the extraction of rock from within the area already approved for extraction. No further area beyond the area already approved for extraction would be disturbed. Minor modifications are proposed to improve the rate of processing in the existing approved processing plant and changes are proposed over time to increase the quantity of products despatched by both rail and road.

The following sections concentrate upon the environmental issues associated with the increased level of production rather than addressing all activities as if the proposed development was for a greenfield site. Given Boral is not seeking to increase the approved area of disturbance, emphasis is placed upon the description/assessment of issues such as noise/vibration, air quality, and transportation. Boral's approach to water management, flora, fauna, Aboriginal heritage on the Project Site is not planned to change, consequently these issues are not addressed in detail and reliance is placed upon the existing practices that were documented in the June 1994 Environmental Impact Statement (Sinclair Knight Merz, 1994). Notwithstanding this position, Boral has commissioned specialist consultants to investigate and assess flora, fauna and Aboriginal heritage issues in the area of the Project Site that has been the subject of existing use rights to date. Further, each consultant has re-examined, to the extent necessary, issues relating to the areas already with development consent to ensure the most current legislative requirements are being satisfied in those areas. Further information on the status of the current approvals for the Dunmore Quarry is presented in Section 2.3.

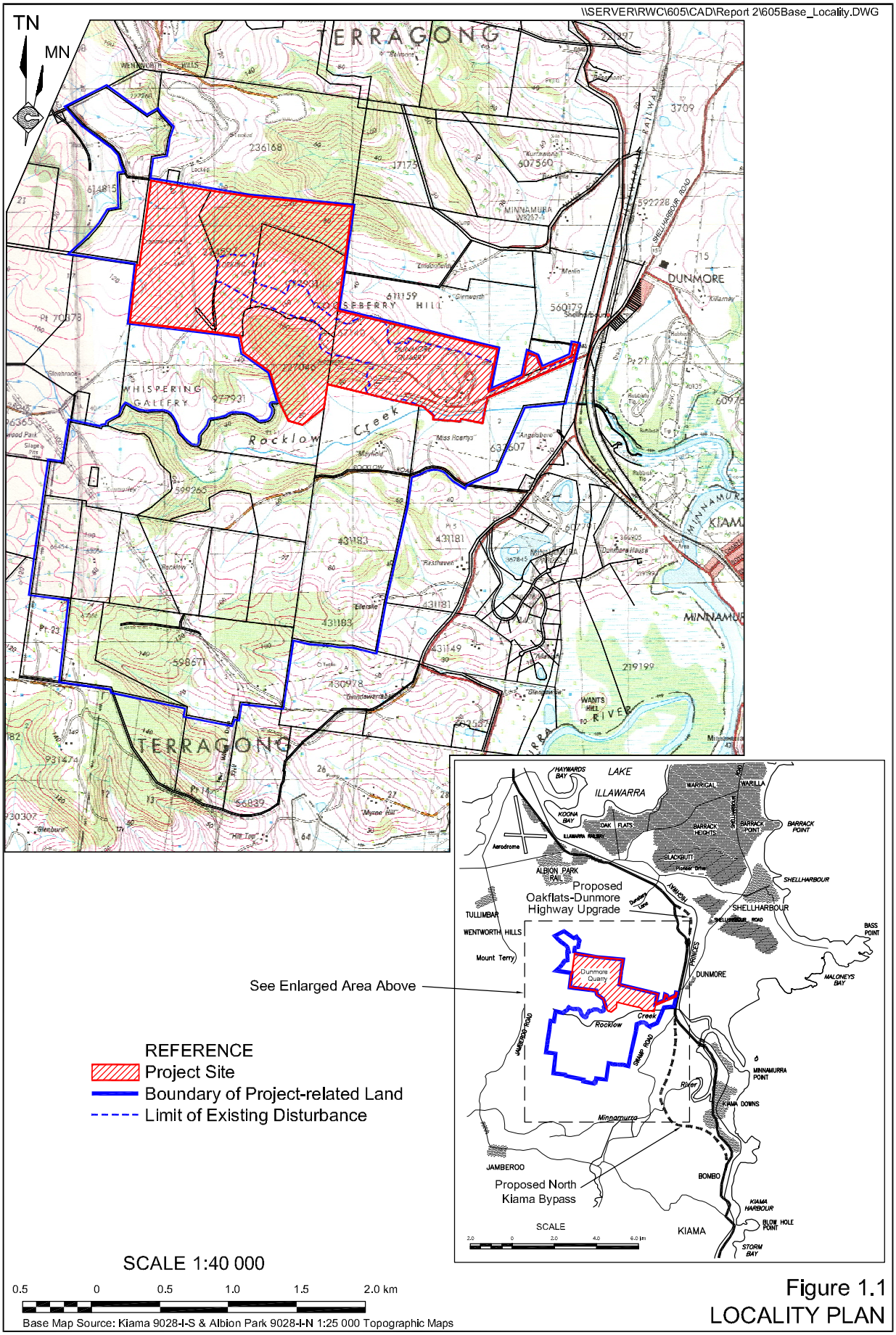


Figure 1.1
LOCALITY PLAN

For each of the main issues relevant to the production increase, this document includes a description of the existing environment together with an evaluation of the effectiveness of recently introduced mitigation measures. Boral's plans for the introduction of further mitigation measures and the assessment of environmental impact are presented together with Boral's ongoing plans for environmental monitoring.

This document has been prepared with consideration given to the EIS Guideline for Extractive Industries – Quarries issued by the Department of Urban Affairs and Planning in September 1996) and matters identified in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*. The contents of this document also incorporate responses to a range of issues raised during discussions and recorded in correspondence from a range of government agencies and the local community (see Section 1.6).

This document has been compiled with reference to published topographic plans issued by the Land and Property Information Branch of the Lands Department. Use is also made of an aerial photograph of the Project Site and its surrounds taken by Photomapping Services on 1 March 2003.

1.2 DOCUMENT FORMAT

This EIS has been compiled in a single volume with a supporting compendium document drawing together the relevant specialist consultant studies.

The specific requirements of the Director-General of the Department of Infrastructure, Planning and Natural Resources and other relevant State government agencies have been incorporated into the appropriate section(s) of the document. **Appendix 2** reproduces all documented requirements from government agencies and reference to the section(s) of text where each requirement has been addressed in the EIS. It is noted that the documented requirements in **Appendix 2** have been addressed to the extent considered appropriate for the proposed development. In some cases, the requirements are not relevant or their detailed consideration would be of little benefit to the Minister when determining Boral's Development Application.

The format of the document is set out below.

Section 1: introduces the proposed development and Boral as the Applicant, briefly reviews the background to the proposal and relevant planning issues and outlines the consultation undertaken with relevant government authorities and the local community. Boral's approach to sustainable development principles, best practice environmental management and documentation is also presented.

Section 2: describes the existing operations in detail with reference to the resources; extraction, processing and product despatch activities, infrastructure, services, hours of operation, waste management, employment and rehabilitation.

Section 3: describes the proposed modifications planned to the extraction, processing and product despatch activities that would need to occur to achieve an annual production rate of 2.5Mtpa. The section concludes with a description of alternatives considered during the design of the proposed development.

Section 4: describes the general environmental setting of the Project Site and provides relevant background information for the environmental components that are discussed throughout Section 5. The principal components relate to topography, geology and soils, meteorology and surrounding land use and residences.

Section 5: this section provides:

(i) a description of the environmental features of the existing environment that may or would be affected by the proposed development;

(ii) the design and operational safeguards and, where appropriate, management procedures, that have been implemented immediately prior to the commencement of the current trial period to minimise any potential adverse impacts;

(iii) the relevant design goals or assessment criteria relating to components such as air quality, noise and vibration;

(iv) an evaluation of the environmental impacts of the site activities during the current trial period;

(v) the additional design and operational safeguards, and, where appropriate, management procedures that would be introduced to manage the environmental impacts arising from the increased level of production; and

(vi) an analysis of the potential impacts the proposed development would have once all design and operational safeguards and procedures are implemented.

Section 6: presents an evaluation and justification of the proposed development in relation to the biophysical, economic and social considerations as well as sustainable development is presented in this section. The consequences of not proceeding with the proposed development are also examined.

Section 7: records the of source and reference documents used in the preparation of this EIS, including the specialist consultant studies compiled in the "*Specialist Consultant Studies Compendium"*.

Section 8: presents a glossary of Acronyms, Symbols and Technical Terms.

Appendices: include:

(i) a copy of the Development Application for the proposed development;

(ii) the Director-General's requirements for the EIS and the requirements of other government agencies and a reference to the relevant the EIS section(s) where each of these requirements are addressed; and

(iii) correspondence from the Wodi Wodi Elders Corporation.

The EIS has been prepared with the input of five specialist consultant firms, which are listed in Section 1.9. Their reports have been compiled into a supplementary document entitled "*Specialist Consultant Studies Compendium*" which has been placed on exhibition with the EIS. Individual copies of each report or the entire supplementary document can be provided to any person who purchases a copy of the EIS. The contents of these reports have been summarised into the appropriate sections of the EIS.

1.3 THE APPLICANT

Boral Resources (NSW) Pty Limited is a subsidiary of the publicly listed Company, Boral Limited, one of Australia's largest construction materials and building products companies. Boral is Australia's leading quarry operator with over 100 quarries producing sand, concrete aggregates, crushed rock, asphalt and sealing aggregates, and road base materials. Boral Limited employs in excess of 3 400 people at its 540 operational sites across New South Wales and 12 600 people worldwide (Boral Limited – Annual Review 2003).

1.4 BACKGROUND TO THE PROPOSED DEVELOPMENT

1.4.1 Introduction

This section provides a brief summary of Boral's quarry operations that currently supply hard rock products to the Sydney and Illawarra construction industries and the need for the production increase at the Dunmore Quarry.

1.4.2 Current Boral Operations

Boral currently produces a range of concrete aggregates, road construction materials and other quarry products at five sites to supply its own and its customers' requirements in the Sydney and Illawarra market areas. **Figure 1.2** shows the locations of Boral's quarry operations in the Sydney/Illawarra area.

Penrith Lakes: Boral is currently a 40% shareholder in the Penrith Lakes Development Corporation, the entity managing the extraction of sand and gravel north of Penrith. For many years, the resources at Penrith Lakes have been the main source of sand and crushed rock for concrete manufacture in the Sydney metropolitan area producing approximately 5.8 million tonnes per annum. The range and quality of products being produced at Penrith Lakes is currently changing with a smaller proportion of high quality coarse aggregates currently being produced. Penrith Lakes is expected to cease as source of construction materials by the end of the decade.

Prospect: Boral produces up to 1.7 million tonnes per annum of mainly road construction materials at its Prospect Quarry. The production of high quality coarse aggregates has recently ceased at Prospect Quarry. This quarry has been an important source of quarry products for Sydney for over 100 years. However, it is anticipated that production will cease at this quarry over the next three to four years.

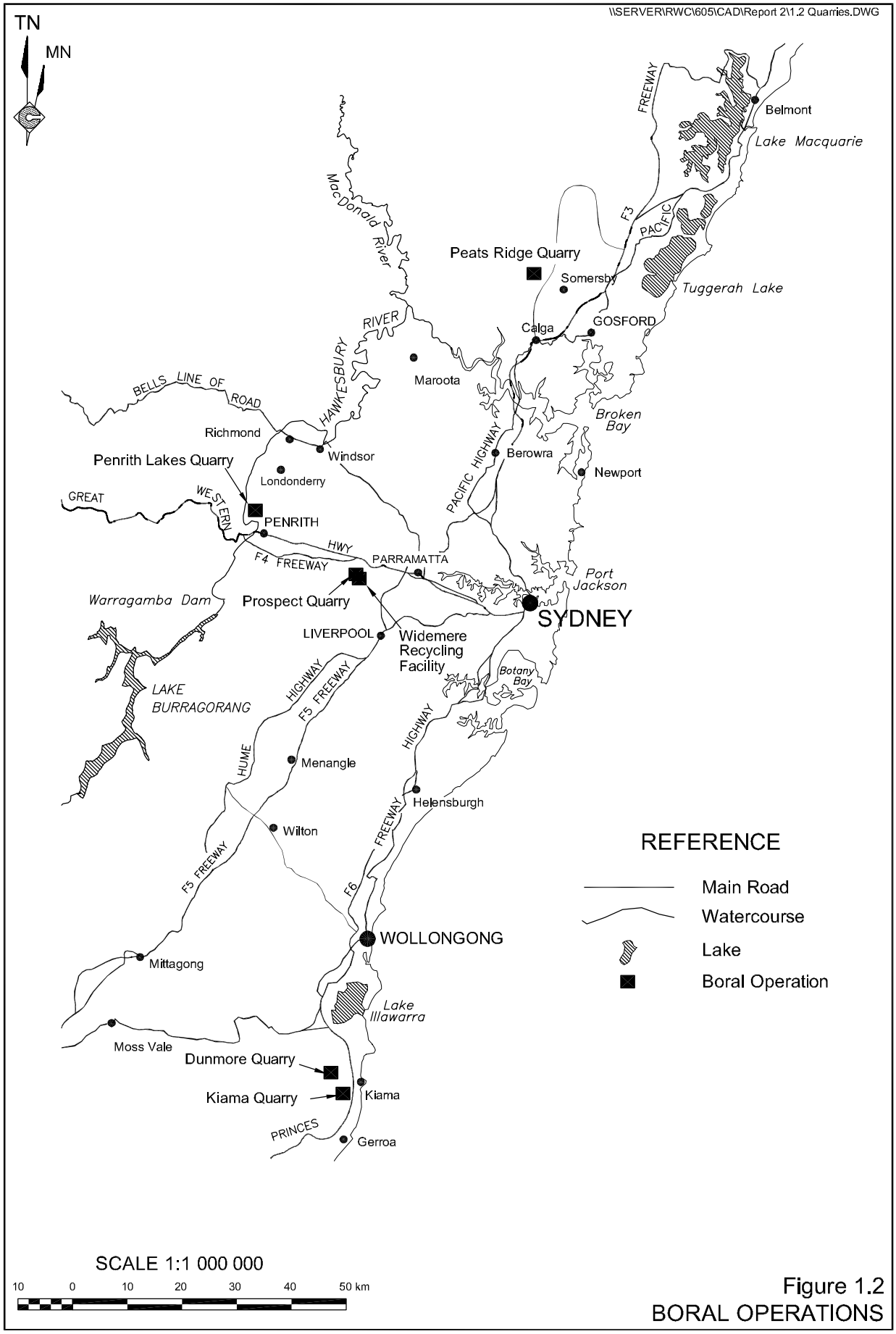


Figure 1.2
BORAL OPERATIONS

Peats Ridge: This quarry is currently producing up to 0.6 million tonnes per annum of high quality basalt products. Boral is currently seeking an approval to increase despatch at this quarry to 0.8 million tonnes per annum. The basalt resource of approximately 19 million tonnes would provide an operational life of approximately 25 years based on the planned new rate of production.

Dunmore: The Dunmore Quarry, currently produces approximately 1.2 million tonnes per annum of both coarse aggregates and road construction materials. The 1.2 million tonnes is effectively the current approved limit of extraction from the Croome Farm and RIC extraction areas, noting that there are no limits on the old Dunmore Quarry area. Annual production statistics are provided to the Department of Mineral Resources each year. The existing 29 million tonne resource would currently produce 1.2 million tonnes of quarry products annually for the next 25 years. The annual level of production is the subject of the current application to increase production.

Kiama: While this quarry has not been actively quarried for the last few years there are ongoing operations to supplement supplies as required.

Apart from producing natural aggregates, Boral is committed to the use of recycled products and waste products such as blast furnace slag.

Boral obtained Development Consent and commenced operations of a Construction and Building Materials Recycling Facility at Widemere south of Boral's Prospect Quarry in 2003. The facility has the capacity to receive and process up to 600 000 tonnes of construction and demolition waste annually. From this facility, Boral produces a range of products that are used in road construction including recycled DGB20, Enviroblend, 20mm recycled road gravel, 20mm recycled road base, select fill etc.

Boral is the major user of blast furnace slag produced at BHP's Port Kembla Steelworks distributed via Australian Steel Mill Services. Boral's Construction Materials Division currently uses approximately 310 000 tonnes of blast furnace slag annually or approximately 60% of the 550 000 tonnes of coarse aggregate produced annually. This material is used principally as a coarse aggregate in concrete production. Small quantities of slag fines are also blended with quarry fines to produce a sand also used in concrete production. It is noteworthy that as a supplier of natural construction materials, Boral has a market share of 30% for the supply of concrete and yet the Company's commitment to the use of slag supports their claims as a market leader in promoting the use of alternative materials.

1.4.3 Plans for Dunmore Quarry

Given the planned cessation of production at the Prospect and Penrith Lakes, Boral has examined the opportunities to maintain current production levels and to provide for sustained production growth from its existing quarries. The substantial hard rock resources at Dunmore, as well as the quarry's strategic location and access to the rail network, offer an opportunity to Boral to provide part of the shortfall arising from the closure of these other quarries.

Boral has closely examined the various factors that would influence the extent of a production increase at the Dunmore Quarry. The principal factors and a commentary on each follows.

Hours of Operation: Until recently, the approved hours of operation generally allowed extraction and processing activities between 6.00am to 6.00pm, Monday to Saturday. Clearly, an increase in the hours of operation would allow the same mobile plant and fixed plant to be used to extract and process a larger quantity hard rock.

In late 2002, Boral sought approval to modify its existing development consents to enable it to extend the hours of operation ultimately to increase production. Shellharbour City Council determined to allow a 9 month trial to proceed following the introduction of a range of noise/air quality mitigation measures. Details of the modified development consents are presented in Section 2.3.

It is Boral's objective that the hours of operation for the trial period are approved long term as a result of this Development Application. Details of the proposed hours of operation are discussed further in Section 3.8.1.

Extraction Operations: The quantity of hard rock extracted and transported to the processing plant is dependent upon the size and number of items of equipment used to extract and transport the hard rock, together with the hours of operation discussed above. Details of the proposed extraction operations are discussed further in Section 3.4.

Processing Operations: The quantity of hard rock processed to yield the products required by Boral's concrete and asphalt plants and the customers is dependent upon the efficiency of all components of the processing plant. At present, a number of plant components have the capacity to increase throughput whereas other components are operating at maximum capacity and consequently would restrict increasing production. A detailed evaluation of the throughput of each plant component has identified where improvements are necessary to increase overall production.

Ultimately, it has been established that the capacity of the processing plant could be increased to 2.5 million tonnes per annum if the hours of operation are permanently increased and the minor plant modifications-upgrade proceeds. The nature and extent of plant and equipment modifications are discussed further in Section 3.5.

Transportation: The transportation of quarry products from Dunmore Quarry is controlled by the size and number of trains and trucks that travel to and from the quarry. At present, there are typically 2 trains per day that service the quarry allowing for the transportation of up to 0.9Mtpa by rail. It is also feasible for the existing operations to despatch by road at least 1.2Mtpa of quarry products as this level of products were despatched by road in the late 1990's, i.e. before the re-introduction of rail transport. Details of Boral's plans to increase product transportation are presented in Section 3.6.

Based upon the review of the above factors, Boral has identified that the principal constraining factors to annual production are the hours of operation and to a lesser extent the capacity of the processing plant. Accordingly, this development has been designed around increasing the hours of production and minor modifications/upgrade to the existing processing plant with a series of minor modifications as described in this document. Section 3.12 includes a discussion on the alternative identified by the former Environment Protection Authority (EPA) relating to increasing the capacity of fixed and mobile plant and equipment rather than increasing hours of operation.

1.4.4 Prioritisation of Issues

The proposal to increase production at the Dunmore Quarry has been developed with consideration given to a wide range of environmental issues. The basis for the prioritisation of the issues has been based largely upon Boral's experiences over the past 5 years as the production of the quarry has been steadily increasing. Contributing factors to setting priorities have been as follows.

- Discussions with neighbours around the quarry.

  In general, Boral's activities have been generally well accepted by its neighbours except for the owner of the former School House, Mrs Margrit Stocker. The principal issue of importance to Mrs Stocker is noise. It is noted that the monitoring undertaken by Richard Heggie Associates has verified that despite Mrs Stocker's complaints, the noise levels have been in compliance within the noise goals established through the Industrial Noise Policy or her complaints don't relate to noise generated at Dunmore Quarry. Boral has also investigated noise-related issues raised by some residents of Dunmore Lakes Estate.

- Discussions with the Department of Environment and Conservation (formerly EPA).

  Issues raised by the EPA focussed on noise and dust. These issues have been regularly discussed with Department representatives since the proposal to extend the hours of operation was first raised with the then EPA and Shellharbour City Council in 2002. The EPA has stated its objective is to achieve no visible dust at the quarry. Whilst Boral recognises it is desirable to reduce visible dust, Environment Australia (1998) recognises that concerns relating to visible dust "are not necessarily in direct proportion to its impact on human health and the environment". Boral places considerable weight upon the monitoring of deposited dust levels to assess the actual level of impact (if any) on the surrounding environment (see below).

- The results of extensive noise and dust monitoring programs.

  Boral has placed considerable emphasis upon the collection of monitoring data that accurately records the environmental impacts of its operations. Clarity has gradually been achieved on issues relating to noise. Boral accepts that dust remains visible around the processing plant but equally recognises that the high density of the latite ($2.7t/m^3$) results in the rapid deposition of dust – a factor supported by the dust monitoring results. The deposited dust monitoring results have in fact confirmed that the quarry is not a major contributor to deposited dust levels in the surrounding environment.

In light of the above commentary, the main issues for consideration have been the control of noise and improving dust emissions.

Other secondary issues that have been considered when developing the proposal to increase production have included product transportation, water management, ecological issues and visibility. Of these issues, production transportation has been assigned the greatest priority. Boral's Dunmore Quarry is the only quarry currently delivering products to its major concrete batching and asphalt plants by rail – a feature that is considered by government agencies and the community to be very positive.

1.5 PLANNING ISSUES

1.5.1 State Planning Issues

The following State Environmental Planning Policies (SEPPs) apply to the proposed development.

State Environmental Planning Policy No. 11 (SEPP 11) – Traffic Generating Development
Clause 7 of SEPP 11 requires that certain development applications be referred to the NSW Roads and Traffic Authority (RTA). Extractive industries are listed under paragraph (m), Schedule 1 of this policy, hence, this proposed development needs to be referred to the RTA.

State Environmental Planning Policy No. 14 (SEPP 14) - Coastal Wetlands
SEPP 14 was gazetted with the aim of preserving and protecting coastal wetlands and applies to any development that has the potential to damage or destroy wetlands.

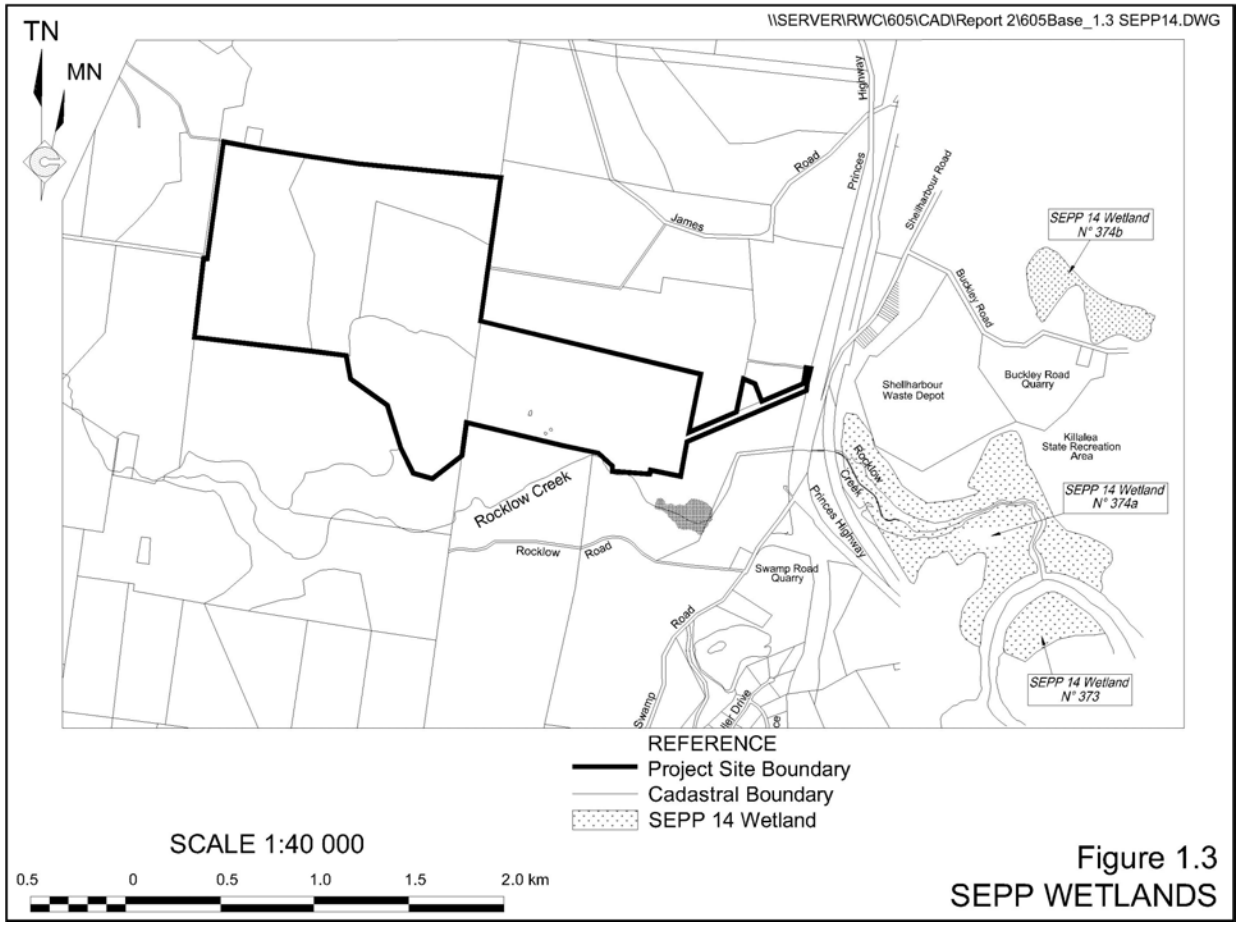
Figure 1.3 shows the location of SEPP 14 Wetland No. 374A. There are no SEPP 14 wetlands on the Project Site itself, however, drainage from the Project Site is able to flow via Rocklow Creek into the SEPP 14 Wetland No. 374A.

State Environmental Planning Policy No. 44 (SEPP 44) - Koala Habitat Protection
Shellharbour Local Government Area is identified in Schedule 1 of this policy as an area that could provide habitat for Koalas. The policy requires an investigation to be carried out to determine if any Koala food trees are present on the Project Site. As a component of the flora and fauna survey, it has been confirmed that the Project Site is not potential Koala habitat.

State Environmental Planning Policy No. 71 (SEPP 71) – Coastal Protection
This policy applies to the Project Site given it lies within the Coastal Zone defined under the *Coastal Protection Act 1979* i.e. the Project Site lies within 1km of the tidal limit of Rocklow Creek. Furthermore, an extractive industry is listed in Schedule 2 of SEPP 71 as a Significant Coastal Development.

The relevant matters referred to in Clause 8 of the SEPP 71 for the Minister to take into account when assessing the proposed production increase area are as follows.

(d) the suitability of development given its type, location and design and its relationship with the surrounding area,



(f) the scenic qualities of the New South Wales coast, and means to protect and improve these qualities,

(g) measures to conserve animals (within the meaning of the *Threatened Species Conservation Act 1995*) and plants (within the meaning of that Act), and their habitats,

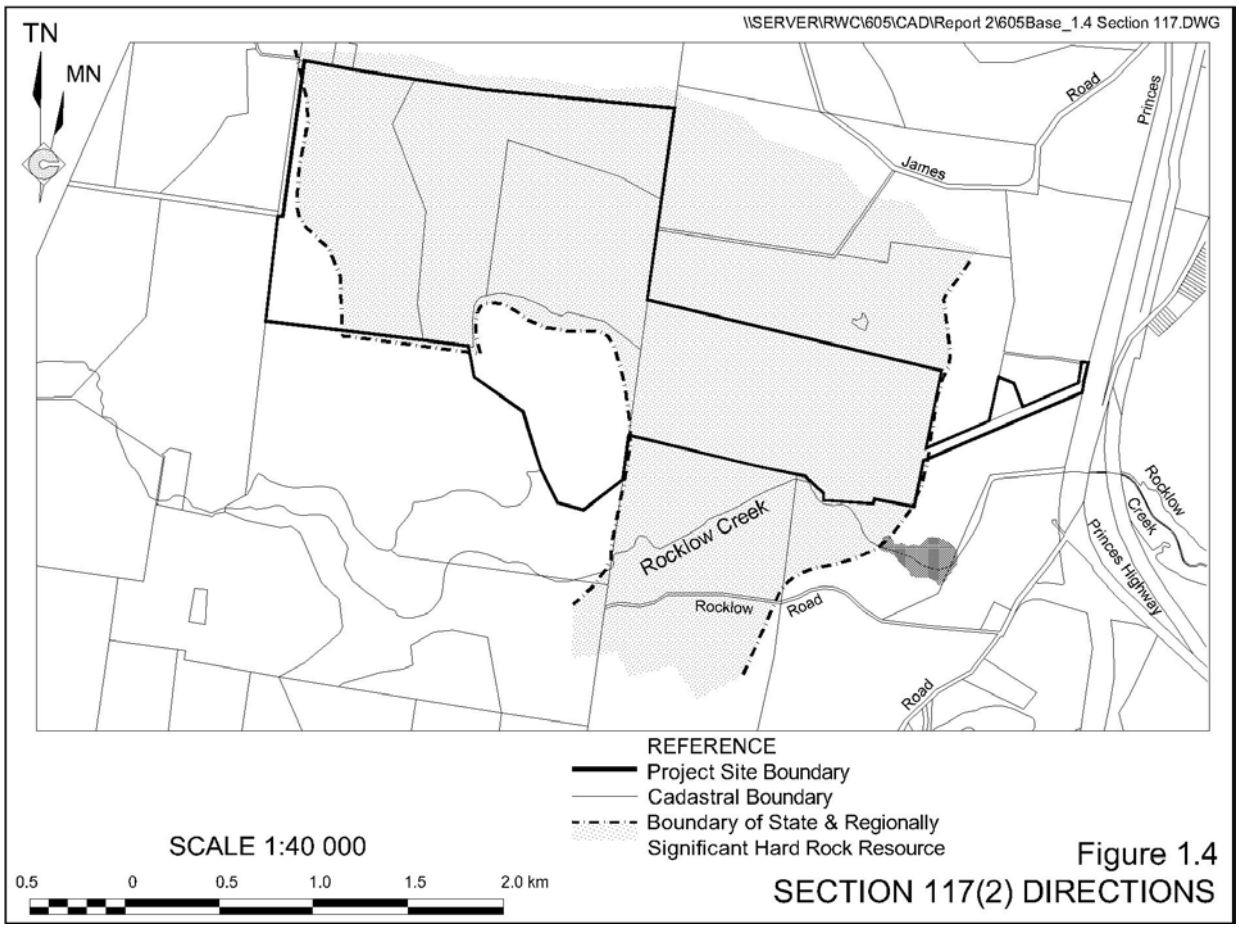
(m) likely impacts of development on the water quality of coastal water bodies,

(n) the conservation and preservation of items of heritage, archaeological or historic significance,

It is noted that SEPP 33 – Hazardous and Offensive Development is not applicable as the operations of the Dunmore Quarry do not pose a significant risk to human health, life or property or to the biophysical environment. SEPP 55 – Remediation of Land is also not applicable given there are no parts of the land within the Project Site known to be contaminated.

Section 117(2) Direction

A Section 117(2) Direction No. G28 under the *Environmental Planning and Assessment Act 1979* was issued by the former Department of Urban Affairs and Planning covering the hard rock resources in the Albion Park/Dunmore Area. The relevant plan accompanying the direction effectively covers the bulk of the Project Site (see **Figure 1.4**). The boundaries of the hard rock aggregate resources shown on the plan attached to the direction were first identified in 1992. It should however be noted that the Dunmore Hard rock resource extends beyond the area shown on **Figure 1.4**. **Figure 1.4** also shows the area of sand within the adjoining Dunmore Lakes Sand Resource that is also covered by a Section 117(2) direction.



1.5.2 Regional Planning Issues

Illawarra Regional Environmental Plan No. 1 (IREP No. 1) applies to the Project Site and the proposed development. IREP No. 1 was gazetted in April 1986 to provide a broad framework for coordinated action between various State government authorities in respect to development of the Illawarra region comprising the Wollongong, Shellharbour, Kiama, Shoalhaven and Wingecarribee Local Government Areas. The objectives of the plan include the following.

- To place certain requirements on developments.
- To provide information and guidance to local Councils with respect to local environmental plans.
- Defining the extent of interest of the State Government through the then Department of Urban Affairs and Planning (DUAP).
- Identifying DUAP's attitude and position on a wide range of environmental, social and economic issues.

Under IREP No. 1, sections of the land within the Project Site, including the rail siding and access road to the Princes Highway are identified on the following plans.

- Land of Prime Crop and Pasture Potential;
- Land Supporting Rainforest Vegetation Species; and,
- Land containing Extractive Materials.

Figure 1.5 displays the locations of these attributes with respect to the Project Site Boundary. Under IREP No. 1, the land within the proposed limit of disturbance is comprised of solely "Land containing Extractive Materials". None of the area identified as "Land Supporting Rainforest Vegetation Species" occurs within the proposed limit of disturbance.

The objectives and other provisions noted in IREP No. 1 relating to land containing extractive material are as follows.

"32. The objectives relating to extractive materials are -

(a) to manage the extractive resources of the region in a co-ordinated manner so as to meet community needs while ensuring that adverse impact on the environment and the community is minimal;

(b) to ensure that development proposals for land containing extractive resources are assessed in relation to the potential problem of rendering those resources unavailable; and

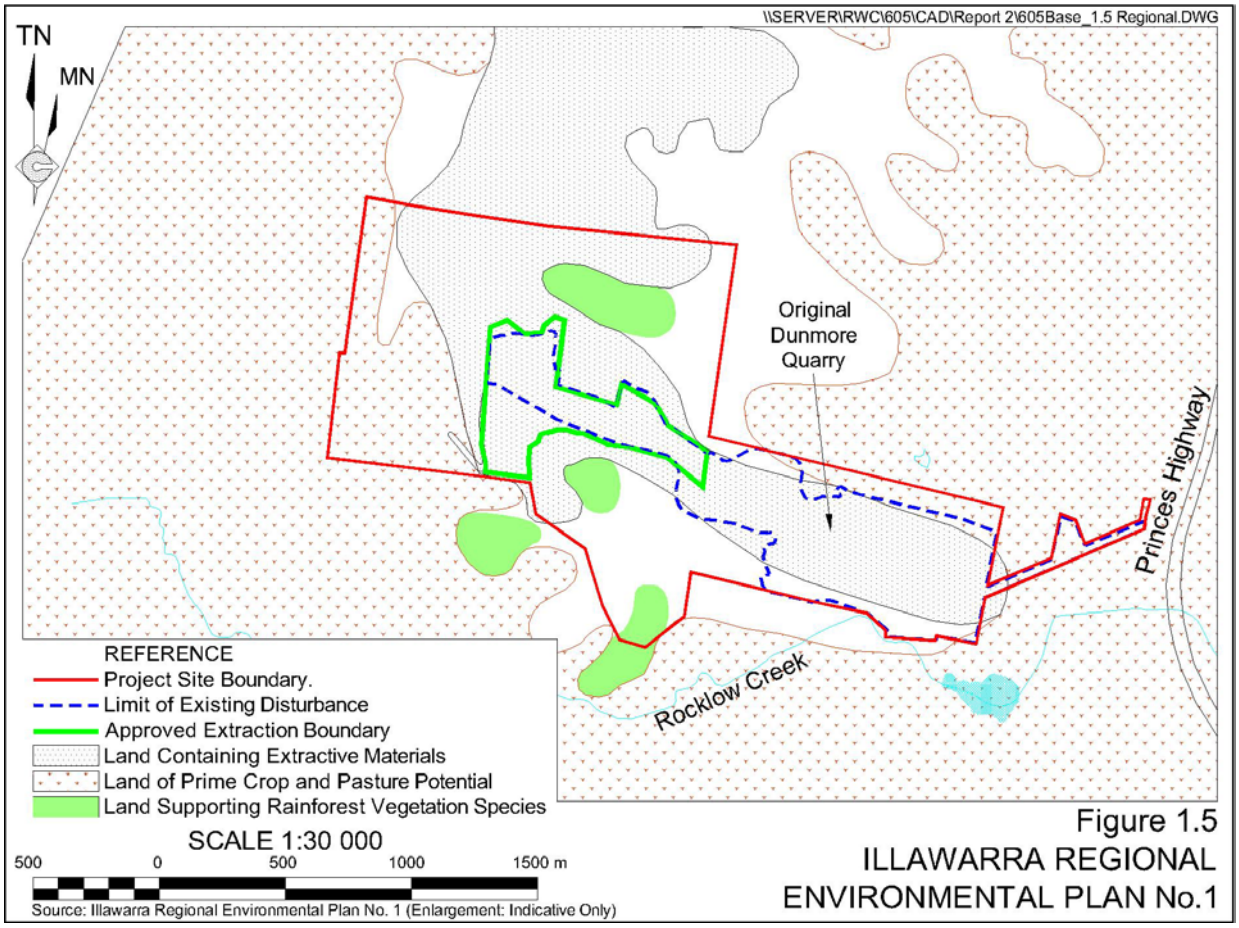


Figure 1.5
ILLAWARRA REGIONAL ENVIRONMENTAL PLAN No.1

(c) to ensure that the transportation of extractive materials has a minimal adverse impact on the community and that the transportation of large volumes of extractive materials shall by-pass urban areas where possible.

33. (1) The consent authority shall not consent to a development application for consent to carry out development on land identified on the map as land containing extractive materials otherwise than for the purposes of -

(a) extractive industries and related purposes;

(b) agriculture and associated purposes;

(c) local road; or

(d) home industries,

without the concurrence of the Director.

(2) In deciding whether to grant concurrence under subclause (1), the Director shall take into account -

(a) the impact the proposed development, if carried out, would have on the availability of extractive materials; and

(b) whether the benefit to the community of the proposed development, if carried out, is greater than the costs to the community of refusing consent to the development application, redesigning or relocating the development or rendering the extractive materials unavailable.

34. A draft local environmental plan for urban development on land identified on the map as containing extractive materials or for adjacent land shall be prepared only after the consent authority has consulted the Secretary of the Department of Mineral Resources and considered -

(a) the impact the proposed development is likely to have on the availability of the particular resources, or on any current resource extraction operations;

(b) whether the development would render that resource unavailable, and considered this cost to the community when compared with costs to the community of not permitting the development; and

(c) whether provision can be made for compatible land uses adjacent to areas of present or likely future resource extraction.

35. When practicable, the consent authority should consider attaching to appropriate development consents a condition requiring the transport of extractive materials or other bulk freight by other than road haulage."

1.5.3 Local Planning Issues

The relevant local planning instrument for the Project Site is Shellharbour City Council's Local Environmental Plan 2000, with the Project Site zoned 4(c) Extractive Industrial and 7(d) Environmental Protection (Scenic) (see **Figure 1.6**). The extraction activities are wholly contained within the 4(c) zone and are a permissible use. The office, weighbridge, laboratory, rail siding and related activities are located within the 7(d) zone and are not a permissible use in this zone given they are associated with an extractive industry. Notwithstanding this zoning, the activities within the 7(d) zone are lawful given the existing use right provisions set out in Section 107 of the *Environmental Planning and Assessment Act 1979*.

There are no Development Control Plans relevant to the Project Site or the activities on the Project Site. It is also noted that Council's Section 94 Contributions Plan does not relate to the proposed development as Boral is the sole user of Tabbita Road and trucks travel directly onto the Princes Highway. Boral fully maintains Tabbita Road.

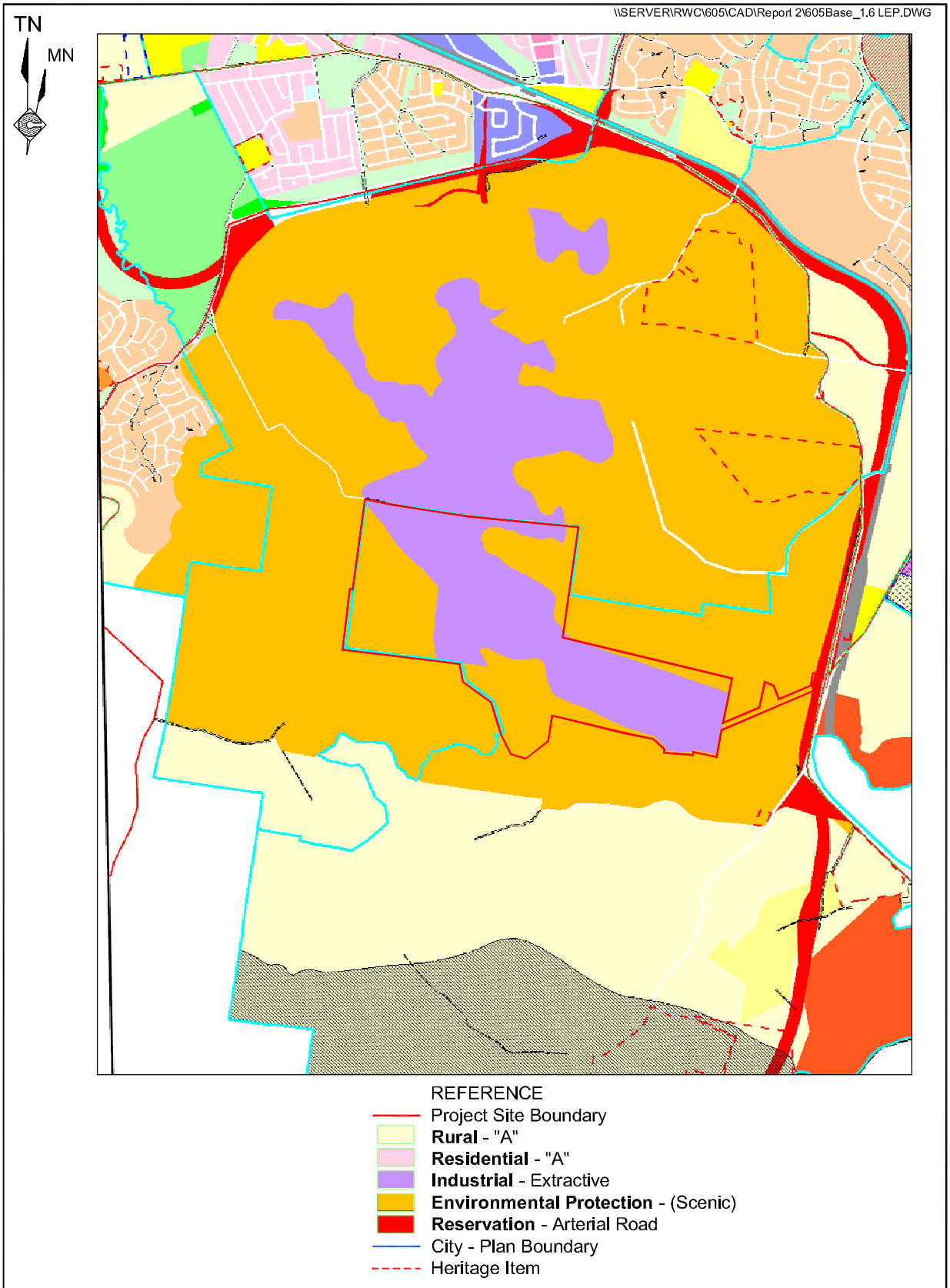


Figure 1.6
SHELLHARBOUR LOCAL ENVIRONMENTAL PLAN 2000

Under the Draft Shellharbour Rural Local Environmental Plan (DSRLEP) 2003, it is proposed to zone the Project Site 1(x) Extractive Industry Zone and 1(rl) Rural Landscape Zone. It is noteworthy that the entire Project Site lies within the area defined as Land Containing Mineral Resources of State and regional significance.

The area defined by Zone 1(x) on the Project Site under the DSRLEP, 2003 is identical to the Shellharbour LEP 2000 zone 4(c) Extractive Industrial and as such it is proposed that extraction activities within the Project Site are permissible. It is noted that the area zoned 1(x) actually covers a smaller area than identified in the Section 117(2) Direction. Zone 1(rl) Rural Landscape Zone would technically continue to prohibit quarry-related activities such as the office, weighbridge, laboratory and rail siding although under Part 2 clause 17(1) "Objectives of the Zone "the DSRLEP states:

One of the primary objectives of the Rural Landscape Zone is to provide for compatible land use adjacent to areas of present or likely future mineral resources of State or regional significance. Clearly, activities related to an approved extractive industry would be compatible with that area.

Boral has made representations to Shellharbour City Council to ensure that the resources on the Company's land are fully recognised within the DSRLEP and that matters relating to extraction, processing and product transportation are recognised when providing limitations on adjoining land uses.

1.6 CONSULTATION

1.6.1 Government Consultation

During the preparation of the EIS, the following government agencies were consulted and invited by the Department of Infrastructure, Planning and Natural Resources (DIPNR) to attend an on-site Planning Focus Meeting on 24 June 2003. DIPNR coordinated the organisation of the Planning Focus Meeting given the State significant status of the proposed development.

- PlanningNSW (now DIPNR)*
- Environment Protection Authority * (now Department of Environment and Conservation)
- Department of Mineral Resources *
- Roads and Traffic Authority*
- Department of Land and Water Conservation (now DIPNR)
- National Parks and Wildlife Service
- Shellharbour City Council

Representatives of those agencies marked with an asterisk (*) attended the meeting. All authorities forwarded their written requirements to either PlanningNSW or R.W. Corkery & Co. Pty Limited following the Planning Focus Meeting. Copies of all written requirements are included in **Appendix 2** together with a reference to where each requirement is addressed in the EIS. A written response was not received from Shellharbour City Council.

The issues raised by the representatives of the four government agencies at the Planning Focus Meeting are presented in **Table 1.1**, with a reference provided after each issue to the section(s) of the EIS that contain text and/or figures related to each issue.

It is noted that at the time of the Planning Focus Meeting, Boral was contemplating increasing annual production at the Dunmore Quarry to 3.5 million tonnes per annum. During the course of the preparation of the EIS, the Company's strategic review resolved to confine the increase in production to 2.5 million tonnes per annum.

TABLE 1.1

Issues Raised by Government Agencies during the Planning Focus Meeting

Page 1 of 2

Issue	Coverage in EIS
Department of Infrastructure, Planning and Natural Resources	
• Flora/fauna/Aboriginal heritage studies required within the area of existing use rights and updates where appropriate on land previously approved for extraction and related activities.	5.5, 5.7
• A case should be made for a development consent duration of greater than 20 years.	3.8.2
• Negotiated agreements with affected parties should be in place before the EIS is lodged.	4.4.1
• The Department would prefer that the EIS contains sufficient detail about site activities rather than relying on a subsequent Environmental Management Plan to provide the required level of detail. This particularly relates to the location/extent of environmental monitoring.	5.1.7, 5.3.6.9 5.4.7
• The cumulative impacts of the Stage 2/Stage 3 Dunmore Lakes Sand Extraction proposal will need to be addressed.	5.3.6.7, 5.6.4.3
• Detailed air quality and noise/vibration assessments need to be undertaken.	5.4.5, 5.3.6
• Identify in EIS the extent of reduction in road haulage through the continued use (and expansion) of rail haulage.	5.6.3
Environment Protection Authority (now Department of Environment and Conservation)	
• EPA would encourage the management of issues relating to air quality, noise/vibration, and water to be undertaken in accordance with best practice.	5.4, 5.3, 5.1
• The current Environment Protection Licence (No. 77) will need to be modified to accommodate the planned production increase above 2Mtpa – as a consequence, the proposed development will be "integrated development".	3.2

TABLE 1.1

Issues Raised by Government Agencies during the Planning Focus Meeting

• The additional hours of operation need to be justified instead of increasing the hourly throughput by use of extra processing equipment.	3.12
• The use of alternative products (e.g. slag) instead of hard rock products.	1.4.2, 3.12
• EPA's objective of no visible dust from the quarry site remains. Assessment needed of deposited dust, TSP and PM_{10}.	5.4
• Provide a comparison of vehicle kilometres travelled by trucks-v-rail movements.	5.6.3.6
• Surface water management needs to be addressed on a catchment basis and site – specific basis.	5.1
• A comprehensive noise assessment will be required in accordance with the Industrial Noise Policy and Environmental Criteria for Road Traffic Noise.	5.3
• A blasting assessment is required – although no changes are planned to the size of the blasts.	5.3.6.8
• All wastes/by-products generated on site should be characterised (including quarry fines) and management strategies outlined.	2.11, 3.9
• EIS to outline environmental management systems in place and planned to manage environmental issues at the quarry.	1.8
• Rehabilitation practices and quarry end use should be outlined.	2.13, 3.11
• EIS should identify likely/proposed changes in surrounding land use.	5.9.3
• Encourage community consultation.	1.6.2
Roads and Traffic Authority	
• Identify impacts of train movements on highway traffic.	5.6.4
• A full traffic assessment is required addressing % road/% rail; product volumes over the years (relating to Princes Highway upgrade stages); intersection analysis (Princes Highway and Tabbita Road/Shellharbour Road); impacts on road pavements/need for pavement rehabilitation; impacts on Mt Ousley traffic.	5.6
• Clearly define activities in EIS e.g. production, extraction, sales.	Glossary
• Restricted access may occur periodically during the construction of the North Kiama By-pass and Oak Flats to Dunmore section of Princes Highway upgrade.	3.6.3.1
Department of Mineral Resources	
• Supply details of quality/quantity of resources in extraction area.	2.4, 3.3
• Include details of production in previous years.	On DMR file
• All future production data to be supplied to DMR.	1.8.2

1.6.2 Community Consultation

The local community around the Dunmore Quarry effectively falls into three groups.

1. Adjoining Landholders
2. Dunmore Village
3. Dunmore Lakes Estate

Adjoining Landholders: Boral has maintained regular contact with many of the adjoining landholders given issues of mutual interest (e.g. fencing) and the regular need for access to monitor quarrying activities. Boral has informed all adjoining rural neighbours about the current trial and its plans to lodge a development application for the production increase.

The principal issues raised by adjoining landholders regarding the current operations relate to noise, blasts and dust.

Dunmore Village: Boral hand-delivered an introductory newsletter to each residence adjacent to Shellharbour Road, Dunmore Village seeking feedback on the current trial period and identification of issues to be addressed in the EIS.

Feedback was received from one Dunmore Village resident who expressed concern regarding trucks travelling on Shellharbour Road late at night. Discussions with the resident established that the offending trucks were not travelling to or from Dunmore Quarry but rather another nearby quarry.

Dunmore Lakes Estate: Boral hand-delivered an introductory letter to all residents informing them of the current trial seeking any feedback about any adverse environmental effects. The residents were subsequently invited to an inspection of the quarry and to identify the issues that they would like addressed in the EIS. Issues raised during the site inspection also focussed on noise, blasting and dust.

All residents at the site meeting acknowledged the need for the quarry and its products but would like the above issues managed, particularly noise from the primary screen house.

Boral's compliance with matters relating to noise, blasting and dust and the issues raised during the community consultative program are discussed in **Sections 5.3 and 5.4.**

Boral intends to continue its pro-active consultation with the local community surrounding the Dunmore Quarry to ensure that the community is well informed about the Company's activities and that the Company is well aware of the level of its environmental impact upon the local community so that it can address and manage these impacts.

1.7 SUSTAINABLE DEVELOPMENT PRINCIPLES

1.7.1 Introduction

Boral is committed to the operation of the Dunmore Quarry in a manner that reflects the integration of the principles of sustainable development and progressively works towards the adoption of best practice environmental management across all activities within the quarry.

This section provides a background on the principles of sustainable development and briefly introduces how Boral has addressed the principles of sustainable development in its plans to increase production at the Dunmore Quarry. A brief discussion is provided on the best practice environmental management practice that Boral is working towards. Section 6 of this document evaluates how the principles of sustainable development have been addressed throughout the various stages of the environmental impact assessment process.

1.7.2 Background

History of Sustainable Development Principles
In 1987, sustainable development was first defined as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Report). Since that time, the concept of sustainable development has evolved and developed to reflect the outcomes from various global conferences, and contributions from various governments, corporations and institutions. In 1992, the Agenda 21 Agreement arising from the Rio Earth Summit classified sustainable development in the following broad themes:

- quality of life;
- efficient use of natural resources;
- protection of global commons;
- management of human settlements; and
- waste management.

"Sustainable economic growth" was subsequently added as a sixth theme in 1997 by the World Bank.

In 1992, the Council of Australian Governments adopted the term "ecologically sustainable development" (ESD) to reflect the growing emphasis upon natural ecologies and ecosystems. When the National Strategy for Ecologically Sustainable Development (NSESD) defined ESD at that time as development that aims to "*meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations"*.

ESD Guiding Principles

Four guiding principles arose from the Inter-government Agreement on the Environment in 1992:

1. The Precautionary Principle

This principle states that "where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation". In the application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and

(ii) an assessment of the risk-weighted consequences of various options.

To satisfy this principle, emphasis needs to be placed upon anticipation and prevention of environmental damage, rather than reacting to it.

2. Social Equity: Intra- and Inter-Generational Equity

This principle is based on social equity in the decisions taken today for the current generation (intra-generational) and future generations (inter-generational).

Intra-generational equity requires that the economic and social benefits of the proposed development be shared equitably among all members of the community. This involves respect for groups and individuals throughout the community.

Inter-generational equity requires that "the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations". In other words, the present generation should pass onto the next generation an environment that does not limit the ability of future generations to attain a quality of life at least equal to the current generation.

3. Conservation of Biological Diversity and Ecological Integrity

Biological diversity or biodiversity describes life forms and is usually considered at three levels: genetic diversity, species diversity and ecosystem diversity. Ecological integrity describes the condition of an ecosystem that is relatively unaltered from its natural state. The maintenance of these ecological processes and systems are essential for elements of life such as food and shelter, however, they should not be exploited to the detriment of plants, animals and non-living elements.

4. Promotion of Improved Valuation, Pricing and Incentive Mechanisms

This principle involves consideration of the materials being extracted and processed and the surrounding environmental resources (e.g. air, water, land and living things) which may be affected. The valuation and pricing of the extracted and processed materials comprises the cost of extracting, processing and rehabilitation costs, profit, delivery costs and the final cost to the customer.

5. Sustainable Development in Legislation

The NSW Government incorporated the above four principles within Schedule 2 of the *Environmental Planning and Assessment Act 1979* for proponents to address in Environmental Impact Statements for new and amended projects. The NSW draft guideline on "Sustainability in Environmental Impact Assessment" identified that there is now a "broader concept of "sustainability" with a stronger focus on the integration of environmental, social and economic goals throughout society and economic development activity".

6. Ecologically Sustainable Use of Natural Resources

Article 10 of the World Charter for Nature adopted by the United Nations in 1982 stated "non-renewable resources which are consumed as they are used shall be exploited with restraint taking into account their abundance and rational possibilities of converting them for consumption, and the compatibility of their exploitation with the functioning of natural systems".

The concept of not wasting natural resources recognised in 1982 has continued throughout many sustainability themes, particularly those relating to social equity.

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* defines ecological sustainable use of natural resources as:

"Use of natural resources within their capacity to sustain natural processes while maintaining the life support systems of nature and ensuring that the benefit of the use to the present generation does not diminish the potential to meet the needs of future generations."

1.7.3 Boral's Approach to Sustainable Development Principles

Throughout the preparation of this document, consideration of sustainable development principles was included during:

- the identification of the objectives for the proposed development (see Section 3.1);
- the design of the components to achieve an increase in production (Section 3); and
- the integration of design and operational safeguards into all project components (Section 5).

Emphasis was placed upon identifying all relevant issues and understanding the features of the biophysical environment prior to the design of the proposed development and the necessary mitigation measures towards the design of a sustainable proposal. The assessment also considered both short- and long-term impacts of the proposed as well as the cumulative impact attributable to the on-site concrete batching plant and proposed san extraction operation.

1.7.4 Boral's Approach to Best Practice Environmental Management

Boral recognises that its approach to environmental management is based on continual improvement and setting realistic priorities to achieve the standards recognised by the Government, industry and the community as best practice.

For the past five years, Boral has been progressively upgrading the Dunmore Quarry processing plant and at the same time introducing additional controls for noise and dust. Achieving best practice requires a combination of monitoring to assess performance and the progressive introduction of controls to achieve a cost-effective and successful outcome.

Boral is fully aware of industry guidelines such as those following compiled by Environment Australia to document best practice environment management in mining. These are being used by Boral as a guide to achieve its continual improvements:

- Community Consultation and Involvement
- Environmental Management Systems
- Environmental Monitoring and Performance
- Rehabilitation and Revegetation
- Environmental Auditing
- Noise, Vibration and Airblast Control
- Dust Control
- Water Management

Boral's approach to Best Practice Environmental Management incorporates elements of the industry-recognised cleaner production principles. To date, Boral has addressed the following elements.

- Planning and leadership – through the Company's Environmental Policy, identification of environmental responsibilities and training.
- Information collection – through internal reviews and evaluation/research of by-products.
- Initial assessments – through detailed environmental assessments of noise and dust and general assessment of other environmental issues.
- Audits – including six monthly internal audits, annual returns and reports complying with Development Consent conditions.

Given the type of products produced by the quarrying industry, opportunities to incorporate life cycle assessments in management decisions are limited.

1.8 ENVIRONMENTAL MANAGEMENT AND DOCUMENTATION

1.8.1 Environmental Management

Boral embraces the principle of sustainable development, i.e. development which meets the needs of the present without comprising the ability of future generations to meet their own needs. This principle is fundamental to Boral's continued success and growth. Specifically Boral is committed to:

- conducting its operations to minimise and, wherever practicable, eliminate adverse environmental impacts;
- continual improvement of its environmental performance including regular review and the setting of rigorous environmental objectives and quantified targets (particularly with regard to the efficient use of energy, conservation of water, minimisation and recycling of wastes, prevention of pollution and effective use of virgin resources and supplemental materials);
- open, constructive dialogue with communities surrounding its operations;
- reducing the greenhouse gas emissions of its processes and facilities;
- complying with environmental legislation, regulations, standards and codes of practice relevant to the particular business as the absolute minimum requirement in each of the communities in which it operates;
- conducting business with suppliers and contractors who also have a commitment to the values and objectives contained in Boral's environmental policy; and
- remediating its contaminated sites to standards internationally acceptable for the site purpose.

Boral is focused on ensuring that its businesses are sustainable in environmental, social and employee impacts. Boral has developed a Sustainability Self Diagnostic Tool (BSSDT) to measure and monitor the sustainable development status of each of Boral's business divisions to enable the establishment of plans and improvement targets. Arising from this assessment each business identifies two projects to be implemented to improve the sustainability as a business. Metro Quarries is proposing to include Dunmore Quarry as one of its projects. More information regarding this tool is available in Boral's Annual Review 2003.

At a site level, the ultimate responsibility for environmental management at the quarry lies with Paul Martinkus, Southern Operations Manager for Boral Quarries who is based at Dunmore Quarry. He is supported by Ion Dumitru, Technical and Product Development Manager and Tony Zdrilic, Environmental Manager.

A systematic approach is taken to all environmental issues with the recognition that training of on-site and off-site personnel underpins the company's environmental performance.

1.8.2 Environmental Documentation

Boral operates its quarries with a range of documentation to ensure that all relevant environmental issues are managed in a pro-active manner. This documentation and environmentally-related activities include the following.

- A Quarry Method Statement and Management Plan for Croome Farm Extraction Area.
- 6 monthly environmental internal audits.
- Environmental training of staff.
- Annual environmental reports for Croome Farm submitted to Shellharbour City Council.
- A 5 year environmental report for RIC land submitted to Shellharbour City Council.
- Monthly reports for the current 9 month trial.

Boral proposes to continue to prepare an annual report to record the progress on site, the results and evaluation of environmental monitoring, compliance issues and the plans for the succeeding 12 months. Statutory reporting would also continue such as the annual return for Environment Protection Licencee No 77 (to the Department of Environment and Conservation) and annual production records to the DMR.

1.9 MANAGEMENT OF INVESTIGATIONS

The preparation of this document has been managed by Mr Robert Corkery, B.Sc.(Hons), M.Appl.Sc., Principal of R.W. Corkery & Co. Pty. Limited. Mr Warren Cooper B.Sc.(Hons), M.Env.Man., Environmental Consultant with R.W. Corkery & Co. Pty. Limited assisted with the preparation of the document.

Assessments relating to various technical aspects of the proposed development and the surrounding environment have been prepared by the following specialist consultants.

- Richard Heggie Associates Pty Ltd (Noise and Blasting Assessment).
- Holmes Air Sciences (Air Quality Assessment)
- Transport and Urban Planning Pty Ltd (Traffic Assessment)
- Kevin Mills and Associates Pty Ltd (Flora/Fauna Assessment)
- Robert Paton Archaeological Studies Pty Ltd (Aboriginal Heritage Assessment)

The preparation of the document was managed within Boral by Mr Ion Dumitru – B.Sc. (Hons), Technical and Product Development Manager. He was assisted by:

- Mr John Worden – B.E., MBA – Development Manager;
- Ms Judy McKittrick, BA. DipEd. M.Env.Plan, Manager: Environment, Planning and Development; and
- Mr Tony Zdrilic, B.App Sc – Environmental Manager.

Section 2
The Existing Operations

PREAMBLE

This section outlines the component activities of the existing operations. All of these activities are either currently approved by Shellharbour City Council or are lawful given their existing use rights status.

The existing operations described relate to all activities undertaken to extract, process, store and despatch the range of hard rock quarry products and by-products produced at the Dunmore Quarry. Also included in this section is an overview of the concrete batching plant on site. Although operated by another corporate identity within the Boral Group, the plant uses aggregates produced at the quarry and contributes to the overall environmental impacts of the site.

This section describes the existing operation in terms of the activities approved between 1986 and 1994 and most recently adjusted to enable a 9 month trial to be conducted of extended hours of operation.

2.1 INTRODUCTION

The existing operations at the Dunmore Quarry comprise a wide range of individual yet related activities that collectively enable Boral to produce a range of high quality aggregates and construction materials for markets throughout the Illawarra and Sydney area.

Figure 2.1 displays the layout within the Project Site with each of the following activities identified.

- The original Dunmore Quarry.
- The current extraction areas Croome Farm/Rail Infrastructure Corporation (RIC).
- A processing plant area incorporating staged crushing and screening facilities.
- Quarry product stockpile areas.
- Quarry fines stockpile areas.
- A concrete batching plant.
- An office, carpark, and weighbridge.
- A workshop/maintenance area.
- A rail siding for the loading of product for rail haulage.
- A laboratory for testing products.
- Water control structures which include dams, pumps and water tanks.
- An explosives magazine (for emergency use only).
- A site meteorological station.

This section provides a detailed description of all of the site activities undertaken by Boral. A description is also provided of the concrete batching plant operated by an associated company, namely Boral Concrete and Quarries (Country) Pty Ltd, as this related activity is located wholly within the Project Site.

The description of the existing operations throughout this section covers all currently approved activities, including the hours of operation permitted during the current trial – see Section 2.10.1.

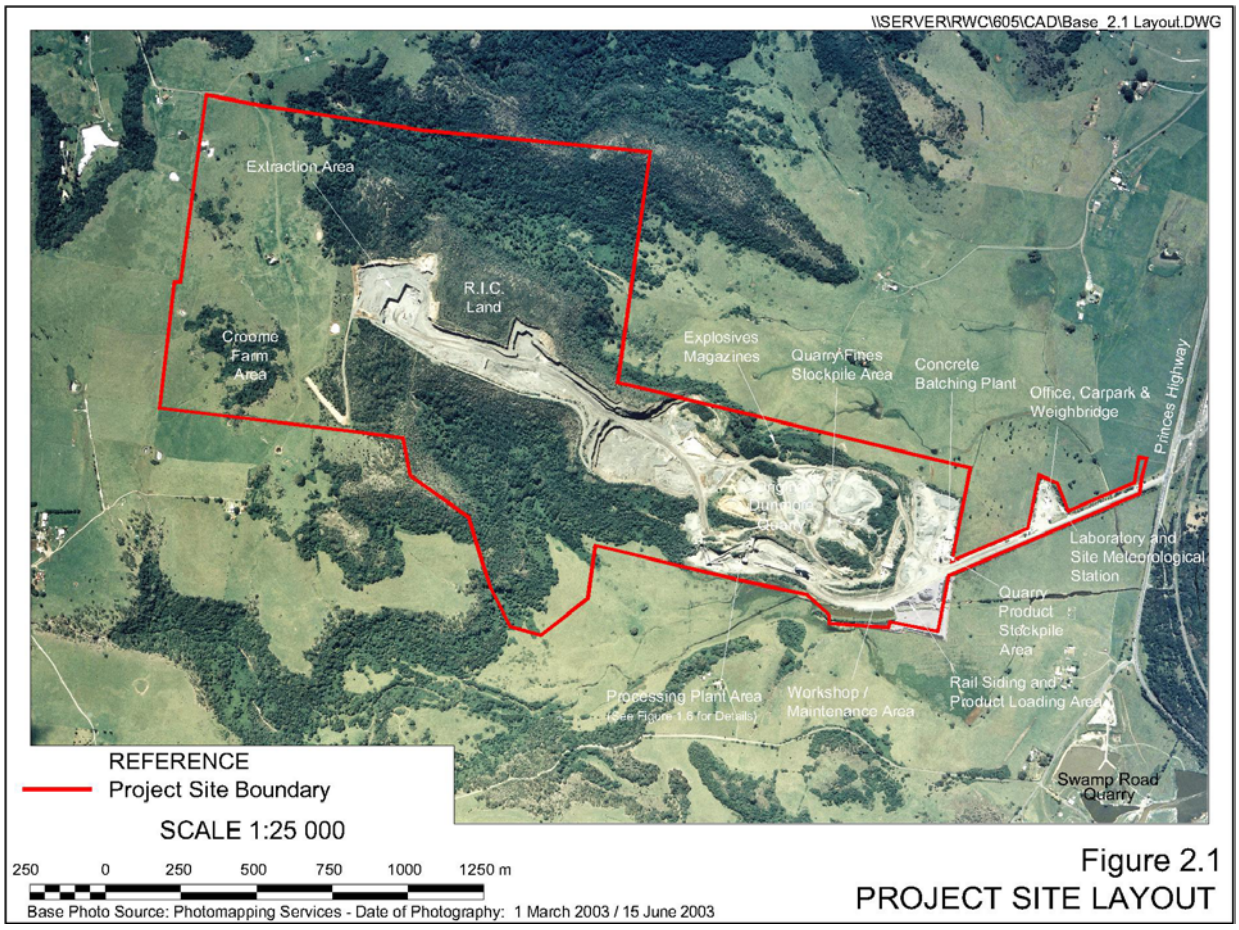


Figure 2.1
PROJECT SITE LAYOUT

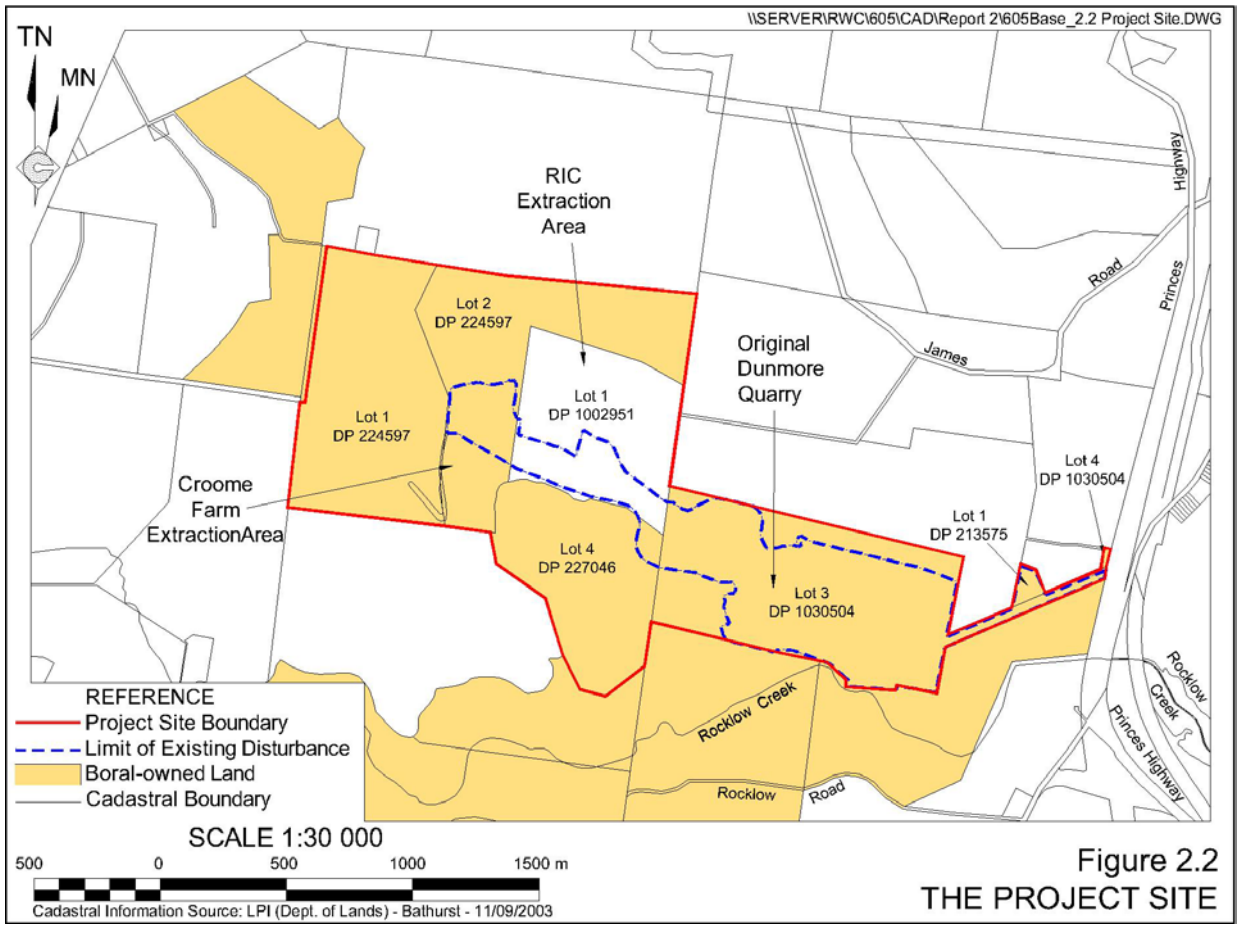
2.2 PROJECT SITE

Dunmore Quarry is located on Lot 1, DP 213575; Lots 3 and 4, DP 1030504; Lot 4, DP 227046; Lot 1, DP 1002951; and Lots 1 and 2, DP 224597. These lots are collectively referred to as the "Project Site" i.e. the area covered by the current Development Application. **Figure 2.2** shows the location of each of these lots while **Table 2.1** lists the area of each lot and area of approved disturbance within each lot.

TABLE 2.1

Land Titles within the Project Site

Lot Number	DP Number	Area (ha)	Area of Approved Disturbance (ha)	Area Currently Disturbed (ha)
1	224597	53.2	0.4	0.4
2	224597	49.7	14.2	6.6
1	1002951	37.4	10.6	10.0
4	227046	36.7	Nil	1.3
3	1030504	68.0	68.0	51.8
4	1030504	0.2	0.2	Nil
1	213575	1.2	1.2	1.2
	TOTAL	**246.4**	**94.6**	**71.3**



The Project Site can be divided into three areas that reflect the different periods of the quarry's development and the various development consents that have been issued to Boral.

1. The original Dunmore Quarry (Commenced 1921) located on Boral-owned land.

2. The central extraction area referred to as Rail Infrastructure Corporation (RIC) extraction area located on land leased to Boral for which a production royalty is applied to any material extracted from this area. Extraction within this area commenced in 1986 with the intent to provide an internal low-level access to the Croome Farm extraction area.

3. The western area, referred to as Croome Farm extraction area, is owned by Boral. Extraction commenced in this area in 2000.

2.3 EXISTING APPROVALS AND LICENCES

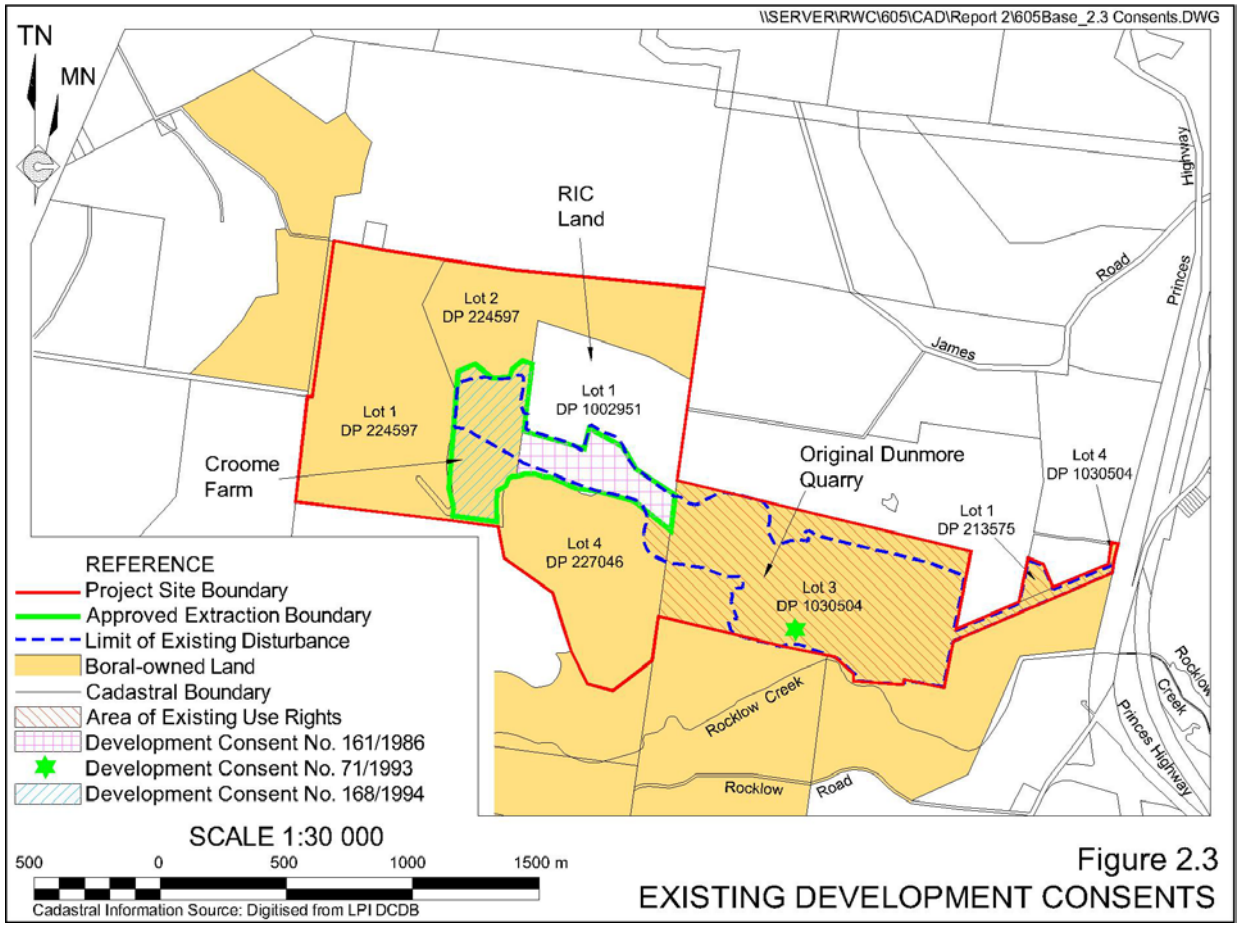
Operations within the Project Site are authorised by a combination of existing use rights and three Development Consents issued by Shellharbour City Council. Each approval is listed in **Table 2.2** with the area covered by each approval shown on **Figure 2.3**. It is noted that each Development Consent has different approved hours of operation. Each of the three Development Consents was modified by Shellharbour City Council on 13 March 2003 to extend the approved hours of operation for a 9 month period commencing after the installation of a range of additional dust and noise mitigation measures. The 9 month trial commenced on 9 July 2003 and is due to cease on 9 April 2004. Boral plans, through the Development Application discussed in this document, to permanently extend the hours of operation for site activities.

TABLE 2.2

Approvals for the Dunmore Quarry Operations

Area	Approval	Conditions of Consent	
		Extraction Rate	**Hours of Operation***
Original Dunmore Quarry	**Existing use rights**. Shellharbour City Council has acknowledged Boral has existing rights over this area in which hours of operation, sales, maintenance and volumes to be extracted are not limited.	No limit	No limitations on any activity
Rail Infrastructure Corporation Land	**Development Consent No. 161/1986**. This consent originally allowed the extraction of approximately 10 million tonnes.	450 000tpa	Extraction: Mon-Fri: 6.00am-4.00pm Sat: 6.00am-noon Maintenance: Mon-Fri: 2.30pm-10.30pm Sat: noon-4.00pm This condition does not set restrictions on sales and processing hours and no limits upon the amount of aggregate to be hauled by road.
Boral Land	**Development Consent 71/1993.** This consent allowed replacement and upgrading of the tertiary screen house.	NA	Mon – Sat: 6.00am to 6.00pm This consent effectively controls the hours of operation of the Processing Plant.
Croome Farm	**Development Consent No. 168/1994 (am 1).** This consent originally allowed extraction of approximately 15 million tonnes of hard rock.	750 000tpa	Extraction and Processing: Mon-Sat: 6.00am-6.00pm Sales: Mon-Sat: 5.00am-midnight Maintenance: Mon-Fri : 4.00pm-midnight Sat: 6.00am-6.00pm This consent limits road haulage of products to 500 000tpa

*Note: A 9 month trial period of extended hours applies to each Development Consent allowing extraction and processing between 6.00am and 10.00pm Monday to Saturday; sales between 5.00am and 12 midnight, Monday to Saturday; and maintenance, 24 hours per day, 7 days per week.



Dunmore Quarry also operates in accordance with Environment Protection Licence No. 77. This licence is renewed annually (Anniversary Date is 31 August) and nominates specific criteria that need to be satisfied with respect to blasting and nominates noise, blasting, dust and water monitoring requirements. The licence has been most recently updated on 8 July 2003 to accommodate the modifications relating to the 9 month trial period.

2.4 RESOURCES

The resources within the Project Site occur within the Bumbo Latite Member, a fine - grained intermediate volcanic rock similar to basalt. The latite occurs as distinct flows, termed the upper, middle and lower flows, all of which dip gently to the east at 2^{o} -3^{o}.

The upper flow ranges in thickness from 20m to 45m, the middle flow is more uniform in thickness averaging 35m to 36m and the lower flow has a thickness that ranges from 25 to 30m. The upper flow rests directly above the middle flow whereas the middle and lower flows are separated by a layer of breccia-agglomerate that ranges from 5m to 20m in thickness. Current extraction activities have concentrated on the upper and middle flows in the Croome Farm and RIC extraction areas. The latite has excellent physical and chemical qualities for concrete and asphalt aggregates, ballast and a range of other materials.

The latite resources, in the approved extraction areas within the Dunmore Quarry are currently estimated at approximately 29 million tonnes (Mt). Approximately 12Mt and 5 Mt respectively remain in the Croome Farm and RIC extraction areas, i.e. comprising latite from the middle and upper flows. The resource within the Croome Farm extraction area is calculated to the current approved depth of extraction, namely 107mAHD. The original Dunmore Quarry contains approximately 2.5 million m^3 of breccia-agglomerate above approximately 12 Mt of latite in the lower flow.

2.5 EXTRACTION OPERATIONS

2.5.1 Approved Extraction Areas

Figure 2.4 displays the approved limit of extraction allowable under the current Development Consents and the original Dunmore Quarry within the Project Site, and the approximate extent of extraction at the end of September 2003. **Figure 2.5** displays the current layout of the entire quarry based on detailed mapping undertaken in March 2003.

Historically, extraction has occurred in the area known as the original Dunmore Quarry. Extraction operations are currently centred on the Croome Farm and RIC extraction areas.

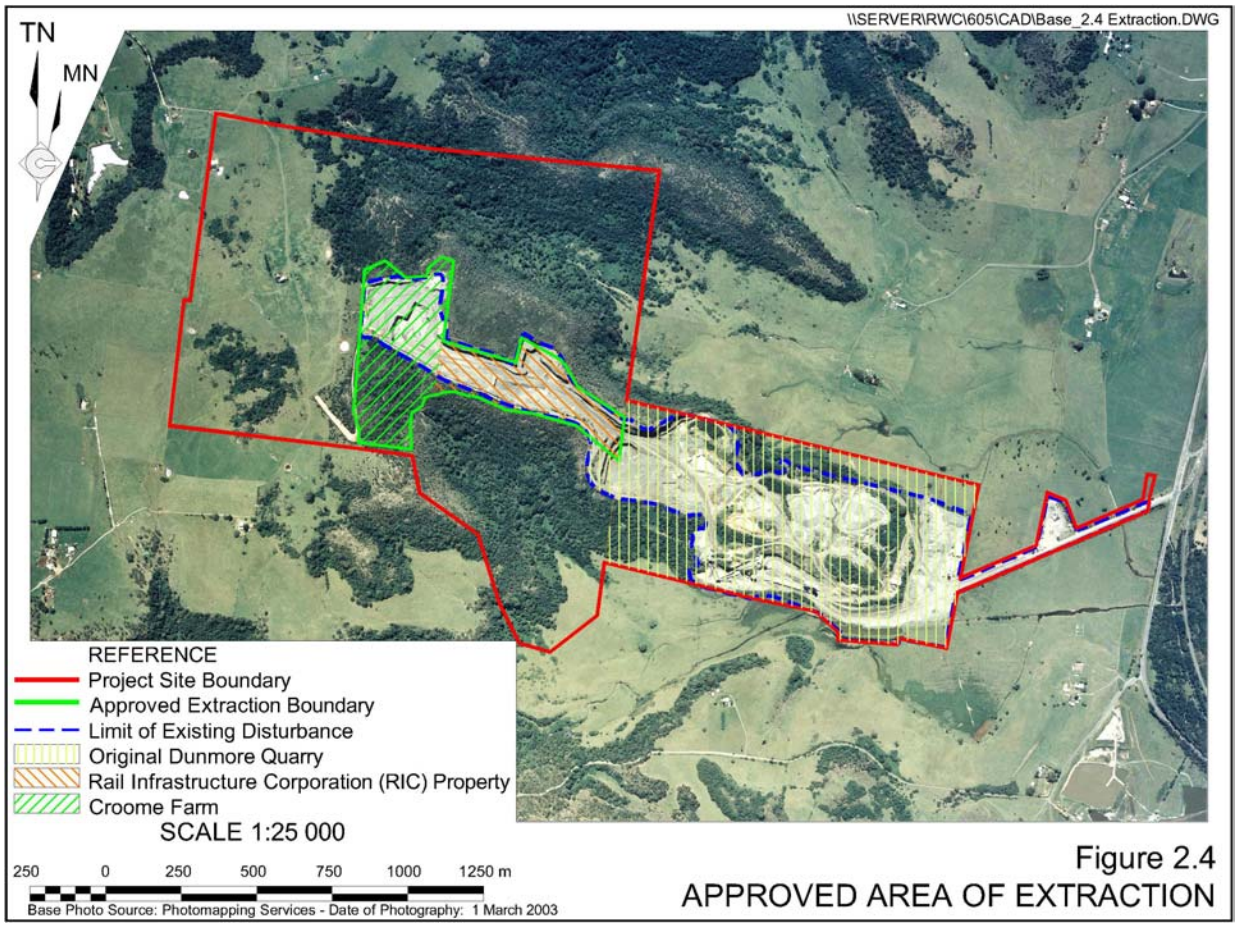
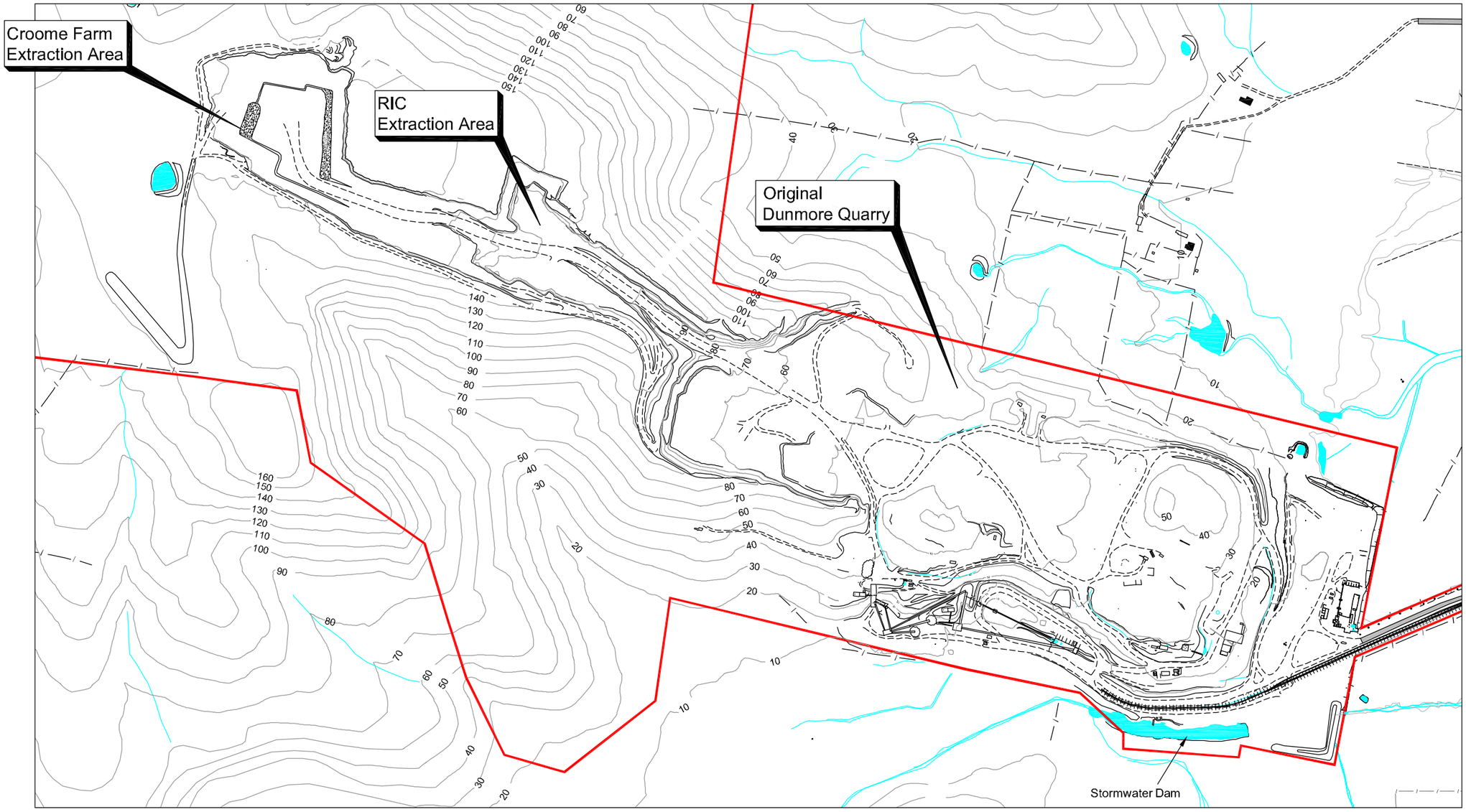


Figure 2.4
APPROVED AREA OF EXTRACTION

\\SERVER\RWC\605\CAD\Report 2\605Base_2.5 Existing.DWG

TN
MN



REFERENCE
Project Site Boundary
Unsealed Road
Fence
250 Contour (Interval = 10m)(m AHD)
Watercourse / Drain
Dam / Water Storage

SCALE 1:7 500

100 0 100 200 300 400 500 m

Base Map Source: Photomapping Services - Date of Photography 1 March 2003

Figure 2.5
EXISTING QUARRY LAYOUT

2.5.2 Extraction Area Design

Figure 2.6 shows the layout and design of the existing approved extraction area within the Dunmore Quarry. The existing principal design parameters of the overall extraction area are set out below.

Face Heights:	15m to 20m
Bench Widths – Final:	10m minimum
Haul Road Widths:	20m (approx)
Haul Road Grade:	Variable and in accordance with manufacturer's safety guidelines.

Original Dunmore Quarry
The existing extraction floor in the original Dunmore Quarry slopes gradually to the east. Elevations of the floor vary from 30mAHD to 60mAHD and there are localised faces where some of the agglomerate has been extracted. The outer faces of the original Dunmore Quarry have been retained to assist in screening exposed extraction faces and stockpiled by-products on the quarry floor.

RIC Extraction Area
The extraction floor levels within the RIC extraction area rise gradually in a westerly direction at about 3% to 4% to meet the horizontal floor (and bench) levels in the Croome Farm extraction area. The extraction faces in the RIC extraction area are typically 15 to 17m high.

Croome Farm Extraction Area
The design of the approved extraction area provides for the creation of three benches in the upper and middle flows in the Croome Farm extraction area, namely at 148mAHD, 133mAHD and 118mAHD. The extraction floor in the Croome Farm extraction area is currently approved to 107mAHD. It is noted that the base of the middle flow occurs at levels that vary from 90mAHD to 104mAHD i.e. 3m to 17m below the approved level of extraction.

Figure 2.6 also shows a longitudinal section through the three extraction areas featuring the current approved limit of extraction and the various flows within each extraction area. The current extent of extraction is also superimposed on this section.

2.5.3 Extraction Method and Procedures

2.5.3.1 Introduction

The extraction method and procedures adopted at the Dunmore Quarry are standard for the quarrying industry where the emphasis is upon drilling and blasting to produce broken rock which is sufficiently small to enable it to be crushed into the required product sizes. The emphasis of the overall method and procedures is to safely produce the required quantity of broken rock within appropriate economies of scale and without causing any adverse environmental impacts for Boral's neighbours and the environment in general.

This sub-section outlines the component activities and procedures used by Boral within the existing extraction areas. To date, each of these activities has been undertaken within the Croome Farm extraction area in small stages each covering 2ha.

2.5.3.2 Vegetation Removal

The first activity involves the removal of all vegetation from the area to be developed for extraction. The vegetation is typically removed by a bulldozer pushing and stockpiling the pushed-up trees and shrubs beyond the limits of the extraction stage being cleared. The vegetation removed to date has been stockpiled on the margins of the active extraction area and within the regeneration area west of the Croome Farm extraction area for use in rehabilitation works in conjunction with the rehabilitation plan for the Project Site. None of the vegetation is burnt.

2.5.3.3 Soil Removal

Soil with any noticeable thickness is limited to the Croome Farm extraction area where soil development consists of reddish brown, friable to clayey loams. The soil in this area varies in thickness from less than 0.2m in the northern and central sections of the extraction area to up to 3m in the southern section of the extraction area. Soil development in the northern and central sections of the Croome Farm and RIC extraction areas is generally very poor with hard rock resource material virtually exposed on the surface.

Where the soil thickness exceeds 0.2m, it is pushed into windrows by a bulldozer and loaded into haul trucks with a front-end loader. The topsoil recovered to date in the Croome Farm extraction area has been used to assist in the revegetation of the acoustic bund wall that is being constructed progressively southwest of the Croome Farm extraction area. Any future excess topsoil from the Croome Farm extraction area would be stored in the original Dunmore Quarry until it is needed for revegetation activities. Soil stockpiles are typically less than 1.5m high and are allowed to regenerate naturally to limit erosion and generation of sediment-laden runoff.

2.5.3.4 Overburden Removal

Within the extraction areas, overburden is essentially weathered latite which, like the soil resources, is confined mainly to the Croome Farm extraction area. At least 120 000m^3 of the 130 000m^3 of overburden defined within the Croome Farm extraction area remains.

Any overburden encountered is similarly pushed up by a bulldozer and loaded into a haul truck by a front-end loader and transported to the nominated overburden stockpile areas – currently the acoustic bund wall being constructed progressively southwest of the Croome Farm extraction area. All excess overburden from the Croome Farm extraction area would similarly be stored on the floor of the original Dunmore Quarry. It is intended that all overburden is progressively returned to the completed extraction areas to provide a substrate for revegetation of the final benches (see Section 2.13).

\\SERVER\RWC\605\CAD\Report 2\605Base_2.5 Layout.DWG

TN
MN

Croome Farm Extraction Area

RIC Extraction Area

Original Dunmore Quarry

A

A'

* 107

* 95

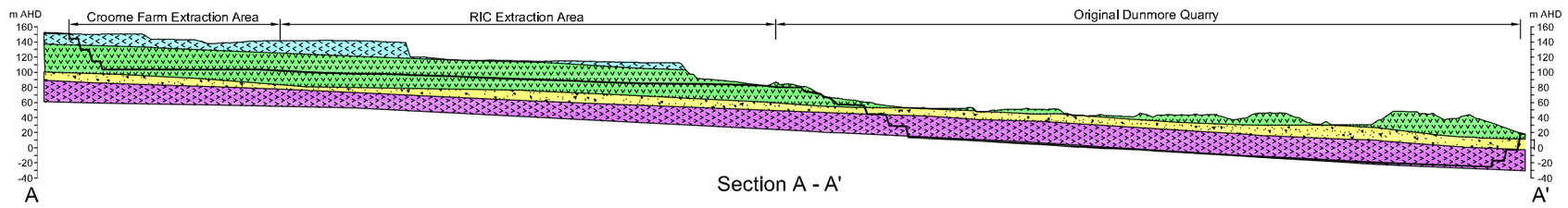
* 25

* -20

REFERENCE
- Project Site Boundary
- Unsealed Road
- Fence
- 250 Contour (Interval = 10m)(m AHD)
- * 95 Final Spot Height (m AHD)
- Watercourse / Drain
- Dam / Water Storage
- Upper Latite Flow
- Middle Latite Flow
- Breccia - Agglomerate
- Lower Latite Flow

Note: Ramps Removed for Clarity

Stormwater Dam



Section A - A'

SCALE 1:7 500

100 0 100 200 300 400 500 m

Base Map Source: Photomapping Services - Date of Photography 1 March 2003

Figure 2.6
EXTRACTION AREAS - LAYOUT AND SECTIONS

2.5.3.5 Blasting

Once exposed, the rock is drilled in a pattern designed to ensure maximum fragmentation and acceptable levels of ground vibration and airblast overpressure. The initial blasts are designed to produce an initial working bench, with subsequent drilling and blasting occurring to produce benches with a face height of 15m to 20m. Drilling of blast holes is currently undertaken on a campaign basis using an Atlas Copco hydraulic percussion drill rig. All blast holes are laser tracked to ensure the appropriate quantity of explosives are placed in each hole. All explosives are transported to the blast site on the day of the blast by a specialist blasting contractor. Blasting is permitted to occur between 8.30am to 5.00pm Monday to Friday, however, it typically occurs between midday and 2.30pm Monday to Friday. For logistical or safety reasons, occasional blasts need to be carried out before midday and occasionally as late as 4.30pm. However, these still occur within the approved hours of operation for blasting.

Details of the design and operational safeguards for blasting are set out in Section 5.4. Blasting currently takes place every 1 to 2 weeks with the average blast size varying from 10 000 tonnes to 90 000 tonnes depending on the location within the extraction area. An average blast would yield approx 50 000 tonnes of broken rock suitable for processing. **Plate 1** shows a completed 70 000t blast in the Croome Farm extraction area.

2.5.3.6 Oversize Rock

Currently, any blasted rock that is too large for direct feed into the primary crushing circuit is either retained for sale as rip rap or reduced in size by a mobile hydraulic rock breaker. Oversize rock is stored on the floor of the extraction area until sufficient quantities are accumulated to warrant the use of the mobile hydraulic rock breaker fitted to an excavator. The frequency and duration of use of the rock breaker is determined by the volume of oversize material produced during normal blasting operations. Typically, the hydraulic rock breaker is used for a period of approximately 15 days every 3 months, typically between 7.00am and 4.00pm. The use of the rock-breaker normally occurs in the section of the extraction area where the oversize rock has accumulated.

2.5.3.7 Load and Haul

The broken rock from blasting is loaded into either Caterpillar 773B or 775 haul trucks using a Caterpillar 992G front-end loader and transported directly to the primary crusher feed bin or the nearby surge stockpile.

During dry periods, dust suppression is undertaken at the loading face through application of water from a high pressure nozzle fitted to the 773B water truck. **Plate 2** shows the hosing down of an active loading face within the Croome Farm extraction area. The application of water significantly reduces the amount of dust released to the air during the loading operation and subsequently in the crushing process. In addition, the haul road from the active extraction area to the primary crusher feed bin is constantly watered by the 773B water truck to minimise any potential dust generated by the movement of the haul trucks on the unsealed roads. **Plate 3** shows a haul truck ready to tip into the primary crusher feed bin.

\\SERVER\RWC\605\CAD\Report 2\Base_Plates.DWG



Plate 1: A completed 70 000 tonne blast in the Croome Farm extraction area showing excellent fragmentation. (Ref: E605-114)



Plate 2: Water truck hosing down the broken rock immediately prior to loading to limit dust generation. (Ref: E605-113)



Plate 3: A haul truck at the primary crusher feed bin. Note the wetted road surface to reduce dust generation by trucks hauling to the crusher feed bin. (Ref: E605-117)



Plate 4: Partly enclosed primary screen house plant & fully enclosed tertiary crusher building and screen house. (Ref: E605-119)

2.5.4 Extraction Sequence

The current extraction sequence within the Croome Farm and RIC extraction areas focuses upon the progression outwards to the final approved limit of extraction and downwards towards the approved depth of extraction. Extraction is sequenced between the two extraction areas to provide an access way through the RIC extraction area from the Croome Farm extraction area to the original Dunmore Quarry.

2.5.5 Rate of Extraction

Current daily extraction rates are in the order of 3 000 to 8 000 tonnes. Factors that influence the daily rate of extraction relate to:

- the haulage distance between the active extraction area and the primary crusher feed bin;
- the occurrences/timing of a blast;
- the proportion of fragmentation/oversize;
- the number of operational hours;
- the number of haul trucks operational on any one day; and
- weather conditions.

2.5.6 Mobile Equipment

The mobile equipment currently used in the extraction operations and its principal function and frequency/duration of use is summarised in **Table 2.3.** The frequency of use provided in **Table 2.3** is recognised to be indicative only. All mobile equipment except the light vehicles are serviced on site in the maintenance workshop area.

2.6 PROCESSING OPERATIONS, PRODUCTS AND STOCKPILING

2.6.1 Introduction

The processing operations at Dunmore Quarry are designed to produce a wide range of products meeting strict engineering specifications suited to their various uses. The existing processing plant has been extensively and progressively upgraded over the past 5 years. Most recently, and prior to the commencement of the trial period of extended hours, Boral undertook a range of other improvements to the plant principally to reduce noise and dust emissions. This sub-section provides a description of the existing processing plant, design and layout, the component activities, the products produced and product stockpiling activities.

TABLE 2.3

Mobile Equipment used for Existing Extraction Operations

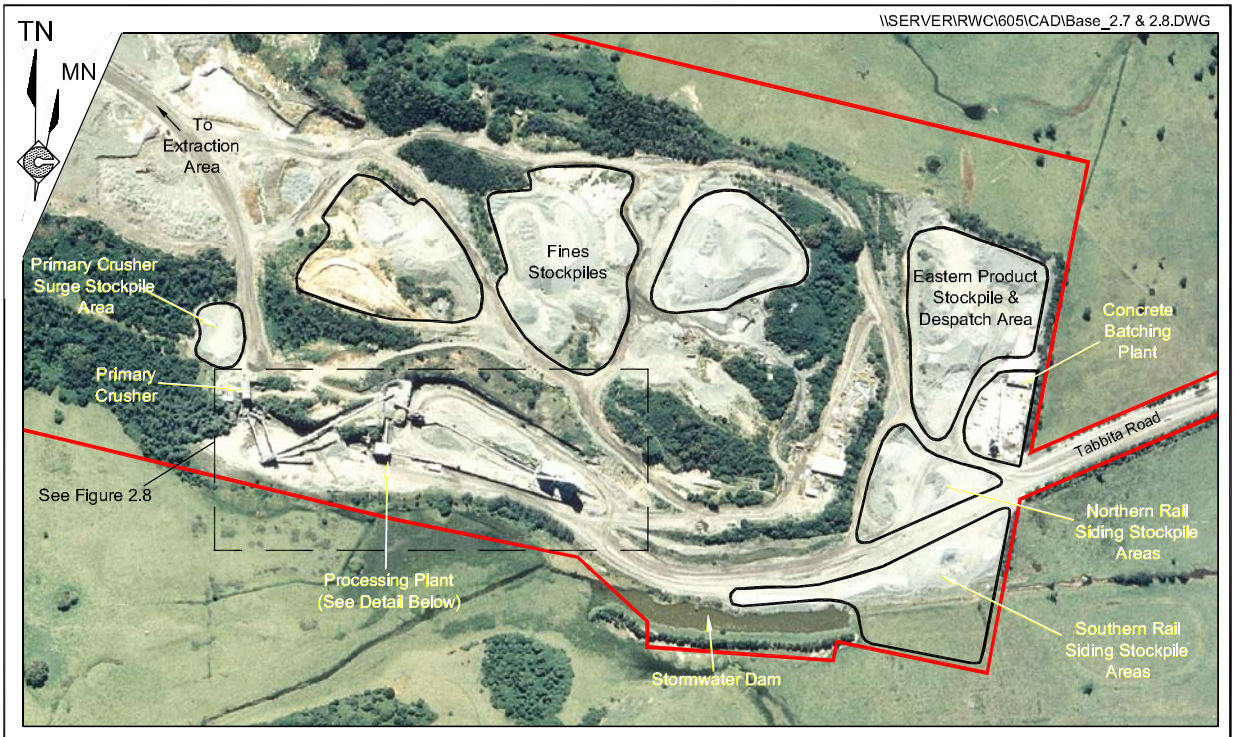
Mobile Equipment	No	Use	Indicative Frequency of Use	Hours of Operation	
				Pre-Trial	Trial Period
Caterpillar D8 Bulldozer	1	Overburden/soil removal	2 days/month	6.00am-6.00pm	6.00am-6.00pm
Caterpillar 773B Haul Truck	3#	Haul broken rock to plant	Continuous	6.00am-6.00pm	6.00am-10.00pm
Caterpillar 775 Haul Truck	1	Haul broken rock to plant	Continuous	6.00am-6.00pm	6.00am-10.00pm
Caterpillar 992G Front-end loader	1	Load broken rock into haul trucks	Continuous	6.00am-6.00pm	6.00am-10.00pm
Atlas Copco F9 hydraulic percussion drill rig	1	Blast hole drilling	15 days/month	6.00am-6.00pm	6.00am-6.00pm
Caterpillar 773B water truck (40 000 litres)	1	Dust suppression	Intermittent dependent upon weather	6.00am-6.00pm	6.00am-10.00pm
Caterpillar 330 rock breaker	1	Reducing oversize broken rock	5 days/month	6.00am-6.00pm	6.00am-6.00pm
Caterpillar G16 Grader	1	Maintenance of haul roads	3 days/month	6.00am-6.00pm	6.00am-6.00pm
Caterpillar 330 Excavator	1	Select loading of broken rock into haul trucks	1 days/month	6.00am-6.00pm	6.00am-6.00pm

#Note: One 773B haul truck spends 60% of its operational time transporting broken rock and 40% of its operational time transporting products to product stockpiles.

2.6.2 Processing Plant Layout and Design

Figure 2.7 shows the general layout of the processing plant and product stockpile areas with respect to other site components whilst **Figure 2.8** displays the design layout of the plant itself. The processing plant is designed in three stages centred around the progressive size reduction of the broken rock delivered to the processing plant from the extraction areas. **Table 2.4** lists the components of each plant and the typical size reduction achieved at each stage. **Plate 4** shows sections of the enclosed primary screen house and tertiary crusher building and screen house.

The processing of broken rock commences at the primary crusher feed bin where rock is fed into the feed bin either directly from a haul truck or by a front-end loader drawing rock from a surge stockpile located adjacent to the primary crusher feed bin. The primary-crushed rock is further reduced in size in a series of crushers prior to being conveyed to the tertiary screen house where the crushed rock is sized according to product specifications. The crushing and screening components of the plant are enclosed or partially enclosed to minimise noise and dust impacts from their operation. All products are conveyed to a series of load-out overhead product bins from where the products are transferred by haul trucks to the respective product stockpile area.



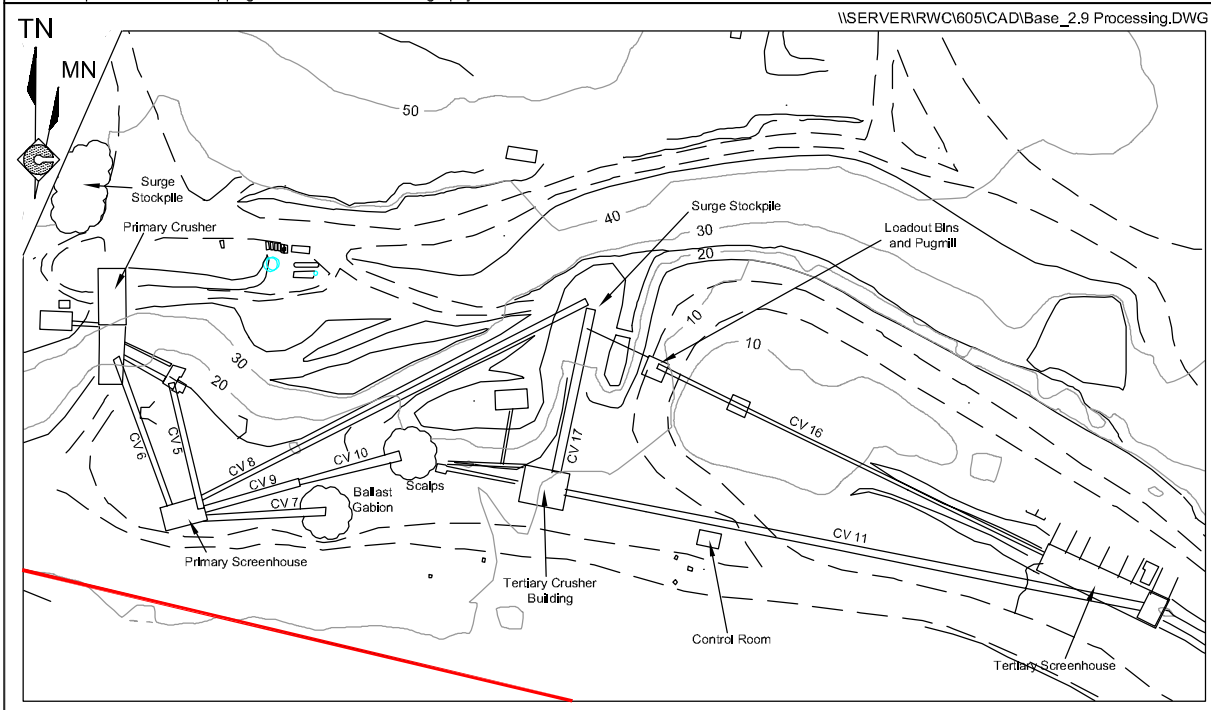
REFERENCE
Project Site Boundary
Approximate Boundary of Stockpile Area

SCALE 1:8 000

100 0 100 200 300 400 m

Base Map Source: Photomapping Services - Date of Photography: 1 March 2003

Figure 2.7
PROCESSING PLANT AND STOCKPILE AREAS



REFERENCE
Project Site Boundary
250 Contour (Interval = 10m)(m AHD)
Internal Road
CV 17 Conveyor (and No.)

SCALE 1:2 500

25 0 25 50 75 100 125 m

Base Map Source: Photomapping Services - Date of Photography: 1 March 2003

Figure 2.8
EXISTING PROCESSING PLANT LAYOUT

TABLE 2.4

Stages and Components of the Processing Plant

Stage	Plant Type	Components	Typical Size
1	Primary Crushing Plant	1 x 1000 tonne apron feeder. 1 x 2 100mm x 1 500mm primary jaw crusher;	< 300mm
2	Secondary Crushing and Screening Plant	1 x 1 600mm x 5 000mm fixed grizzly; 1 x 2 100mm standard cone crusher; 2 x 1 800mm x 4 800mm screens.	< 100mm
3	Tertiary Crushing and Screening Plant	2 x 105mm cone crushers; 1 x 75mm cone crusher; 1 x 1 200mm gyrodisc; 1 x 9 600 rotopactor; 4 x 1 800mm x 4 800mm screens	< 25mm
	Tertiary Screening Plant	4 x 1 800mm x 4 800mm screens 2 x 1 500mm x 3 600mm screens 3 x 1 500mm x 3 000mm screens 16 x 100 tonne storage bins	

Dust extraction devices are installed throughout the different stages of the plant to minimise fugitive dust emissions. The <75µm fraction is collected, bagged and stored on site for future sale. The crushing and screening plant has an Automated Shut Down System that is linked to an anaemometer located at an elevated location central to the plant so that in the evenings (6.00pm to 10.00pm), during adverse weather conditions, the primary crusher and screen cease operating to minimise potential noise impacts. Further details on how this mitigation measure operates is provided in Section 5.3.5.

2.6.3 Production Rate

The processing plant is currently operating at a rate of approximately 500 tonnes per hour.

2.6.4 Products

The current range of products and by-products produced by Boral at the Dunmore Quarry is listed in **Table 2.5**.

The <5mm fines are an important by-product produced and account for approximately 30% of annual production. Excess quarry fines can be used as manufactured sand or bedding material. They are stockpiled on site within the original Dunmore Quarry for future use. The fines are also used to produce a product known as Nusoil™. The product is used as a soil additive and conditioner to assist in increasing agricultural yields both in Australia and with some exports to Asia.

TABLE 2.5

Dunmore Quarry Product and By-product Range

Product/By-product	Size
Breakwater stone (rip-rap)	>500mm
Gabion rock	75-150mm, 90-250mm
Rail ballast	63mm
Concrete aggregate	10, 20, 20/10, 40mm
Asphalt aggregate	28mm
Cover aggregate	5,7,10,20mm
Prepared Road Base	20mm, 40mm
Fines	<5mm
Nusoil™ (3 grades)	<75µm, 2mm, 4mm

2.6.5 Product Stockpiling

The sized products are transported from the processing plant using two Caterpillar 773B haul trucks and stockpiled within the various stockpile areas on site prior to despatch to customers. The current stockpile areas shown on **Figure 2.8**. The stockpile areas adjacent to the rail siding are used solely for the storage of products to be despatched by rail. Other areas are used to store products despatched by road. All quarry fines are stockpiled within the original Dunmore Quarry.

2.6.6 Mobile Equipment

The mobile plant currently used to transfer products from the processing plant, maintain stockpiles and load products into trains and trucks are listed in **Table 2.6**.

All mobile equipment except light vehicles are serviced on site in the maintenance workshop area.

2.7 CONCRETE BATCHING PLANT

2.7.1 Introduction

Boral, through its associated company, Boral Concrete and Quarries (Country) Pty Ltd, currently operates a concrete batching plant within the Project Site (See **Figure 2.1)** for plant location). This plant operates under the conditions of Development Consent 97/144 granted by Shellharbour City Council on 4 December 1997. Although this operation is not regarded as a component of the current proposed development, information on the operation of the plant is included in this document as it has been considered in the overall assessment of cumulative impacts in the areas of air quality, noise generation and transportation of products from the Project Site.

TABLE 2.6

Mobile Equipment used for Existing Processing and Stockpiling Operations

Mobile Equipment	No	Use	Indicative Frequency of Use	Hours of Operation	
				Pre-Trial	Trial Period
Caterpillar 773B Haul Truck	2#	Transfer of products to stockpiles	Intermittent	6.00am-midnight	6.00am-midnight
Caterpillar 988 Front-end loader	1	Loading trains and trucks	Intermittent	6.00am-midnight	6.00am-midnight
Komatsu WA600 Front-end loader	1	Loading trains and trucks	Intermittent	6.00am-midnight	6.00am-midnight
Caterpillar 773B water truck*	1	Dust suppression on unsealed roads/areas	Intermittent	6.00am-midnight	6.00am-midnight
Caterpillar Grader* G16	1	Maintenance of haul roads	3 days/month	6.00am-6.00pm	6.00am-6.00pm
Caterpillar 330 Excavator*	1	Selected loading of product	5 days/month	6.00am-6.00pm	6.00am-6.00pm
Light vehicles	7	Personnel transport	Intermittent	24 hours	24 hours

* Shared use with operations in extraction areas. #Note: One 773B haul truck spends 60% of its operational time transporting broken rock and 40% of its operational time transporting products to product stockpiles.

2.7.2 Operations

The concrete batching plant is a conventional pre-mix batching plant that blends coarse aggregates, fine aggregates (sand), cement/flyash with water to produce ready mix concrete that is despatched off site typically in 6 m^3 capacity agitator trucks. The coarse aggregates are drawn from stockpiles created from materials delivered from the adjoining processing plant whilst all other raw materials are imported to the site.

The plant typically produces approximately 24 000 m^3 of concrete per year. The plant operates within the period 6.00am to 6.00pm weekdays and 6.30am to 4.00pm Saturdays. The plant is fitted with standard air quality controls and operates with the required surface water management system.

2.7.3 Transportation

The delivery of raw materials and despatch of concrete typically generates approximately 68 truck movements daily whilst light vehicles generate approximately 14 movements daily.

2.8 PRODUCT TRANSPORTATION

2.8.1 Introduction

Dunmore Quarry typically despatches approximately 1.2 million tonnes of products per year. The products are transported from site via a dual system of rail and road transport. Access to rail distribution is of significant strategic importance to the operation of Dunmore Quarry.

Equally, the transportation of products from Dunmore Quarry by road is an integral component of the operation for flexibility of distribution for the wide range of products, particularly to those customers who do not have access to or require rail access.

The description of the product transportation in this sub-section is drawn from Boral's records and a detailed study undertaken by Transport and Urban Planning whose report is incorporated as Part 3 of the *Specialist Consultant Studies Compendium*.

2.8.2 Rail Traffic

2.8.2.1 Introduction

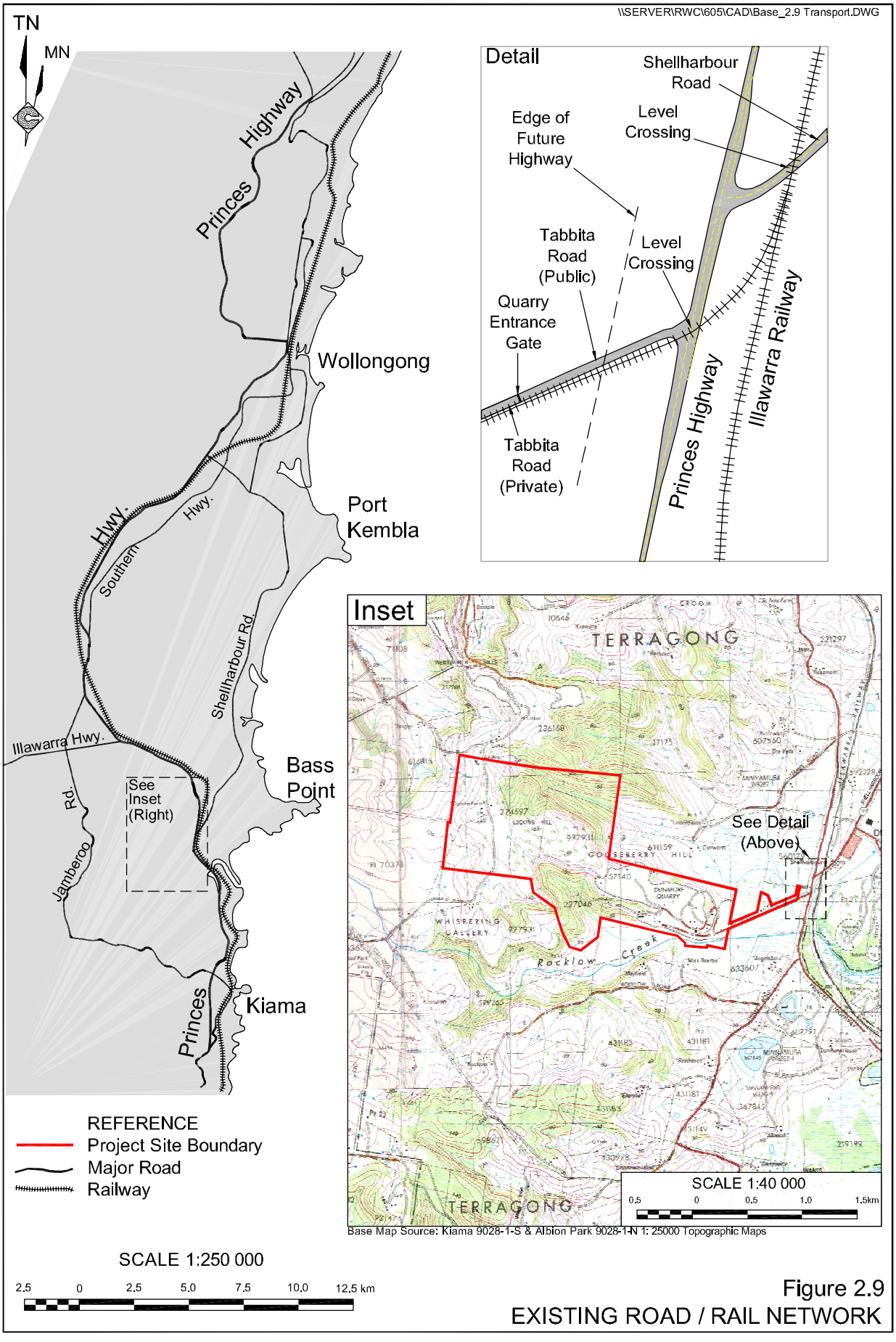
The use of rail to transport quarry products between Dunmore Quarry and Sydney is recognised as strategically, economically and environmentally important. The considerable investment in rail infrastructure at the rail loading and unloading points is an acknowledgement of Boral's commitment to the long-term, efficient and environmentally responsible delivery of its quarry products to city markets.

A rail siding from the Illawarra Railway Line has been in existence within the Project Site for a number of decades. (**Figure 2.9**). Quarry products have been despatched by rail for a number of years except for a six year period between 1993 and 1999 when all products were despatched by road. Prior to early 2000, when Boral recommenced the despatch of quarry products by rail, almost 1.1 million tonnes of products were being despatched northwards by road from its Kiama and Dunmore Quarries.

Boral has recognised the considerable economic and environmental advantages of despatching a significant proportion of its products by rail particularly given the bulk of Dunmore Quarry's products are destined to Sydney markets. Boral has rail sidings at St Peters and more recently at Enfield in Sydney at which products are unloaded and used predominantly for concrete and asphalt manufacture.

2.8.2.2 Train Movements

Details of the current transportation of quarry products by train from the Project Site are set out in **Table 2.7.** It is noted that the times of train arrivals and departures listed in **Table 2.7** relate to current timetables which can be changed by the service provider and are therefore beyond Boral's control.



Base Map Source: Kiama 9028-1-S & Albion Park 9028-1-N 1: 25000 Topographic Maps

Figure 2.9
EXISTING ROAD / RAIL NETWORK

TABLE 2.7

Current Train Movements to and from Dunmore Quarry

	Transport Rate	Typical Time of Day Arrival/Departure	Capacity of Train
Train 1	6 days per week	1.30am/11.35am	30 x 70 tonne wagons (2100t)
Train 2	5 days per week	4.51pm/9.00pm	14 x 70 tonne wagons (980t)

At the above transport rates, the total tonnage of products currently despatched per week is approximately 17 500 tonnes. Annually, the quantity of products currently despatched by rail varies between approximately 700 000 tonnes and 900 000 tonnes per annum. A quantity of 900 000 tonnes is equivalent to approximately 31 360 truck loads (Average load = 28.7 tonnes).

The rail crossing across the Princes Highway is controlled by flashing lights. Pacific National employees supervise the arrival of unladen trains and the crossing of the highway whilst Boral employees supervise the departure of the laden trains when crossing the highway. It is noted that the level crossing will be removed once the Princess Highway overpass above the rail siding is fully constructed in about 2010 (see Section 5.6.3.2)

2.8.3 Road Traffic

2.8.3.1 Introduction

Road access to Dunmore Quarry is available from Tabbita Road, a road that intersects with the Princes Highway approximately 130m south of the highway's intersection with Shellharbour Road. The section of Tabbita Road to the quarry entrance is a public road, whereas beyond the quarry entrance, Tabbita Road continues as a sealed private road to the site office approximately 500m west of the Princes Highway.

Transportation of products by road is an important component of Boral's product distribution given that many customers and a number of Boral's own concrete batching plants do not have rail unloading facilities. Delivery of a proportion of products by truck provides for considerable flexibility in delivery time and locations.

This sub-section also records the traffic travelling to and from the concrete batching plant within the Project Site and the light vehicle traffic associated with employee/visitor traffic.

2.8.3.2 Product Transport Routes

All quarry products despatched by road from the Dunmore Quarry are transported to customers throughout Sydney and the Illawarra via the State, regional and local road network. State Highway No 1, the Princes Highway, is an approved B-double route. Approximately 93% of the trucks travel northwards from Dunmore on the Princes Highway whilst the remaining 7% travel southwards on the highway.

2.8.3.3 Product Vehicle Types and Traffic Levels

Quarry products are transported by a range of truck configurations and capacities with approximately 50 per cent of vehicles comprising Company-owned trucks. The truck configurations that operate from the Dunmore Quarry are typically:

- rigid trucks and trailers (Average load = 32 tonnes);
- triaxle trailers (Average load = 29.5 tonnes);
- rigid 6 wheel trucks (Average load = 12 tonnes);
- rigid 8 wheel trucks (Average load = 17 tonnes); and
- B-double truck/trailer (Average load = 41 tonnes).

Transport and Urban Planning recorded that an average of 62 loads are despatched from Dunmore Quarry on a weekday, ie based on an annualised rate of despatch of 500 000 tonnes, an average load of 28.7 tonnes and an equivalent of 280 operational days per year. These loads generate a total of 124 truck movements, ie 62 in/62 out. The 85th percentile level of truck traffic would be approximately 89 loads or 178 movements per day.

The hourly distribution of truck traffic varies noticeably during the day with the busiest hour currently between 6.00am and 7.00am. Typically, an average of 26 movements occur during this early morning period, accounting for approximately 21% of all despatches. More than 50% of products are despatched by 11.00am of a weekday. The hourly distribution of product despatch varies according to the destination of the deliveries, however, historically product despatch typically reduces beyond 4.00pm when the average number of loads despatched varies from 1 to 3 per hour.

2.8.3.4 Despatch Procedures and Driving Practices

All trucks are loaded with products from one of the various stockpile areas by front-end loader. Trucks pass through a tyre cleaning bay, loads are measured by the weighbridge and sales documentation completed prior to vehicles leaving the site. No truck is allowed to leave the site with a load in excess of the truck's legal load limit.

All truck drivers are required to ensure that all site rules and safety requirements are observed at all times. This includes Boral's requirements that loads are covered, tailgates fastened, and that no product is outside the truck body. Courtesy and safe driving practices are required of all truck drivers when entering and leaving Tabbita Road.

2.9 INFRASTRUCTURE AND SERVICES

2.9.1 Infrastructure

The principal infrastructure on the Project Site comprises the internal road network, a rail siding (previously discussed in Section 2.8.2), a maintenance workshop for all mobile equipment, laboratory, a site office/training room, and employee amenities. These facilities have been progressively upgraded to meet increasing standards for employee occupational health and safety requirements.

2.9.2 Services

2.9.2.1 Power

Boral currently sources its electrical power from Origin Energy. The power is reticulated to the site via overhead power lines that enter the Project Site along Tabbita Road. All power enters the main receival transformer near the site office and is distributed further throughout the site. The current power usage for all activities on site, including processing between 6.00am and 10.00pm, is equivalent to approximately 6 000 megawatt hours per annum.

2.9.2.2 Telecommunications

Underground communication lines are provided to the Dunmore Quarry for telephone, facsimile and email services. Those lines in place are adequate for the Company's communication requirements.

2.9.2.3 Water

Boral currently uses an estimated 300kL of water per day or approximately 97ML of water annually for dust suppression on site roads, stockpile areas, and within the processing plant. This water is drawn from the site stormwater dam immediately south of the rail siding stockpile areas. The total water usage effectively equates to approximately 80L of water per tonne of product despatched.

Small quantities are used for site ablutions and amenities. This water is drawn from mains water. Daily mains water usage is approximately 100kL. Much of this water is used in the on-site concrete batching plant.

2.9.2.4 Fuel

The liquid fuel requirements for the mobile equipment to operate the Dunmore Quarry amount to approximately 80 000 litres per month. All mobile equipment on site is diesel powered. All diesel is delivered to the site by conventional 30 000 litre tankers and stored in a bunded fuel farm in an area west of the maintenance workshop area. All product trucks are fuelled off site.

A typical return trip by truck to Sydney for an average load of products consumes five times as much diesel per tonne of products transported over the same distance by rail.

2.10 HOURS OF OPERATION AND PROJECT LIFE

2.10.1 Hours of Operation

The current approved hours of operation for the Dunmore Quarry are listed in **Table 2.8**. These operational hours were approved by Shellharbour City Council on 13 March 2003 for a 9 month trial period which commenced on 9 July 2003. The hours of operation immediately prior to the commencement of the trial period are discussed in Section 2.3 (**Table 2.2**).

TABLE 2.8

Activities and Current Approved Hours of Operation

Activity	Day	Approved Hours of Operation
Extraction and Processing	Monday to Saturday	6.00am to 10.00pm
Blasting	Monday to Friday	8.30am to 5.00pm
Sales*	Monday to Saturday	5.00am to midnight
Maintenance	7 days a week	24 hours
*Sales include the transfer of products from the processing plant to the product stockpile areas.		

2.10.2 Project Life

Based on the current latite resources approved for extraction of approximately 29 million tonnes and annual production rate of 1.2Mtpa, the Dunmore Quarry currently has an operational project life of approximately 25 years.

2.11 BY-PRODUCTS AND WASTE MANAGEMENT

2.11.1 Introduction

Boral is committed to ensuring its extraction and processing activities produces either products or by-products and no rock wastes. The products are the core materials used for concrete manufacture and road construction whereas the by-products are invariably the finer fractions screened from the core products. Boral continually endeavours to promote the sale of the by-products such as manufactured sand and Nusoil™ to achieve the highest possible level of resource utilisation. It is noted that materials such as overburden are not classified as by-products as they are being set aside for use in future rehabilitation activities.

2.11.2 By-products

2.11.2.1 Oversize Management

Small quantities of oversize material are currently produced during blasting. A substantial proportion of the oversize rock is sold/used as rip-rap or armourstone. Where oversize is produced from blasting and not sold for rip-rap or armourstone, the rock is retained within the extraction area until sufficient quantities accumulate to warrant the use of a mobile rock breaker to reduce the oversize material in size to allow the rock to be processed with the remainder of the broken rock. A rock breaker is currently used about 5 days per month to reduce the dimensions of the oversize rock.

2.11.2.2 Quarry Fines Management

The <5mm fines remain a major component of the crushing and screening process with up to 30% of total production reporting to the fines fraction. This material is stockpiled within the original Dunmore Quarry for Nusoil™ , for site rehabilitation or future sale as manufactured sand.

2.11.2.3 Extraction Dust

The processing of latite produces fine dust (<75µm) that is collected from the crushing and screening operations by a dust extraction system. This material is bagged in bulk bags and stored on site as a saleable by-product. The current processing plant throughput generates approximately 10 tonnes of this material per week. This material is marketed by Boral as "Nusoil™", a proprietary soil conditioner.

2.11.3 Non-Production Wastes

2.11.3.1 Introduction

Boral is committed to the waste hierarchy whereby emphasis is placed upon return → reuse → recycle → disposal of its non-production wastes.

2.11.3.2 Domestic Wastes and Maintenance Consumables

All paper and general wastes originating from the site office, amenities, training room and control room together with routine maintenance consumables are placed in separate containers for general waste and recyclables and removed from site by a licensed waste contractor. No wastes are buried on site.

2.11.3.3 Construction and Workshop Wastes

During past construction activities and during normal workshop operations, any waste metals are set aside in scrap metal bins for periodic collection.

2.11.3.4 Waste Oils and Filters

All waste oil is collected and stored on site in 1000L containers within a bunded area. The containers are removed from site by a licensed contractor with all relevant waste tracking documentation completed.

All oil filters are separately stored and returned to the manufacturer for reuse.

2.11.3.5 Sewage

Septic sewerage treatment systems are used at the weighbridge/office training room, site amenities, control room, supervisor's office and lunch room. A recent inspection by officers of Shellharbour City Council established that all systems are operating efficiently.

2.12 EMPLOYMENT

Prior to the commencement of the 9 month trial period, Boral employed 31 people on a full-time basis at Dunmore Quarry. Categories of employment are shown in **Table 2.9**. Since the commencement of the 9 month trial period, a further 15 people have been employed. **Table 2.9** also records the categories of employment of the additional workforce.

TABLE 2.9

Employment Categories and Numbers.

Category	Trial Period	Category	Trial Period
Quarry Manager	1	Excavator/Loader Operator	2
Quarry Supervisor	3	Sales Loader Operator	4
Quarry Engineer	1	Truck Operator	8
Maintenance Supervisor	1	Load Out Bin Truck Operator	2
Quality Supervisor	1	Fitters	8
Control Room Operator	2	Laboratory Technician	1
Apprentice	1	Labourer / Operator	9
Weighbridge Clerk	2		

A range of contractors are employed casually or regularly to undertake a range of activities such as drilling/blast, rock breaking, selected maintenance and product transportation. In addition to the employees and contractors, Boral purchases a number of its goods and services from Illawarra businesses, all of which generate indirect employment in the Illawarra area.

2.13 REHABILITATION AND FINAL LAND USE

2.13.1 Introduction

The approach to rehabilitation of the three extraction areas is variable and no overall rehabilitation plan exists as the quarry has developed in a number of stages. This sub-section reviews the status of the current rehabilitation plans for each extraction area and discusses the factors influencing the approach to the determination of the final land use.

2.13.2 Original Dunmore Quarry

No formal rehabilitation plan exists for the Original Dunmore Quarry. It has been recognised that extraction of the breccia-agglomerate and lower floor would ultimately leave a void with a series of perimeter benches. **Figure 2.10** displays a schematic approach to the final landform and rehabilitation within the Original Dunmore Quarry. The principal features of this landform would be as follows.

- A total of 3 to 5 benches would remain typically 5m to 10m wide, depending upon geotechnical stability.

- A floor area of approximately 13ha sloping to the eastern end. The final floor would fall from 25mAHD on the western end to -20mAHD on the eastern end, a distance of approximately 900m.

It is envisaged that small quantities of overburden would be placed on the benches to provide a substrate for the establishment of a range of tree and shrubs.

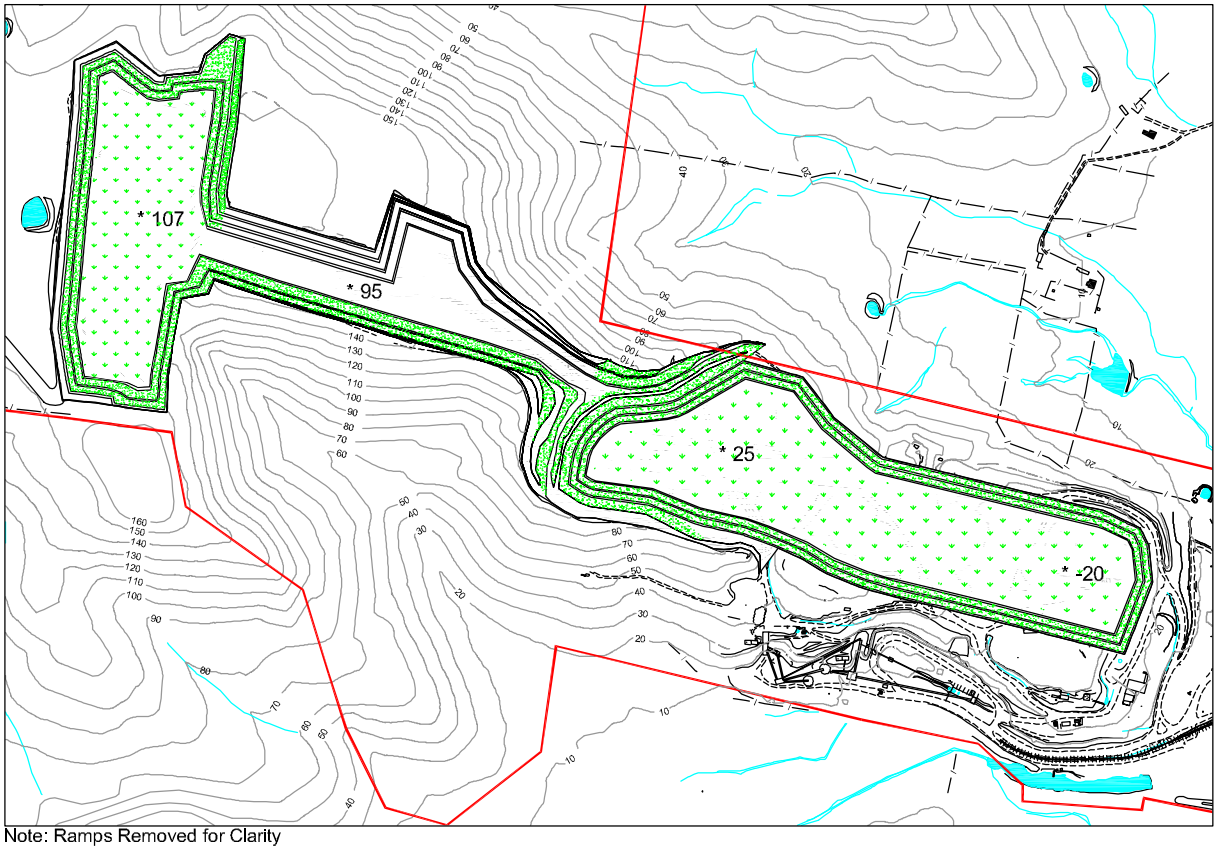
2.13.3 RIC Extraction Area

The approved rehabilitation plan for the RIC extraction area is drawn from the 1986 Environmental Impact Statement for the RIC land, then referred to as the State Rail Authority (SRA) land. The planned rehabilitation of the RIC extraction area was incorporated in the agreement between RIC and Boral to provide for RIC to establish a processing plant in the key-hole area and to continue the extraction of latite northwards from the RIC land. The 1986 EIS records the following rehabilitation strategy.

- *"Revegetation of the quarry rim, particularly along the southern and north-eastern faces. It is hoped that most existing vegetation will be retained, but where disturbance occurs, replanting will be carried out.*

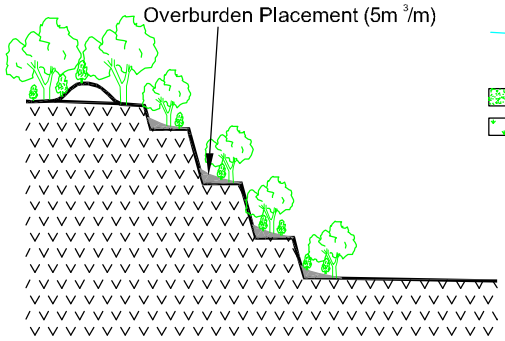
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Note: Ramps Removed for Clarity

REFERENCE
- Project Site Boundary
- Unsealed Road
- Fence
- Contour (Interval = 10m)(m AHD)
- * 25 Final Spot Height (m AHD)
- Watercourse / Drain
- Dam / Water Storage
- Extraction Bench Rehabilitation (See Detail)
- Extraction Floor Rehabilitation



Extraction Bench Rehabilitation
Typical Section

SCALE 1:12 500

200 0 200 400 600 m

Base Map Source: Photomapping Services - Date of Photography 1 March 2003

Figure 2.10
CURRENT REHABILITATION PLAN

- *Vegetating the top east-facing bench at the eastern end of the proposed extraction area. This face will be battered and planted with trees and shrubs at an early stage of the extraction program.*

- *Vegetating the top bench on the north-eastern side of the quarry extension by battering and planting with trees and shrubs. This will be carried out progressively as the benches are no longer required.*

The southern benches will not be rehabilitated during the proposed quarry extraction program. The top bench is intended to be used as a haul route to gain access to BMG's reserves in Croome Farm. The next two benches will be used by the SRA to gain access to their remaining reserves. BMG Quarries will rehabilitate the top southern bench subsequent to extraction in Croome Farm.

Rehabilitation of benches will be by way of blasting the tops of benches to remove the angular, planar appearance. Stored overburden will be used to create a growth medium for vegetation. Species native to the site will be planted, including melaleucas and acacias. Taller species indigenous to the area and likely to survive the harsh conditions will also be selectively planted".

Figure 2.10 displays the schematic final benches in the RIC land.

2.13.4 Croome Farm Extraction Area

The approach to the rehabilitation of the Croome Farm extraction area is set out in the 1994 EIS compiled by Sinclair Knight Merz. The EIS expressed uncertainty about the timing of the rehabilitation given the potential to deepen or widen the extraction area. For the purposes of the 1994 proposal, it was envisaged that the final landform would be self-draining to the east through the RIC land and would have the appearance of an amphitheatre with an opening towards the east.

Figure 2.10 displays the schematic final landform and the revegetated benches around the Croome Farm extraction area. No final land use was proposed for the Croome Farm area. Rather, the following factors were identified as likely to influence the selection of the final land use.

- Compatibility with surrounding land uses.
- Physical constraints.
- Soil availability or suitability of alternative top dressing materials.
- Visual implications and landscape compatibility.
- Existing ecological values.
- Existing land capability for the site and surrounding areas.
- Requirements of State and local authorities and community organisations.

Boral recognises that for many of its quarries, it is often premature to specify the proposed end use at the commencement of a quarry, or in this case, approximately 20 years before extraction ceases. The planning of land uses within completed extraction areas is best undertaken within the last five or so years of an operation to reflect the economic and community needs prevailing at that time.

Current examples of Boral's approach to quarry end use include:

- Greystanes Estate (Prospect Quarry) which is being rehabilitated and developed to provide a major employment/industrial area as well as a new residential estate; and

- the former Moorebank brickworks site which is being rehabilitated and developed for residential housing.

Section 3
The Proposed Development

PREAMBLE

This section commences with an outline of the Company's objectives for increasing production levels at the Dunmore Quarry and the proposed means to be adopted to achieve those objectives. Details of the proposal and the approvals required to increase production levels are provided. Where the proposed increase in production would modify the existing operations, the details of these changes are provided together with details of the hours of operation, mobile and fixed plant and equipment and employment levels.

This section describes Boral's proposal in sufficient detail to provide the reader with an overall understanding of what is proposed and how all activities would be carried out. Further details on the key issues of noise and blasting, air quality and transportation of the final products is presented in Section 5 of this document.

3.1 INTRODUCTION

3.1.1 Overview

Boral proposes to increase production at the Dunmore Quarry from the existing levels of approximately 1.2 million tonnes per annum (Mtpa) to 2.5Mtpa by 2005. The increase in production would be achieved through a combination of increased operating hours, minor changes to equipment types and configurations - mainly within the crushing and conveying circuits, additional mobile equipment and an increase in rail and road transportation of products.

Boral is seeking a single Development Consent to cover the entire Project Site which would supersede the existing Development Consents and existing use rights that currently permit the operations within the Project Site. The removal of inconsistencies between the current Development Consents and existing use rights would provide clarity for Boral, government agencies and the local community on all aspects of the ongoing operations.

This section focuses upon the proposed development. Some components such as waste management and utilities/services would remain comparable with the existing operations. However, for completeness, that information is duplicated in this section to provide readers with a full description of the proposed development.

3.1.2 Objectives

Boral's principal objectives for increasing production at the Dunmore Quarry are to:

(i) supply the increasing demand for hard rock products from Dunmore, and

(ii) supply part of the shortfall of quarry products resulting from the planned closures of other sources operated by Boral;

It remains Boral's objective to continue production of quality products meeting industry specifications and to undertake the ongoing operations in a safe and environmentally responsible manner.

3.2 APPROVALS REQUIRED

Boral requires the following approvals to enable the proposed increased production level to be achieved and to fully recover the defined resource within the approved extraction area.

1. Development Consent

Development Consent is being sought under Section 76A(7) of the *Environmental Planning and Assessment Act 1979* from the Minister for Infrastructure, Planning and Natural Resources as the proposed development is classified as a State significant development. This EIS document supports the development application to the Minister. Boral is seeking a Development Consent for a period of time sufficient to extract and process the defined resources within the Project Site.

It is Boral's intention to surrender the existing development consents and existing use rights (outlined in Section 2.3) in the event that an acceptable and comprehensive single development consent is issued by the Minister for the ongoing operation of the Dunmore Quarry.

2. Environment Protection Licence

Boral is seeking a modification to its Environment Protection Licence No. 77 from the Department of Environment and Conservation under the *Protection of the Environment Operations Act 1997* to reflect the proposed increase in production levels and permanent extension of the hours of operation on the site.

3. Section 90 Consent

Boral is seeking consent under Section 90 of *National Parks and Wildlife Act 1974* from the Department of Environment and Conservation to remove a scarred tree located within the Croome Farm extraction area.

3.3 RESOURCES

The latite resources within the original Dunmore Quarry, RIC and Croome Farm extraction areas total approximately 31 million tonnes (Mt). This amount includes 12Mt within the original Dunmore Quarry, 5Mt within the RIC extraction area and 14Mt in the Croome Farm extraction area.

The total resource quantity of 31Mt is 2Mt greater than the quantity currently approved for extraction (see Section 2.4) as there is an additional 2Mt of rock that can be extracted from the Croome Farm extraction area below 107mAHD (see Section on **Figure 3.1**). Extraction of the rock in this part of the extraction area is currently not approved. It is also noted that the original Dunmore Quarry contains approximately 2.5 million m^3 of breccia-agglomerate above the 12Mt of latite in the lower flow.

3.4 EXTRACTION OPERATIONS

3.4.1 Introduction

The existing extraction plan as shown on **Figure 2.6** would be modified slightly in order to recover the full 31 million tonnes of latite identified within the approved extraction area. There would be no change to the footprint of the proposed extraction area from the area identified on **Figure 2.5**. Future extraction operations would continue in the same manner as existing operations (see Section 2.5.3), only the rate of production would increase.

3.4.2 Extraction Plan

Figure 3.1 shows the proposed extraction plan for the remaining life of the project. The main variation to the current approved extraction plan is the proposed extraction of all latite from the middle flow within the Croome Farm extraction area. The current approval permits extraction to a depth of 107mAHD whereas the base of the high quality rock of the middle flow occurs between 3m and 17m below the 107m level.

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REFERENCE
- Project Site Boundary
- Unsealed Road
- Fence
- 250 Contour (Interval = 10m)(m AHD)
- * 95 Final Spot Height (m AHD)
- Watercourse / Drain
- Dam / Water Storage
- Upper Latite Flow
- Middle Latite Flow
- Breccia - Agglomerate
- Lower Latite Flow

Croome Farm Extraction Area

RIC Extraction Area

Original Dunmore Quarry

* 104

* 95

* 93

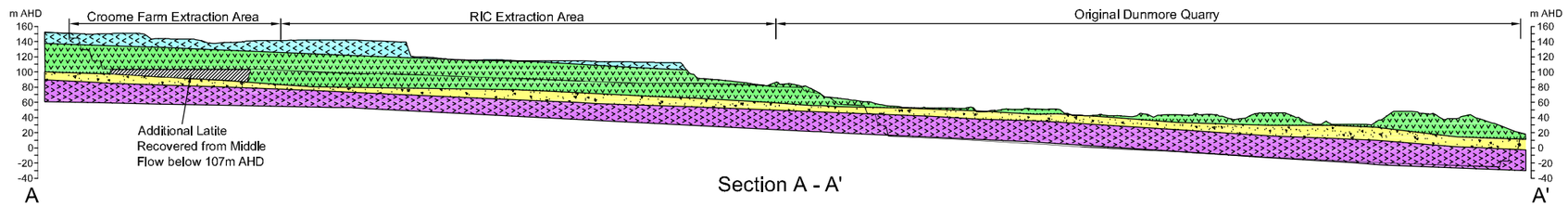
* 25

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A

A

Note: Ramps Removed for Clarity



Section A - A'

SCALE 1:7 500

100 0 100 200 300 400 500 m

Figure 3.1
PROPOSED QUARRY -
LAYOUT AND SECTIONS

The design of the proposed extraction area is based upon the following parameters.

- All future face heights = approximately 15m.
- All final bench widths would vary from 5m to 10m (the exact width would be determined through a geotechnical assessment).
- Extraction faces would typically lie at approximately 80°.
- Quarry benches would either be horizontal or slope gradually towards the east, coinciding with the natural slope of the latite flows.
- The final extraction floors would dip parallel to the base of the flow being extracted.

3.4.3 Extraction Rate

The annual rate of extraction is proposed to increase from the existing rate of approximately 1.2Mtpa to approximately 2.5Mtpa. On a daily basis, the quantity of rock extracted would vary from approximately 5 000 tonnes to 12 000 tonnes.

3.4.4 Blasting

The blast design and quantity of rock blasted on each occasion is not proposed to change. Only the frequency of blasting would change. It is envisaged that there would be on average approximately 72 blasts per year.

Boral currently envisages the drilling activities would progressively change from a part-time activity (currently 15 days per month) to full time basis (25 days per month). The hours of operation for drilling activities would occur between 6.00am and 10.00pm. For the evening period, between 6.00pm and 10.00pm, drilling would be confined to second bench level or lower within the extraction areas. Blasts would be initiated between 9.00am and 5.00pm Monday to Saturday, i.e. the preferred period for blasting endorsed by the Department of Environment and Conservation. Details of the design and operational safeguards for the drilling and blasting operations are presented in Section 5.3.6.8.

3.4.5 Load and Haul

The proposed increase in production would require additional haulage of broken rock from the active extraction area(s) to the primary crusher feed bin. This would be achieved through a combination of the extended hours of operations and the introduction of an additional haul truck(see Section 3.4.6).

The existing general haul road network would be maintained, however, it would be periodically relocated and progressively lowered as the extraction areas are deepened.

3.4.6 Mobile Equipment

Table 3.1 lists the mobile equipment to be used for the proposed extraction operations. A fourth haul truck would be added to the mobile fleet to haul the additional quantity of broken rock to the primary crusher feeder bin. The Caterpillar 992G Front-end loader would be used to feed the primary crusher feed bin from the surge stockpile during periods when haul trucks are not operating (eg before and after blasts). It is envisaged that all equipment would be replaced periodically with similar-sized equipment.

TABLE 3.1

Mobile Equipment used for Proposed Extraction Operations

Mobile Equipment	No	Use	Indicative Frequency of Use	Hours of Operation
Caterpillar D8 Bulldozer	1	Overburden/soil removal	2 days/month	8.00am-6.00pm
Caterpillar 773B Haul Truck	4*	Haul broken rock to plant	Continuous	6.00am-10.00pm
Caterpillar 775 Haul Truck	1	Haul broken rock to plant	Continuous	6.00am-10.00pm
Caterpillar 992G Front-end loader	1	Load broken rock into haul trucks	Continuous	6.00am-10.00pm
Atlas Copco F9 hydraulic percussion drill rig	1	Blast hole drilling	Continuous	6.00am-10.00pm#
Caterpillar 773B water truck (40 000 litres)	1	Dust suppression	Intermittent dependent upon weather	6.00am-10.00pm
Caterpillar 330 Mobile rock breaker	1	Reducing oversize broken rock	8 days/month	6.00am-6.00pm
Caterpillar G16 Grader	1	Maintenance of haul roads	6 days/month	6.00am-6.00pm
Caterpillar 330 Excavator	1	Select loading of broken rock into haul trucks	2 days/month	6.00am-6.00pm

* One 773B haul truck would also spends 40% of its operational time assisting with the transfer of products to the product stockpile areas.
\# Drilling between 6.00pm and 10.00pm would occur on the second bench level or lower to avoid the propagation of excessive noise levels.

3.5 PROCESSING OPERATIONS, PRODUCTS AND STOCKPILES

3.5.1 Introduction

The increased level of production through the processing plant would be achieved through a combination of increased hours of operation and a range of minor modifications to the conveying and crushing circuits. Overall, the changes to the plant are designed to optimise throughput and remove existing bottlenecks.

3.5.2 Processing Plant Layout and Design

Figure 3.2 shows the modified layout of the processing plant. The principal modifications identified on **Figure 3.2** are as follows.

The principal modifications/upgrades to the processing plant would involve the following.

- Conveyor CV17 would be extended to enable products to be discharged into a new surge bin and feeders on the southern side of the tertiary crusher building (rather than on the northern side).
- The extended conveyor would be enclosed within a larger fully enclosed building (see **Figure 3.3**). The building would be extended to the east and to the south by the dimensions shown on **Figure 3.3**. The extended building would be clad in colourbond of the same colour as the existing buildings.
- Two new conveyors (CV 18 and CV 19) would be constructed to convey oversize material from the tertiary crusher building back to the surge stockpile.
- Two crushers within the tertiary crusher building would be upgraded to increase throughput. The new crushers would discharge onto two new 1800m x 4800m screens.
- The Barmac crusher currently positioned adjacent to Conveyor CV 8 would also be upgraded to increase throughput.

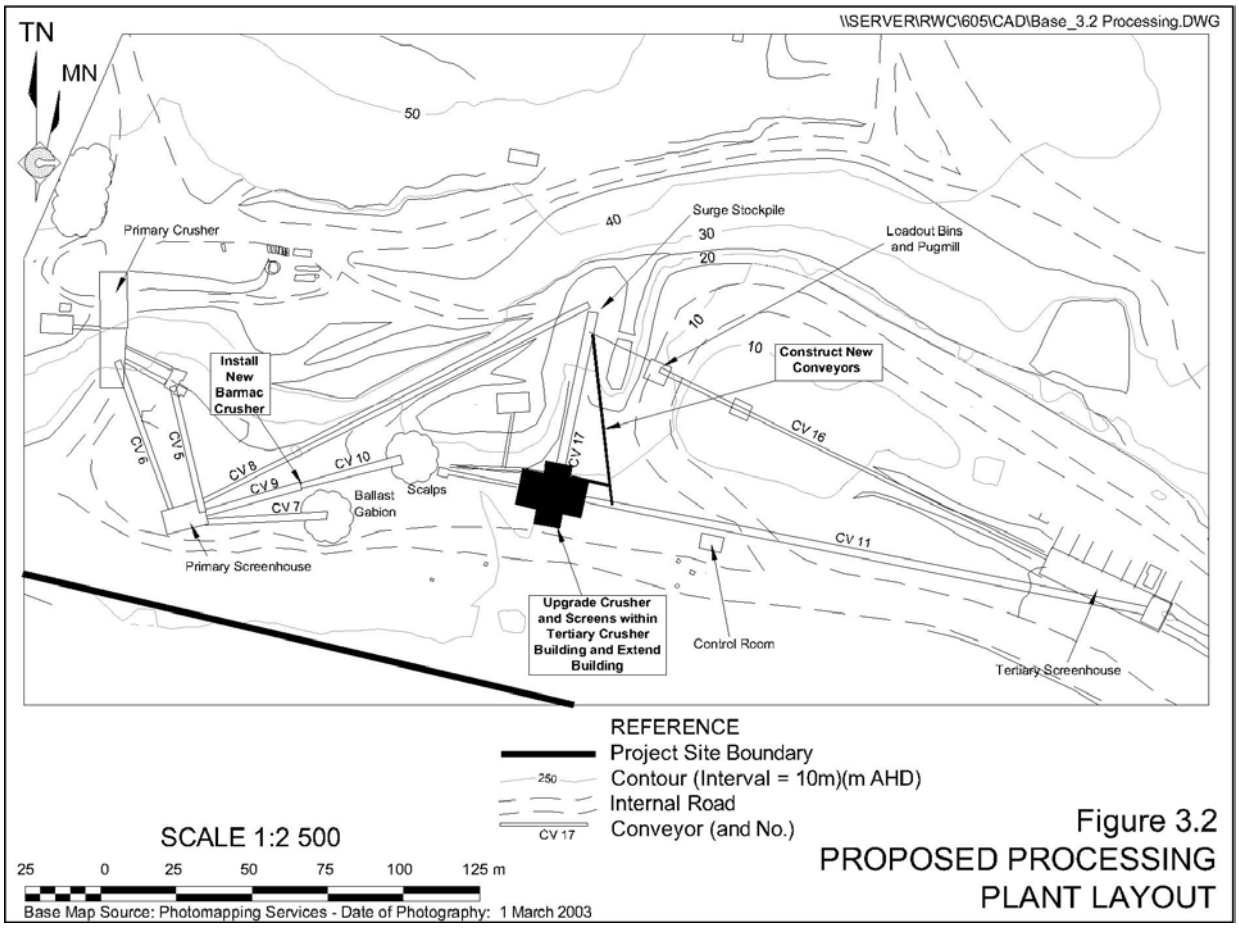
3.5.3 Plant Upgrade and Commissioning

The upgrade of the processing plant would occur over a period of approximately six months. The principal activities would involve:

- dismantling/extending the tertiary crusher building;
- erection/installation of new conveyors, and extension of an existing conveyor; and
- removal of old crushers and screens and replacement of new crushers and screens.

These activities would be undertaken by a contractor appointed by Boral who would be expected to work between the hours of 6.00am and 6.00pm Monday to Saturday. Some inaudible construction activities such as electrical wiring would be undertaken outside of these hours.

The equipment likely to be used during the construction period would include cranes and some welding equipment.



3.5.4 Production Rates

The crushing and screening plant production rates are proposed to increase from the current level of approximately 500 tonnes per hour (tph) to approximately 750tph.

The average monthly throughput would increase from the existing 100 000 tonnes to approximately 210 000 tonnes.

3.5.5 Products and Stockpiles

Boral proposes to continue producing the current range of products from the upper and middle latite flows. Additional products would be produced from the breccia-agglomerate between the middle and lower flows. These products would typically be prepared road bases and other road pavement materials. The lower flow would produce the same quality products as those being currently being produced from upper and middle flows.

Sufficient capacity exists within the current stockpiling areas to accommodate the proposed increase in production. The proposed increases in production would be matched with increases in product sales which would minimise accumulation of excess product in the various product stockpile areas.

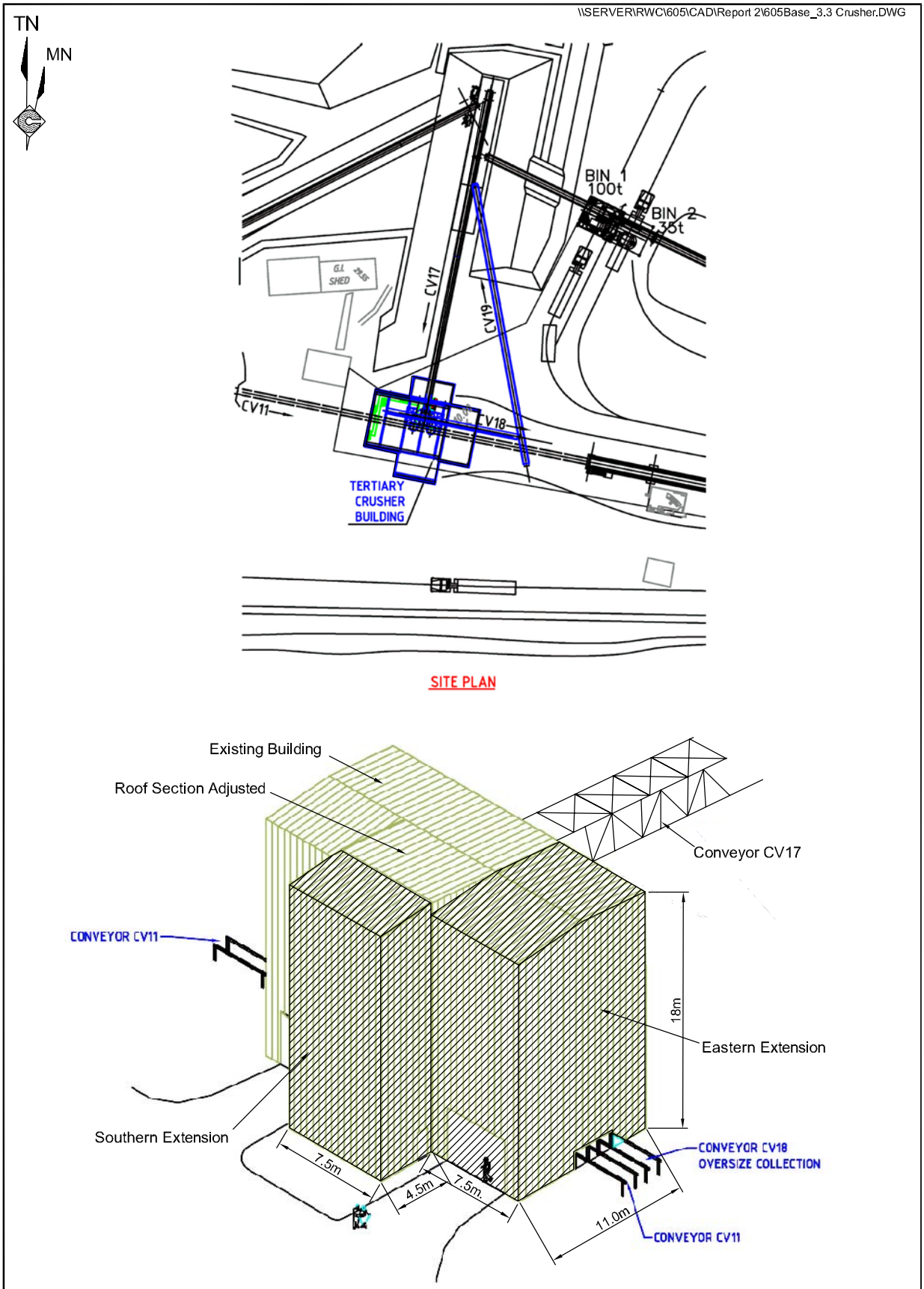


Figure 3.3
PROPOSED TERTIARY
CRUSHER BUILDING EXTENSION

Source: MBK South Coast

3.5.6 Mobile Equipment

Table 3.2 lists the mobile equipment to be used around the processing plant and product stockpile areas.

TABLE 3.2

Mobile Equipment used for Proposed Processing and Stockpiling Operations

Mobile equipment	No	Use	Indicative Frequency of Use	Hours of Operation
Caterpillar 773B Haul Truck	2*	Transfer of products to stockpiles	Intermittent	6.00am-midnight#
Caterpillar 988 Front-end loader	1	Loading trains and trucks	Intermittent	24 hours
Komatsu WA600 Front-end loader	1	Loading trains and trucks	Intermittent	24 hours
Caterpillar 773B water truck	1	Dust suppression on unsealed roads/areas	Intermittent dependent on weather	6.00pm-midnight
Caterpillar Grader 616	1	Maintenance of haul roads	5 days/month	6.00am-6.00pm
Caterpillar 330 Excavator	1	Selected loading of product	8 days/month	6.00am-6.00pm
Light vehicles	7	Personnel transport	Intermittent	24 hours

Product transfer continues for up to 2 hours beyond the cessation of processing (10.00pm) to deliver all processed products to the product stockpile areas as part of the existing sales process.
* One 773B haul truck would also spends 40% of its operational time assisting with the transfer of products to the product stockpile areas.

3.6 PRODUCT TRANSPORTATION

3.6.1 Introduction

The existing dual transport system of rail and road transport would be maintained. The use of both rail and road provides Boral with a high level of flexibility to deliver products to its sites with rail facilities and other sites where access is only possible by road.

Boral anticipates that the proportion of 2.5 million tonnes of products despatched by rail and road would be approximately 60:40, i.e. 1.5 million tonnes by rail and 1.0 million tonnes by road. Clearly, the exact proportion of each would depend on destinations for the quarry's products, however, with the development of two rail terminals in Sydney, Boral is committed to maximising the proportion of its products transported by rail.

The description of the proposed product transportation in this section is drawn from a detailed study undertaken by Transport and Urban Planning whose report is incorporated as Part 3 of the "*Specialist Consultant Studies Compendium*".

3.6.2 Rail Transportation

Boral proposes to despatch approximately 1.5 million tonnes of its products annually from Dunmore Quarry to its St Peters and Enfield rail terminals in Sydney. It is proposed to progressively increase the number of wagons on the morning and evening trains. Ultimately, the products would be despatched in two x 45 wagon trains per day (6 days per week) each capable of carrying 3 100 tonnes.

It is envisaged that the arrival/despatch times for all trains would be comparable to those currently in place, namely:

- 1.30am arrival/11.35am departure, and
- 4.51pm arrival/9.00pm departure.

It is noted that train arrival and departure times are set by the service provider and are therefore beyond Boral's control. Current timetables could change throughout the life of the quarry.

It is proposed that up to 12 train loads of quarry products, or up to 37 200 tonnes of products would be despatched per week. On average, Boral expects that each train would carry approximately 750 000 tonnes of quarry products annually.

3.6.3 Road Transportation

3.6.3.1 Access

Access to Dunmore Quarry would continue to be via the Princes Highway and Tabitta Road.

During the early part of the proposed development ie from 2004 to about 2010, the access arrangements from Tabitta Road to the Princes Highway would be periodically varied to accommodate the planned construction/upgrading of the Princes Highway. In any event, Boral intends to liaise regularly with the RTA to ensure access arrangements during the construction period are clarified.

3.6.3.2 Road Transport Routes

It is proposed that all quarry products would continue to be despatched by road via the Princes Highway. Boral expects the proportion of trucks travelling northwards to remain at the current level of approximately 93% with approximately 7% of trucks travelling southwards on the Princes Highway. Of the 93% of trucks travelling northwards, approximately 88% would travel via Mt Ousley with the remainder delivering products to the Wollongong/Port Kembla area.

3.6.3.3 Product Vehicle Types and Traffic Levels

There would be few changes to the vehicle types and truck/trailer configurations used to deliver the quarry products. Nevertheless, any changes would generally reflect gradual changes to the overall transport industry, such as a growing increase in the use of larger capacity trucks (e.g. B-doubles) which in turn permits a general reduction in total vehicle movements with associated safety and environmental benefits.

The despatch of 1 million tonnes of products from the Dunmore Quarry by road would generate an average of 246 truck movements per day i.e. 123 loads or 123 in/123 out. On a busy day, the 85th percentile level of truck movements would increase to 288 i.e. 144 loads or 144 in/144 out. These levels are based on an average load of 29 tonnes and an equivalent of 280 operational days per year. Given Boral is seeking approval to despatch its products 7 days per week (see Section 3.7.1), the above levels are conservative.

The distribution of quarry products by road would progressively extend beyond the current period when the bulk of products are despatched between 6.00am and 4.00pm. It is likely that there will be an increase in products despatched between 4.00pm and 6.00am.

It is envisaged that the busiest hour would continue to be between 6.00am and 7.00am when an average of 24 truck loads would be despatched generating 48 truck movements.

For the purpose of assessing impacts of future truck movements on the local noise climate, the following estimates of traffic movements are provided.

Truck movements between 7.00am and 10.00pm = 208
Truck movements between 10.00pm and 7.00am = 40

It is noted that truck movements of this magnitude occurred from Dunmore Quarry prior to the re-introduction of rail product despatch in early 2000. In the late 1990's, up to 1.1 million tonnes of products were despatched by road from Dunmore and Kiama Quarries, typically in trucks with an average smaller capacity than the average 29 tonnes envisaged for future movements.

3.7 INFRASTRUCTURE AND SERVICES

3.7.1 Infrastructure

Throughout the remaining operational life of the Dunmore Quarry, Boral proposes to upgrade various site components. For example, a new workshop facility is planned which would incorporate an upgraded hydrocarbon storage area.

3.7.2 Services

3.7.2.1 Power

The proposed modifications to the processing plant would require an increase in electrical power usage of approximately 1 000 megawatt hours per year above the current usage.

3.7.2.2 Water

Boral anticipates its average daily water usage would increase to approximately 500kL per day with a maximum daily usage of 750kL. The annual water usage would be up to approximately 165ML per year. This quantity of water would continue to be drawn from the site stormwater dam. In the event of a shortfall from this source, Boral would supplement its supplies by pumping water from the tidal section of Rocklow Creek. This source would only be used if it is absolutely essential to maintain production and then it would only be used for dust suppression on the site haul roads that are located within the catchment of the site stormwater dam.

3.7.2.3 Fuel

The monthly diesel requirements for on-site mobile equipment for the increase in the level of production would be approximately 140 000 litres per month. Boral proposes during the next 5 years to relocate the bulk fuel storage from an area adjacent to the new maintenance workshop area.

3.8 HOURS OF OPERATION AND PROJECT LIFE

3.8.1 Hours of Operation

Boral is seeking a consistent set of operating hours for the following activities on the Project Site.

- Extraction and Processing: Monday-Saturday: 6.00am-10.00pm
- Product Transfer to Stockpiles Monday-Saturday: 6.00am-Midnight
- Sales: Monday-Saturday: 24 hours
  Sunday: 6.00am-10.00pm
- Maintenance: 24 hours, 7 days a week

These operating hours are required to achieve the increased level of production proposed. It is noted that the hours of operation for both extraction and processing are consistent with those currently in place during the 9 month trial period.

3.8.2 Project Life

The life of this project is difficult to predict as it would be influenced by a range of factors such as changes in market conditions, market opportunities for the sale of the breccia-agglomerate and the need for flexibility, particularly in the latter stages of the project. Based on the increase in production from about 1.2Mtpa to 2.5Mtpa, variations in annual demand, and the current defined latite resource of 31 million tonnes, it is currently estimated that the proposed development would have a project life in the order of 20 to 25 years subject to market conditions.

It should also be noted that there are extensive reserves outside of the approved extraction areas that Boral may seek approval to extract in the future. Decisions regarding future extraction of these areas would clearly influence the project life of the development the subject of this application.

3.9 BY-PRODUCTS AND WASTE MANAGEMENT

3.9.1 Introduction

Boral intends to adopt similar approaches to manage its by-products and wastes in the future as it has in the past. Hence, the text in the following sub-section is similar to that for the existing operations presented as Section 2.11.

3.9.2 By-products

3.9.2.1 Oversize Management

Small quantities of oversize material would continue to be produced during blasting. A substantial proportion of the oversize rock would be sold/used as rip-rap or armourstone. Where oversize is produced from blasting and not sold for rip-rap or armourstone, the rock would be retained within the extraction area until sufficient quantities accumulate to warrant the use of a mobile rock breaker to reduce the oversize material in size to allow the rock to be processed with the remainder of the broken rock. A rock breaker would be used for about 8 days per month to reduce the dimensions of the oversize rock.

3.9.2.2 Breccia-Agglomerate

Approximately 2.5 million m^3 of breccia-agglomerate occurs within the original Dunmore Quarry above the lower flow. At this stage, Boral is uncertain how much breccia-agglomerate can be sold. Boral would endeavour to maximise the use of the material in a range of road pavement materials. The general extent of use of this material in products would be determined prior to removal.

It is proposed that the unsaleable breccia-agglomerate would be progressively placed into the floor of the original Dunmore Quarry as the extraction of the lower floor advances from west to east.

3.9.2.3 Quarry Fines Management

The <5mm fines would remain a major by-product of the crushing and screening process with up to 30% of total production reporting to the fines fraction. This material would continue to be stockpiled within the original Dunmore Quarry for Nusoil™, site rehabilitation or future sale as manufactured sand.

3.9.2.4 Extraction Dust

The processing of latite produces fine dust (<75µm) that is collected from the crushing and screening operations by a dust extraction system. This material would continue to be bagged in bulk bags and stored on site as a saleable product. It is envisaged that the increased production level would enable approximately 15 tonnes of this material to be collected each week. This material would continue to be marketed by Boral as "Nusoil™", a proprietary soil conditioner.

3.9.3 Non-Production Wastes

3.9.3.1 Introduction

Boral is committed to the waste hierarchy where emphasis is placed upon return reuse recycle and disposal of its non-production wastes.

3.9.3.2 Domestic Wastes and Maintenance Consumables

All paper and general wastes originating from the site office, amenities, training room and control room together with routine maintenance consumables would continue to be placed in separate containers for general waste and recyclables and removed from site by a licensed waste contractor. No wastes would be buried on site.

3.9.3.3 Construction and Workshop Wastes

During all construction activities and during normal workshop operations, any waste metals would be set aside in scrap metal bins for periodic collection.

3.9.3.4 Waste Oils and Filters

All waste oil would be collected and stored on site in 1000L or similar sized containers within a bunded area. The containers would be removed from site by a licensed contractor with all relevant waste tracking documentation completed.

All oil filters would be separately stored and returned to the manufacturer for reuse.

3.9.3.5 Sewage

Septic sewage treatment systems would continue to be used at the weighbridge/office training room, site amenities, control room, supervisors office and lunch room. All systems would be checked annually to ensure they are operating efficiently.

3.10 EMPLOYMENT

A permanent increase in hours of operation would enable Boral to maintain the additional shift that started at the commencement of the trial period, employing 15 people. A total of 46 persons would be employed full-time at the quarry together with casual contractors and employees. Details of the categories of full-time employment are set out in **Table 3.3**.

TABLE 3.3

Employment Categories and Numbers.

Category	Number	Category	Number
Quarry Manager	1	Excavator/Loader Operator	2
Quarry Supervisor	3	Sales Loader Operator	4
Quarry Engineer	1	Truck Operator	8
Maintenance Supervisor	1	Load Out Bin Truck Operator	2
Quality Supervisor	1	Fitters	8
Control Room Operator	2	Laboratory Technician	1
Apprentice	1	Labourer / Operator	9
Weighbridge Clerk	2	**TOTAL**	**46**

3.11 REHABILITATION

3.11.1 Introduction

This document provides an integrated approach to rehabilitation of all the areas currently disturbed and planned to be disturbed within the Project Site.

3.11.2 Rehabilitation and Final Land Use Objectives

The following objectives have been adopted when developing the rehabilitation procedures for the Dunmore Quarry.

- To produce a stable final landform able to support a range of alternative final land uses.
- To minimise the environmental impact of all site earthworks associated with environmental controls and rehabilitation activities.

- To optimise the use of available weathered rock and soil as a substrate for vegetation.
- To achieve a stable and functional drainage system at the site under extreme rainfall events.

3.11.3 Final Landform

The final landform (**Figure 3.4**) at the completion of extraction within the Project Site would comprise a series of elongate benches, sloping extraction floors and potentially an area of the original Dunmore Quarry backfilled with breccia-conglomerate.

All final faces would be checked for geotechnical stability and where appropriate remedial action taken to achieve an acceptable level of stability.

3.11.4 Rehabilitation Procedures

3.11.4.1 Introduction

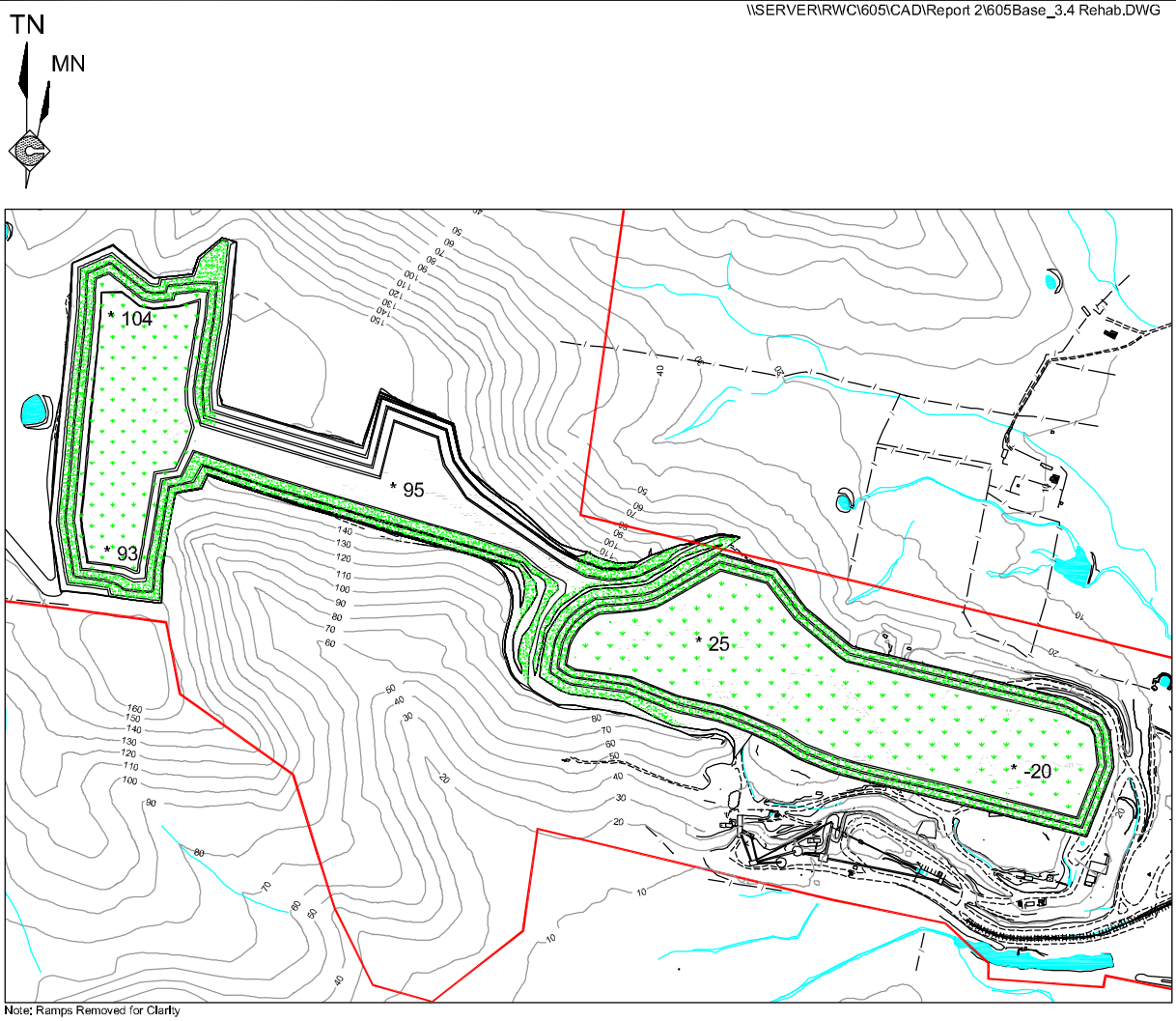
The majority of the extraction areas would not be able to be rehabilitated until the completion of extraction activities, although rehabilitation would progressively be carried out on areas such as final benches within the extraction areas and any disturbed areas beyond the final extraction area or development limits. The principal materials available for rehabilitation of all three extraction areas include the 110 000m^3 of overburden and 10 000m^3 of soil to be recovered from the Croome Farm extraction area. This material would be stored within the original Dunmore Quarry and recovered when required. Boral would also supplement the overburden and soil with one or more of the Nusoil^{TM} products to assist in vegetation growth.

This sub-section outlines the procedures to be adopted in each extraction area. The decommissioning of the processing plant is not envisaged at the completion of extraction within the Project Site as it is likely that other hard rock resources would be processed at the plant. This is one of the reasons why development consent beyond 20 years is being sought.

3.11.4.2 Original Dunmore Quarry

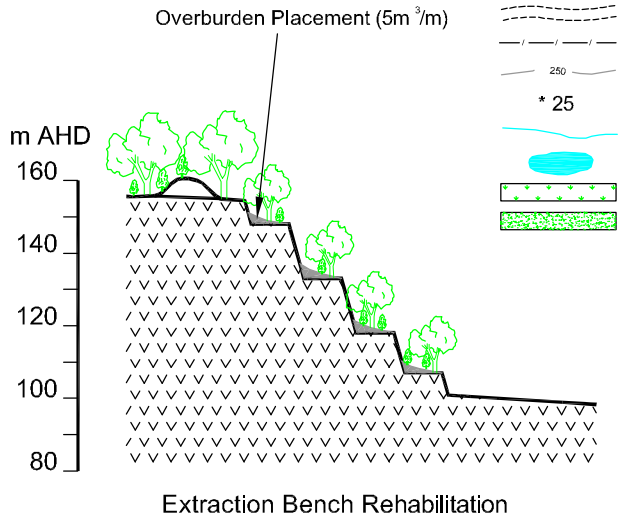
Figure 3.5 illustrates the final landform within the original Dunmore Quarry. Two options are suggested depending upon the amount of breccia-agglomerate that is backfilled within the final landform.

\\SERVER\RWC\605\CAD\Report 2\605Base_3.4 Rehab.DWG



Note: Ramps Removed for Clarity

REFERENCE
Project Site Boundary
Unsealed Road
Fence
250 Contour (Interval = 10m)(m AHD)
* 25 Final Spot Height (m AHD)
Watercourse / Drain
Dam / Water Storage
Extraction Floor Rehabilitation
Extraction Bench Rehabilitation (See Detail)
(See Table 3.4 for Species List)



Extraction Bench Rehabilitation

SCALE 1:12 500

200 0 200 400 600 m

Figure 3.4
PROPOSED REHABILITATION PLAN

TABLE 3.4

Species Suitable for Planting on Benches and Extraction Floor

Taxonomic Name	Common Name
Acacia binervata	Two-veined Hickory
Acacia maidenii	Maiden's Wattle
Acacia mearnsii	Black Wattle
Alphitonia excelsa	Red Ash
Breynia oblongifolia	Breynia
Claoxylon australe	Brittlewood
Clerodendrum tomentosum	Hairy Clerodendrum
Commersonia fraseri	Brush Kurrajong
Croton verreauxii	Native Cascarilla
Cryptocarya microneura	Murrogun
Diploglottis australis	Native Tamarind
Dodonaea viscosa	Hop-bush
Duboisia myoporoides	Corkwood
Ehretia acuminata	Koda
Eucalyptus botryoides/E. saligna	Blue Gum
Eucalyptus quadrangulata	Coast White Box
Eucalyptus tereticornis	Forest Red Gum
Exocarpos cupressiformis	Native Cherry
Ficus macrophylla	Moreton Bay Fig
Ficus rubiginosa	Port Jackson Fig
Geijera salicifolia var. *latifolia*	Brush Wilga
Guioa semiglauca	Guioa
Hibiscus heterophyllus	Native Hibiscus
Indigofera australis	Austral Indigo
Jacksonia scoparia	Winged Broom-pea
Leucopogon juniperinus	Juniper Beard-heath
Livistona australis	Cabbage Palm
Maclura cochinchinensis	Cockspur Thorn
Melaleuca armillaris	Bracelet Honey-myrtle
Melia azedarach	White Cedar
Notelaea venosa	Native Olive
Omalanthus nutans	Native Bleeding Heart
Ozothamnus diosmifolius	Everlasting
Pittosporum undulatum	Sweet Pittosporum
Polyscias elegans	Celerywood
Polyscias sambucifolia	Elderberry Panax
Protanthera linearis	Narrow-leaved Mintbush
Rapanea howittiana	Muttonwood
Rhodamnia rubescens	Scrub Turpentine
Streblus brunonianus	Whalebone Tree
Syzygium australe	Brush Cherry
Toona ciliata	Red Cedar
Trema aspera	Native Peach
Zieria granulata	Illawarra Zieria

Source: Kevin Mills and Associates

Figure 3.5(a) shows the final landform without any backfill and **Figure 3.5(b)** shows the final landform with an estimated 3 million m^3 of backfill (20% swell factor). In reality, the final landform is likely to lie between both options.

The main features of the rehabilitated landform in the original Dunmore Quarry would include the following.

1. A sloping floor covering approximately 13ha (**Figure 3.5(a)**). Elevations on the floor would range from 25mAHD on the western end to approximately -20mAHD on the eastern end. In the event that some or all of the breccia-agglomerate is backfilled into the extracted landform the final floor would be shaped to achieve a useful landform (**Figure 3.5(b)**).

2. Two to three sloping benches generally parallel to the sloping floor. These benches would be 5m to 10m wide with access ramps left at strategic locations within the area.

3. An entry point would be created along the southern boundary of the area to provide long term access onto the final floor. The exact location of this access would be determined closer to the end of extraction.

All final benches would be rehabilitated through the placement of overburden and any available soil on the benches and revegetated. An estimated 4.3km of benches within the original quarry would be rehabilitated in this manner requiring approximately 20 000m^3 of overburden on the benches. The overburden would be placed on the benches in a random manner to encourage the retention of rainfall and seepage. **Figure 3.4** conceptually shows the final vegetated benches. The trees and shrubs to be planted on the benches would be drawn from the following species supplied by Kevin Mills and Associates (**Table 3.4)**.

The extent of overburden placement on the floor of the original Dunmore Quarry would be dependant upon the ongoing land use within the area.

3.11.4.3 RIC Extraction Area

When extraction ceases in the RIC extraction area, Boral intends to leave the southern extraction faces as terminal faces rehabilitated in the same manner described for the original Dunmore Quarry and shown on **Figure 3.4**. The northern extraction faces would be left unrehabilitated given it is the intention of RIC to develop its own quarry northwards from these faces. An access would be maintained through the floor of the RIC extraction area between the Croome Farm extraction area and the original Dunmore Quarry for the life of the agreement between Boral and RIC.

The southern benches in the RIC extraction area totalling 1.5km in length would require an estimated 8 000m^3 of overburden as a substrate for the revegetation of these benches.

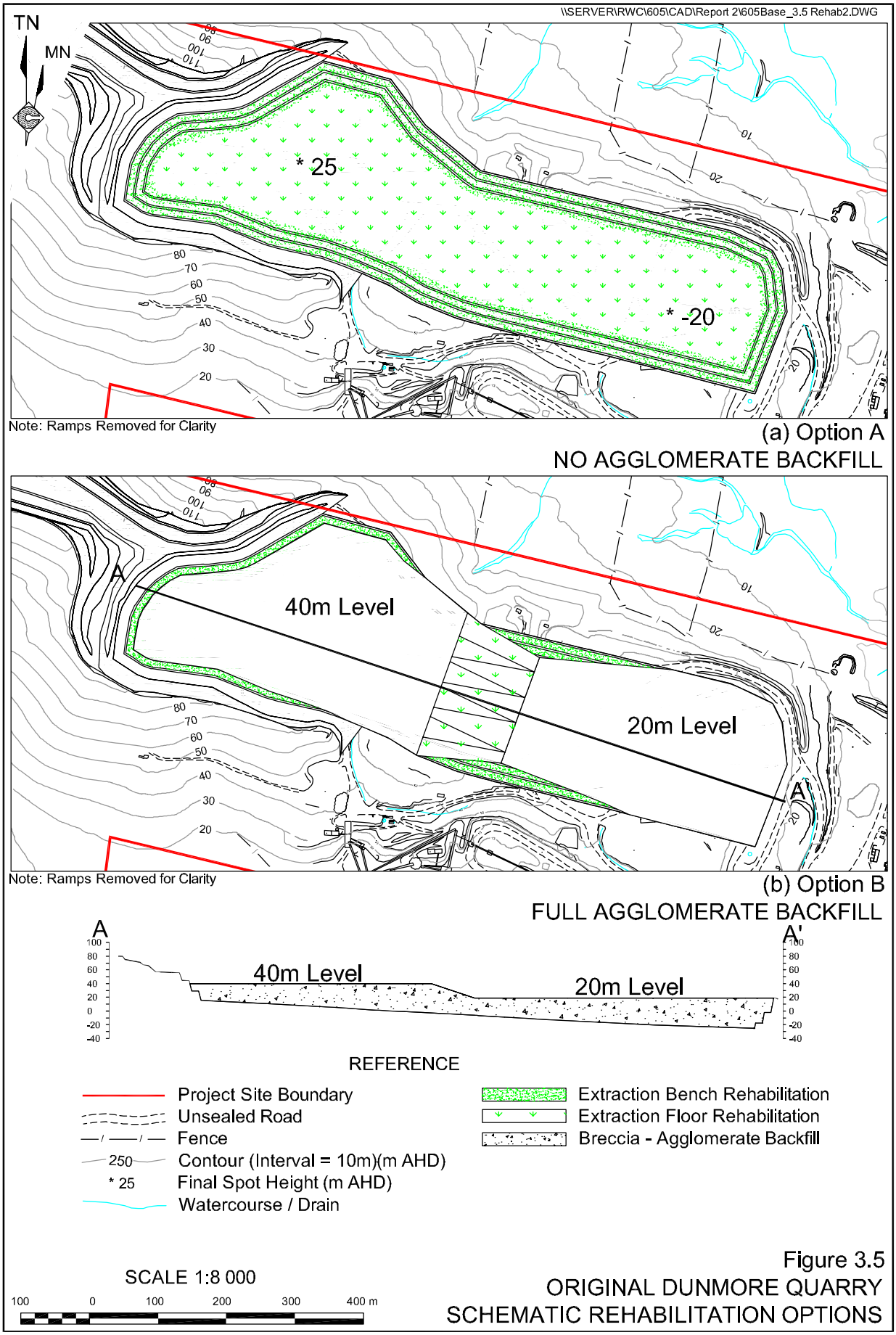


Figure 3.5
ORIGINAL DUNMORE QUARRY
SCHEMATIC REHABILITATION OPTIONS

3.11.4.4 Croome Farm Extraction Area

Figure 3.4 shows the Croome Farm extraction area would be left as an amphitheatre with an opening to the east. The extraction area would be fully internally draining and all benches would be rehabilitated in the manner discussed earlier and shown on **Figure 3.4**. It is envisaged that the floor of the Croome Farm extraction area would be covered with a thin veneer of overburden and revegetated using the tree and shrub species referred to in **Table 3.3**. This however, would be determined once a final land use is identified.

The perimeter benches around the Croome Farm extraction area total approximately 6km in length and would require an estimated 30 000m^3 of overburden to form a suitable substrate for the revegetation planned. A further 20 000m^3 of overburden would be placed on the extraction floor to achieve a thickness of approximately 0.3m.

3.11.5 Final Land Use

Boral's plans for a final land use for the original Dunmore Quarry and Croome Farm extraction area are likely to be determined within the final 5 years of their operational life. A greater understanding of RIC's plans for their resource area would be known at that time. Clearly, it would be difficult to consider any other land use close to the RIC extraction area whilst extraction activities are underway in that area.

As discussed in Section 2.13.4 Boral recognises that for many of its quarries, it is often premature to specify the proposed end use at the commencement of a quarry, or in this case, approximately 20 years before extraction ceases. The development of land uses within completed extraction areas is best undertaken within the last five or so years of an operation to reflect the economic and community needs prevailing at that time.

Current examples of Boral's approach to quarry end use include:

- Greystanes Estate (Prospect Quarry) which is being rehabilitated and developed to provide a major employment/industrial area as well as a new residential estate; and

- The former Moorebank brickworks site which is being rehabilitated and developed for residential housing.

3.12 ALTERNATIVES ASSESSMENT

3.12.1 Introduction

Schedule 3.2 of the *Environmental Planning and Assessment Regulation 2000* requires that an EIS include an analysis of any feasible alternatives to carrying out the proposed development. The following alternatives were considered by Boral during the planning stages for the proposed development but were not accepted in favour of the components incorporated earlier in this section.

- The 'do nothing" option, i.e. maintain production at 1.2Mtpa (see Section 3.12.2).

- Modes of transport i.e. road -v- rail (see Section 3.12.3).

- Alternative aggregate sources (see Section 3.12.4).

- Maintain existing hours (see Section 3.12.5).

It is noted that two options are incorporated in Section 3.11 for the rehabilitation of the original Dunmore Quarry. These options have been included in that section, and not this section, to assist readers to gain an understanding of the possible final landform for the original Dunmore Quarry.

3.12.2 Maintain Production at 1.2Mtpa

The maintenance of the 1.2Mtpa production level effectively represents the "do nothing" option or could equally respond to the requirement for the EIS to address the consequences of the Development Application not being approved.

As outlined in Section 1.4.2, Boral is planning to expand production at some of its quarries in the next five years to enable these sources to replace the production that will likely be foregone when sites such as Prospect Quarry and Penrith Lakes cease production of coarse aggregates.

In the event that the proposed production increase to 2.5Mtpa is not approved, Boral would need to consider:

(i) increasing production at other quarries; or

(ii) developing one or more new quarries.

Given that the bulk of the market requirement for coarse aggregate is within the Sydney metropolitan area, Boral considers it is far more appropriate to increase production at Dunmore Quarry given the opportunity to expand the rail transportation of its products.

It is noted that the current upper production limit of 1.2Mtpa relates only to the Croome Farm and RIC extraction areas. In the event that the Development Application is not approved, Boral would continue to rely upon the existing use rights within the original Dunmore Quarry which would enable Boral to extract hard rock from that area. Many of those products would be road pavement materials produced from the breccia-agglomerate within the existing floor of the original Dunmore Quarry. This alternative is not favoured by Boral as it would prefer to be able to produce up to 2.5Mtpa of premium quality products in the short-term and provide for the gradual extraction of the breccia-agglomerate.

Another consequence of the "do nothing" option, would be the loss of the opportunity to develop a single uniform set of operating conditions for the entire quarry. Reliance would be placed on the current Development Consents and the existing use rights with their inconsistent conditional requirements. A significant consequence of the "do nothing" option is that the employment level would be reduced to 31 persons, i.e. 15 less than the number currently employed for the trial period.

3.12.3 Modes of Transport

The presence of the rail siding at Dunmore Quarry prompts consideration of why greater use is not made of rail to deliver products to Sydney, particularly as 80% of the trucks departing the quarry are destined for Sydney suburbs. Whilst Boral delivers a substantial proportion of its products by rail to St Peters and Enfield, products are also delivered by truck to a range of other destinations in Sydney that do not have rail access.

Boral's use of rail to transport up to 1.5Mtpa to Sydney is based on the use of products close to the rail terminals. Clearly, if the opportunity arose to use more aggregates near a railway terminal in Sydney, Boral would introduce further rail transport from Dunmore.

3.12.4 Alternative Aggregate Sources

3.12.4.1 Natural Aggregates

Boral currently sources its requirements for premium natural coarse aggregates for the Sydney metropolitan area a principally from Penrith Lakes with lesser quantities from Peats Ridge. The bulk of the products from Prospect Quarry are road pavement materials. Other sources that Boral plans to ultimately develop include the Mt Misery/Hurdle Ridge via Berrima. This site is approved to produce up to 1Mtpa of coarse aggregate, however, it does not have access to rail. This source will be developed in the future principally to supply the expanding markets in southwestern Sydney and the Southern Highlands.

3.12.4.2 Alternative Materials as Aggregates

The use of recycled construction materials and waste products such as blast furnace slag are genuine alternatives to natural quarry aggregates. However, each of these materials has limitations placed upon their availability or uses. Consequently, a demand for quality coarse natural aggregate remains.

Recycled Concrete
Boral is supportive of the use of recycled concrete as a replacement for natural aggregates provided the quality assurance requirements are satisfied. Boral's commitment to the use of crushed concrete as a coarse aggregate is demonstrated through its recent construction of a Construction and Building Recycling Facility at Widemere south of its Prospect Quarry in Sydney. This plant has a capacity to process up to 600 000 tonnes of raw materials delivered to the plant. The bulk of the products produced are road pavement materials including recycled DGB 20, enviroblend™, Superfill, Bases and sub-pavement materials.

The limitations for coarse recycled concrete to be used as an aggregate in concrete, particularly high strength concrete, are as follows.

- The high water absorption of the material increases the water demand in concrete, and hence, the amount of cement required.
- An increase in the drying shrinkage occurs.
- The raw materials are not always clean eg contaminated with plastic or wood.

Whilst the use of crushed recycled concrete offers a range of benefits, including the responsible reduction in the use of natural aggregates, the use of recycled concrete aggregates is itself limited by the availability waste concrete in the first place. In Sydney, an estimated 1.5 million tonnes of construction and demolition wastes are recycled annually of which approximately 20% or 300 000 tonnes is waste concrete. Therefore, in reality only a small portion of select coarse concrete aggregate could be considered a replacement for natural aggregates.

Blast Furnace Slag

Boral is supportive of the use of blast furnace slag as an alternative to rock aggregate products. However, there are currently limitations or constraints upon the extent that slag can be used as a substitute for natural aggregates due to a range of chemical or physical properties and economic factors.

The issues on the limitations of slag as a substitute for natural aggregates are well recognised by Government and Industry. The issues relate principally to quality and availability. Some of the issues when using slag as a substitute for natural aggregates include variability in aggregate size, composition and chemical reactivity. These properties are important in determining and producing stabile concrete products. Whitehouse (1997) recorded that fine aggregates, obtained from the crushing of slag provides only limited quantities of material suitable for use in concrete manufacture due to the shape of the crushed product creating workability problems.

The extent to which slag materials can be substituted for natural aggregates particularly in concrete is determined by technical and economic factors and their higher handling and transport and/or processing costs compared with natural aggregates.

Notwithstanding the above limitations of using slag as a substitute for natural aggregates, Boral is already using substantial quantities of slag in its concrete products. In 2002/2003, Boral used in excess of 300 000 tonnes of coarse crushed slag as a raw material in concrete. Where feasible, Boral would continue to use slag as a substitute for natural aggregates and would continue to identify opportunities to expand its feasible use in the future.

Apart from the issues relating to quality of slag, the issue of availability of slag needs to be considered. The optimum and highest value product produced from blast furnace slag for the construction industry is finely ground slag which is included as an additive in cement. Hence, the availability of slag for crushing to produce coarse concrete aggregates is limited to approximately 550 000 tonnes per year, 60% of which is already used by Boral in concrete manufacture. The remainder of this material is used by other extractive industry Companies and Government organisations such as the RTA.

In conclusion, the demand for natural coarse aggregates is expected to continue, particularly for use in concrete where quality is paramount. The issues of quality and availability of alternative materials will continue to limit their use.

3.12.5 Maintenance of Existing Hours

The Department of Environment and Conservation has requested that Boral document the reasons behind its preference to extend hours of operation to increase production rather than increase the hourly throughput of the site components within the normal approved hours of production.

Boral has closely examined the extent to which the capacity of the existing plant can be increased by removing various process bottlenecks and achieving optimum efficiency. The planned increase in production from 500tph to 750tph within the current hours of operation would enable Boral to produce up to 1.8Mtpa which is insufficient to meet the Company's projected demands. In order to achieve an annual production level of 2.5Mtpa, the hourly throughput would need to be increased to 1000tph which is clearly beyond the capability of the existing plant. The principal limiting factors would be the production capacity of the primary/secondary circuits which would need to be fully replaced to achieve such a throughput.

Boral has chosen the most economically responsible option to optimise the processing plant throughput and better utilise the plant through increased hours of production. Clearly, Boral recognises from an economic point of view that it would be far more appropriate to improve the noise controls on the processing plant to allow it to operate for an additional four hours per day than to virtually construct a new primary/secondary circuit and again upgrade the tertiary circuit. It is also noted that the extended hours of operation provide for a greater flexibility for the delivery of the quarry's products.

In light of the above discussions, Boral has determined that increasing the hours of operation and minor modifications to the processing plant is the most appropriate approach to increase production to 2.5Mtpa.

Section 4
Environmental Setting

PREAMBLE

This section describes the components of the local environmental setting within and surrounding the Project Site.

Emphasis is placed upon providing information about the relevant environmental features that would contribute to or influence the assessment of environmental effects of the proposal to increase production levels at the Dunmore Quarry.

Information is provided on topography, geology, meteorology, land use and the surrounding residences. More detailed information on the other features of the local environment that would or may be affected by the proposal are described in detail in Section 5 in conjunction with the design and operational safeguards and impact assessment of those features.

4.1 TOPOGRAPHY

4.1.1 Local Topography

The Project Site is located on two hills known locally as Locking Hill and Gooseberry Hill, which form part of the lower slopes of the Illawarra escarpment. Locally, the lower slopes form a series of lobate to elongate northwest-southeast orientated ridges typically with a peak of 140mAHD to 160mAHD before merging with the Minnamurra River flood plain. All drainage from the Project Site flows into Rocklow Creek to the south and into tributaries of Rocklow Creek to the northeast (**Figure 4.1**).

Rocklow Creek and its tributaries flow into and across the low lying flood plains before flowing into the Minnamurra River.

4.1.2 Project Site Topography

The majority of the Project Site is located along the upper surface of the northwest-southeast orientated ridge formed by Locking Hill and Gooseberry Hill with a maximum elevation of approximately 164mAHD which gradually reduces via a series of quarried landforms to approximately 10mAHD at the eastern margin of the extraction and stockpiling precinct, and 2mAHD at the weighbridge and office complex.

The northern and southern boundaries of the approved extraction area coincide with the crests of steep slopes. The slopes have been retained to reduce impacts on visual amenity into the site.

The northern and southern slopes of the ridge are steep (1:2.5, V:H) and are traversed by intermittent creeks which form tributaries to Rocklow Creek, which itself is regularly dry.

4.2 GEOLOGY

4.2.1 Introduction

This section introduces the regional and Project Site geology. Details of the resources within the Project Site have previously been discussed in Sections 2.4 and 3.3.

4.2.2 Regional Geology

The regional geology has been described in the report: Geology of the Wollongong, Kiama and Robertson 1:50 000 Sheets (1974).

The Dunmore-Kiama area is underlain by a conformable sequence of Permian (250-290 million years old) sedimentary and volcanic rocks that are collectively termed the Broughton Formation. The Broughton Formation overlies the Shoalhaven group of rocks and underlies the Illawarra Coal Measures.

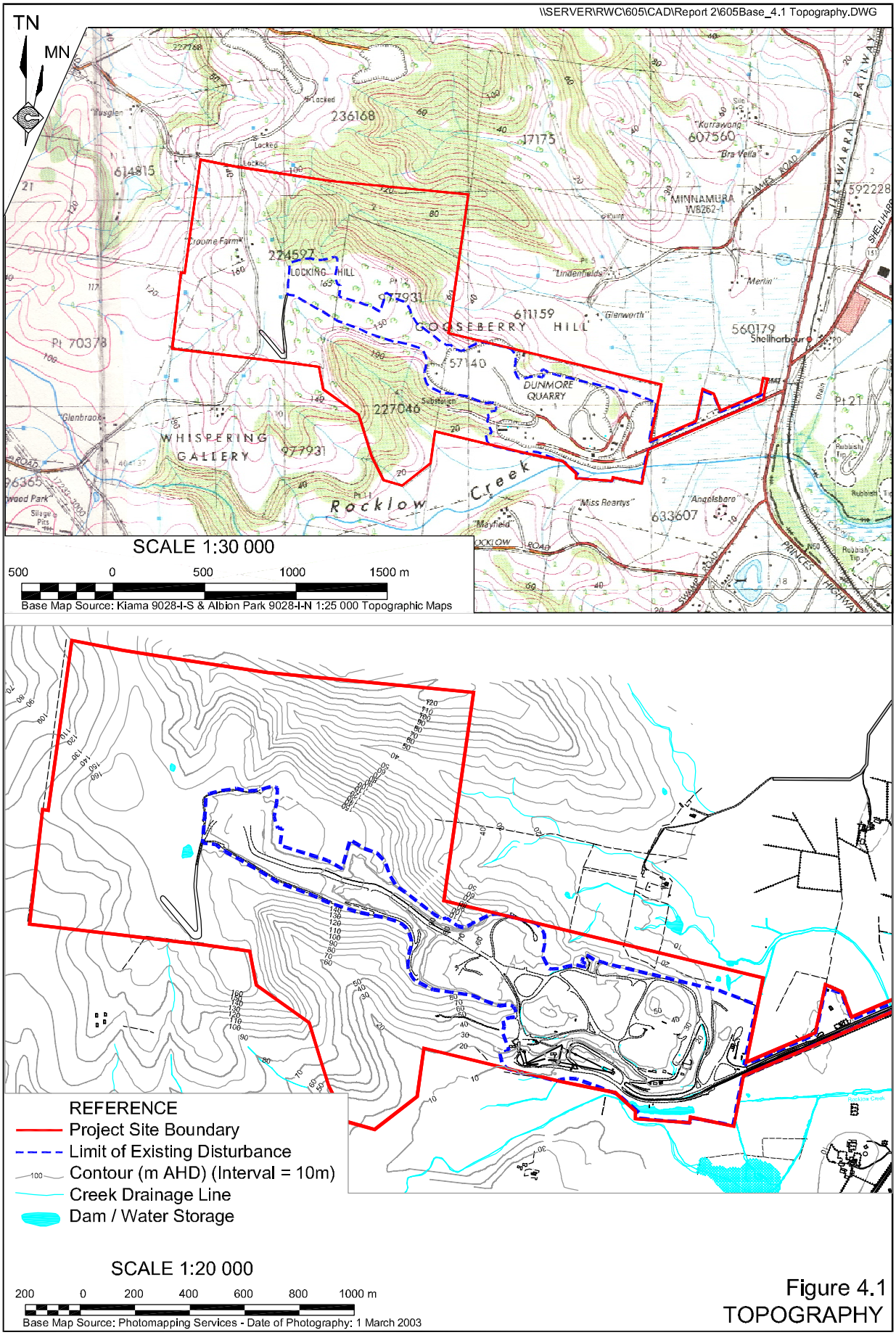


Figure 4.1
TOPOGRAPHY

Included in the Broughton Formation are fine latite members which are interbedded with volcanogenic sandstones, tuffs and tuffaceous sandstones. One of these, the Bumbo Latite Member, which can achieve thicknesses of up to approximately 150m, contains the latite that is quarried extensively throughout the Albion Park – Dunmore Area.

4.2.3 Project Site Geology

Within the Project Site, the Bumbo Latite Member overlies the Kiama Sandstone and consists of three separate flows, termed the lower, middle and upper flows (**see Figure 4.2**). The upper and lower flows are typically massive whereas the middle flow generally exhibits well developed columnar jointing. Diffusion of iron oxides during cooling of the upper flow has resulted in a characteristic pinkish tinge. The base of the middle flow is defined by a breccia - agglomeritic layer formed during emplacement. The flows dip generally to the southeast at about 2° to 3°.

Within the current extraction area, the three flows and the agglomerate layer can have a combined thickness that ranges from 85m to 130m. The main variation in thickness is in the upper flow, due to the topographic surface and the agglomerate layer, which shows thickening to the east with an inconsistent upper contact displaying localised dips and rolls.

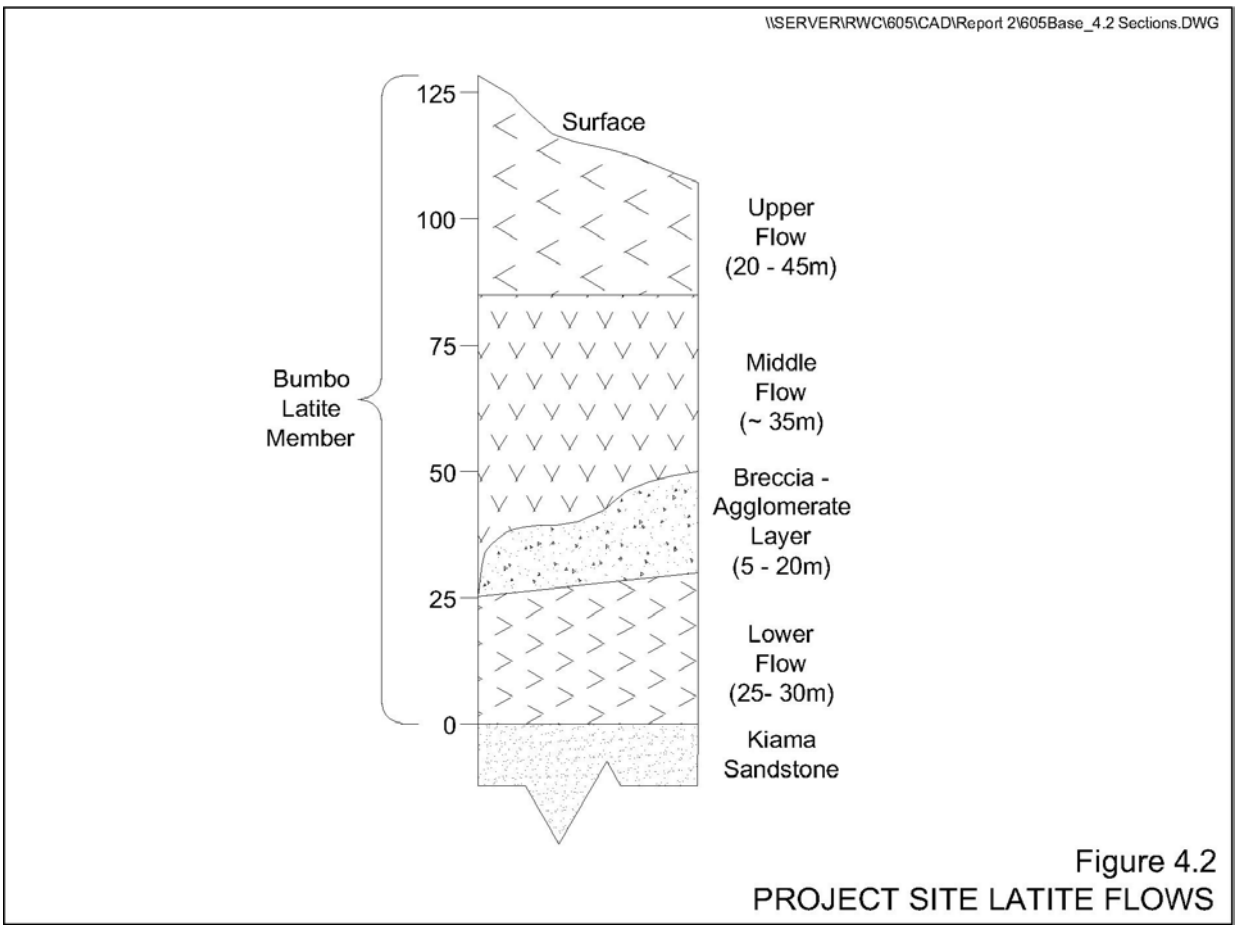


Figure 4.2
PROJECT SITE LATITE FLOWS

4.3 METEOROLOGY

4.3.1 Introduction

The sub-sections present summaries of the meteorological data relevant to the Project Site. The assessment of impact undertaken by Specialist Consultants has been based on meteorological data that may include the following data sources but may also include additional data sets depending on the form of the data sets, locality of data collection sites with respect to the Project Site and the type of assessment being undertaken. Based on the availability of relevant data, the aspects of the meteorological environment have been calculated that best represent the conditions for the project site for use in the assessment of impacts.

4.3.2 Source of Data

The meteorological data presented in this section has been drawn from a range of sources including the Bureau of Meteorology stations at:

- the Kiama Bowling Club (Station 068038) approximately 6 km to the south of the Project Site;
- Nowra RAN Air Station (Station:068076) situated approximately 35 km to the south of the Project Site and the closest recording site for evaporation; and
- the Dunmore Quarry Site.

These combined data sources best reflect the meteorological environment that occurs at the Dunmore Project Site. The data collected comprises temperature, rainfall, frequency of frosts and fog, pan evaporation and wind.

4.3.3 Temperature

Average daily maximum and minimum temperatures recorded at Kiama are presented in **Table 4.1**. The Kiama area generally experiences warm summers and mild winters. Mean daily temperatures range from 8.4^{o}C (minimum) to 18.1^{o}C (maximum) in winter, and from 16.4^{o}C (minimum) to 25.1^{o}C (maximum) in summer. February is the warmest month and July the coldest month.

4.3.4 Rainfall

The annual rainfall distributions for Kiama are shown in **Table 3.1** and are based on approximately 98 years of record keeping.

The average annual rainfall for Kiama is 1 261 mm. Highest rainfalls at Kiama occur in the period between March and June. March has the highest mean rainfalls of 145 mm. August and September are the driest months at Kiama with mean rainfalls of approximately 77 mm and 75 mm respectively. On average, Kiama experiences 10 rain days per month and 128 rain days per year.

4.3.5 Temperature Inversions

Temperature inversions are noise enhancing phenomena and are often expressed as fogs and occur in conjunction with frosts. They invariably occur of an evening with clear skies and when wind speeds are low or calm conditions prevail. The inversions normally disappear early the following morning. **Table 4.1** presents a record of fog and frost frequencies for Kiama, the closest recording site to the Project Site. Fogs generally occur in January and February whilst frosts occur from May to July, although the frequency of both phenomena is very low.

TABLE 4.1

Climatic Summary - Kiama[a] and Nowra[b]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
TEMPERATURE (Kiama)													
Mean Daily Maximum (^{o}C)	25.1	25.1	24.2	22.2	20.1	17.6	16.8	18.1	19.8	21.7	22.5	24	21.3
Mean Daily Minimum (^{o}C)	17.6	17.8	16.4	13.8	12.2	9.3	8.4	8.8	10.6	12.4	14.3	16.4	12.9
RAINFALL (Kiama)													
Mean Monthly Rainfall (mm)	111	119	145	132	121	126	87.6	77.4	75.2	86.7	86.8	94.4	1261
Highest Monthly Rainfall (mm)	365	508	620	686	623	671	456	378	239	444	592	408	-
Lowest Monthly Rainfall (mm)	13.9	3.2	9.2	7.7	1.5	0	0	0	1.8	4.4	1.5	4.6	-
Mean Number of Rain Days	12.2	11.7	12.7	11.2	10.8	9.8	8.6	8.5	9.2	10.7	11	11.3	127.6
MEAN MONTHLY EVAPORATION (mm) (Nowra)													
	195	159	145	120	96	87	96	123	150	176	183	213	-
FROST FREQUENCY (Kiama)													
Mean number of days with frost	Nil	Nil	Nil	Nil	0.1	0.1	0.3	Nil	Nil	Nil	Nil	Nil	0.5
FOG FREQUENCY (Kiama)													
Mean number of days with fog	0.1	0.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.1	Nil	0.3

a -Climate averages for Station: 068038 KIAMA BOWLING CLUB
Commenced: 1897; Last record: 2003; Latitude (deg S): -34.6750; Longitude (deg E): 150.8519; State: NSW
b -Climate averages for Station:068076 NOWRA RAN AIR STATION
Commenced: 1942; Last record: 2000; Latitude:-34.9449 S; Longitude: 150.5450 E Elevation: 109.0 m State: NSW

4.3.6 Wind

The wind speed and direction recorded at Dunmore Quarry are graphically presented on a annual and seasonal basis on **Figure 4.3**. The Project Site is subject to reasonably strong onshore winds predominantly from a north-easterly direction, particularly in spring and summer. In autumn and winter there is a stronger influence from the south-westerly quadrant.

4.3.7 Evaporation

Table 4.1 presents mean daily pan evaporation for Nowra, the closest recording site for evaporation. Evaporation exceeds rainfall throughout the year with the exception of May and June.

4.4 LAND OWNERSHIP AND SURROUNDING RESIDENCES

4.4.1 Surrounding Land Ownership and Usage

The ownership of land surrounding the Project Site is shown on **Figure 4.4** and listed in **Table 3.2**.

It is noted that Boral holds negotiated agreements with Mrs J. Creagan, Readymix and Dunmore Sand & Soil Pty Ltd which recognises that reasonable exceedances of noise levels above specified noise goals are acceptable, and accordingly the residences on their respective properties can be considered as project-related. A verbal agreement is also in place with Readymix – which is to be formalised in writing.

4.4.2 Surrounding Residences

Table 4.3 lists a number of the closest residences on the properties adjoining and/or surrounding the Project Site together with the distance of these residences to the closest section of the approved extraction areas and processing plant.

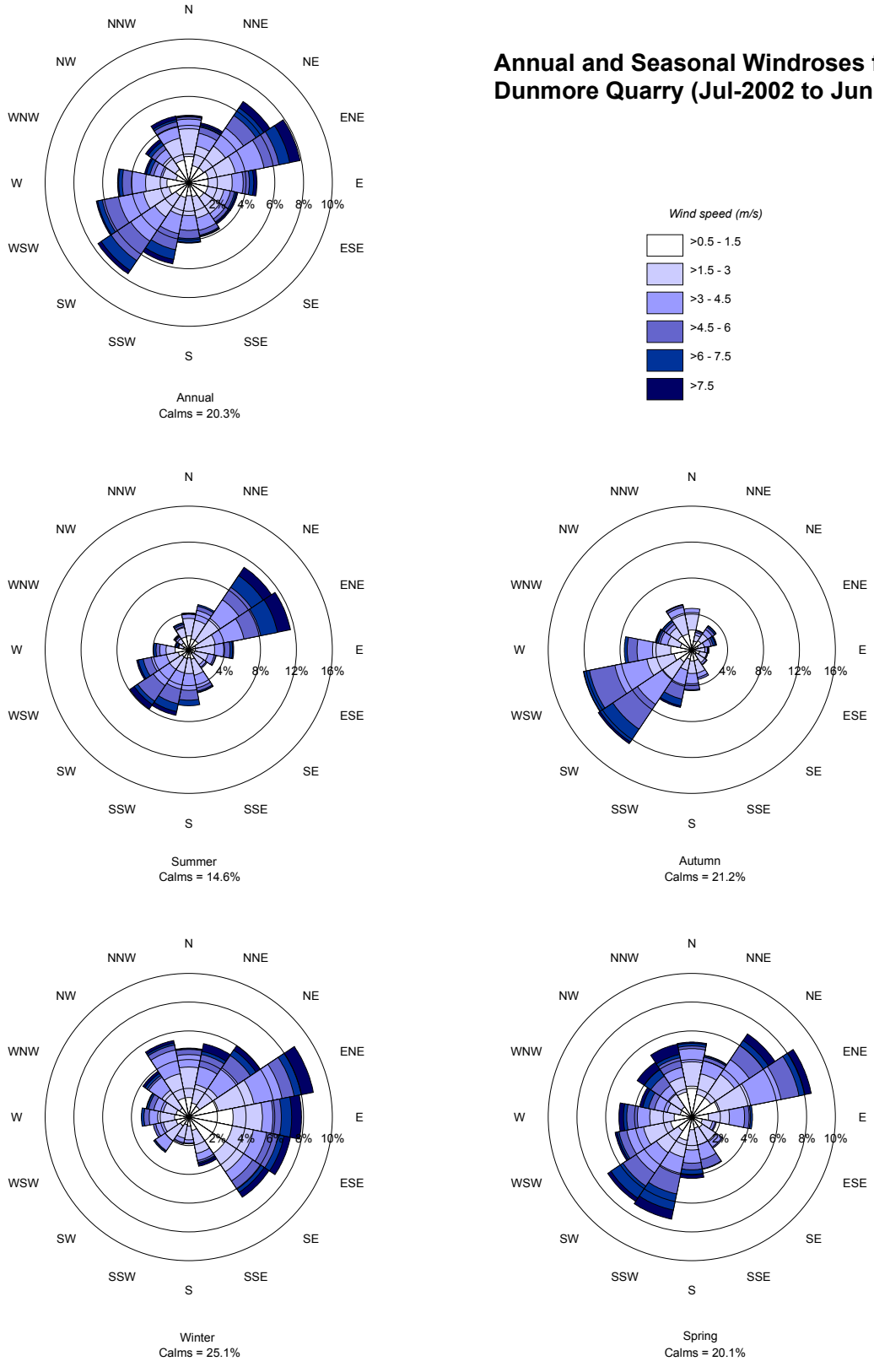


Figure 4.3 Annual Wind Roses

Source: Holmes Air Sciences, Figure 4

Table 4.2

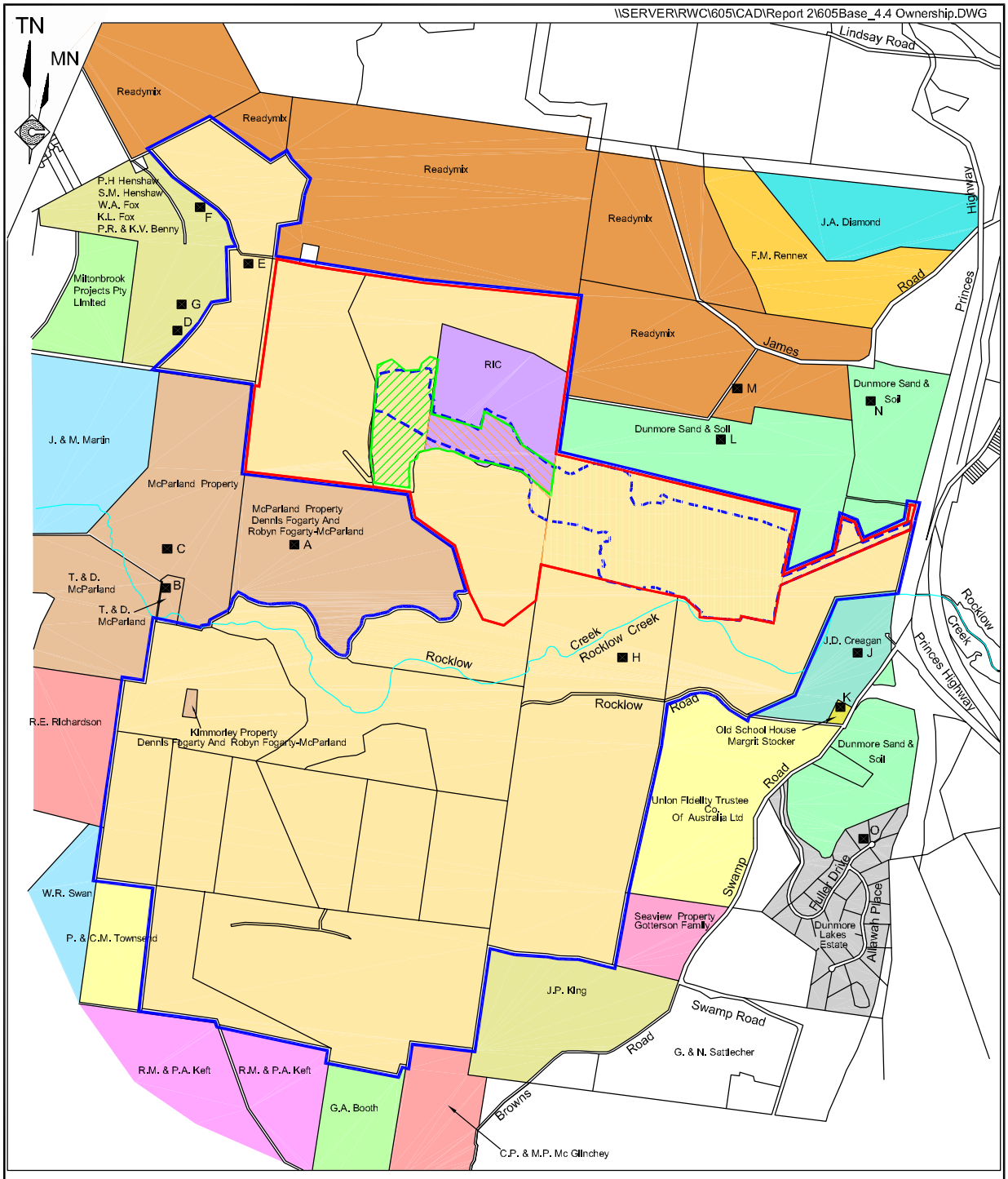
Surrounding Land Ownership

Land Description	Owner	Use
Lot 1 DP74108	Readymix	Grazing / quarry holding
Lot 1 DP227268	Readymix	Grazing / quarry holding
Lot 1 DP236168	Readymix	Undeveloped / quarry holding
Lot 1 DP17175	Readymix	Undeveloped / quarry holding
Lot 1 DP126752	Readymix	Undeveloped / quarry holding
Lot 2 DP607560	Readymix	Undeveloped / quarry holding
Lot 100 DP717430	J.A. Diamond	Undeveloped / quarry holding
Lot 6 DP 611159	Dunmore Sand & Soil Pty Ltd	Grazing/ proposed sand extraction
Lot 5 DP560179	Dunmore Sand & Soil Pty Ltd	Grazing/ proposed sand extraction
Lot 5 DP1030504	Dunmore Sand & Soil Pty Ltd	Grazing/ proposed sand extraction
Lot 50 DP1012246	Dunmore Sand & Soil Pty Ltd	Grazing/ proposed sand extraction
Lot 17 DP607791	Dunmore Sand & Soil Pty Ltd	Grazing/ proposed sand extraction
Lot 5 DP1001931	J. Creagan	Rural / Grazing
Lot 1 DP745632	M Stocker	Residential /Wedding Reception Venue
Lot 5 DP431181	Union Fidelity Trustee Co. of Australia Ltd	Rural / Grazing
Lot 1 DP132404	Seaview Property Gotterson Family	Rural Residential / Grazing
Lot A DP430978	J.P. King	Rural Residential / Grazing
Lot 1 DP56839	C.P. & M.P. McGlinchey	Rural Residential / Grazing
Lot 141 DP1041341	G.A. Booth	Rural Residential / Grazing
Lot 1 DP714877	R.M. & P.A. Keft	Rural / Grazing
Pt 23 DP751290	P. & C.M. Townsend	Rural Residential / Grazing
Lot 6 DP621070	W.R. Swan	Rural / Grazing
Lot 12 DP866128	R.E. Richardson	Rural / Grazing
Lot 21 DP716691	T.D. McParland	Rural / Grazing
Lot A DP404137	T.D. McParland	Rural / Grazing
Lot 10 DP977931	D. Fogarty & R. Fogarty-McParland	Rural / Grazing
Lot 1 DP722558	J. & M. Martin	Rural / Grazing
Lot 2 DP1046022	Miltonbrook Projects Pty Limited	Rural / Grazing
Lot 11 DP618815	P.H. Henshaw, S.M. Henshaw, W.A. Fox, K.L. Fox, P.R. & K.V. Benny	Rural / Grazing

Table 4.3

Distances to Surrounding Residences

Residence	Ownership	Distance (m) to	
		Closest Part of Extraction	Processing Plant
A	Fogarty and Fogarty - McParland	460	1500
B	T & D McParland	1100	2140
C	T & D McParland	1020	2140
D	P & S Henshaw, W & K Fox, P & K Benny	950	2350
F	P & S Henshaw, W & K Fox, P & K Benny	1110	2600
G	P & S Henshaw, W & K Fox, P & K Benny	960	2400
J	J D Creagan	400	880
K	M Stocker	480	920
L	Dunmore Sand & Soil P/L	300	680
M	Readymix	570	940
N	Dunmore Sand & Soil P/L	715	1120



REFERENCE
- Project-related Land
- Project Site Boundary
- Approved Extraction Boundary
- Limit of Existing Disturbance
- Boral-owned Land
- Original Dunmore Quarry
- Rail Infrastructure Corporation (RIC) Extraction Area
- Croome Farm Extraction Area
- Cadastral Boundary
- A Residence / Identifier

SCALE 1:30 000

500 0 500 1000 1500 m

Cadastral Information Source: Digitised from LPI DCDB

Figure 4.4
LAND OWNERSHIP

Section 5
Environmental Features, Safeguards & Impacts

PREAMBLE

This section describes the environmental features of the Project Site that may be influenced by activities on or related to the Project Site, proposed safeguards and an assessment of the level of impact the proposed activities may have after the implementation of those safeguards. Where appropriate, proposed monitoring strategies are outlined.

Consideration of elements of the biophysical environment that would not be materially influenced by the proposed development and that have been addressed in previous assessments have been summarised for the reader's benefit.

5.1 WATER RESOURCES

5.1.1 Introduction

The water resources within the Project Site comprise both surface and groundwater, however, the main resource requiring management is surface water.

Boral proposes to manage surface water on the Project Site generally in accordance with the Stormwater Management Plan (SMP) prepared by Environmental Resources Management in May 2002 (ERM, 2002). This report was submitted to the former EPA (now DEC) in 2002 and Boral is awaiting a response before implementing the recommendations of the report. This section draws heavily on the ERM report for much of the detail on water management for the Project Site.

The following sub-sections describe the existing regional, local and Project Site drainage and groundwater occurrences and presents Boral's plans to manage and use the water resources on site. The sub-section also includes the relevant water quality discharge criteria, water management controls and provides an assessment of impacts associated with the proposed development.

5.1.2 Surface Water

5.1.2.1 Regional and Local Drainage

The Minnamurra River and Rocklow Creek (a major tributary) are the main drainage features in the vicinity of the Project Site with the waters from these drainages ultimately flowing into the Tasman Sea at Minnamurra Point approximately 1.5km to the east of Dunmore. Both the Minnamurra River catchment (120km^2) and the Rocklow Creek catchment (21km^2) originate in the Illawarra Range to the west of the Project Site. **Figure 5.1** displays the Project Site with respect to both the Minnamurra River and Rocklow Creek catchments.

The headwaters of Rocklow Creek lie approximately 3km west of the Project Site. The creek flows generally in an easterly direction, although for a 2km section the creek immediately west of the Princes Highway, the creek is confined to a series of straight man-made channels and a localised diversion through a swampy area immediately south of the stormwater dam. The man-made channel is typically 3m to 4m wide and less than 1m deep.

The tidal influence from the Minnamurra River normally extends upstream into Rocklow Creek to a point immediately east of the Illawarra Railway Line. During a king tide event, saline water can reach the section of Rocklow Creek immediately west of the Princes Highway.

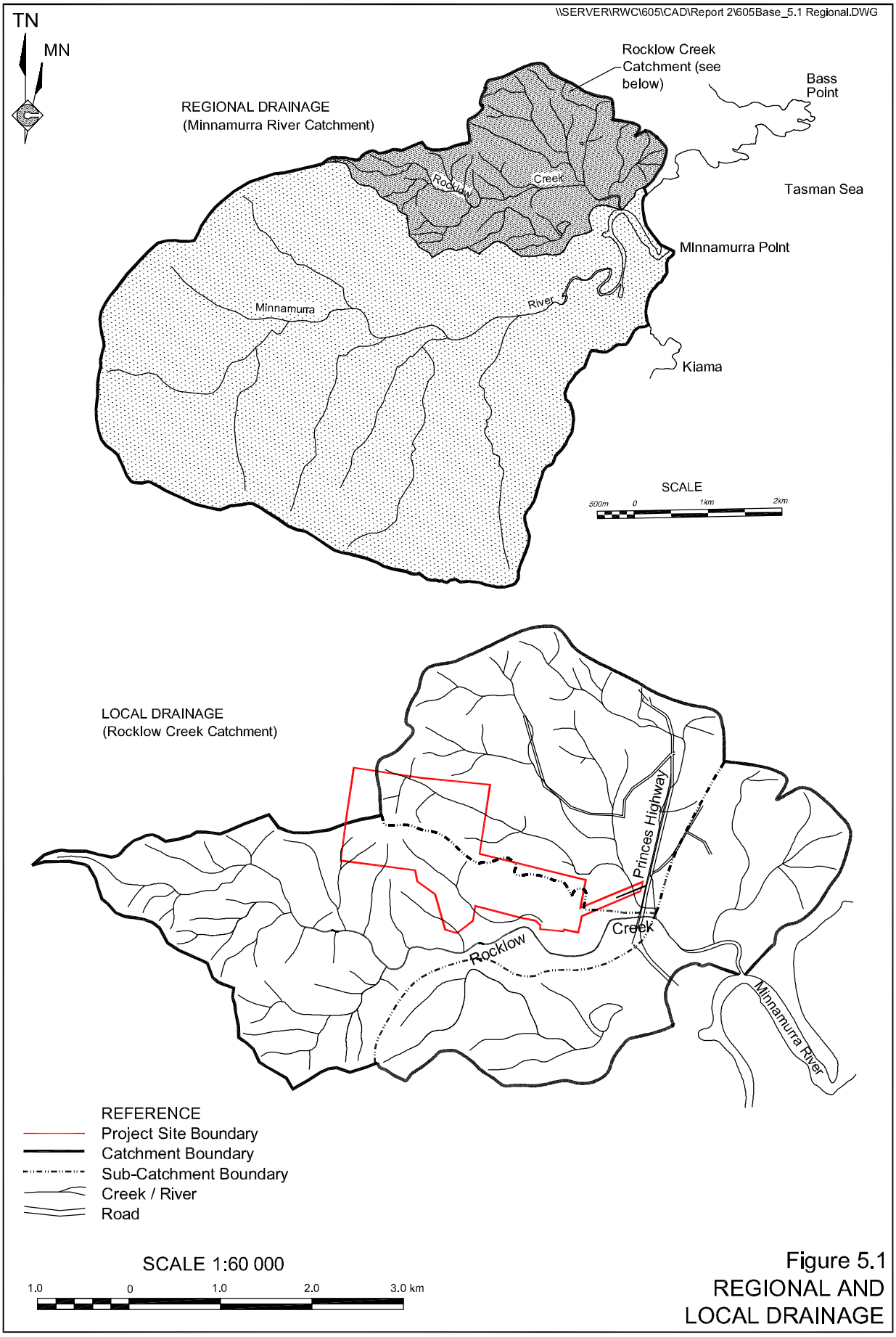


Figure 5.1
REGIONAL AND
LOCAL DRAINAGE

5.1.2.2 Existing Project Site Drainage

Drainage within the Project Site is essentially subdivided into clean runoff from beyond the extraction areas and potentially sediment-laden runoff from within the extraction and infrastructure areas. **Figure 5.2** displays the existing divide between the clean and potentially sediment-laden runoff within the Project Site. The catchment area for potentially sediment-laden runoff for the Project Site is essentially defined by the area of disturbance, bund walls and topographic watershed lines. All clean runoff from the Project Site flows directly into the tributaries of Rocklow Creek which is predominantly dry for most of the year.

At present, all runoff from site components such as the product stockpile areas, workshop and maintenance area, processing area as well as the extraction area flows into a dedicated stormwater dam located to the southeast of the processing area (**Figure 5.2**).

The extraction areas are bound to the north and south by steep slopes that direct clean runoff to flow overland into a number of intermittent tributaries which in turn flow directly into Rocklow Creek, or northward into an unnamed tributary of Rocklow Creek. The western extent of the extraction area has a bund wall that diverts any clean surface flow away into the local tributary system. Water accumulating within the extraction areas is due to rain falling directly onto the areas and minor groundwater seepages. Runoff within the RIC extraction area drain to the east via roadside drains to the stormwater dam in the southeastern corner of the Project Site.

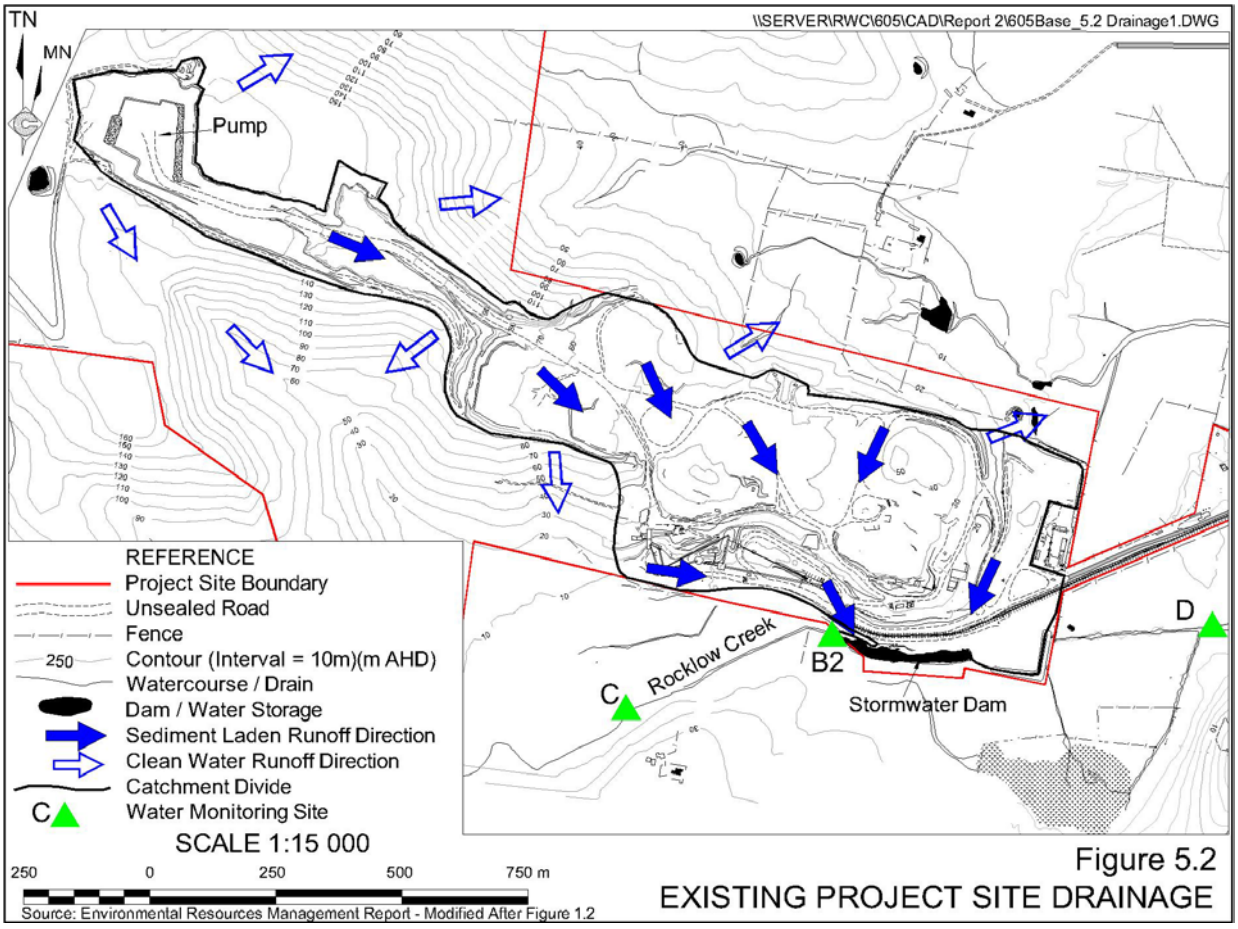


Figure 5.2
EXISTING PROJECT SITE DRAINAGE

Runoff within the Croome Farm extraction area accumulates at the lowest point within the extraction floor. This water either seeps into the groundwater or is used for dust suppression. After major storm events, accumulated water is pumped a short distance to the western end of the RIC extraction area where it naturally flows via the roadside drains to the storm water dam.

The stormwater dam, in combination with the low lying swampy area immediately to the south, is an integral part of the existing quarry water management system. The function of the swampy area was recognised in Condition No 7 of Development Consent 161/1986 (Pt 2). The stormwater dam and the swampy area provide the required conditions for the majority of suspended solids to effectively settle out of suspension prior to discharge from Boral's property. Retention times within the dam are generally sufficient to ensure settling of coarse particles prior to any release and the swampy area affectively removes the bulk of the fines from water flowing throughout that area. Stormwater overflows from the western end of the stormwater dam and flows through the low lying swampy area to the south, also on Boral-owned land, prior to draining into Rocklow Creek and across the Boral property boundary. The distance of the flow path between the western end of the stormwater dam and the Boral property boundary through the very flat swampy area is approximately 400m to 500m.

5.1.2.3 Surface Water Quality

Surface water quality is primarily influenced by the nature of operations within the Project Site. Consequently, potential contaminants are restricted to coarse and fine sediments and oil and grease from mobile equipment.

Monitoring of water quality is undertaken on a monthly, or event-related basis (depending on rainfall and stream flows), at the point where Rocklow Creek flows off Boral's property i.e. Site D on **Figure 5.2.** The results of water quality tests at Site D for the period 24 March 2000 to 28 August 2003 are presented in **Table 5.1**. These results show that there have only been two occasions when the level of suspended solids has been above 50mg/L (58.7mg/L and 102 mg/L occurring on 10 May 2001 and 12 April 2003) coinciding with heavy rainfall events.

5.1.3 Groundwater Occurrences

Boreholes drilled during the various evaluation phases for quarry design and development did not encounter any significant groundwater inflows at the extraction depths proposed. This is consistent with experiences to date and correlates with the observed low porosity levels of the resource material. Porosity is dominantly controlled by fracture systems or flow boundaries between the latite flows, and may occasionally produce higher localised groundwater flow, typically of short duration. Topography controlled mounding of the groundwater within the extraction area at Croome Farm is evident with only minor inflows occurring.

TABLE 5.1

Water Monitoring Results – Site D

Date	pH	TSS (mg/L)	Oil & Grease (mg/L)	Date	pH	TSS (mg/L)	Oil & Grease (mg/L)
24.03.01	7.2	14	<1	27.04.02	7	14.2	<1
10.05.01	7.7	58.7	<1	01.06.02	7.3	28.3	<1
12.06.01	6.8	25.7	<1	19/20.06.02	7.1	19.2	6.7
14.07.01	6.7	18	<1	28.06.02	6.9	18.7	<1
31.07.01	6.9	11.8	<1	12.03.03	6.8	8.4	17.9
31.08.01	7.2	15.8	<1	12.04.03	7	102	<1
12.02.02	7.8	10	1.2	03.05.03	6.8	12.2	<1
20.02.02	6.8	8.8	<1	19.05.03	6.6	8	<1
02.03.02	6.8	25.3	3.8	28.05.03	6.7	5.6	<1
09.03.02	6.7	18.3	1.5	13.06.03	7.2	13.6	<1
16.03.02	6.8	21.7	<1	16.07.03	7	10	<1
23.03.02	6.7	20.8	<1	06.08.03	7	15.6	1.6
03.04.02	6.9	7.4	<1	28.08.03	7.4	14	<1
12.04.02	6.9	23	<1				

All groundwater outflow into the active extraction areas is considered a component of the surface water management system and managed accordingly.

5.1.4 Water Management Controls

It is recognised that the drainage patterns within the Project Site will continually change throughout the operational life of the quarry as the extraction areas are deepened and internal haul roads and benches are moved.

In recognition of the changing drainage patterns, the Stormwater Management Plan submitted to the EPA details the proposed changes to the drainage and water storage facilities to manage surface water flow within the Project Site until the recommencement of extraction within the original Dunmore Quarry. All facilities have been designed to contain or convey runoff from a 1 in 10 year ARI 24 hour duration design storm and ensure sufficient residence time for any water runoff to meet water quality guidelines.

For the purposes of considering future controls, the disturbed catchment within the Project Site is considered as four sub-catchments, as shown in **Figure 5.3**.

Croome Farm Catchment
Most runoff within the Croome Farm extraction area would be contained within the lowest point of the extraction floor. This water would either seep into the groundwater or would be used for dust suppression. After major storm events, accumulated water would be pumped a short distance to the western end of the RIC extraction area where it would be discharged into either the central northern or central southern catchment in staged releases to ensure adequate retention time for the removal of any coarse sediment.

Based on the ultimate catchment area of 14.7ha, the storage sump within the Croome Farm extraction area would require a maximum storage capacity of approximately 18ML. In reality, this will effectively be achieved by a sloping floor in the extraction area that will allow for the accumulation of water at one end.

Central Northern Catchment

This area would be bound by the main haul road through the RIC extraction area to the south, the limit of disturbance to the north, Croome Farm extraction area to the west and a raised haul road within the original Dunmore Quarry to the east. All runoff from this area would report to the eastern end of the catchment and would be retained within a proposed storage basin. Based on a catchment area of approximately 9ha, the storage basin would have a maximum storage capacity of approximately 14ML. In the event of rainfall exceeding the design criteria, overflow from the storage basin would flow towards the stormwater dam.

Central Southern Catchment

This area comprises the southern side of the main haul road through the RIC extraction area and into the western section of the original Dunmore Quarry. The surface water would collect at the eastern end of this catchment in a proposed storage basin to be used either for dust suppression or allowed to overflow into the eastern catchment and ultimately into the stormwater dam. Based on the approximate area of 13ha, a maximum storage capacity of approximately 16ML is envisaged for this proposed storage basin.

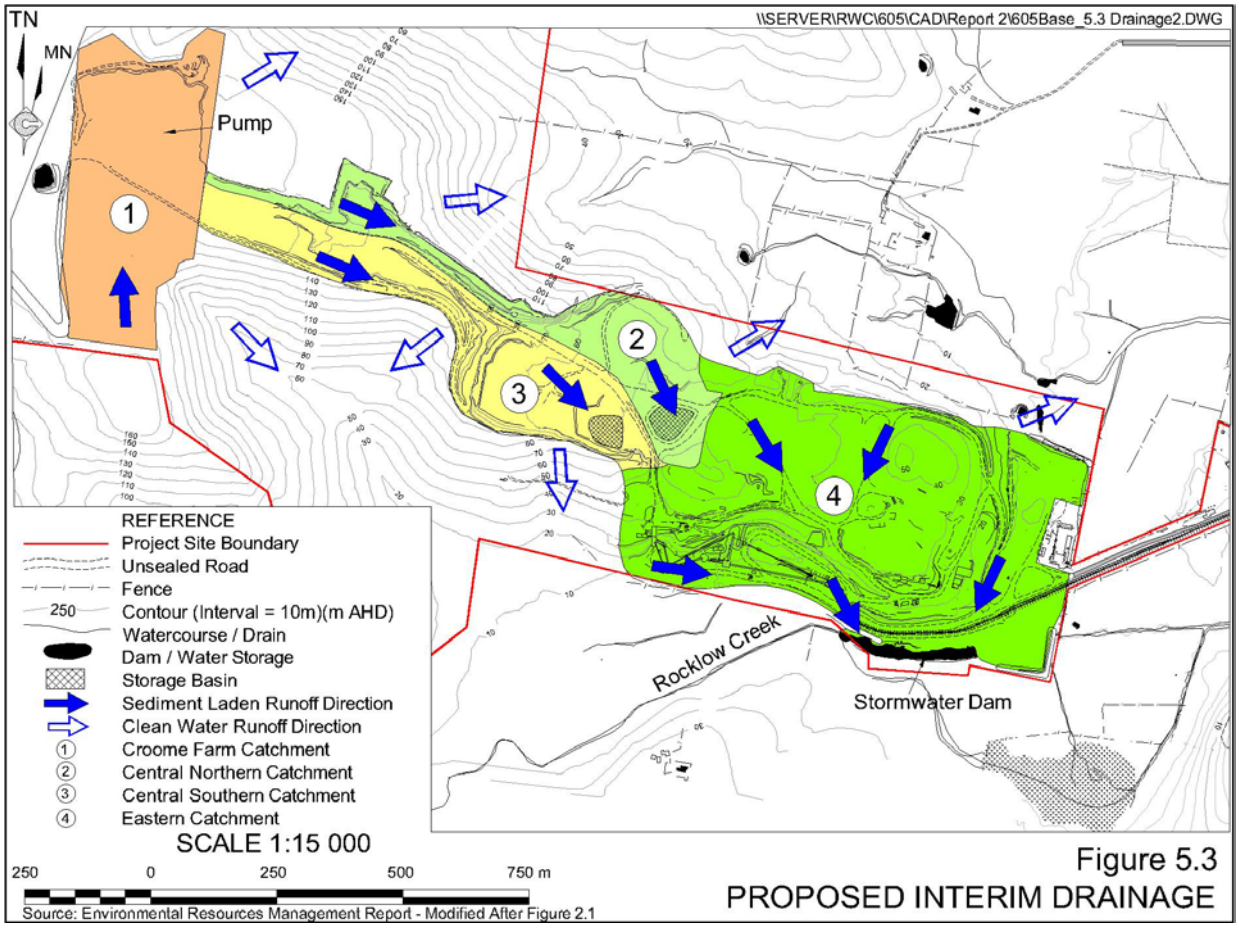


Figure 5.3
PROPOSED INTERIM DRAINAGE

Eastern Catchment

This catchment encompasses the remainder of the Project Site comprising the processing area, product stockpiles, magazine and workshop areas. This catchment would continue to drain directly to the stormwater dam. This dam currently has storage capacity of approximately 15ML.

An important part of the proposed water management system is to increase water storage capacity within the area of disturbance through the construction of intermediate storage basins. These structures would also assist in controlling excessive runoff from heavy rainfall events. The storages would serve to collect runoff in areas closer to the areas regularly requiring dust suppression.

Management of the stormwater dam is an important element in the water management plan for the site. Following major rainfall events, this dam would most likely receive releases from the storages located in the three other catchments prior to release into the swampy area and then into Rocklow Creek. Management of the water level in the stormwater dam is critical to ensure the storage capacity is available in the dam to accommodate any releases from the other catchments after heavy rainfall events and to allow settling times that allow for the water quality criteria to be met prior to any release into Rocklow Creek.

Extraction will progressively alter the two central and the eastern catchment areas. Alternative water storage areas would be created to ensure the ongoing management of the 1 in 10 year ARI 24 hour duration design storm events.

As a component of the Stormwater Management Plan, Boral would adopt the following measures to minimise impacts on water quality.

- Temporary erosion and sedimentation control structures would be erected/constructed to ensure any area of disturbance will not impact on clean runoff water quality.

- Drainage systems would be installed to maximise water retention times to enable sedimentation of coarse particles from any sediment-laden runoff.

- Sumps within active extraction areas.

- In the case of extreme weather events, flocculants may be required for addition to the dam waters to ensure settling of fine suspended clay particles prior to release.

- Any substantial spillage of hydrocarbons would be cleaned up within 24 hours of the spillage noting that this has not occurred to date.

5.1.5 Water Usage

5.1.5.1 Dust Suppression

Water is used to suppress dust on haul roads, active extraction areas, stockpiles, within the processing plant area and operating extraction areas. The current water usage is approximately 300kL/day (97ML/yr) with water usage directly dependant on the prevailing climatic conditions. The proposed increase in production would require up to 165ML/yr to ensure sufficient dust suppression occurs in critical areas of potential dust generation.

5.1.5.2 Reliability of Water Supply

Water for use in dust suppression would be drawn from the storage basins within the central catchments, sumps within the Croome Farm extraction area and from the stormwater dam. These structures would collectively have a capacity to contain approximately 88ML of runoff. Reliability studies undertaken by ERM identified that the proposed storages would not be able to supply all water requirements in future and that it would be necessary to obtain water from off-site.

During periods when insufficient water is available from the onsite water storages water may be sourced from Rocklow Creek. This potentially saline water would only be used within the catchment areas that report to the stormwater dam. This approach is predicated on the fact that any saline overflow would ultimately flow into the saline section of Rocklow Creek and hence cause no adverse impact.

5.1.6 Assessment of Impacts

5.1.6.1 Potential Sources of Water Contamination

The principal potential sources of water contamination from activities at the Project Site include:

- surface runoff from active extraction and processing areas,
- surface runoff from material and product stockpile areas,
- surface runoff from roads, and
- spillages of fuel, oil or lubricants.

The principal contaminant in all but the last item would be suspended solids i.e. predominantly silt particles in the water.

5.1.6.2 Criteria for Impact Assessment

The criteria to assess impacts on surface water focus on those parameters listed in the Environment Protection Licence No. 77 for the Dunmore Quarry, namely:

- a pH within the range 6.5 to 8.5,
- Total Suspended Solids (TSS) <50mg/L, and
- contains no visible oil or grease <10mg/L.

5.1.6.3 Surface Water

Monitoring results presented in **Table 5.1** indicate that there have been few instances when total suspended solids within the overflow from the stormwater dam have exceeded the EPA water quality criteria. Each exceedance occurred during high rainfall storm events. The majority of samples produce results well below the 50mg/L criteria value. If the two high values are removed from the dataset, the results for all samples average approximately 16mg/L All other requirements for these samples were within the EPA criteria. These results indicate that to date, there has been very little impact, if any, upon water quality in Rocklow Creek.

The increased surface water storage capacity within the Project Site would reduce the opportunities for the stormwater dam to overflow, hence, future impacts on water quality in Rocklow Creek would be negligible.

5.1.6.4 Groundwater

There are currently no discernable impacts on the groundwater beneath the Project Site as a result of the current operations at the Project Site apart from some minor inflows into the extraction area. The proposed increase in production is unlikely to cause any additional issues or impacts upon the groundwater resources.

5.1.7 Monitoring Program

Monitoring of the site water management system would be undertaken to identify any maintenance requirements or where modifications may be required and to ensure ongoing compliance with the water quality criteria specified within Environment Protection Licence No. 77.

The monitoring program would involve the continuation of monthly and/or event-related water quality monitoring at Site D (**Figure 5.2**). All samples would be tested for pH, TSS and oil and grease,

The results of all monitoring would be recorded and summarised in the annual performance report for the site. The report would also present an evaluation/interpretation of the monitoring results and any appropriate modifications for the future monitoring and/or reporting.

5.2 SOILS

5.2.1 Soil Occurrences and Characteristics

The natural soils within the remaining areas to be disturbed are confined solely to the Croome Farm extraction area. Sinclair Knight Mertz (1994) report that the soils in this area are dominated by reddish-brown friable to clayey loams that range in thickness from less than 0.2m over approximately 50% of the area to 3.0m. The soils exhibit a slightly elevated acidity and lower fertility than would typically be expected from "basaltic" derived soils.

For the purposes of this assessment, it is recognised that the soils cannot practically be recovered over much of the area, however, for approximately 5ha in the southern part of the Croome Farm extraction area, the topsoil suited to recovery is approximately 0.3m thick. In total approximately 10 000m^3 of topsoil is present in the Croome Farm extraction area.

5.2.2 Soil Management Controls

The principal soil management controls to be adopted would focus on the careful recovery and storage of topsoil materials until they are required for rehabilitation. These controls involve the following.

1. The careful stripping of topsoil to recover the seed-bearing and organic component without diluting the topsoil with subsoil.

2. All stripped topsoil would be stored within the original Dunmore Quarry and relocated, when appropriate, to a further storage area prior to it being used for site rehabilitation.

3. Reliance would be placed upon the natural regeneration for the growth of stabilising vegetation.

5.2.3 Assessment of Impacts

The proposed method of collection, storage and reuse of the soil would ensure there are negligible impacts on the soil resources on the Project Site.

5.3 NOISE AND BLASTING

5.3.1 Introduction

The objectives of the noise assessment are to identify the potential impacts of noise generated from extraction, processing and transportation at the Dunmore Quarry during the proposed increase in production and extension to operating hours. The cumulative impacts of the operation of Dunmore Quarry in conjunction with other proposed extractive and associated operations are also addressed where information is available on those operations.

The noise and blasting assessment has been prepared in accordance with:

- Australian Standard AS 1055-1997 "Description and Measurement of Environmental Noise" Part 1, 2 and 3,
- the NSW Industrial Noise Policy (INP),
- the Environmental Criteria for Road Traffic Noise (ECRTN), and
- relevant sections of the Environmental Noise Control Manual.

The approach to assessing the future noise levels has drawn heavily upon the results of a comprehensive noise assessment conducted by Richard Heggie Associates during the pre-mitigation/post mitigation period of the plant upgrade and during the current trial period. The noise assessment undertaken for the proposed development has focussed upon the non-project related residences around the Dunmore Quarry. For most of the surrounding residences, Boral has negotiated agreements with the landowners with respect to noise which effectively means they are project-related and not subject to assessment under the INP.

This section summarises the noise and blasting assessment of the proposed production increase undertaken by Richard Heggie Associates, specialist acoustic consultants, whose report is incorporated in full as Part 1 of the "*Specialist Consultant Studies Compendium*".

5.3.2 Environmental Noise Control General Objectives

Responsibility for the control of noise emission in New South Wales is vested in Local Government and the EPA. The EPA released an Industrial Noise Policy (INP) in January 2000 that provides a framework and process for deriving noise criteria for consents and licences that would enable the EPA to regulate premises that are scheduled under the *Protection of the Environment Operations Act 1997*.

The specific policy objectives are:

- to establish noise criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses;
- to use the criteria as the basis for deriving project specific noise levels;

- to promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects;
- to outline a range of mitigation measures that could be used to minimise noise impacts;
- to provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise impacts with the economic, social and environmental considerations of industrial development; and
- to carry out functions relating to the prevention, minimisation and control of noise from premises scheduled under the Act.

The noise and blasting assessment has addressed the potential impacts of noise generated from extraction, processing and transportation at the Project Site in the following areas using the objectives listed for each.

Assessing Intrusiveness
For assessing intrusiveness, the background noise needs to be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{Aeq}) of the source should not be more than 5 decibels above the measured background level (L_{A90}).

Assessing Amenity
The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion value, then noise levels from new industries need to be designed so that the cumulative effect does not produce noise levels that would significantly exceed the criterion. For high-traffic areas there is a separate amenity criterion. The cumulative effect of noise from industrial sources needs to be considered in assessing impact.

Sleep Disturbance
Sleep arousal has been assessed using the guidelines set out in the EPA's Environmental Noise Control Manual (1994) (ENCM) Section 19-3.

Road Traffic Noise
The Environment Protection Authority released the "Environmental Criteria for Road Traffic Noise" in May 1999. The policy sets out noise criteria applicable to different road classifications for the purpose of defining traffic noise impacts.

Blasting
The effects of blasting are generally related to ground vibration and airblast overpressure. The levels at which ground vibration and airblast overpressure can cause concern or discomfort to residents are generally lower than the relevant building damage limits. The DEC advocates the use of the ANZECC guidelines for assessing potential residential disturbance arising from blast emissions.

5.3.3 Existing Noise Climate

An understanding of the existing noise climate around the Project Site was gained through the measurement of noise by a combination of unattended and operator-attended noise monitoring. Weather data for the survey period was obtained from the weather station located at Dunmore Quarry. Noise data during periods of any rainfall and/or wind speeds in excess of 5 m/s (approximately 9 knots) were discarded in accordance with INP data exclusion rules.

The objective of the background monitoring survey was to measure L_{A90}(15minute) and L_{Aeq}(15minute) noise levels at the nearest potentially affected receptors during daytime, evening and night-time periods to enable the determination of the intrusiveness and amenity criteria for the development.

Ambient noise levels were monitored at four locations adjacent to the Project Site, during October 2001 and July 1999 (see **Table 5.2)**. These background noise measurements have been supplemented with measurements undertaken during the pre- and post-mitigation period and most recently during the pre-trial and trial period from April to September 2003. **Figure 5.4** shows each noise monitoring location. Operator-attended noise measurements were also taken in order to determine the character and contribution of noise sources to the total ambient noise level.

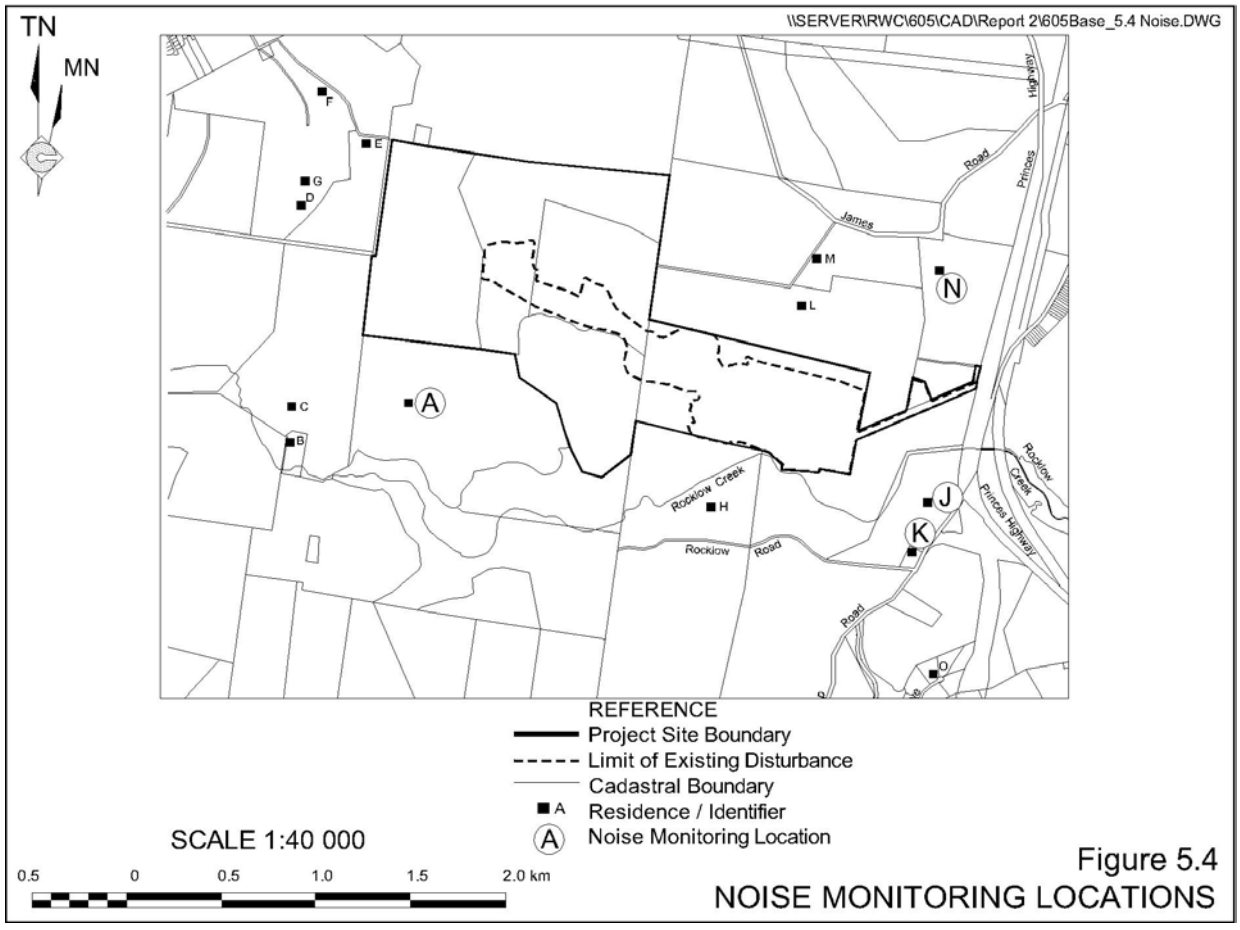


Figure 5.4
NOISE MONITORING LOCATIONS

TABLE 5.2

Ambient Noise Monitoring Locations

Noise Monitoring Location[#]	Description
A	McParland Residence
J	Creagan Residence, Swamp Road
K	Stocker Residence, Swamp Road
N	Dunmore Sand and Soil Residence, James Road (Quarrying company owned)

Source: Richard Heggie Associates – Table 5.1.1 [#]See Figure 5.4

The noise loggers were programmed to record statistical noise level indices continuously in 15 minute intervals, including the L_{Amax}, L_{A1}, L_{A10}, L_{A50}, L_{A90}, L_{A99}, L_{Amin} and the L_{Aeq}. A summary of the results of the survey to identify the ambient noise levels from each monitoring location are presented in **Table 5.3**.

TABLE 5.3

Summary of Existing Ambient Background Noise Levels

Noise Monitoring Location[#]	Description	Background Noise Level LA90 dB(A) Rating Background Level	Estimated Contribution from Industrial Noise Sources LAeq dB(A)
Location A McParland Residence	**Shoulder** 6.00 am to 7.00am	30	<39
	Daytime 7.00am to 6.00pm	30	<44
	Evening 6.00 pm to 10.00 pm	30	<39
	Night 10.00 pm to 7.00 am	30	<34
Location J Creagan Residence	**Shoulder** 6.00 am to 7.00am	49	<39
	Daytime 7.00am to 6.00pm	51	<44
	Evening 6.00 pm to 10.00 pm	47	<39
	Night 10.00 pm to 7.00 am	36	<34
Location K Stocker Residence	**Shoulder** 6.00 am to 7.00am	42	<39
	Daytime 7.00am to 6.00pm	44	<44
	Evening 6.00 pm to 10.00 pm	39	<39
	Night 10.00 pm to 7.00 am	33	<34
Location N Dunmore Sand and Soil Residence (Quarrying Company owned)	**Shoulder** 6.00 am to 7.00 am	41	<39
	Daytime 7.00am to 6.00pm	41	<44
	Evening 6.00 pm to 10.00 pm	38	<39
	Night 10.00 pm to 7.00 am	32	<34

Note: The LA90 represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level.
LAeq - The equivalent continuous noise level is defined as the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

Source: Richard Heggie Associates – Modified after Table 5.1.2 [#]See Figure 5.4

Location A is the closest privately owned residence to the Croome Farm section of the Project Site. This location is remote from the Princes Highway and exhibits an ambient noise climate typical of a rural area. Locations J, K and N are more exposed to the Princes Highway and the ambient noise is dominated by noise from traffic with contributions from the Boral and Dunmore Lakes quarries. The acoustical environment (having through traffic with characteristic heavy and continuous traffic flows during peak periods) is best described by the urban category.

The estimated industrial contribution at each monitoring location was made in the absence of noise from the Boral Dunmore Quarry operation.

5.3.4 Environmental Noise Goals

The noise emission design goals for the proposed continued operation of Dunmore Quarry have been established with reference to the INP which refers to two types of noise design goals. In most cases, one of the design goals becomes the controlling goal.

5.3.4.1 The Intrusiveness Design Goal

This applies to noises heard at residences and specifies that the L_{Aeq} noise level from the proposed operation should not exceed the rating background level (RBL) by more than 5dB(A). The intrusiveness criteria have been set from RBL's determined in the absence of noise from the Dunmore Quarry and were determined from the noise monitoring results contained within **Table 5.3**.

5.3.4.2 The Amenity Design Goal

The amenity criteria have been set with reference to the industrial noise contribution, measured at the monitoring locations, in accordance with the INP. The existing L_{Aeq} noise levels, measured in the vicinity of the Dunmore Quarry, include natural sources, some passing traffic noise and noise from the existing quarrying operations. The amenity criteria are set from L_{Aeq} measurements of only industrial noise sources in the area (ie excluding noise from transportation, natural sources and Dunmore Quarry). Extracts from the INP that relate to the setting of amenity criteria are given in **Table 5.4** and **Table 5.5**. The residences surrounding Dunmore Quarry are best described under the rural and urban categories.

TABLE 5.4

Amenity Design Goal - Recommended L_{Aeq} Noise Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Period	Recommended L_{Aeq} Noise Level	
			Acceptable - dB(A)	Recommended Maximum - dB(A)
Residence	Rural	Daytime	50	55
		Evening	45	50
		Night	40	45
Residence	Suburban	Daytime	55	60
		Evening	45	50
		Night	40	45
School Classroom - internal	All	Noisiest 1 hour period when in use	35	40

Note: Monday to Saturday - Daytime 7.00am - 6.00pm; Evening 6.00pm - 10.00pm; Night-time 10.00pm - 7.00am.
On Sundays and Public Holidays, Daytime 8.00am - 6.00pm; Evening 6.00pm - 10.00pm; Night-time 10.00pm - 8.00am.
The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

Source: Richard Heggie Associates – Table 6.1.1

TABLE 5.5

Modification to Acceptable Noise Level (ANL)* to Account for Existing Levels of Industrial Noise

Total Existing L_{Aeq} noise level from Industrial Noise Sources	Maximum L_{Aeq} Noise Level for Noise from New Sources Alone, dB(A)
≥ Acceptable noise level plus 2 dB(A)	If existing noise level is *likely to decrease* in future acceptable noise level minus 10 dB(A) If existing noise level is *unlikely to decrease* in future existing noise level minus 10 dB(A)
Acceptable noise level plus 1 dB(A)	Acceptable noise level minus 8 dB(A)
Acceptable noise level	Acceptable noise level minus 8 dB(A)
Acceptable noise level minus 1 dB(A)	Acceptable noise level minus 6 dB(A)
Acceptable noise level minus 2 dB(A)	Acceptable noise level minus 4 dB(A)
Acceptable noise level minus 3 dB(A)	Acceptable noise level minus 3 dB(A)
Acceptable noise level minus 4 dB(A)	Acceptable noise level minus 2 dB(A)
Acceptable noise level minus 5 dB(A)	Acceptable noise level minus 2 dB(A)
Acceptable noise level minus 6 dB(A)	Acceptable noise level minus 1 dB(A)
< Acceptable noise level minus 6 dB(A)	Acceptable noise level

* ANL = recommended acceptable LAeq noise level for the specific receiver, area and time of day from **Table 6.1.1**.

Source: Richard Heggie Associates – Table 6.1.2

The resulting project specific noise design goals for the Dunmore Quarry are given in **Table 5.6**.

TABLE 5.6

Dunmore Quarry Project Specific Noise Design Goals

Location[#]	Description		Intrusiveness Criterion $L_{Aeq(15minute)}$	Amenity Criterion L_{Aeq}
Location A McParland Residence	**Shoulder**	6.00am to 7.00am	35	45
	Daytime	7.00am to 6.00pm	35	50
	Evening	6.00pm to 10.00pm	35	45
	Night	10.00pm to 7.00am	35	40
Location K Stocker Residence	**Shoulder**	6.00am to 7.00m	47	53
	Daytime	7.00am to 6.00pm	49	60
	Evening	6.00pm to 10.00pm	44	50
	Night	10.00pm to 7.00am	38	45

Source: Richard Heggie Associates – Modified after Table 6.2.1 [#]See Figure 5.4

5.3.4.3 The Sleep Disturbance Goals

The EPA NSW Industrial Noise Policy (INP) dated 2000 has an objective to establish noise criteria that would protect the community from excessive intrusive noise and preserve amenity. The INP however, does not provide a mechanism for directly addressing sleep disturbance.

Policy documents that provide some guidance in addressing sleep disturbance are the Environmental Noise Control Manual (ENCM) dated 1994 and the EPA Environmental Criteria for Road Traffic Noise (ERCTN) dated 1999.

The ENCM provides limited guidance in the determination of sleep disturbance goals and states that *the L_{A1} level of any specific source should not exceed the background noise level L_{A90} by more that 15 dB(A) when measured at the bedroom window.*

The ECRTN being a more recent document provides a more comprehensive treatment of sleep disturbance issues. The policy recognises that "*because the relationship between noise, sleep disturbance and health is not fully understood at this stage, it is not possible to define fully how the different characteristics of road traffic should be measured to best estimate effects on sleep."*

The EPA ECRTN policy document draws the following conclusions in relation to sleep disturbance:

- Maximum internal noise levels below 50 dB(A) to 55 dB(A) are unlikely to cause awakening reactions.
- One or two noise events per night, with maximum internal noise levels of 65 dB(A) to 70 dB(A) (inside dwellings) are not likely to affect health and well being significantly.
- At the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance.

The DEC current preferred method to determine a morning shoulder RBL is to take the midpoint between the daytime and night-time period, as it is claimed that the 10th percentile method does not give a statistically valid ABL level. In the Dunmore Quarry case the current EPA approach under estimates the actual ambient noise level during this period. A conservative approach has been used in this report where the minimum L_{A90} level recorded in the morning shoulder period has been used as the ABL level instead of the 10th percentile levels. An RBL level using the modified ABL levels was then calculated.

The appropriate night-time sleep disturbance goals from this analysis are set out in **Table 5.7**.

TABLE 5.7

Dunmore Quarry Sleep Disturbance Goals

Location	Description	Sleep Disturbance Goal $L_{A1(1minute)}$
Location A	**Morning Shoulder** 6.00am to 7.00am	45 dB(A)
McParland Residence	**Night** 10.00pm to 6.00am	45 dB(A)
Location K	**Morning Shoulder** 6.00am to 7.00am	55 dB(A)
Stocker Residence	**Night** 10.00pm to 7.00am	48 dB(A)
Source: Richard Heggie Associates – Modified after Table 6.3.1		

5.3.4.4 Road Traffic Noise Goals

The "Environmental Criteria for Road Traffic Noise" sets out noise criteria applicable to different road classifications for the purpose of defining traffic noise impacts. Dunmore Quarry uses the Princes Highway to despatch the majority of the finished product to the customer. This roadway clearly falls into the category of "arterial road" and it is for this reason the noise criteria outlined in **Table 5.8** have been adopted.

TABLE 5.8

EPA Environmental Goal for Road Traffic Noise

Policy	Descriptor	Traffic Noise Goal
8. Land use developments with the potential to create additional traffic on a freeway or arterial road	$L_{Aeq(15hour)}$ daytime	60 dB(A)*
	$L_{Aeq(9hour)}$ night-time	55 dB(A)*
* - In all cases (where criteria are already exceeded), traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB(A).		
Source: Richard Heggie Associates – Table 6.4.1		

5.3.4.5 Blasting Emissions Goals

The EPA has set down guidelines for blasting based on human comfort levels. The guidelines have been adapted from the ANZECC Guidelines "*Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration"* and are as follows.

"Airblast
The recommended maximum level for airblast is 115 dB Linear Peak. The level of 115 dB may be exceeded on up to 5% of the total number of blasts over a period of 12 months. However, the level should not exceed 120 dB Linear Peak at any time.

Ground Vibration
The recommended maximum level for ground vibration is 5 mm/s (peak particle velocity [ppv]). It is recommended that a level of 2 mm/s be considered as a long term regulatory goal. The ppv level of 5 mm/s may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10 mm/s at any time.

Times and Frequency of Blasting
Blasting should only generally be permitted during the hours of 9.00 am to 5.00 pm Monday to Saturday. Blasting should not take place on Sundays or Public Holidays. Blasting should generally take place no more than once per day".

5.3.5 Design and Operational Safeguards

5.3.5.1 Current Noise Strategy

The Project Site operates under a noise mitigation strategy to reduce the noise impact on surrounding residential receivers based on best environmental practice as defined by Environment Australia as *"the most practical and effective methodology that is in use or otherwise available"*. The mitigation strategy already being adopted by Boral includes:

- Construction of a 4 m high acoustic bund approximately 50m from Residence K (Stocker). – already constructed.
- Construction of an acoustic bund on the south-western corner of the Croome Farm development to shield Location A (McParland) from noise from quarrying activity. The construction of this bund is ongoing.
- The construction of an acoustic wall (at RL 7 m) adjacent to the product stockpile area and rail loading area. – already constructed.
- The cladding of Screenhouse 1. The cladding has been constructed on the southern and eastern sides and includes a solid floor at screen level. Chutes below screen level have been shielded on the southern and eastern sides.
- Drilling would be conducted between 6.00am and 10.00pm, however, for the evening period, between 6.00pm and 10.00pm, drilling would be confined to the second bench level or lower.
- Boral has a negotiated agreement with the landholder of Location J (Creagan), Locations L and N (Dunmore Sand and Soil) acknowledging/accepting exceedances to EPA noise goals. Readymix has verbally advised it would be prepared to complete a similar negotiated agreement for Residence M.

5.3.5.2 Noise Management Strategy for Evening Operations

In order to further reduce the impact of operation of Dunmore Quarry in periods of adverse weather conditions in the evening period (winds from the west) best management practice strategies are currently being employed.

Wind speed and direction is monitored using an anemometer located centrally within the processing area. The anemometer has a sensor height of 10 m. The weather station is linked to the quarry primary crusher feeder. When wind speeds between 2 m/s and 3 m/s are detected between 6.00pm and 10.00pm from the westerly sector, the primary crusher feeder is automatically shut down. The weather station monitors average wind speeds over a 30 minute period from the west $\pm 45^{o}$ to determine the need to activate the automatic shutdown. Shutdown involves the primary jaw crusher, gyratory crusher, and primary screen. The secondary/tertiary section of the plant continues to operate from a surge stockpile of primary crushed material. Stockpiling and sales operate as normal. Measurements of noise levels during shutdown periods have established that a reduction of 2 to 3 dB(A) is possible as a result of implementing this control measure.

5.3.5.3 Noise Management Strategy for Night Period

In order to reduce the impact of operations of Dunmore Quarry during the night-time period the following management strategies would be employed:

- All processing and extraction would cease at 10.00pm.
- Sales activity, which includes hauling of finished product from processing plant bins to the product stockpiles (10.00pm to midnight), loading trucks and trains and despatch of trucks and trains would continue from 10.00pm to 6.00am (Monday to Saturday).
- During periods when temperature inversions are likely or westerly wind of between 2 m/s and 3m/s are measured, the quarry operation would employ one front-end loader only to load materials for sale.

In addition to these strategies, the following specific safeguards would also be implemented.

- The primary crusher receival bin would be left full prior to the morning start-up.
- Where possible, oversized raw feed would be avoided between 6.00am and 7.00am.
- Noise damping would be installed on chutes on No. 1 screen.
- An early morning loading area would be designated close to the existing stockpile bunds to shield the loading process.
- New silencers for haul trucks are being evaluated (one has been installed).

Boral also intends to investigate the following.

- Further cladding of plant components.
- The use of flashing lights connected to headlights of mobile equipment – to avoid the use of reversing alarms at night.
- The replacement of the single large start-up siren with a series of smaller localised sirens.

Richard Heggie Associates incorporates a comparative assessment in their full report of the mitigation measures adopted or planned by Boral and those considered to be contemporary best practice. Overall, Boral is well placed with the adoption of the measures to control noise.

5.3.6 Assessment of Impacts

5.3.6.1 Trial Period

A nine month trial period was approved by Shellharbour City Council to enable Boral to demonstrate that all environmental issues, particularly noise, would satisfy the goals set down in the Industrial Noise Policy (INP). The evaluation of the additional design and operations safeguards adopted prior to the commencement of the trial period (on 9 July 2003) involved a program of detailed monitoring by Richard Heggie Associates. The objectives of the noise monitoring assessment were as follows.

- Measure the ambient noise levels at the four closest receiver locations surrounding the quarry. Noise surveys comprise both continuous unattended monitoring and operator-attended monitoring.
- Qualify all sources of noise within each of the attended surveys, including estimated contribution or maximum level of each source.
- Assess the noise emissions of Dunmore Quarry in relation to project specific noise goals for the site and with regard to wind speed and direction during the noise surveys.
- Compare measured noise levels with predicted noise levels for the site.

Both attended and unattended noise monitoring was undertaken at four locations, namely at:

- Location A (McParland Residence);
- Location J (Creagan Residence);
- Location K (Stocker Residence); and
- a control point between the Stocker residence and the quarry.

It is noted that a negotiated agreement is in place with Mrs Creagan for Location J. The monitoring was undertaken both before the commencement of the trial period (pre-mitigation and without the quarry operation) and post-mitigation with the quarry operating. The assessment of the trial period also involved a comparative assessment of the measured noise levels against the noise model developed by Richard Heggie Associates.

The results of the measured and predicted noise levels are presented in **Table 5.9**. The comparison established that the predicted and measured noise levels correlate well as they were typically within 2dB(A) under a range of atmospheric conditions.

TABLE 5.9

Predicted versus Measured Quarry Contribution

Location		Noise Emission Level LAeq(15mintes)			
		J - Creagan	K - Stocker	Control Point	Intermediate Point Quarry Side of Bund Near Stocker
Wind 3 m/s	Predicted	54 dBA	49 dBA	54 dBA	53 dBA
	Measured	Not measured	47 dBA	Not measured	Not measured
Wind 3 m/s wind switch activated	Predicted	52 dBA	43 dBA	49 dBA	48 dBA
	Measured	Not measured	Not measured	Not measured	48 dBA
Wind 2 m/s	Predicted	52 dBA	46 dBA	52 dBA	51 dBA
	Measured	51 dBA#	Not measured	51 dBA	Not measured
Wind 1 m/s	Predicted	50 dBA	44 dBA	50 dBA	49 dBA
	Measured	Not measured	44 dBA 42 dBA	Not measured	50 dBA
Inversion 3^0C	Predicted	51 dBA	45 dBA	51 dBA	51 dBA
	Measured	51 dBA	46 dBA	Not measured	Not measured
Calm	Predicted	45 dBA	39 dBA	48 dBA	47 dBA
	Measured	40 dBA#	<45 dBA	49 dBA	Not measured

Source: Richard Heggie Associates – Table 8.1.6 # Results of continuous unattended monitoring

The recorded status of the trial with respect to noise measured at the Stocker residence is set out below.

Evening Period Calm Conditions
The results of noise prediction and operator-attended measurements indicate that noise emissions from the quarry would be below the project specific goals for the evening period under calm conditions.

Evening Period Calm Conditions during Temperature Inversion
The results of noise prediction and operator-attended measurements indicate that noise emissions from the quarry would be up to 2 dB(A) above the project specific goals for the evening period. It is considered that the noise exceedance is due to weather effects that, in accordance with the INP, are not classified as significant.

Evening Period Moderate Wind Enhancement
Moderate wind enhancement is likely to occur for approximately 16% and 22% of the time during autumn and winter evenings respectively. The results of noise prediction and operator attended measurements indicate that noise emissions from the quarry would approach the project specific goals for the evening period and may be exceeded by up to 2 dBA for short periods prior to the activation of the wind switch.

It is noted that the INP states "*a development will be deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2 dB(A) above the statutory noise limit specified in the consent or licence condition*".

Evening Period Severe Wind Enhancement
Severe wind enhancement is likely to occur for approximately 4% and 8% of the time during autumn and winter evenings respectively. The results of noise prediction and operator attended measurements indicate that noise emissions from the quarry would meet the project specific goals following the activation of the wind switch. It is possible that some exceedances of the project specific noise levels may occur for a short period of time prior to the activation of the wind switch.

5.3.6.2 Operational Noise Modelling

A computer model was used to predict the noise emissions from the Project Site. The Environmental Noise Model (ENM) used has been produced in conjunction with the former EPA and is the preferred noise modelling package for industrial sites. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model used this map, together with the noise source data, ground cover, shielding by barriers and/or adjacent buildings and atmospheric information to predict noise levels. Mobile noise sources (such as haul trucks and product trucks) were modelled at worst case locations on each respective haulage route and assumed to operate in repetitive cycles. Noise modelling was carried out for calm and prevailing atmospheric conditions. The noise model also accounted for the noise attenuation from the implementation of the Noise Mitigation Strategy for the Project Site.

A calibration noise survey was conducted to verify the accuracy of the noise model. A series of controlled activity noise surveys were undertaken at a range of distances from the Dunmore Quarry plant to determine the contribution of the crushing plant and, in particular, the primary plant. During the controlled activity survey, the crushing plant was operated continuously and at full capacity. Noise levels were recorded with the primary plant "on" (jaw crusher, primary gyratory crusher and No.1 Screen) and primary plant "off" to determine the contribution of the primary plant to the overall quarry noise level

In order to more accurately calibrate the noise model, the predicted noise levels were compared to the measured noise levels which identified that the predicted noise levels were within an acceptable degree of tolerance to those measured in the field.

5.3.6.3 Effects of Meteorology on Predicted Noise Levels

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the source of the noise. As the strength of the wind increases the noise produced by the wind would obscure noise from most industrial and transport sources. When wind blows from the source to the receiver at speeds up to 3 m/s for more than 30% of the time in any period (day, evening, night) of any season, wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

Weather data was obtained, for the past 12 months, from a weather station located at the Albion Park Airport. The Albion Park weather station is located in the same topographical basin as, and in close proximity to, Dunmore Quarry. This data was analysed to determine the frequency of occurrence of winds up to speeds of 3 m/s for daytime, evening and night in each season.

Weather has been recorded at the Boral Dunmore Quarry weather station since 19 March 2003. To supplement the Albion Park data weather data from the Dunmore Quarry has been analysed from March to August 2003 to determine the frequency occurrence of winds during day, evening and night periods. Seasonal wind records indicate that winds of up to 3 m/s are a feature of the area, as the frequency of such wind from the western sector exceeds the 30% threshold for autumn and winter evenings. During summer and autumn nights winds from the westerly sector (based on Albion Park data) are above the 30% threshold, however, the local weather station at Dunmore Quarry does not show the same trend during Autumn. Further information from the Dunmore Quarry weather station is required to establish a trend based on 12 months of data. Winds from the western sector, during evening and night periods, have been treated as significant for the purpose of this investigation.

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months. For a temperature inversion to be a significant characteristic of the area it needs to occur for approximately 30% of the total night time during winter, or about two nights per week. The EPA Industrial Noise Policy states that temperature inversions need only be considered for the night noise assessment period (ie after 10.00 pm).

Although no measurement of temperature inversion was available from the Albion Park weather station, it has been assumed that temperature inversions are a feature of the area.

5.3.6.4 Predicted Noise Levels

Noise levels were predicted at the representative residential locations surrounding Dunmore Quarry. Noise contours were produced for the Dunmore Quarry operational stages which represent the worst case scenarios for daytime, evening and night-time and are presented as **Figures 5.5, 5.6** and **5.7**.

Noise Impact under Calm Conditions
A summary of the predicted noise levels at the most potentially affected non project-related residences under calm conditions is presented in **Table 5.10.**

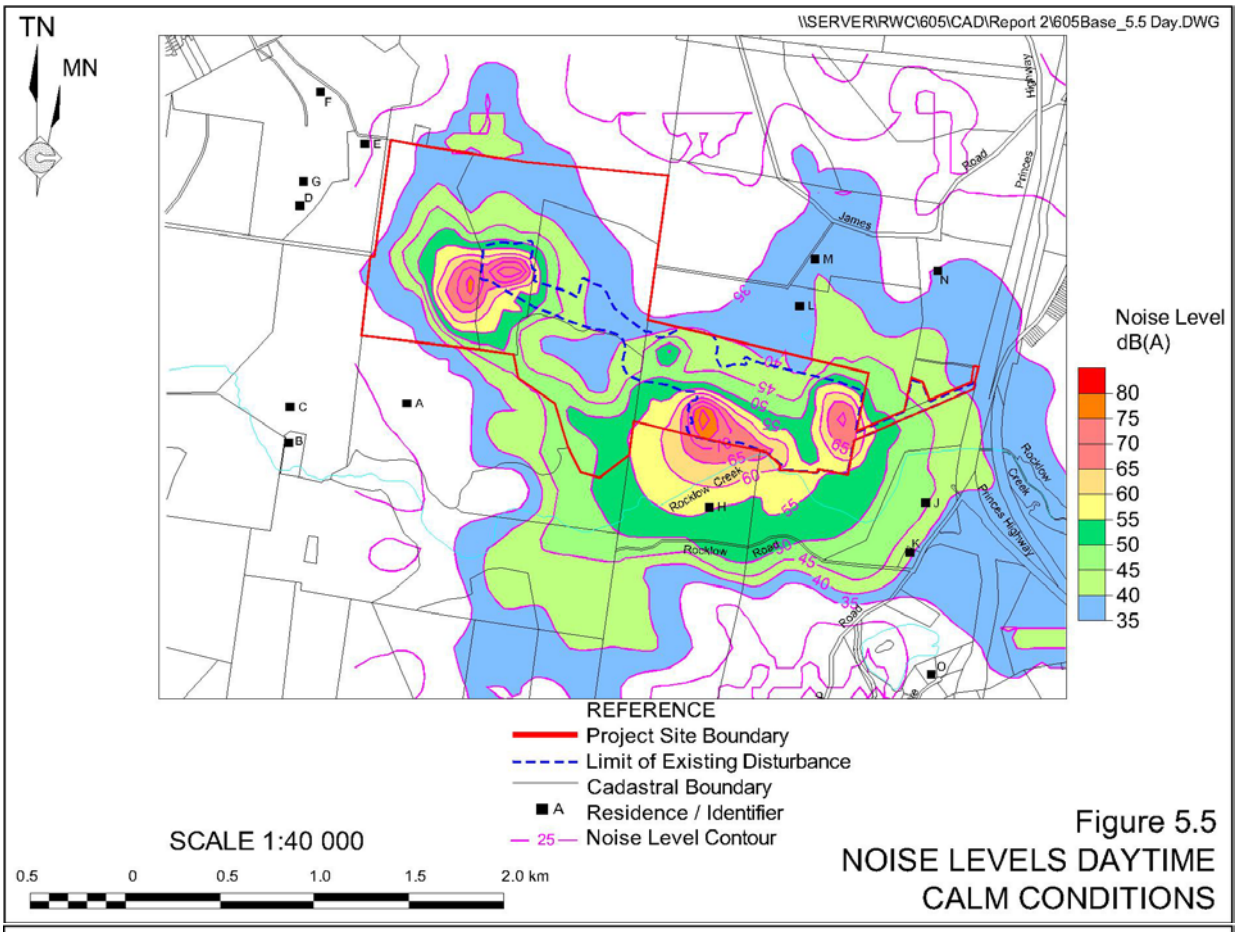


Figure 5.5
NOISE LEVELS DAYTIME
CALM CONDITIONS

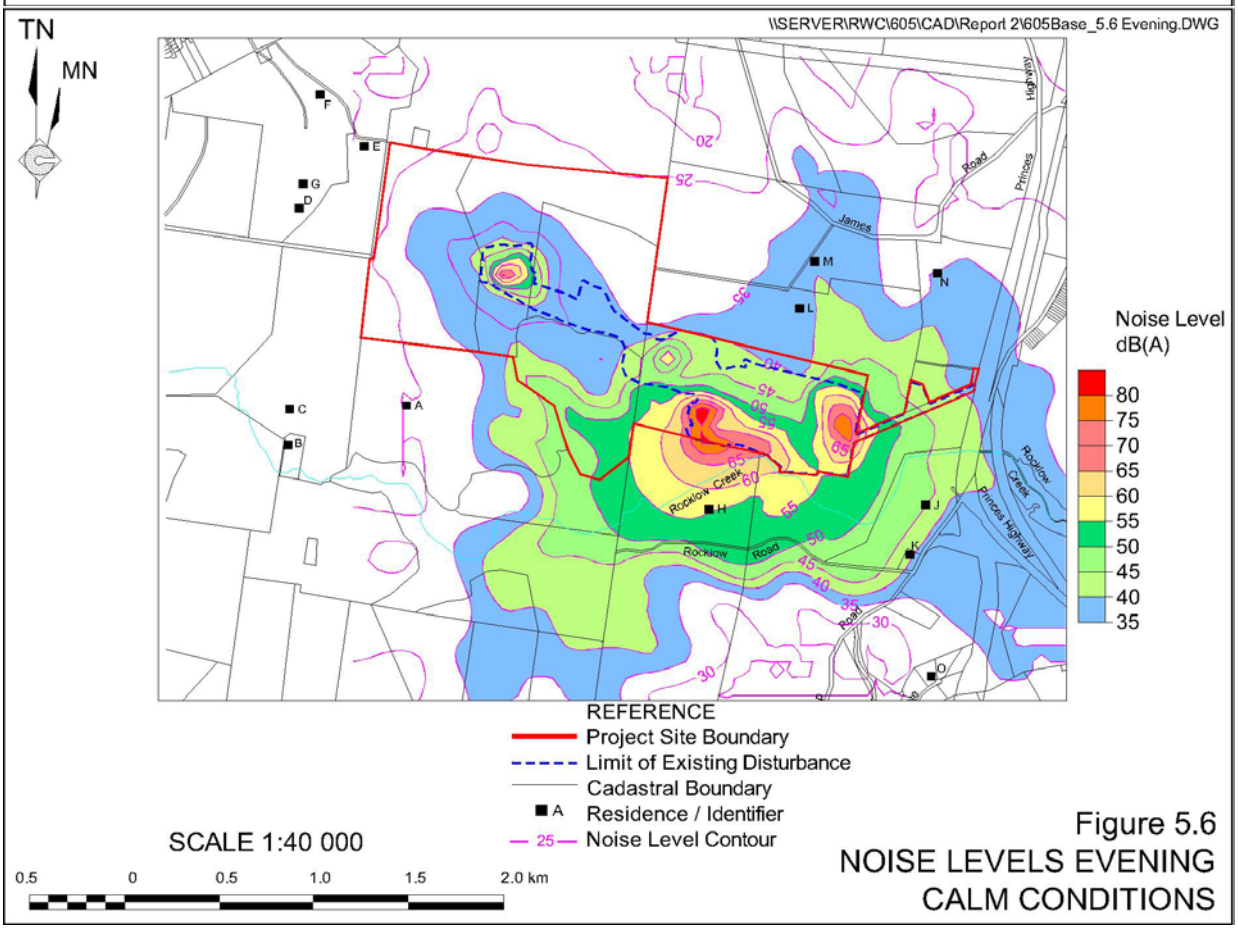


Figure 5.6
NOISE LEVELS EVENING
CALM CONDITIONS

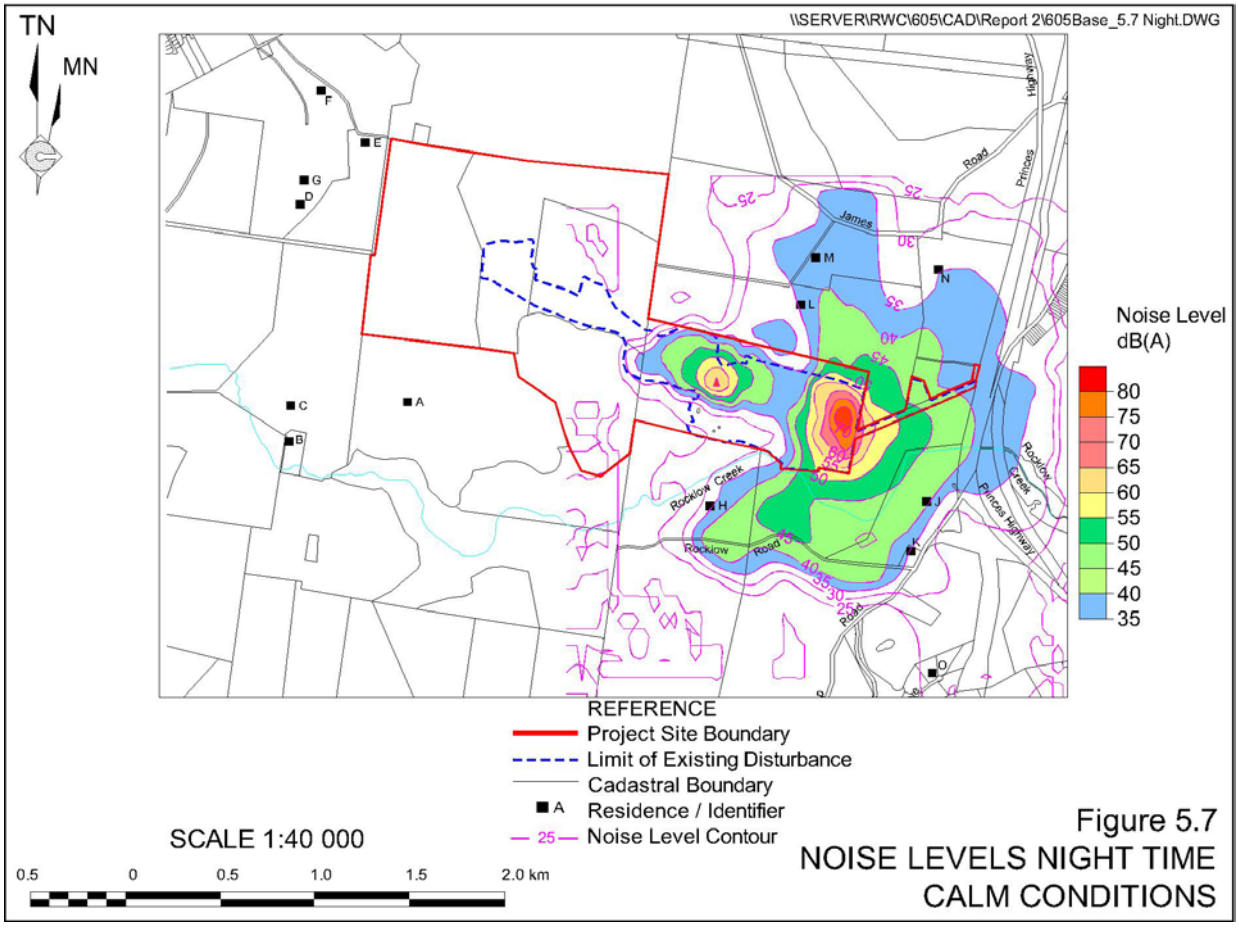


TABLE 5.10

Noise Impact Assessment Under Calm Weather Conditions

Location	Predicted Noise Level dB(A)			Project Specific Design Goal dB(A)
	Period	Existing	Proposed	LAeq(15minute)
Location A McParland Residence	Shoulder	31	31	35
	Daytime	33	33	35
	Evening	31	31	35
	Night	<20	<20	35
Location K Stocker Residence	Shoulder	40	40	47
	Daytime	40	40	49
	Evening	40	40	44
	Night	34	34	38
Location O Dunmore Lakes Estate	Shoulder	33	33	47
	Daytime	33	33	49
	Evening	33	33	44
	Night	30	30	38

Shoulder = 6.00am to 7.00am / Daytime = 7.00am to 6.00pm / Evening = 6.00pm to 10.00pm / Night = 10.00pm to 6.00am
Source: Richard Heggie Associates – Modified after Table 7.2.1

Predicted noise levels, for the existing and proposed production rates show that full quarry operation (all equipment with the exception of the hydraulic rock hammer and dozer during the morning shoulder and evening period) would comply with the EPA project specific goals under

calm weather conditions at all residential locations for daytime, evening and morning shoulder periods.

Noise Prediction under Prevailing Weather Conditions Evening Period
Noise levels were predicted under prevailing weather conditions at all residences surrounding the Dunmore Quarry for each operational stage of development. The potential noise enhancement due atmospheric conditions was comprehensively modelled to consider all significant adverse weather conditions. Atmospheric conditions which produced worst case noise enhancement typically included periods of wind from the west.

Predicted noise levels for the operation of Dunmore Quarry during the evenings in autumn and winter, under adverse winds, would comply with the project specific noise levels at all location. At Location K(stocker) a minor exceedance of 1 dB(A) may occur for the proposed operating situation. Such an exceedance is deemed to be compliant under the INP which states "*a development will be deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2 dB(A) above the statutory noise limit specified in the consent or licence condition*".

Noise Prediction under Prevailing Weather Conditions Night Period
Predicted noise levels for the operation of Dunmore Quarry during the nights in autumn and winter, under adverse winds and temperature inversion conditions, would comply with the project specific noise levels at all locations.

It should be noted that night-time sales loading is currently approved from 10.00 pm to midnight and from 5.00 am to 6.00 am.

Noise Prediction under Prevailing Weather Conditions Morning Shoulder Period
Predicted noise levels for the operation of Dunmore Quarry during the morning shoulder period in autumn and winter, under adverse winds and temperature inversion conditions, would comply with the project specific noise levels at all locations for the existing and proposed quarry production rates.

5.3.6.5 Sleep Disturbance

Night Period 10.00 pm to 6.00 am
To predict the possible occurrence of sleep disturbance from operation at night the L_{A1} levels of the loading of material into truck and rail bodies (the most likely cause of sleep disturbance) were measured. These levels were used as input to the acoustic model for the site and predictions were made at surrounding residences.

The predicted results indicate that the Project Site would meet the sleep disturbance criterion at night at all residences.

Morning Shoulder Period
Dunmore Quarry currently operates at full production in the 6.00 am to 7.00 am period. With an increase in production there would be no change to the types of events likely to cause sleep disturbance. The impact, with respect to awakening reactions, in the morning shoulder operation occurs at Location K (Stocker) and is a result of the operation of the crushing plant. At other locations the impact noise associated with operation of the crushing plant is less of an

issue and levels more applicable to night-time operation would prevail. To gain an appreciation of the type and magnitude of emergence events in the morning shoulder period, noise measurements were conducted at Location K (Stocker) with, and without, Dunmore Quarry in operation. A summary of the measurements are contained within **Table 5.11**.

TABLE 5.11

Measured Sleep Disturbance Noise Levels Morning Shoulder Period

Location	Sleep Disturbance Level LA1(1minute) dB(A)	Description Of Event	Background Noise Level LA90(15minute) dB(A)	Sleep Disturbance Goal LA1(1minute) dB(A)
Location K (Stocker) 14/10/03 6.40 am Dunmore Quarry operating	53	Car on Swamp Rd	48	55
	56	Birds		
	53	Quarry rock on metal		
	57	Birds		
	51	Quarry rock on metal		
	51	Quarry rock on metal		
	54	Quarry rock on metal		
Location K (Stocker) 15/10/03 6.25 am Dunmore Quarry not operating	54	Bird	43	55
	56	Bird		
	55	Bird		
	55	Bird		
	51	Traffic		
	55	Bird		
	64	Truck on Swamp Road		
	52	Traffic		

Source: Richard Heggie Associates – Table 7.3.2

The measurements summarised in **Table 5.11** at Location K (Stocker) typically ranged between 51 dB(A) and 54 dB(A). LA1(1minute) noise levels of similar magnitude (cars 53 dB(A), trucks on Swamp Road up to 64 dB(A), birds up to 55 dB(A)) were recorded without the quarry in operation.

The outcome of this comparative study of sleep disturbance noise levels indicates that the potential for sleep disturbance from quarry noise sources is low. This is due to the fact that noise levels from ambient noise sources, such as those from passing and distant traffic, are similar or greater than those generated by the quarry. Quarry noise sources which have the potential to cause sleep disturbance are not considered as significant emergence events as they are not greater than 15 dB(A) above background noise levels at the time of the survey.

Although the operation of Dunmore Quarry complies with the proposed sleep disturbance goals, Boral will continue to investigate a range of noise reduction measures to reduce the likelihood of quarry operational noise causing awakening reactions in the morning shoulder period.

5.3.6.6 Transport Noise

Dunmore Quarry products are transported from the quarry via road and rail predominantly to the Sydney market. Transportation of products by rail would increase from the existing level of 700 000 tonnes to 900 000 tonnes up to approximately 1.5Mt by 2005.

Current road access to the Dunmore Quarry is from the Princes Highway. The Roads and Traffic Authority (RTA) proposes to construct an overpass over the rail siding at Dunmore Quarry as part of an upgrade of the Princes Highway. An interim stage is proposed whereby the northbound lane will pass over the rail siding whilst southbound traffic will remain at the existing level. The upgrade will involve the closure of the Shellharbour Road intersection by about 2010 and the overpass has been designed for traffic to only enter and leave Dunmore Quarry from the north. Traffic travelling south from the quarry will need to initially travel north to a proposed interchange at Oak Flats before turning south towards Kiama.

Assessment of Road Traffic Noise
Calculation of the daytime L_{Aeq}(15hour) and the night-time L_{Aeq}(9hour) traffic noise levels have been conducted using a computer prediction model for residences in the vicinity of the Princes Highway. The prediction method included allowances for speed of vehicle, percentage of heavy vehicles, road surface and grade of road. Consideration was given to the projected annual increase in traffic on the Princes Highway as well as to the proposed additional Dunmore Quarry vehicles.

The noise from road traffic was predicted at distances of 10 m, 25 m and 50 m from the roadway and identified that the area of greatest potential impact from an increase in quarry traffic would occur at Albion Park where some residences are within 10 m of the edge of the highway road pavement. The existing traffic noise level for daytime L_{Aeq}(15hour) of 73.0 dB(A) and night-time L_{Aeq}(9hour) of 67.0 dB(A) exceeds the EPA road traffic criteria. The EPA policy states that where traffic noise criteria are already exceeded traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB(A). The results presented in **Table 5.12** show that the proposed Dunmore Quarry road traffic movements are estimated to increase the current Princes Highway contributed traffic noise level by up to 0.6 dB(A). The L_{Amax} noise level from existing heavy vehicle movements would remain unchanged.

Assessment of Rail Noise
The noise impact of train arrival and departure at Dunmore Quarry will not change significantly due to the proposed increase in material to be despatched by rail.

Noise from trains on the Project Site is considered to be part of the operational noise from the quarry and has therefore formed part of the noise modelling and prediction of on-site noise emissions. The noise from trains entering, leaving and being loaded has been considered in noise predictions for the operation of Dunmore Quarry during the day, evening and night periods.

TABLE 5.12

Predicted Traffic Noise

Description	Distance to Receiver					
	10 m		25 m		50 m	
	Day $L_{Aeq(15hour)}$	Night $L_{Aeq(9hour)}$	Day $L_{Aeq(15hour)}$	Night $L_{Aeq(9hour)}$	Day $L_{Aeq(15hour)}$	Night $L_{Aeq(9hour)}$
Current Princes Highway Traffic including existing Boral heavy vehicles	73.0 dBA	67.0 dBA	69.2 dBA	63.3 dBA	66.2 dBA	60.3 dBA
Future Princes Highway traffic with additional Boral heavy vehicles	73.6 dBA	67.5 dBA	69.8 dBA	63.8 dBA	66.8 dBA	60.8 dBA
Source: Richard Heggie Associates – Table 7.7.1.4						

On leaving the Project Site and entering the rail corridor, noise from Dunmore Quarry rail movements would need to comply with the conditions of the EPL held by the RIC for the rail network to Sydney. The noise licence conditions applicable to this situation state that "*the licensee is required to work towards the goal of 60 dB(A)Leq, (24hr) and 85 dB(A) max pass-by noise, (24hr) at one metre from the facade of the nearest affected residential property"*.

Giving consideration to the fact that the proposed Dunmore Quarry train despatches will not result in any additional rail movements, but just trains of greater length, it is envisaged that the change in noise level, when compared to that for the existing rail movements on the line, would be insignificant.

5.3.6.7 Cumulative Noise Impacts

For the purposes of assessing cumulative noise impacts for Boral's proposed development, emphasis is placed upon the proposed adjoining development identified as Dunmore Lakes Sand Extraction Proposal Stages 2 & 3. This is considered appropriate given its close proximity to Dunmore Quarry and the proposed common use of Tabbita Road to gain access to the Princes Highway. It is noted that the Dunmore concrete batching plant has already been factored into the site noise assessment. Consideration of cumulative noise impacts with the Albion Park quarries operated by Readymix and Cleary Bros. was assessed to be inappropriate given the considerable distance to the nearby residences and the intervening topographic shielding.

The NSW Industrial Noise Policy (INP) prescribes detailed calculation routines for establishing "project specific" L_{Aeq}(15minute) intrusive criteria and L_{Aeq}(period) amenity criteria at potentially affected receivers for a development (in isolation).

Potential cumulative noise impacts from existing and successive resource developments are embraced by the INP procedures by ensuring that the appropriate noise emission criteria (and consent limits) are established with a view to maintaining acceptable noise amenity levels for residences.

In order to assess potential cumulative noise impacts it is important to appreciate and distinguish between the INP's first and second environmental noise control objectives as follows:

Intrusive Noise Criteria L_{Aeq}(15minute)
The INP's first objective, that the intrusive noise emission from any single source does not exceed the background level by more than 5 dB(A), relates to each individual development and the intrusive noise limit is generally specified in the Development Consent and/or Licences and Approvals.

There is not an established procedure (or regulatory requirement) to determine the cumulative intrusive LAeq(15minute) noise criterion in relation to the simultaneous operation of Dunmore Quarry, Dunmore concrete batching operation and the proposed Dunmore Sand and Soil Stage 2 and Stage 3 development.

Cumulative Noise Amenity Criteria LAeq(period)
The INP's second objective is that the L_{Aeq}(period) amenity level does not exceed the specified "acceptable" level appropriate for the particular locality and land use. This goal is aimed at restricting the potential cumulative increase in noise *amenity* levels (otherwise known as "background creep").

Indicative Cumulative Noise Impact Assessment
An indicative cumulative noise impact assessment has been based upon an evaluation of the predicted worst case noise emission levels produced by the existing and future operations of the Dunmore Quarry, Dunmore concrete batching operation and the proposed Dunmore Sand and Soil Stage 2 and Stage 3 development. Operational noise levels for Dunmore Sand and Soil Stage 2 & Stage 3 were obtained from a recent noise impact assessment being conducted by the proponent. The results of the cumulative impact assessment are contained within **Table 5.13.**

TABLE 5.13

Indicative Maximum Cumulative Noise Impact Assessment Summary

Operation	Location A McParland LAeq(15minute) Daytime dB(A)		Location K Stocker LAeq(15minute) Daytime	
	Shoulder	Day	Shoulder	Day
Dunmore Quarry	34	33	45	40
Dunmore Sand and Soil Stage 2 & 3	N/A	<20	N/A	40
Dunmore concrete batching plant	<20	<20	34	30
Cumulative Amenity level	**31**	**30**	**42**	**40**
Acceptable Amenity Level	**45**	**50**	**53**	**60**

Note: Cumulative impact could not be calculated at residences owned by Dunmore Sand and Soil as no noise predictions have been made at these company owned residences.

Source: Richard Heggie Associates – Table 7.4.1

Based upon the results presented in **Table 5.13**, the estimated cumulative LAeq(period) amenity levels are below the INP's acceptable goal during all periods of the day.

5.3.6.8 Blasting

Proposed Blast Design
The personnel responsible for the design of a blast need to take a wide range of factors into account to ensure that both satisfactory fragmentation is achieved and the environmental effects of blasting are acceptable.

A typical blast design used at Dunmore Quarry is presented in **Table 5.14**.

TABLE 5.14

Typical Blast Design Details - Dunmore Quarry

Blast Design Parameter	Typical Dimension
Bench height	15m to 18m
Burden	3.8m to 4.5m
Spacing	4.5m to 5.1m
Stemming length	3m
Number of Holes	50 to 80
Delay timing	Nonel (single hole per delay)
Column explosive	Emulsion

Source: Richard Heggie Associates – Table 9.2.1

Assessment of Blasting Impacts
The effects of blasting are generally related to ground vibration and airblast overpressure. The levels at which ground vibration and airblast overpressure can cause concern or discomfort to residents are generally lower than the relevant building damage limits. All blasts would be designed to ensure that airblast and ground vibration levels are maintained within the EPA and ANZECC guidelines discussed previously in Section 5.3.4.5.

The assessment of blasting impacts is based principally upon the measured blast emission data for the current Croome Farm and RIC extraction areas. This information has been compiled to develop prediction site laws.

Table 5.15 and **Table 5.16** present the predicted airblast and ground vibration levels at a range of residential locations around the Project Site. In all cases, the relevant goals would be satisfied. These predictions are supported by a comprehensive set of monitoring data compiled from records measured at a reference point between the Croome Farm extraction area and the McParland residence. Recent monitoring at a residence in Dunmore Lakes Estate established that two blasts did not trigger any recording, i.e. the ground vibrations levels were <0.3mm/s.

Table 5.15

Predicted Blasting Levels – Croome Farm Extraction Area- (MIC 100 kg)

Residential Location	Predicted Quarry Blasting Level	
	Airblast dB Linear	Ground Vibration mm/s
Location A (McParland)	115	4.2
Location J (Creagan)	106	0.8
Location K (Stocker)	105	0.8
Location L (Dunmore Sand & Soil)	110	1.6
Location M (Readymix)	109	1.5
Location N Dunmore Sand & Soil)	106	0.9
Location O Dunmore Lakes Estate	104	0.6

Source: Richard Heggie Associates – Table 9.6.1

Table 5.16

Predicted Blasting Levels – Croome Farm Extraction Area Southwestern Extremity (MIC 30 kg)

Residential Location	Predicted Quarry Blasting Level	
	Airblast dB Linear	Ground Vibration mm/s
Location A (McParland)	115	3.5
Location J (Creagan)	102	0.3
Location K (Stocker)	102	0.3
Location L (Dunmore Sand & Soil)	106	0.6
Location M (Readymix)	105	0.5
Location N Dunmore Sand & Soil)	102	0.3
Location O Dunmore Lakes Estate	101	0.3

Source: Richard Heggie Associates – Table 9.6.2

5.3.6.9 Monitoring Program

Boral would continue to undertake a program of noise and blast monitoring to record the noise and blasting levels generated by its operations in the surrounding environment. The program would build upon the monitoring undertaken to date particularly to evaluate the trial period. Specific details of the proposed program are included in full in a report by Richard Heggie Associates included as Part 1 in the *Specialist Consultant Studies Compendium.*

Noise Monitoring
An overview of the proposed noise monitoring program is set out below. It is stressed at the outset that it is important for the noise monitoring program to be flexible to accommodate changes with site activities, surrounding land ownership and the monitoring results themselves.

- Operator-Attended Noise Surveys: These surveys would be undertaken to quantify the intrusive noise emissions from extraction, processing sales activity and rail loading as well as the overall level of ambient noise. It would be important to ensure that noise levels emitted from all fixed and mobile plant are consistent with the levels used by Richard Heggie Associates in their predictive noise assessment. Operator-attended noise measurements would be conducted, as a minimum, one day per calendar quarter and at the commencement of any significant operational event at Locations A (McParland Residence), K (Stocker Residence) and O (Dunmore Lakes Estate). Operator-attended noise measurements would be carried out during the day, evening and night-time periods.

- Unattended Continuous Noise Surveys: These surveys would be undertaken to quantify overall ambient noise amenity levels resulting from extraction, processing, sales activity, rail loading and other environmental noise sources. Unattended continuous noise logging would be carried out on a quarterly basis for a minimum period of one week at Locations A (McParland Residence), K (Stocker Residence) and O (Dunmore Lakes Estate).

- Weather Monitoring: The relevant weather parameters to be measured would include record mean wind speed and direction, rainfall and mean air temperature.

- Plant and Equipment Operational Log: It is proposed to record during the period of operator-attended and unattended noise surveys what equipment is operating/not operating during the survey period(s).

Boral proposes to review the noise monitoring program on a regular basis to ensure that the data being collected is meaningful and of value in demonstrating the performance of site activities.

Blast Monitoring
It is proposed that all future blasting the Croome Farm and RIC extraction area are monitored at the reference point between the Croome Farm extraction area and the McParland residence. It is alos proposed to undertake comparative monitoring on a monthly basis at the McParland residence to establish a clear relationship between measurements at the reference point and the residents.

Boral proposes to assess the need for an additional (or replacement) blast monitoring site once extraction resumes in the original Dunmore Quarry. The assessment would be undertaken in consultation with the Department of Environment and Conservation.

Apart from recording details of the airblast overpressure levels and ground vibration, it is proposed to record the location and elevation of the blast site, details of the blast pattern and the maximum instantaneous charge used.

Reporting

Boral proposes to continue to forward all blast monitoring data to the Department of Environment and Conservation as is current practice. It is also proposed that a summary of all noise and blast monitoring, together with an interpretation of the data, is included in each annual report for the project. Any appropriate modifications for future monitoring and/or reporting would also be identified.

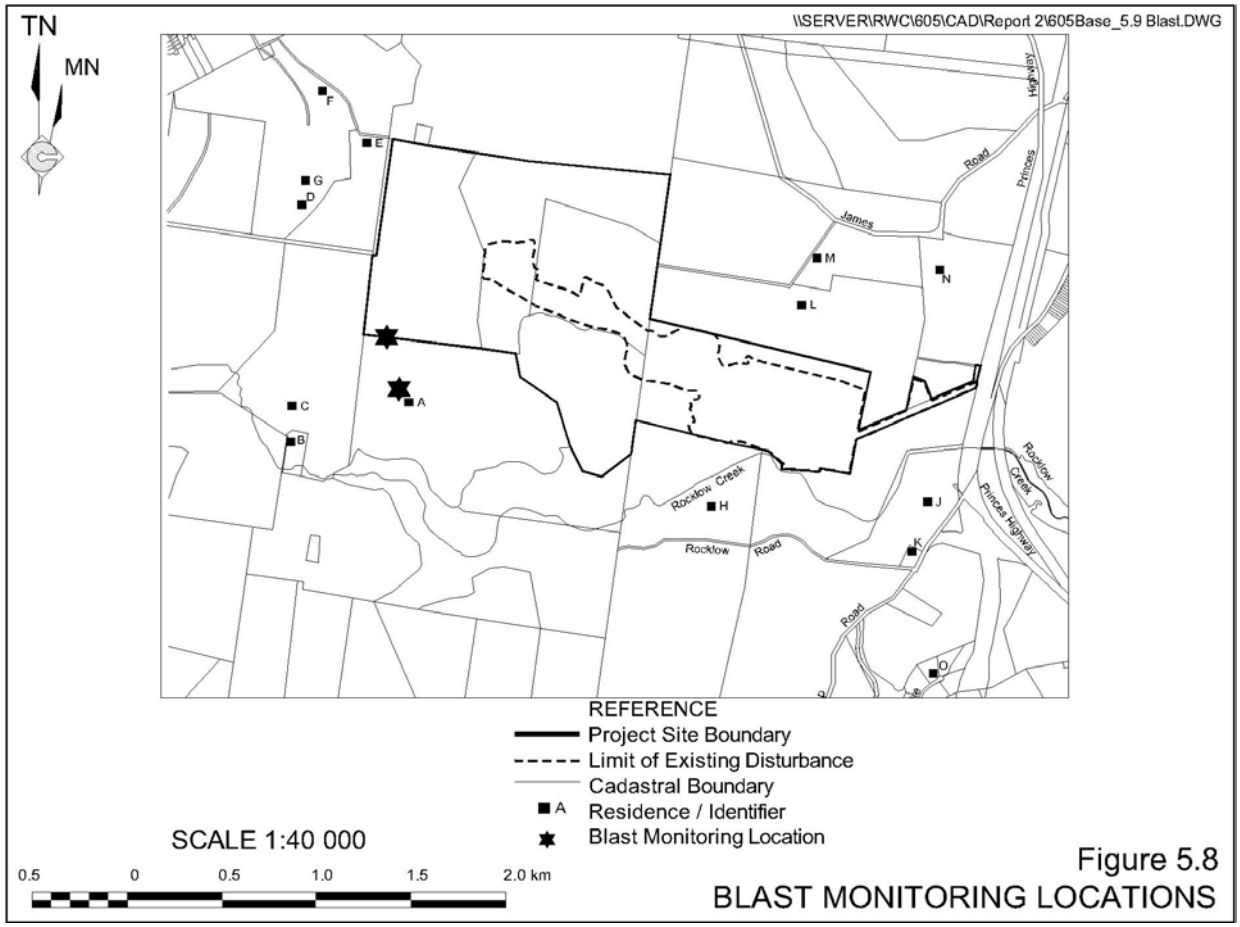


Figure 5.8
BLAST MONITORING LOCATIONS

5.4 AIR QUALITY

5.4.1 Introduction

Dust is an issue for all quarries to manage. It is invariably one of the most visible aspects of quarrying yet, as recorded by Environmental Australia (1998), its visibility often raises concerns which are not necessarily in direct proportion to its impact on human health and the environment. The extent to which impacts upon human health or the environment occur depends on the size and concentration of particles in the air and their composition. The human respiratory system has a built-in defensive system that prevents particles larger than about 10 μm from reaching sensitive areas of the respiratory system. Particles smaller than this are referred to as PM_{10}. As particles larger than 10 μm can also contribute to environmental degradation, the air quality assessment also considered the total mass of particles suspended in the air, i.e. Total Suspended Particulate matter (TSP). TSP generally measures dust particles smaller than 30 μm as material larger than this tends to settle out of the atmosphere quickly. These latter particles are referred to as deposited dust.

The air quality assessment of the proposed increase in production at Dunmore Quarry has been undertaken by Holmes Air Sciences, specialist air quality consultants. Their assessment is summarised in this section and a full copy of their report is included as Part 2 of the *Specialist Consultant Studies Compendium*. Their report quantitatively assesses the change in dust impacts likely to arise from the proposed operational changes based on the use of a computer-based dispersion model (following the guidelines developed by the EPA (NSW EPA, 2001)) to predict ground-level dust concentrations and deposition levels in the vicinity of the quarry. The dispersion model predictions were compared to relevant air quality goals defined by Government Agencies to assess the effect that the dust emissions would have on existing air quality.

The generation of greenhouse gases, by diesel-powered equipment on site and delivering products from Dunmore Quarry and from the use of electricity onsite has also been quantified by Holmes Air Sciences.

5.4.2 Existing Air Quality

Four dust deposition gauges have been established in the vicinity of the Dunmore Quarry since January 1997. The locations of the gauges in relation to the Project Site are shown in **Figure 5.9.** The gauges, which conform to Australian Standard AS3580.10.1-2003 record the rate at which dust settles over a known area for periods of approximately 1 month. Annual dust deposition levels for the period 1997 to 2003 are presented in **Table 5.17**. These values reflect all background sources relevant to that specific gauge site and would include any contribution from activities on the Project Site as well as other sources. It is noted that both insoluble solids and ash are reported in **Table 5.17**. However, since dust from Dunmore Quarry would be non-combustible, the concentration of ash would be a more accurate indicator of the contribution from the quarry.

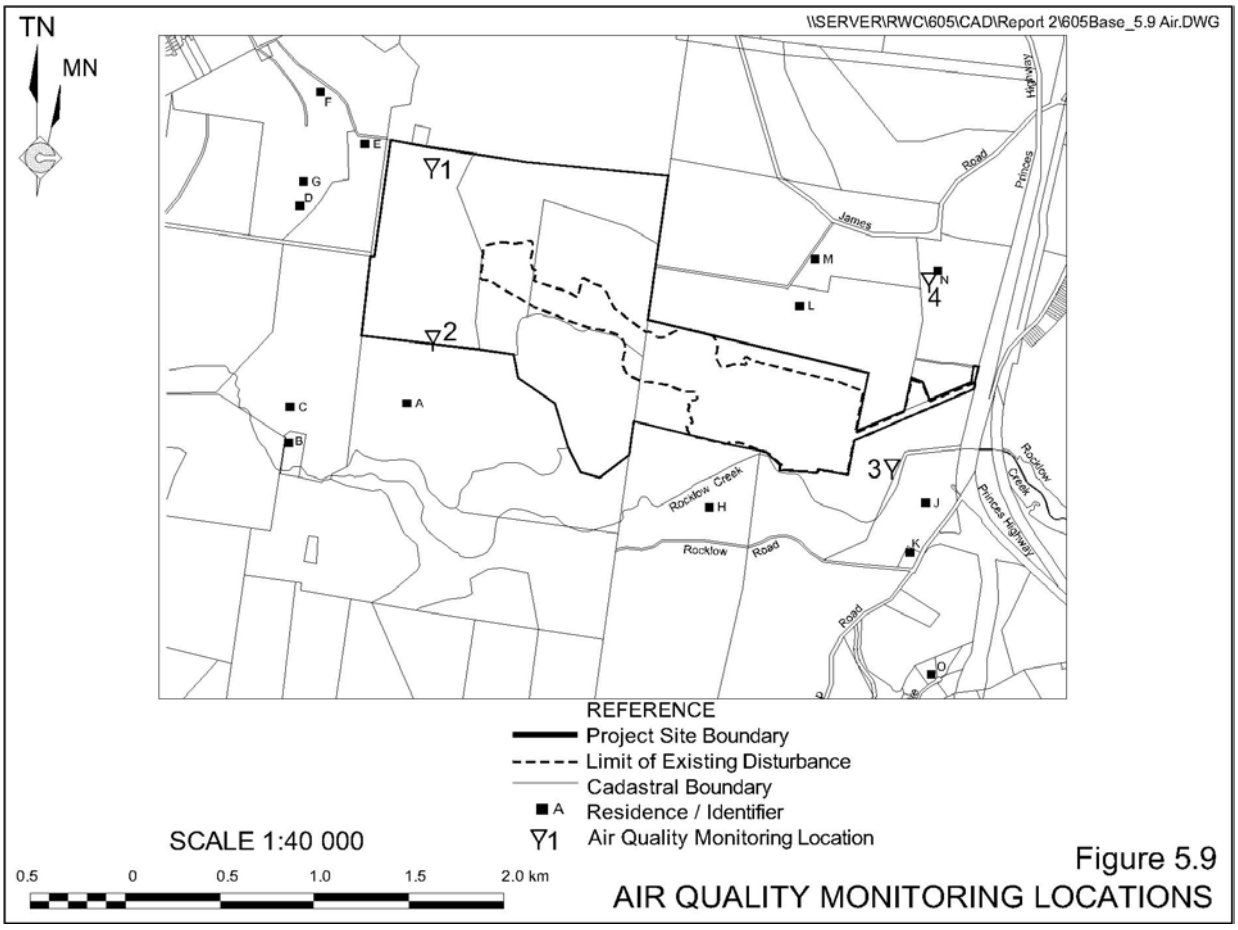


TABLE 5.17

Annual Average Dust Deposition Levels

Year	Insoluble solids(g/m^2/month)				Ash (g/m^2/month)			
	DG1	DG2	DG3	DG4	DG1	DG2	DG3	DG4
1997	5.3	2.7	3.3	2.9	2.7	1.7	2.1	1.8
1998	4.4	4.0	3.8	7.2	1.8	2.6	2.4	2.8
1999	5.7	3.2	3.6	3.5	2.6	1.4	2.1	1.9
2000	3.5	3.1	3.4	3.7	1.8	1.8	2.0	1.9
2001	2.5	3.5	5.5	3.6	1.3	1.7	2.9	2.0
2002	4.5	2.8	4.2	3.1	1.8	1.7	2.7	1.8
2003*	2.7	2.2	3.7	2.8	1.5	1.4	2.4	1.8
* Period – January to September 2003								
Source: Modified after Holmes Air Sciences – Table 6								

No one gauge has consistently recorded annual monthly average dust deposition levels higher than the other three gauges. The NSW EPA 4 g/m^2/month dust fallout criteria for insoluble solids has been equalled or exceeded for at least one year for each gauge, however, the more relevant ash content has typically been between 1.4 and 2.8g/m^2/month. The measured deposited dust (and ash) levels support Environment Australia's commentary that the presence

of small quantities of visible dust around a processing plant doesn't necessarily adversely impact on the surrounding environment.

It is likely that there would be some contribution from the Project Site to the deposition levels measured at the gauges. To quantify the air quality impact from the Project Site, the data have been analysed in conjunction with meteorological data on wind direction frequency, where collection began in July 2002, from the Dunmore Quarry. An analysis of the data for the period July 2002 to June 2003 is presented in **Table 5.18** and represented graphically in **Figure 5.10**.

TABLE 5.18

Analysis of wind direction and dust deposition data

Gauge ID	**DG1**	**DG2**	**DG3**	**DG4**
Direction(s) to quarry from gauge	SSE, SE	NE, ENE, E, ESE	NW, WNW	SW, WSW, W
Percentage of month when wind is blowing from quarry towards gauge (measured deposition, g/m^2/month)				
Jul-02	16% (3.89)	44% (2.14)	1% (2.52)	3% (2.82)
Aug-02	12% (14.58)	36% (2.76)	2% (2.91)	5% (2.15)
Sep-02	3% (-)	18% (1.95)	15% (3.16)	14% (-)
Oct-02	8% (1.91)	20% (1.52)	6% (1.57)	17% (1.54)
Nov-02	8% (6.19)	27% (4.86)	3% (4.07)	22% (4.73)
Dec-02	5% (2.72)	27% (5.8)	7% (5.24)	22% (4.52)
Jan-03	7% (1.22)	29% (3.11)	2% (3.21)	20% (3.13)
Feb-03	10% (2.02)	37% (4.69)	2% (5.00)	12% (5.77)
Mar-03	8% (2.76)	15% (2.75)	3% (3.61)	23% (3.62)
Apr-03	5% (5.26)	9% (2.41)	8% (5.69)	38% (2.89)
May-03	4% (1.58)	5% (1.32)	13% (2.30)	36% (1.14)
Jun-03	2% (2.35)	9% (1.71)	17% (4.38)	18% (2.47)
Source: Holmes Air Sciences 2003 – Table 7				

From the data presented in **Table 5.18** and **Figure 5.10,** there does not appear to be a correlation between the more frequent winds from the Project Site towards the gauges and higher recorded dust deposition levels. There is no systematic increase in observed dust deposition with increasing frequency of winds from the Project Site to the deposition gauges. This suggests that any dust emissions from the Project Site do not contribute significantly to the recorded dust levels at the gauge sites.

There are no on-site measurements of TSP or PM_{10} concentrations. Reliance has been placed upon deposited dust monitoring results and the general relationship that exists between deposited dust and TSP/PM_{10} concentrations. Areas experiencing deposited dust levels of $4g/m^2$/month typically experience annual TSP concentrations of $90\mu g/m^3$. Further, in quarrying areas, typically 40% of TSP will be in the PM_{10} size range. It is noted that the major contributor to TSP and PM_{10} in the Dunmore area would be traffic on the Princes Highway and perhaps sea-salt.

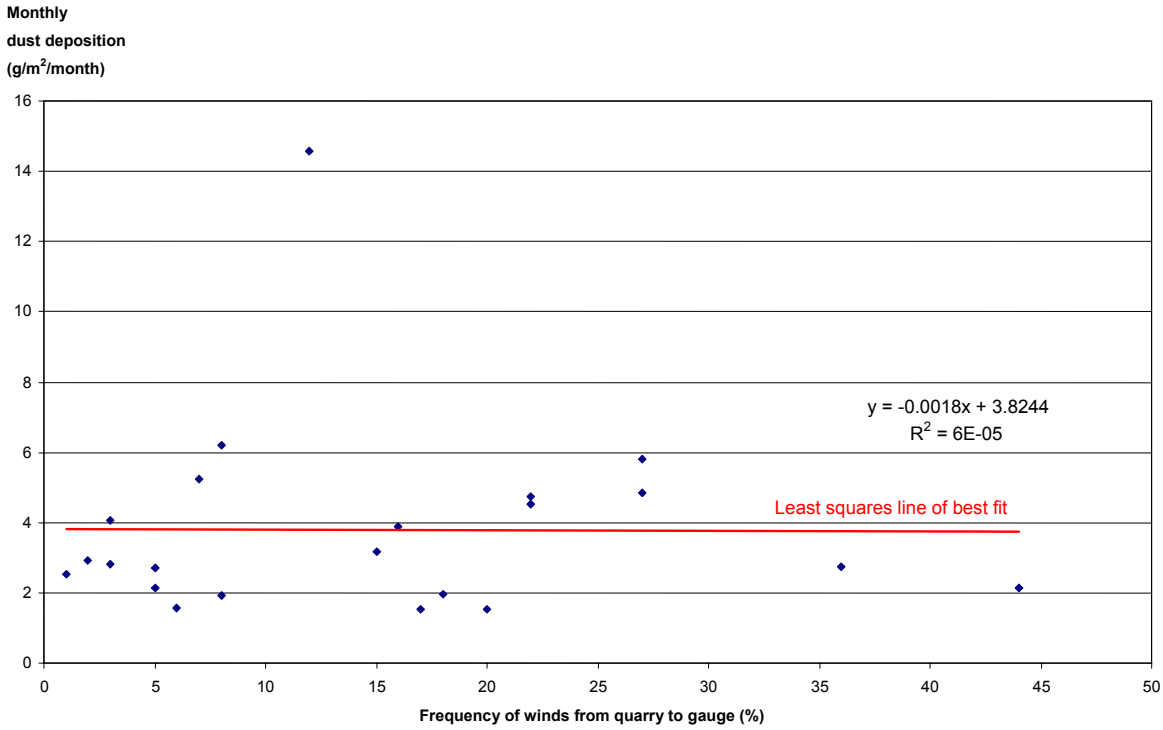


Figure 5.10 Analysis of wind frequency and dust deposition data

Source: Holmes Air Sciences 2003 - Figure 10

Based on a review of EPA monitoring data on the south coast a value of 5 µg/m^3 has been taken to be the annual average PM_{10} background level that would be recorded on the Dunmore site in the absence of the quarry. Assuming that TSP levels would be double the PM_{10} level an annual average background TSP level would be 10 µg/m^3. Both the assumed annual average PM_{10} and TSP levels are comparatively low.

For the purpose of modelling dispersion from the Project Site, meteorological data from the Dunmore Quarry, Wollongong Airport, Gerroa and the CSIRO's prognostic model (TAPM) were collected and assessed for compatibility. Data were also compiled on atmospheric stability from the Dunmore Quarry and Albion Park data sets.

Seasonally, wind patterns from all four datasets are similar with westerly winds more common in winter and NE and ENE winds (sea breezes) more common in the warmer months. Few periods when the wind speed was below 0.5 m/s (calms) were obtained from the Albion Park and TAPM datasets while calm periods accounted for 10% to 20% of the time for the Gerroa and Dunmore Quarry data. The annual average wind speeds from the Dunmore Quarry, Albion Park, Gerroa and TAPM data were 2.6, 3.7, 4.3 and 4.0 m/s respectively. The most common stability occurrences for all four sites were calculated to be D class which continues to suggest that the dispersion conditions would be such that dust emissions would disperse rapidly for a significant proportion of the time.

Holmes Air Sciences selected the Dunmore Quarry data to use in the dispersion modelling.

5.4.3 Potential Sources and Quantities of Dust Generation

The main sources of dust associated with the operation of the quarry are as follows.

- 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
- Wind erosion from stockpiles and unpaved exposed areas

The quantities of dust currently generated on site and likely to be generated at the higher level of production have been compiled by Holmes Air Sciences with reference to a series of recognised emission factors relevant to mining and quarrying industries. The quantities of dust generated annually are estimated to be approximately 264 tonnes for the existing operation and 468 tonnes for future operations. This represents approximately 0.018% of the maximum quantity of rock proposed to be extracted and is considerably less than the quantity of dust recovered through dust extraction and sold as a by-product, i.e. Nusoil^{TM}.

5.4.4 Safeguards and Management Procedures

Boral currently adopts the following safeguards and management procedures to limit the generation of dust from the Project Site.

1. Engineering controls such as shielding and enclosing crushers and screens, conveyors, transfer points and the use of water during extraction, processing and stockpiling operations. These controls aim to minimise entrainment of dust and/or maximise its recovery ultimately reducing the amount of dust visible around these areas.

2. Planning controls (which increase the separation between dust emission sources on the plant and sensitive areas). Boral has placed considerable emphasis upon the presence of extensive Company-owned buffers around the Dunmore Quarry.

3. Operational controls which vary operations when adverse meteorological conditions occur.

The dust control measures that form part of the existing operations are listed below.

- Unsealed surfaces are regularly wet down by a water truck. Water sprays are used as required on broken rock, haul roads and stockpiles.
- Enclosure of crushing, screening and transfer points with dust extraction devices incorporated into processing operations recover at least 10 tonnes of fine dust each week from the tertiary crushing and screening operations.

- Use of water truck within the product stockpile area during loading and unloading of material to trucks, crushers, stockpiles and trains. The average daily usage of water for dust suppression is approximately 300 000 litres.

- All product transport trucks use a tyre wash-down bay before leaving site.

In many cases, the additional controls installed prior to the trial period to reduce noise levels of the processing operation would contribute equally in reducing dust generation. In any event, Boral proposes to progressively upgrade efficiency of some of the controls to achieve a high standard of dust control consistent with best practice. One control which is to be upgraded would be the collection or dampening down of drill rig cuttings to reduce the quantity of dust released to the atmosphere during a blast.

5.4.5 Assessment of Impacts

5.4.5.1 Introduction

In August 2001, the NSW EPA published new guidelines for the assessment of air pollution sources using dispersion models (NSW EPA, 2001). The guidelines specify how assessments based on the use of air dispersion models should be undertaken. They included guidelines for the preparation of meteorological data to be used in dispersion models, the way in which emissions should be estimated and the relevant air quality criteria for assessing the significance of predicted concentration and deposition rates from the proposal. The approach taken by Holmes Air Sciences for the Dunmore Quarry production increase follows as closely as possible the approaches suggested by the guidelines.

5.4.5.2 Guidelines for Dust Impact Assessment

In order to assess the effect that the dust emissions would have on existing air quality, the dispersion model predictions were compared to relevant air quality goals listed in **Table 5.19** defined by Government Agencies. Air quality standards and goals refer to pollutant levels which include the contribution from specific projects and existing sources.

In addition to health impacts, dust also has the potential to cause nuisance impacts by depositing on surfaces. **Table 5.20** shows the maximum acceptable increase in dust deposition over the existing dust levels. These criteria for dust fallout levels are set to protect against nuisance impacts (NSW EPA, 2001).

5.4.5.3 Dust Modelling and Predicted Dust Levels

Dispersion modelling of deposited dust for the Project Site was undertaken using the guidelines for the assessment of air pollution using dispersion models (EPA 2001). The model ISCST3 was used as it has been the most widely used model in NSW for assessment of dust impacts and extractive industries. The modelling for the existing operation used the current consent operation hours while the modelling for the proposed operation was based on the operational hours set out in Section 3.8.1.

TABLE 5.19

Air Quality Assessment Criteria for Particulate Matter Concentrations

POLLUTANT	STANDARD / GOAL	AVERAGING PERIOD	AGENCY
Total suspended particulate matter (TSP)	90 μg/m^3	Annual mean	NHMRC
Particulate matter < 10 μm (PM_{10})	50 μg/m^3	24-hour maximum	DEC (formerly NSW EPA)
	30 μg/m^3	Annual mean	DEC long-term reporting goal
	50 μg/m^3	(24-hour average, 5 exceedances permitted per year)	NEPM
Particulate matter < 2.5 μm ($PM_{2.5}$)	8 μg/m^3	Annual mean	NEPM*
	25 μg/m^3	24-hour maximum	NEPM*
* Long-term reporting goal, not yet applied to projects in NSW.			
Source: Holmes Air Sciences 2003 - Table 2			

TABLE 5.20

NSW EPA Criteria for Dust Fallout

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m^2/month	4 g/m^2/month
Source: Holmes Air Sciences 2003 - Table 3			

The inputs to the model include details about the site activities represented by a series of individual sources across the project Site, site topographic data, metrological data, and the various emissions attributed to each activity. Modelling also took into account that particulate matter derived from a Dunmore Quarry extracting latite is composed mainly of relatively dense material which would have a high fallout rate when compared to dust generated from other sources. Latite has a density of 2.7t/m^3.

Predicted dust concentrations and deposition rates due to the existing and proposed operations have been calculated and are presented as isopleth diagrams (**Figures 5.11** to **5.14**) of the following.

1. Predicted maximum 24 hour average PM_{10} concentration (**Figure 5.11**).
2. Predicted annual average PM_{10} concentration (**Figure 5.12**).
3. Predicted annual average TSP concentration (**Figure 5.13**); and
4. Predicted annual average dust deposition (**Figure 5.14**).

The predicted dust levels at a range of surrounding residences are listed in **Table 5.21** with comparisons to the air quality goals.

5.4.5.4 Assessment of Dust Impacts

Trial Period
Holmes Air Sciences undertook an assessment of deposited dust levels during the first three months of the current trial and comparable months between 1997 and 2002. The assessment identified that for Monitoring Locations 2 and 4, the average deposited dust level over the 3 month period was lower than the 3-month average for the same months for all previous years. For Monitoring Locations 1 and 3, the average level during the trial lay midway between average levels in previous years.

As discussed in Section 5.4.2 the dust deposition levels do not appear to be strongly affected by emissions from the quarry and most of the observed variation is almost certainly due to changes in dust levels independent of the quarry. However, it can be concluded that the emissions from the quarry during the trail period have not caused dust deposition levels to increase above the pre-trail levels and it is plausible that the recently introduced measures to reduce noise levels have contributed to marginally lowering dust emission from the quarry and therefore the contribution that the quarry makes to deposited dust levels in the surrounding environment.

Future Operations
Boral has been working progressively towards the reduction of visible dust on the Project Site, particularly around the processing plant. The proposed objective of the Department of Environment and Conservation for no visible dust is acknowledged, however, in reality the small quantities of dust that are visible remain close to the source of the dust and do not report in any substantial quantities to the dust deposition gauges on the boundary of the Project Site. Consequently, the nearby residents would not be affected by dust.

Table 5.21 shows that for the existing and proposed operations, the predicted dust PM_{10} and TSP concentrations and dust deposition all fall below the air quality goals for each residence.

The predicted annual average dust deposition levels at each of the monitoring gauges is between about 0.1 and 0.8 and 0.3 g/m^2/month. The significantly higher levels of dust deposition recorded by the gauges as shown in Section 5.4.2 and **Table 5.21** suggest that there are other dust sources in the area significantly contributing to dust deposition.

5.4.5.5 Assessment of Greenhouse Gas Impacts

Greenhouse gases would be emitted from on-site mobile equipment and the trucks and trains delivering products to markets. Holmes Air Sciences estimates that approximately 26 621 tonnes) of carbon dioxide would be emitted annually once production at the Dunmore Quarry achieves an annual production of 2.5Mtpa. The above emissions estimate also provides for the electrical energy used on-site.

The quantity of greenhouse gases emitted is justified given that there is no practical alternative fuel for the activities undertaken on-site. Further the quarry design is shaped by the requirement to minimise haul distances and to maximise the efficiency with which quarrying equipment can be used. This automatically ensures that diesel fuel use is minimised.

It is noteworthy that Boral's use of trains to deliver 1.5 million tonnes of products would reduce the quantity of greenhouse gases emitted by 80% compared to the same quantity of products being delivered by road.

TABLE 5.21

Predicted Dust Levels at Surrounding Residences

Residence ID	Maximum 24-hour PM_{10} ($\mu g/m^3$) Goal : 50 $\mu g/m^3$		Annual average PM_{10} ($\mu g/m^3$) Goal : 30 $\mu g/m^3$ (Model predictions with estimated background are shown in parentheses)	
	1.4 Mtpa	2.5 Mtpa	1.4 Mtpa	2.5 Mtpa
A	9.6	25.7	1.6 (6.6)	4.5 (9.5)
B	5.4	8.7	0.8 (5.8)	2.2 (7.2)
C	5.3	12.6	0.9 (5.9)	2.5 (7.5)
D	9.4	30.8	1.1 (6.1)	3.8 (8.8)
E	6.3	12.4	0.8 (5.8)	2.3 (7.3)
F	4.7	7.9	0.6 (5.6)	1.5 (6.5)
G	8.9	29	0.9 (5.9)	2.8 (7.8)
J	13.4	22.7	1.5 (6.5)	6.9 (11.9)
K	9.5	19.6	1.4 (6.4)	5.7 (10.7)
L	9	27	4.1 (9.1)	10.5 (15.5)
M	6.9	18.4	2.6 (7.6)	6.7 (11.7)
N	6.4	19.3	1.8 (6.8)	5.2 (10.2)
Residence ID	Annual average TSP ($\mu g/m^3$) Goal : 90 $\mu g/m^3$ (Model predictions with estimated background are shown in parentheses)		Annual average dust deposition (g/m^2/month) Goal : 2 g/m^2/month	
	1.4 Mtpa	2.5 Mtpa	1.4 Mtpa	2.5 Mtpa
A	2.1 (12.1)	5.4 (15.4)	2.1 (12.1)	5.4 (15.4)
B	1.1 (11.1)	2.9 (12.9)	1.1 (11.1)	2.9 (12.9)
C	1.1 (11.1)	3.1 (13.1)	1.1 (11.1)	3.1 (13.1)
D	1.4 (11.4)	4.3 (14.3)	1.4 (11.4)	4.3 (14.3)
E	1.1 (11.1)	2.6 (12.6)	1.1 (11.1)	2.6 (12.6)
F	0.7 (10.7)	1.7 (11.7)	0.7 (10.7)	1.7 (11.7)
G	1.2 (11.2)	3.2 (13.2)	1.2 (11.2)	3.2 (13.2)
J	2.1 (12.1)	7.9 (17.9)	2.1 (12.1)	7.9 (17.9)
K	1.8 (11.8)	6.4 (16.4)	1.8 (11.8)	6.4 (16.4)
L	6 (16)	13.4 (23.4)	6.0 (16.0)	13.4 (23.4)
M	3.7 (13.7)	8.4 (18.4)	3.7 (13.7)	8.4 (18.4)
N	2.6 (12.6)	6.5 (16.5)	2.6 (12.6)	6.5 (16.5)

Source: Holmes Air Sciences 2003 - Table 11

5.4.5.6 Cumulative Impacts

Cumulative air quality effects may arise from Project-related dust sources adding to non-Project related dust sources which contribute to the local air quality. Other possible non-Project-related dust generating sources in the Dunmore-Albion Park area may include the existing and proposed activities of Dunmore Sand and Soil, and the existing Readymix and Cleary Bros. hard rock quarries at Albion Park, sea salt and traffic related dust from the main road and local road network. The dust monitoring data collected at Dunmore Quarry is likely to include contributions from all these sources to various degrees. It is noted that the Readymix and

Cleary Bros. quarries also extract and process latite. It is likely that because of the high density of this material, that like Dunmore Quarry, any dust-generated would settle close to its source.

Dunmore Sand and Soil is a wet dredge and processing operation and would be expected to contribute very little to particulate matter loadings in the area. The closest Albion Park quarry is approximately 1km to the north of Dunmore Quarry and separated by moderately densely vegetated land. The annual wind patterns tend to be aligned northeast to southwest and this would tend to produce parallel rather than overlapping plumes.

The approach to the air quality assessment has been to estimate background dust levels due to non-Project related sources and add these estimates to dispersion model predictions for the Project. This approach effectively assesses the cumulative aspect of the Project.

5.4.6 Monitoring Program

Boral proposes to continue the deposited dust monitoring program at the existing four dust deposition gauges. I

The results of all air quality monitoring would be reported in each annual report.

5.4.7 Conclusion

The air quality assessment has established that with the level of controls recently established, and to be further upgraded, the proposed operations at Dunmore Quarry would contribute only a small fraction of the total dust likely to be deposited in the local environment. Air quality goals for deposited dust, and TSP and PM_{10} would be satisfied at all surrounding residences for the proposed increased level of production.

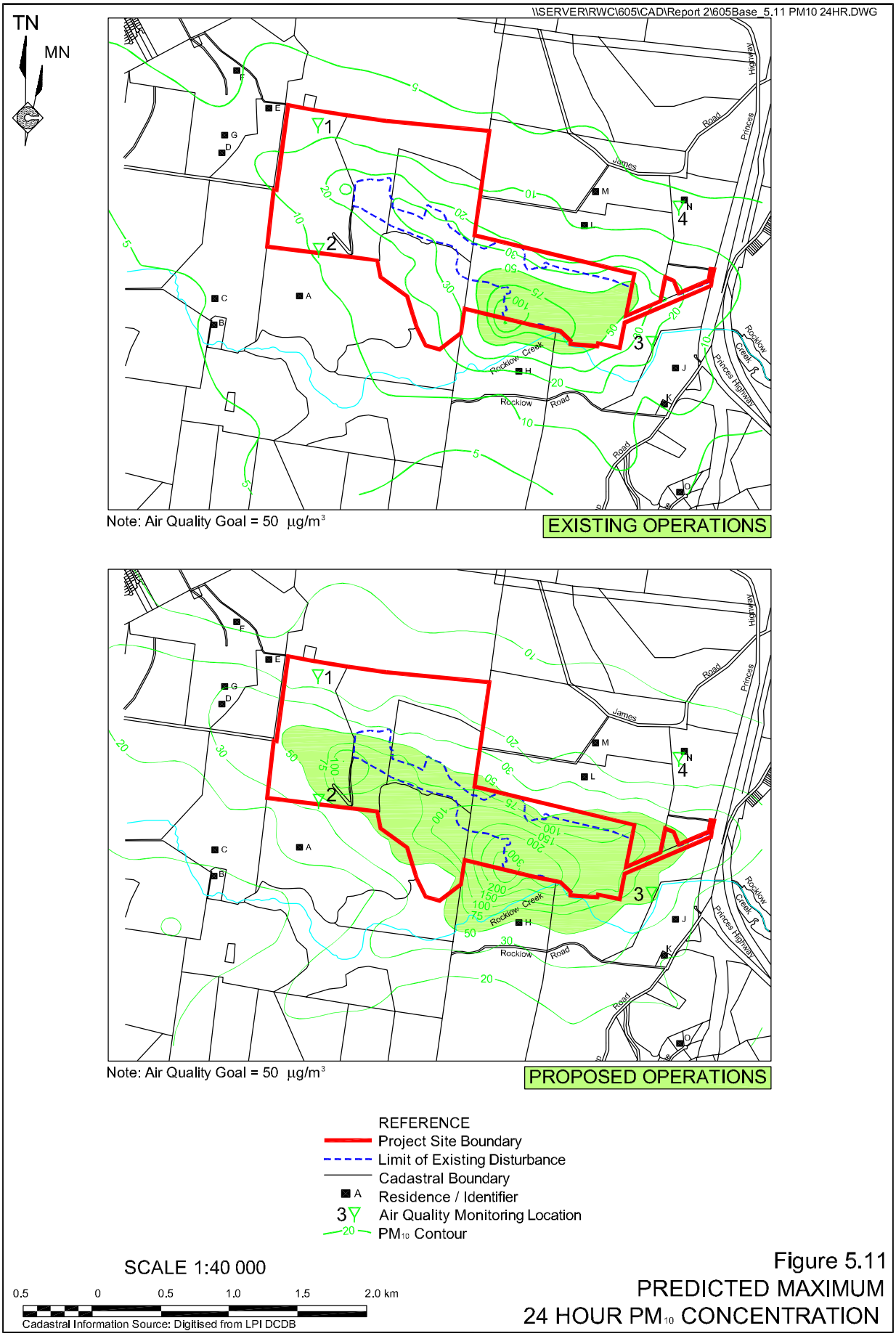


Figure 5.11
PREDICTED MAXIMUM
24 HOUR PM_{10} CONCENTRATION

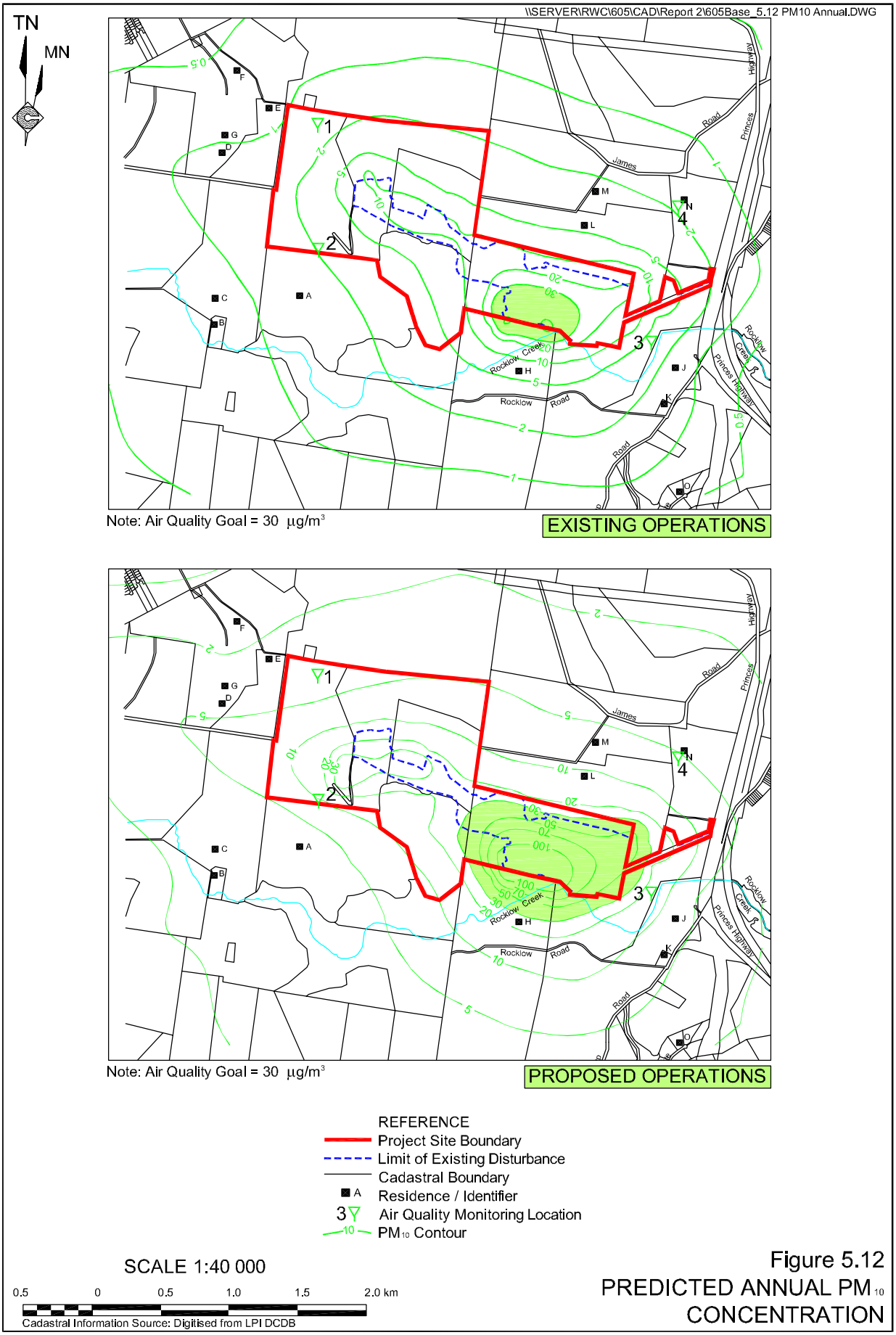


Figure 5.12
PREDICTED ANNUAL PM_{10} CONCENTRATION

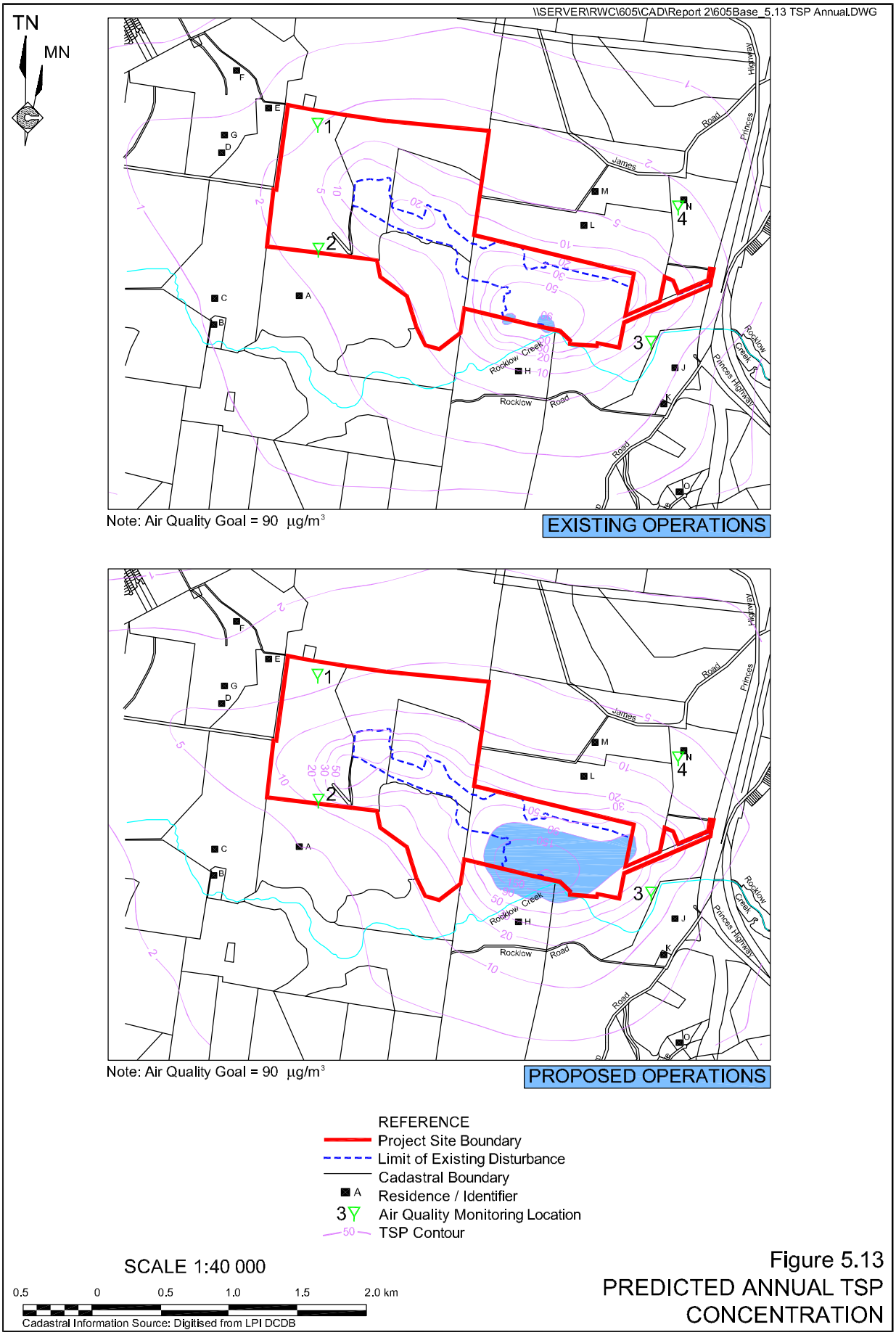


Figure 5.13
PREDICTED ANNUAL TSP CONCENTRATION

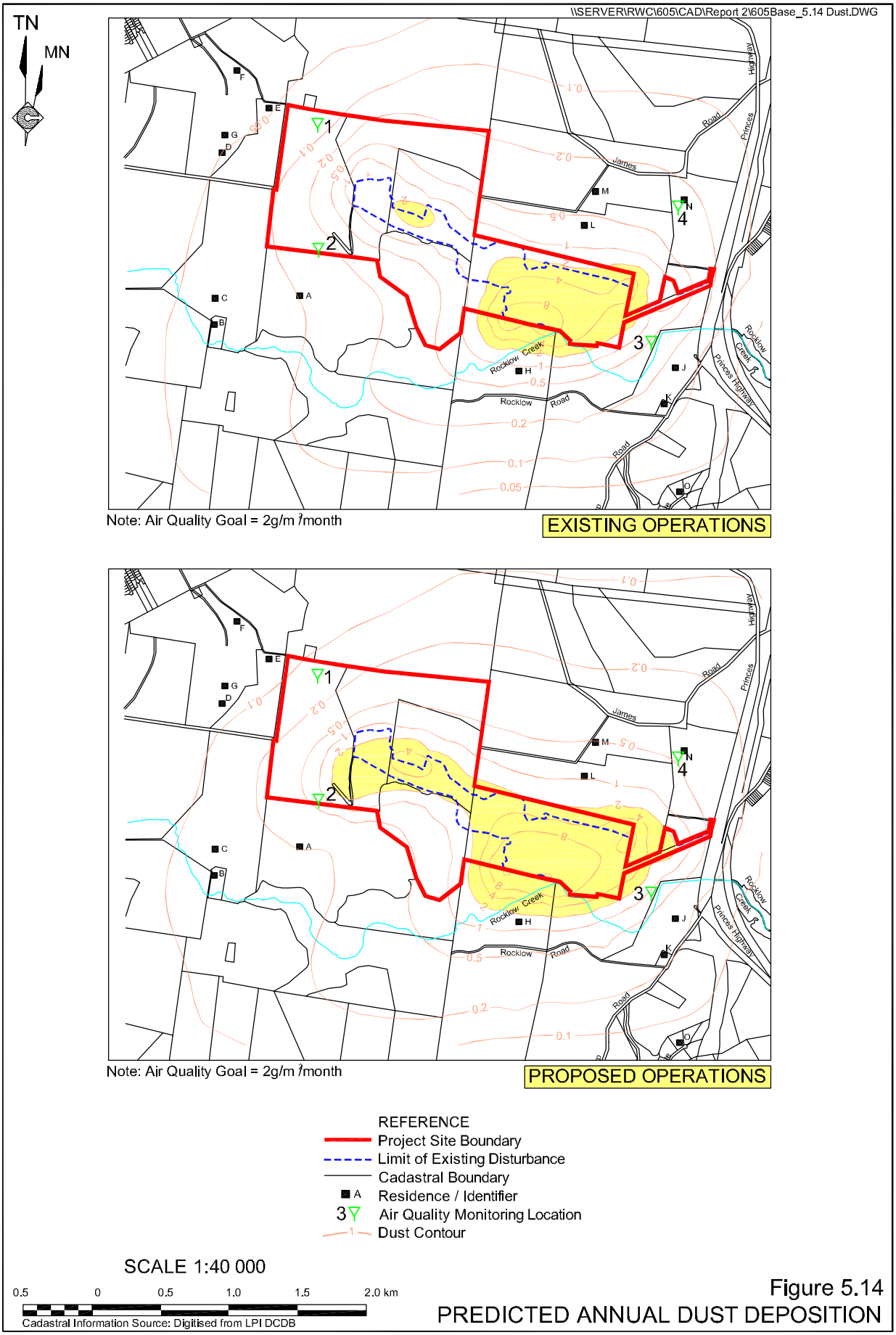


Figure 5.14
PREDICTED ANNUAL DUST DEPOSITION

5.5 ECOLOGY

5.5.1 Introduction

The ecology of the Project Site has been assessed over a number of years as different Development Applications have been submitted although it is noted that no site specific survey has been undertaken of the original Dunmore Quarry as this part of the Project Site has been operating with existing use rights and no surveys have been required. The following ecological assessments have been completed for various parts of the Project Site.

Rail Infrastructure Corporation Extraction Area - Development Consent No 161/1986 area.

- Flora description in EIS (1986) prepared by BMG Resources.
- Fauna study by Mr Dominic Fanning, August 1986.

Croome Farm Extraction Area - Development Consent No 168/1994.

- Flora survey undertaken by Mr Roger Lembit, Environmental Consultant (1994).
- Fauna assessment conducted by Arncliffe Ecological Surveys (1994).
- Supplementary flora assessment by Kevin Mills & Associates Pty Ltd in June, 1995.

Original Dunmore Quarry area and Boral land - Development Consent 71/1993.

- Ecological survey by Kevin Mills & Associates Pty Ltd undertaken in October 2003.

In addition to the above studies, the Project Site was included in an assessment of the natural vegetation of the City of Shellharbour, conducted by Kevin Mills & Associates Pty Ltd for the Shellharbour City Council in 2001.

The recent assessment by Kevin Mills & Associates Pty Ltd 2003 focuses on the original Dunmore Quarry but also includes a broad assessment of the entire Project Site where emphasis is placed upon species that are identified as threatened and not previously assessed through an eight-part test. The assessment is summarised in the following sub-sections and is included in full as Part 4 of the *Specialist Consultant Studies Compendium*.

For the purposes of describing the Ecology of the Project Site, Kevin Mills & Associates Pty Ltd divided the Project Site into two sections.

Western Section = Croome Farm and Rail Infrastructure Corporation land.
Eastern Section = original Dunmore Quarry.

5.5.2 Flora

5.5.2.1 Previous Investigations

The 1986 assessment on the Rail Infrastructure Corporation land described the flora assemblage on site as simple, consisting dominantly of *Melaleuca Armillaris* and *Acacia parramattensis* (BMG Resources Limited, 1986). The acacia was reported to be regrowth after a 1981 bushfire. Occasional immature eucalyptus, small heath scrub species and pockets of lantana were also reported.

The 1994 Roger Lembit flora assessment identified four vegetation units in the Croome Farm extraction area:

- Dry Rainforest in the gullies in the north and south-east.
- Blue Gum forest in the southern area.
- Melaleuca scrub on ridgetops and upper slopes.
- Disturbed areas including roads and edges of the existing quarry.

This assessment identified the presence of the endangered species *Zieria granulata* with an estimated population of 350 plants.

The Kevin Mills & Associates Pty Ltd supplementary assessment (June 1995) on the same area indicates that the Dry Rainforest was of great conservation importance as it had largely been removed from the Illawarra Coastal plain. The Melaleuca scrub community was also considered to be important because it represented a restricted community demonstrating original vegetation patterns in its association with the rainforest. It also contained the threatened *Zieria granulata.*

5.5.2.2 Results of 2003 Investigations

Western Section
The 2003 flora assessment by Kevin Mills & Associates Pty Ltd identified predominantly natural ridgetop and gully vegetation in the southern part of the western section.

Two district communities were identified: *Melaleuca armillaris* Tall Shrubland and Blue Gum - White Box Woodland/Forest, confirming the vegetation noted in previous studies. The distribution of these communities is illustrated on **Figure 5.15** and described below.

Blue Gum-White Box Woodland/Forest
This stand occurs in a shallow gully and contains Coast White Box (*Eucalyptus quadrangulata*), Blue Gum (*E. botryoides/E. saligna*) and Forest Red Gum (*E. tereticornis*). A number of smaller trees are present including Black Wattle (*Acacia mearnsii*), native Cherry (*Exocarpos cupressiformis*) and several rainforest trees.

Melaleuca armillaris Tall Shrubland
This community occurs on the dry ridges in the south and southwestern part of the western section. This community is generally in good natural condition except for the lantana understorey towards the gully. The characteristic species of this community include Mulga Fern (*Cheilianthes sieberi*), Golden Everlasting (*Bracteantha bracteata*), Love Grass (*Eragrotis sp.*), Pale Fan flower (*Scaevola albida*) and Cockspur Flower (*Plectranthus graveolens*). This is an endangered ecological community under the NSW *Threatened Species Conservation Act 1995* (Section 5.5.2.2).

The only other vegetation identified in the area was lantana thickets in and around the above two communities and exotic grassland dominated by Kikuyu Grass (*Pennisetum clandestinum*).

One threatened species, *Zieria granulata,* was identified in the western section. This species has been previously identified on the Project Site and approximately 40 plants were identified within the Melaleuca shrubland just beyond the current limit of the RIC extraction area (**Figure 5.15**). Plants were also identified further to the south on the rocky edges of the gorge where the plant is relatively common.

Eastern Section
The eastern section has been highly disturbed and the remaining vegetation is primarily lantana thicket and planted native forest trees with scattered remnant rainforest trees, indicative of Illawarra Subtropical Rainforest and some other native and weed species regrowth.

Lantana is present in thick patches around the eastern section and is interspersed with numerous other weeds and also some native creepers and hardy rainforest species such as Red Ash (*Alphitonia excelsa*) and Sweet Pittosporum (*Pittosporum undulatum*). The weeds in the eastern section include Caster Oil Plant (*Ricinus communis*), Cape Ivy (*Delairea odorata*), White Passionfruit (*Passiflora subpeltata*), Tobacco Bush (*Solanum mauritianum*). The complete list of plant species is available in the full report in Part 4 of the *Specialist Consultant Studies Compendium*.

On the south-facing slope in the southwestern corner, there are small stands of subtropical rainforest trees among a thicket of lantana. The rainforest species in this area include Red Ash (*Alphitonia excelsa*), Native Hibiscus (*Hibiscus heterophyllus*) and Brush Kurrajong (*Commersonia fraseri*).

A section of *Melaleuca armillaris* Tall Shrubland occurs in the far north-western corner on the higher part of the ridge. This stand continues into the shrubland to the west along the outside edge of the western patch. A number of planted tree species such as *Eucalyptus maculata* and *E. tereticornis* are also located on bund walls and adjacent slopes (**Figure 5.15).**

Zieria granulata was identified in two locations in the eastern section. Six plants were found on the lower part of the original Dunmore Quarry and at least 32 plants were identified in the far northwestern corner, amongst the *Melaleuca armillaris* Tall Shrubland.

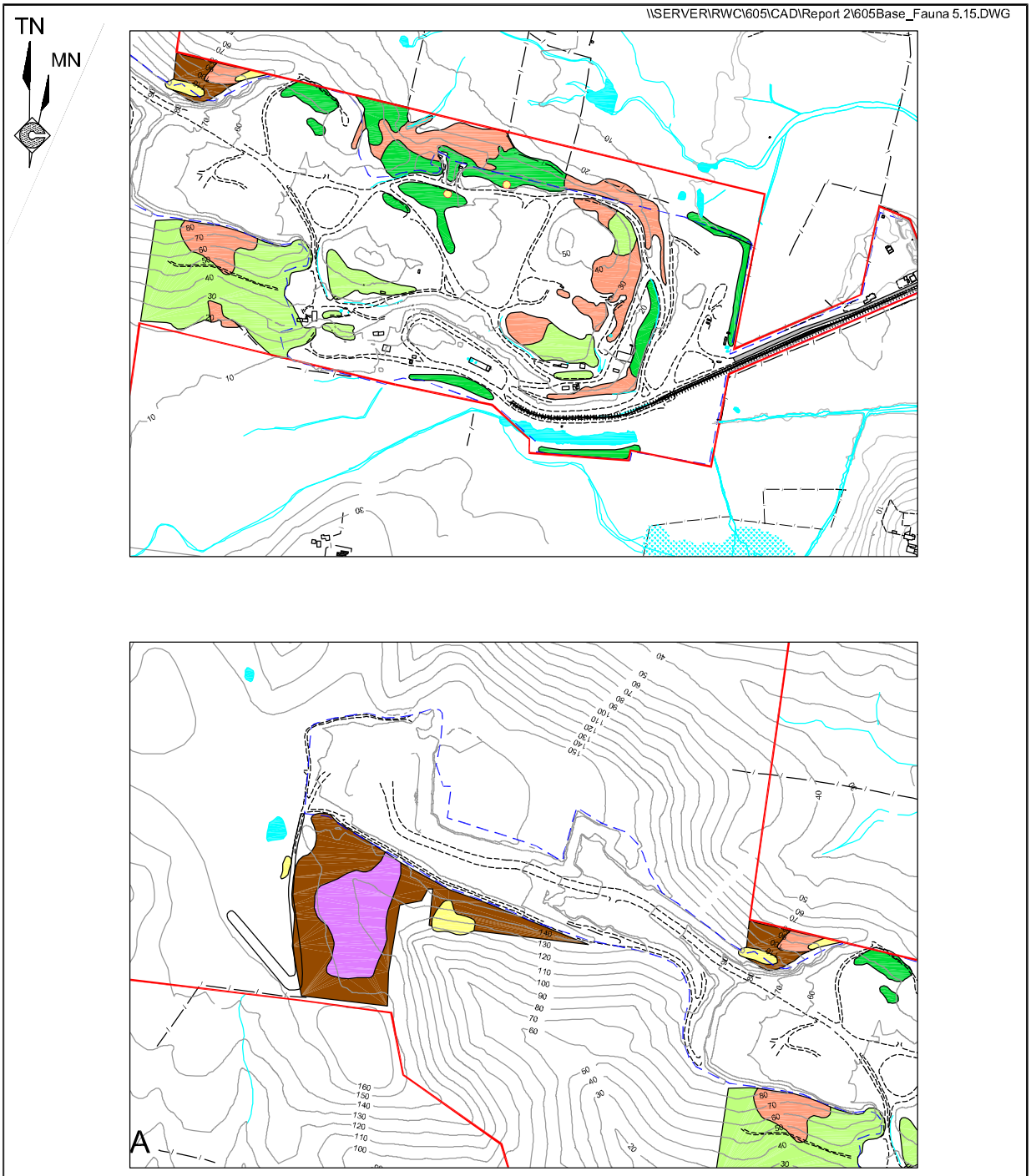


Figure 5.15
VEGETATION MAP

5.5.2.3 Conservation Significance

The NSW Wildlife Atlas identifies a number of flora species that may potentially occur on or surrounding Project Site. These are presented in **Table 5.22** where an assessment of their potential to occur on the Project Site is provided.

Only one of these species, *Zieria granulata* has been identified on the Project Site. In some places, it appears that this species has been planted as part of the quarry revegetation program.

The stands of *Melaleuca armillaris* Tall Shrubland and the Illawarra Subtropical Rainforest occurring on the Project Site are classified as endangered ecological communities under the NSW *Threatened Species Conservation Act 1995*.

Approximately 5.4 ha of *Melaleuca armillaris* Tall Shrubland occur on the western section and approximately 0.5ha occur in the far north-western corner of the eastern section. Development Consent already exists for the removal of the stand of *Melaleuca armillaris* Tall Shrubland in the western section, while the community in the eastern section would not be impacted.

The Illawarra Subtropical Rainforest occurs primarily outside the Project Site in the gorge to the south and some remnants occur on the slope in the southwestern section of the southern area. These areas would not be affected by ongoing quarry operations.

5.5.2.4 Safeguards

The safeguards for vegetation on the Project Site largely relate to the continuation of vegetation management activities already undertaken at the existing quarry operations.

Boral proposes to update the weed management plan compiled by Kevin Mills and Associates in 1996. There are a number of weeds on the Project Site that require continuous control efforts, the most important of which are as follows.

Bitou Bush	*Chrysanthemoides monilifera*
Blackberry	*Rubus fruticosus*
Castor Oil Plant	*Ricinus communis*
Crofton Weed	*Ageratina adenophora*
Large-leaved privet	*Ligustrum lucidum*
Morning Glory	*Ipomoea indica italics*
Small-leaved Privet	*Ligustrum sinense*

A corridor of trees was planted in 1996 as a wildlife corridor along the western edge of the Croome Farm extraction area. Kevin Mills and Associates note that a number of the trees have died and as a consequence, the gap between the trees is too great and there is a gap in the plantings around the dam. Boral would ensure a useful wildlife corridor and vegetation buffer are maintained.

TABLE 5.22
Threatened Plant Species known to occur in the Local Area

Species	TSC Act[1]	EPBC Act[1]	Potential to occur on the Project Site (Low/Medium/High)
White-flowered Wax Plant *Cynanchum elegans*	E	E	High. *Cynanchum elegans* is a vine that occurs mainly in dry subtropical rainforest and thickets of Lantana. The species was not seen on the Project Site, although it could occur in Lantana thickets or stands of rainforest.
Illawarra Socketwood *Daphnandra* sp. C	E	E	Low. This small tree species inhabits subtropical rain forest, often in rocky gullies. The species was not seen on the Project Site, although it is conceivable that it could occur within stands of moist rainforest.
Illawarra Irene *Irenepharsus trypherus*	E	E	Low. *Irenepharsus trypherus* is a small herb that occurs in moist gullies and ravines. The species was not seen on the Project Site and is not expected to occur there; there is no suitable habitat.
Spike Rice-flower *Pimelea spicata*	E	E	Low. *Pimelea spicata* is a small shrub that occurs in patches of native grassland, or mixed native and introduced grasses. It was not seen on the Project Site, and is not expected to occur in these heavily grazed paddocks dominated by introduced pasture species.
Illawarra Greenhood *Pterostylis gibbosa*	E	E	Low. The habitat on the Project Site is not suitable for this small terrestrial orchid, which occurs in dry forest and woodland.
Illawarra Zieria *Zieria granulata*	E	E	Present. *Zieria granulata* grows on rock outcrops in subtropical rainforest, dry woodland and paperbark scrub. It occurs in several places within the Project Site, but essentially outside the areas disturbed by extraction operations.

1. V vulnerable; E endangered; - not listed.

Source: Kevin Mills & Associates Pty Ltd – Table 6.

The endangered species *Zieria granulata* would continue to be used in the planting programs around the Project Site. In the event that any of this plant is to be removed, cuttings would be taken for use in replanting prior to clearing. *Melaleuca armillaris* would also be used in the replanting programs to increase the amount of this species on the Project Site.

The clearing of vegetation would be undertaken using stringent controls such as clear surveyed demarcation of clearing areas on the ground prior to any machinery disturbance.

A number of areas of vegetation on the Project Site beyond the approved extraction area are worthy of protection. These areas include the rainforest in the gorge to the south of the western section and the *Melaleuca armillaris* Tall Shrubland along the edge of this gorge, just outside the active extraction area. These areas would be fenced to visibly identify the vegetation protection areas and to inhibit entry by machinery and employees.

5.5.2.5 Assessment of Impacts

The proposed increase in quarry production would not have any impact on the natural vegetation or habitats in the eastern section of the Project Site. This is because a raised production level would not result in any habitat areas being cleared or modified beyond that already approved.

Approximately 7.8ha of the existing natural vegetation in the western section of the Project Site would be removed as the Croome Farm extraction area is extended albeit only within the area already approved for extraction under Development Consent No. 168/1994(am1). The vegetation communities to be removed in this area are estimated to be:

Melaleuca armillaris Tall Shrubland	5.4 ha, and
Blue Gum - White Box Woodland/Forest	2.4 ha.

The species of most importance in the area is the endangered shrub *Zieria granulata*. The survey found about 40 plants beyond the southern edge of the existing RIC extraction (see **Figure 5.15**). Boral does not plan to extend the RIC extraction area any further south. Consequently, there would be no impact upon this group of plants.

The 'eight-part test' required under the *Threatened Species Conservation Act 1995* undertaken by Kevin Mills and Associates (2003) focuses on the eastern section where there has been no previous impact assessment. The western section, and the Croome Farm extraction area in particular, has previously been assessed and no further assessment is considered necessary given Boral has no plans to extend beyond the area approved for extraction in 1996. The 'eight-part test' undertaken on the Eastern Section concluded that:

- the proposed increase in production would not affect the life cycle of the endangered ecological communities or *Zieria granulata;*
- no 'significant areas of known habitat' or 'critical habitat' for this species or the ecological communities exist on the Project Site;
- the proposed development is not a key threatening process, and

- that even though *Zieria granulata* is close to its distribution limit, the proposed development would not have a significant impact on this species or the ecological communities on the Project Site.

A full copy of the "eight-part test" for *Zieria granulata* is included in Part 4 of the *Specialist Consultant Studies Compendium.*

5.5.3 Fauna

5.5.3.1 Previous Investigations

The fauna study completed by Mr Dominic Fanning in August 1986 was conducted through traversing the RIC extraction area by foot where possible and noting habitat types present, their distribution and extent and their quality with respect to structural variability and disturbance. One evening was spent spotlighting and 200 trap-nights were completed using Elliot small mammal traps. The assessment concluded that the site was floristically simple and hence the presence of fauna was limited. Only four mammal species were recorded at the time, namely: Eastern Kangaroo, Wallaroo, Bush Rat and Southern Brown Bandicoot. It is noted that surveys in recent years have not identified the Eastern Kangaroo, Wallaroo, Bush Rat and Southern Brown Bandicoot. However, all of these species are common and widespread in the Illawarra area.

Fifteen native bird species were recorded during the survey, of which five were abundant on the Project Site. One reptile, the common skink *Lampropholis guichenoti* was recorded and no amphibians or fish species were recorded due to the lack of watercourses or pools.

The report concluded that the Project Site had low conservation significance with respect to fauna and that the adjacent native forest areas would support a much higher diversity of species and should be protected.

The 1994 Croome Farm EIS contained a fauna survey conducted in September 1992 by Arncliffe Ecological Surveys (1994). Five fauna habitats were identified during this survey namely, closed scrub, open forest, cleared farming land, closed forest and green Wattle open scrub. A total of 48 species were detected during the survey with a further 53 listed as 'likely to occur'. No threatened species were identified during this survey.

5.5.3.2 Results of 2003 Investigations

5.5.3.2.1 Fauna Habitat

Kevin Mills and Associates conducted a fauna assessment over the Project Site in October 2003. This assessment was conducted through identification of potential habitat for threatened species as well as observation and recording of fauna and signs of fauna in the area.

Fauna habitat identified is reflective of the vegetation communities present on the Project Site. Observed habitats include treed areas of planted Wattles and Eucalypts and Lantana shrubland. Rainforest plants throughout the Project Site provide potential habitat for bird species but most trees are small with no hollows for fauna habitat. The largest trees on the Project Site are

within the Blue Gum - White Box Woodland/Forest in the southwestern portion of the western section (**Figure 5.15**). There is also a number of large fig trees (*Ficus spp*) scattered throughout the Project Site which would provide foraging habitat for fruit eating birds and mammals.

The main water body within the Project Site is the stormwater dam immediately south of the processing plant. This area does not provide attractive habitat to aquatic or wetland species.

5.5.3.2.2 Fauna Species

The complete lists of fauna species identified during the survey are presented in the full report in Part 4 of the *Specialist Consultant Studies Compendium* and records of the species previously identified on the Project Site.

Eight mammal species were observed on the Project Site, five of which were introduced including cattle, foxes, house mice and rabbits. Seventy-three bird species were observed during the survey, seven of which were introduced. Only three frog species and six reptile species were recorded. The majority of these species were observed during previous surveys of the area.

5.5.3.3 Conservation Significance

A search of the NSW Wildlife Atlas was conducted to identify threatened fauna species that have potential to occur within approximately 10km of the Project Site. **Table 5.23** lists these species.

No threatened species were recorded during this survey, nor during previous surveys. The threatened species, the Powerful Owl and the Grey-headed Flying-Fox are expected to occur on the Project Site. No endangered fauna populations were recorded on the Project Site.

In addition to threatened species, the EPBC Act allows for the listing of internationally protected migratory species, that is species listed under the Japan-Australia Migratory Bird Agreement (JAMBA), the China - Australia Migratory Bird Agreement (CAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). The surveys conducted on the Project Site over time have identified a number of birds species protected under these agreements including the Australian Wood Duck, Chestnut Teal, Hardhead, Masked Lapwing, Brown Goshawk and Pacific Black Duck.

The Wanderer Butterfly is also an internationally protected migratory species. This common species was also observed on the Project Site.

TABLE 5.23

Threatened Fauna Species known to occur in the Local Area

Species	TSC Act[+]	EPBC Act[+]	Potential to occur on the Project Site (Low/Medium/High)
Mammals			
Grey-headed Flying-fox *Pteropus poliocephalus*	V	V	High. Grey-headed Flying-foxes are common in the local area, and are expected to occur in the Project Site because of the occurrence of figs and other native trees.
Large Bentwing-bat *Miniopterus schreibersii*	V	-	Moderate. They could turn up almost anywhere briefly, but are not expected to occur on the Project Site because of the lack of roosting opportunities within the Project Site.
Large-eared Pied Bat *Chalinolobus dwyeri*	V	-	
Large-footed Myotis *Myotis adversus*	V	-	Low. Also known as the fishing-bat, Large-footed Myotis scan the surface of water for prey. Because there are no large expanses of water on the Project Site, this species is not expected to occur there.
Birds			
Australasian Bittern *Botaurus poiciloptilus*	V	-	Low. Australasian Bitterns inhabit fresh and brackish wetlands. They have been recorded on the floodplain of Rocklow Creek, and in the reed beds near the highway, just north of Dunmore railway station (Chafer 1997). There are no suitable wetlands on the Project Site.
Barking Owl *Ninox connivens*	V	-	Low. This species occurs mainly in forest, and is very rare locally.
Black Bittern *Ixobrychus flavicollis*	V	-	Low. Black Bitterns occur fairly regularly in the saline wetlands associated with the Minnamurra River. There are no suitable wetlands on the Project Site.
Blue-billed Duck *Oxyura australis*	V	-	Low. Blue-billed Ducks are almost totally aquatic. They occur in deep, permanent swamps and lakes. There is no suitable habitat on the Project Site.
Comb-crested Jacana *Irediparra gallinacea*	V	-	Low. The Comb-crested Jacana has been recorded in the Shellharbour local government area on only one previous occasion, in 1984, at Dunmore Swamp. There are no suitable wetlands on the Project Site.

TABLE 5.23

Threatened Fauna Species known to occur in the Local Area

Species	TSC Act[+]	EPBC Act[+]	Potential to occur on the Project Site (Low/Medium/High)
Freckled Duck *Stictonetta naevosa*	V	-	Low. Freckled Ducks occur in densely vegetated freshwater wetlands, lagoons and lakes. There is no suitable habitat on the Project Site.
Glossy Black-Cockatoo *Calyptorhynchus lathami*	V	-	Low. There is no suitable habitat on the Project Site for Glossy Black-Cockatoos, which occur in stands of mature Black She-oak *Allocasuarina littoralis*.
Species			(Low/Medium/High)
Pink Robin *Petroica rodinogaster*	V	-	Low. Pink Robins inhabit moist forest in southeastern Australia, especially Tasmania. The species is only an occasional winter migrant to this district.
Powerful Owl *Ninox strenua*	V	-	Moderate. Powerful Owls occur in forest and woodland. The species could conceivably occur in the small areas of trees on the Project Site.
Regent Honeyeater *Xanthomyza phrygia*	E	E	Low. Regent Honeyeaters occur in woodland and open forest, wooded farmland and urban areas with mature trees. This highly nomadic species is not expected to occur on the Project Site; there is one previous record from the local area.
Rose-crowned Fruit-Dove *Ptilinopus regina*	V	-	Low. Rose-crowned Fruit-Doves occur in rainforest near the coast. The species has been recorded at Bass Point but is very rare in this district.
Superb Parrot *Polytelis swainsonii*	V	V	Low. This species occurs in forest and woodland, usually with a grassy understorey, west of the great divide. The local record would almost certainly be of an aviary escapee.
Swift Parrot *Lathamus discolor*	E	E	Moderate. There is suitable treed habitat on the Project Site for Swift Parrots, although it is not very good habitat for these parrots.
Amphibians			
Green and Golden Bell Frog *Litoria aurea*	E	V	Low. Green and Golden Bell Frogs occur in Killalea Lagoon, and were recorded on the old Shellharbour golf course in 1987. The species has not been found in any other wetlands in the Shellharbour district.

1. V vulnerable; E endangered; - not listed.

Source: Kevin Mills & Associates - Table 7

SEPP No. 44 - Koala Habitat Protection

The *State Environmental Planning Policy No. 44 - Koala Habitat Protection* (SEPP 44) applies in the Shellharbour local government area. SEPP 44 aims to identify potential Koala habitat in the form of native vegetation where the trees of the types listed in Schedule 2 of the SEPP constitute at least 15% of the trees in the area.

There is only one Schedule 2 tree species on the Project Site namely Forest Red Gum (*Eucalyptus tereticornis*). This tree species only represents a low percentage of the trees on the Project Site and there have been no Koalas observed in the area or the district, hence the Project Site does not constitute potential Koala habitat and no further provisions of the SEPP apply.

5.5.3.4 Safeguards

The fauna habitat on the Project Site is limited in area and the majority of this area would not be disturbed as part of the proposed development (Section 5.5.2.5).

The replanting program would be continued around the margins of the Project Site to increase and re-establish areas of fauna habitat. A wildlife corridor has also been established on the western side of the Croome Farm extraction area. This corridor is periodically replanted to increase the density and/or replace any dead plants (Section 5.5.2.4). This corridor was created as the Project Site holds a critical position in the line of vegetation stretching from near Jamberoo in the south to the Oak Flats - Albion Park Rail area in the north (Sinclair Knight Merz, 1995). Boral is committed to ensure the wildlife corridor is regularly managed to minimise the duration before it becomes effective.

Other management measures that would continue to be employed on site include the covering of any food waste from site amenities, lunch rooms and offices to deter vermin and introduced scavenger species.

The areas of threatened ecological communities to be protected from disturbance, as described in Section 5.2.2.4, would also provide protected habitat for the fauna species that inhabit or traverse the Project Site.

5.5.3.5 Assessment of Impacts

The proposed development would result in an estimated area of 7.8ha of native vegetation being cleared. The Development Consent to remove this vegetation within the Croome Farm extraction area already exists. Due to the amount of native habitat to the south of the Project Site and the lack of threatened species on the Project Site, the impact of this clearing is assessed as not significant. Nevertheless, safeguards related ensuring that the area to be cleared is clearly marked on the ground would minimise impact on the Project Site fauna habitat.

Although there were no threatened fauna species identified on the Project Site, an 'eight-part test' as required by the TSC Act was conducted. The full test is included in Part 4 of the *Specialist Consultant Studies Compendium*. The test concludes that the proposed development would not have a significant impact on any threatened fauna species, populations or their habitat.

An assessment of potential impact was also conducted on the migratory species. It was concluded that as there was no "important habitat" for these species on the Project Site, nor is there an 'ecologically significant proportion' of a population of these species on the Project Site, the proposal is not likely to have a significant impact on any internationally protected migratory species.

5.6 TRANSPORTATION

5.6.1 Introduction

Efficient transportation of products from the Project Site is an integral part of the proposed development. This section reviews the existing and proposed road network, road traffic types and levels, and assesses the potential traffic impacts that could arise from the proposed development.

The information in this section is a summary of the traffic assessment of the proposed development conducted by Transport and Urban Planning (2003). The full assessment report is included as Part 3 of the *Specialist Consultant Studies Compendium.* This assessment was based on the estimated traffic levels for the proposed development presented in Section 3.6.3.3.

5.6.2 Existing Product Transportation

5.6.2.1 Road Network and Classification

The Project Site is well located with respect to the State Road Network (**Figure 5.16**). Access to the Dunmore Quarry is via Tabbita Road, essentially a private road that provides direct access from the Princes Highway (SH1) to both the quarry and Boral's concrete batching plant.

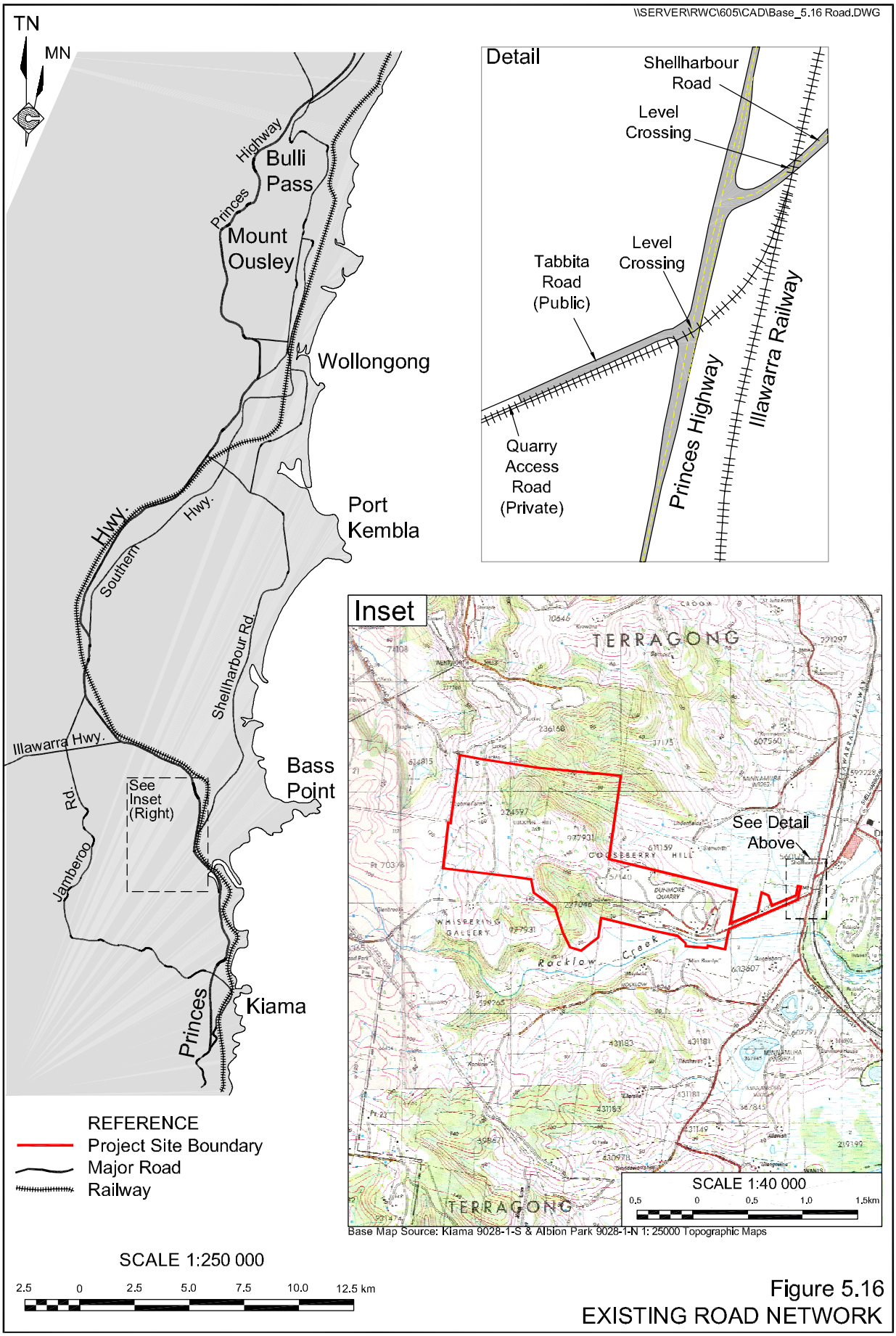
Tabbita Road forms a T junction intersection with the Princes Highway 130m south of Shellharbour Road at Dunmore. The Princes Highway is a State Highway and is important in the Illawarra and South Coast road network.

Other nearby intersections with the Princes Highway are Swamp Road, 670m south of Tabbita Road, and Shellharbour Road, 130m north of Tabbita Road.

5.6.2.2 Road and Rail Design

Figure 5.16 provides the layout and detail of the road network immediately adjacent to the entrance to Dunmore Quarry.

Tabbita Road is of variable width and is approximately 10m wide near the intersection with the Princes Highway with one sealed lane in each direction and a truck stop area near the intersection. Tabbita Road is a public road between the Princes Highway and the quarry entrance gate but a private access road beyond the gate. Entry to the quarry is controlled at the site office and weighbridge facility, with a large carpark area provided for both light vehicles and off-road vehicles.



Base Map Source: Kiama 9028-1-S & Albion Park 9028-1-N 1: 25000 Topographic Maps

Figure 5.16
EXISTING ROAD NETWORK

At the intersection with Tabbita Road, the Princes Highway is four lanes wide. The intersection has the following traffic management controls in place.

- 2 lanes in northern approach of the Princes Highway with the kerbside lane ending 100m south of Tabbita Road.
- 2 lanes in southern approach of the Princes Highway with the median lane feeding the right turn lane into Shellharbour Road.
- One approach and departure lane in Tabbita Road with Tabbita Road subject to "Give Way" control at the Princes Highway.

Sight distances at the intersection are in excess of 300m to the north and south, meeting AUSTROAD requirements for an operating speed limit of 100km/h.

Upgrading of the Princes Highway is currently being undertaken by the NSW Roads and Traffic Authority (RTA) through two major projects: Oak Flats to Dunmore and the North Kiama Bypass. At the completion of these projects, scheduled for 2010, the Princes Highway in the vicinity of the Project Site would provide two lanes in either direction with a central median and upgraded intersections including on and off ramps at Tabbita Road (see Section 5.6.3.2).

The rail siding into the Dunmore Quarry is located immediately south of Tabbita Road and crosses the Princes Highway on the southern side of the Tabbita Road intersection to connect with the main southern rail line. The level crossing is provided with warning signs and flashing lights.

5.6.2.3 Existing Traffic Types and Levels

Road Traffic
The current levels of product despatch vary daily and reflect prevailing market requirements and factors such as weather. Between 49 and 140 loads are despatched each weekday with an average of 62 loads per day despatched from the quarry. Hence on an average day, there are approximately 124 truck movements (62 truck movements in and 62 out) on Tabbita Road. Based on the existing records of the quarry, the 85th percentile day generates 89 loads or 178 truck movements (i.e. 89 in / 89 out) (**Table 5.24**). There are also an average of 34 truck loads using Tabbita Road that originate from the Boral concrete batching plant.

The transportation fleet used at the Boral Dunmore Quarry includes B-doubles, semi-trailer tippers and rigid trucks with and without trailers. The current average load despatched from Dunmore Quarry is approximately 28.7 tonnes.

Road transport routes for the delivery of product is via Tabbita Road and then onto the Princes Highway either north (average of 93% trucks per day) or south (average of 7% trucks per day). The northbound trucks generally travel along the Princes Highway to the F6 via Albion Park, with 88% of all road transport continuing towards Sydney on the Princes Highway via Mount Ousley. Product trips to the south travel along the Princes Highway to Kiama and beyond.

TABLE 5.24

Existing Product Loads from Dunmore Quarry

Time	Product Truck Distribution	Product Loads Per Hour	
		Average Day	85th Percentile Day
6am – 7am	21%	13	19
7am – 8am	5%	3	4
8am – 9am	10%	6	9
9am – 10am	6.5%	4	6
10am – 11am	10%	6	9
11am – 12 noon	6.5%	4	6
12 noon – 1pm	4.5%	3	4
1pm – 2pm	9%	6	8
2pm – 3pm	8%	5	7
3pm – 4pm	10%	6	9
4pm – 5pm	4.5%	3	4
5pm – 6pm	3.5%	2	3
6pm – 7pm	1.5%	1	1
Total Daily	**100%**	**62**	**89**
Based on 280 days per year and average loads of 28.7 tonnes		Note: one load generates two truck movements	
Source: Transport & Urban Planning – Table 2.1			

Peak hour traffic volumes at the intersection of Princes Highway and Tabbita Road were also recorded during the 7 day period in September 2003 (**Table 5.25 and Figure 5.17**).

TABLE 5.25

Peak Hour Intersection Traffic – Princes Highway and Tabbita Road

	Northbound Traffic on Princes Highway	Southbound Traffic on Princes Highway
AM Peak Hour (vph)	1195	825
PM Peak Hour (vph)	1022	1262

In addition, the right turn into Tabbita Road numbered 3 to 13 vehicles per hour (2.30 - 3.30pm), the left turn out of Tabbita Road numbered up to 18 vehicles per hour and the right turn out up to 7 vehicles per hour and the left turn into Tabbita Road numbers up to 14 vehicles per hour (**Figure 5.17**).

Table 5.26 displays the annual average daily traffic (AADT) volumes as recorded by the Roads and Traffic Authority for the Princes Highway, approximately 0.8km north and south of Shellharbour Road (MR 522) between 1994 and 2000.

TABLE 5.26

Average Annual Daily Traffic (AADT)

Location	Year		
	1994	**1997**	**2000**
0.8km north of MR 522#	18 992	19 995	20 928
0.8km south of MR 522#	25 118	27 174	27 956
Source: RTA Traffic Volumes Data Southern Region, 2000 #Shellharbour Road = MR 522			
Source: Transport & Urban Planning – Table 4.1			

More recent, AADT traffic data for March 2003 indicates current traffic volumes in the order of 20 000 vehicles per day (see **Table 5.27**).

TABLE 5.27

Average Annual Daily Traffic – Princes Highway (March 2003)

Location	Monday – Friday	Saturday – Sunday
0.8km north of MR 522#	20 000 vpd incl 10.5% heavy vehicles	20 000 vpd incl 3.5% heavy vehicles
0.8km south of MR 522#	26 000 vpd incl 2.7% heavy vehicles	28 500 vpd incl 2.5% heavy vehicles
#Shellharbour Road = MR 522		
Source: Transport & Urban Planning – Table 4.2		

Existing traffic service levels on the Princes Highway north of Kiama Downs are poor due to slow travel times during peak (seasonal) demands, unsatisfactory accident records, capacity constraints and inadequate traffic controls / management at side junctions. The North Kiama Bypass route improvement currently being undertaken by the NSW RTA should improve these conditions.

Rail Traffic

Boral currently dispatches two trains daily, transporting 2100 tonnes (30 wagons) and 980 tonnes (14 wagons) respectively (Monday to Friday), with an additional train departing on Saturdays. This equates to approximately 700 000 to 900 000 tonnes per annum despatched by rail. The trains deliver products primarily to St Peters and the recently developed rail siding at Enfield.

5.6.3 Proposed Product Transportation

5.6.3.1 Introduction

The proposed development would result in an increase in transportation of both truck and rail. The transport modal splits for product departures are as follows.

- 2.2 million tonnes per annum (2004)
  Train - 1.4 million tonnes pa
  Road - 0.8 million tonnes pa, i.e. 100 truck loads per average day with 28.7 tonne loads.

- 2.5 million tonnes per annum (2005)
  Train - 1.5 million tonnes pa
  Road - 1.0 million tonnes pa, i.e. 123 trucks per average day with 29 tonne loads.

5.6.3.2 Proposed Road Network

The Roads and Traffic Authority has confirmed that the proposed upgrading of the Princes Highway at Dunmore would be completed in two stages.

- Stage 1 referred to as the North Kiama Bypass involves the construction of an interim arrangement near Tabbita Road which will be completed in late 2005;

- Stage 2 which is the completion of the ultimate proposed scheme for Princes Highway between Oak Flats and North Kiama by 2010.

A third stage (currently unscheduled) would involve the completion of the Oak Flats to Yallah link which will follow a route to the west of Albion Park (behind the airport) to rejoin the Princes Highway at Yallah south of the F6 Freeway.

Each of these stages is shown in **Figure 5.17**. Details of these arrangements are described in the full Transport and Urban Planning Report included as Part 3 of the *Specialist Consultant Studies Compendium*.

Figure 5.18 shows the interim and final layouts of the Tabbita Road/Princes Highway intersection

The upgrading of the road/rail network throughout the Illawarra is one of the key elements recorded in the document "Illawarra's Action for Transport 2002-2006". A further element of importance to Boral and the distribution of product from the Dunmore Quarry is the identification of key freight links such as the Illawarra Rail Line.

5.6.3.3 Proposed Traffic Types and Levels

It is anticipated that there would be very little change in the types of trucks used for product transportation, apart from gradual changes to reflect transport industry changes such as the increasing use of larger capacity trucks (B-doubles for example) to maximise product transport and minimise vehicle movements.

Based on proposed annual sales of 2.5 million tonnes, of which 1.0 million tonnes would be by road, 280 operating days per year and average loads of 29 tonnes, an average of approximately 123 loaded trucks would be despatched daily generating 246 truck movements daily. On an average day, 3 570 tonnes of quarry products would be despatched by road.

Table 5.28 displays the indicative hourly truck movements to and from the quarry for an average day and 85th percentile day, based on the existing distribution of trucks leaving the quarry over a four week period in August 2003 and projections of increased movements beyond the existing 6.00am to 7.00pm period. The quantity of truck traffic between 12 midnight and 5.00am would typically be low, however, Boral recognises that some customers benefit by operating during periods of low traffic levels and congestion on local roads. It is stressed that the truck levels set out in **Table 5.28** are indicative only and variations due to a wide range of circumstances could occur.

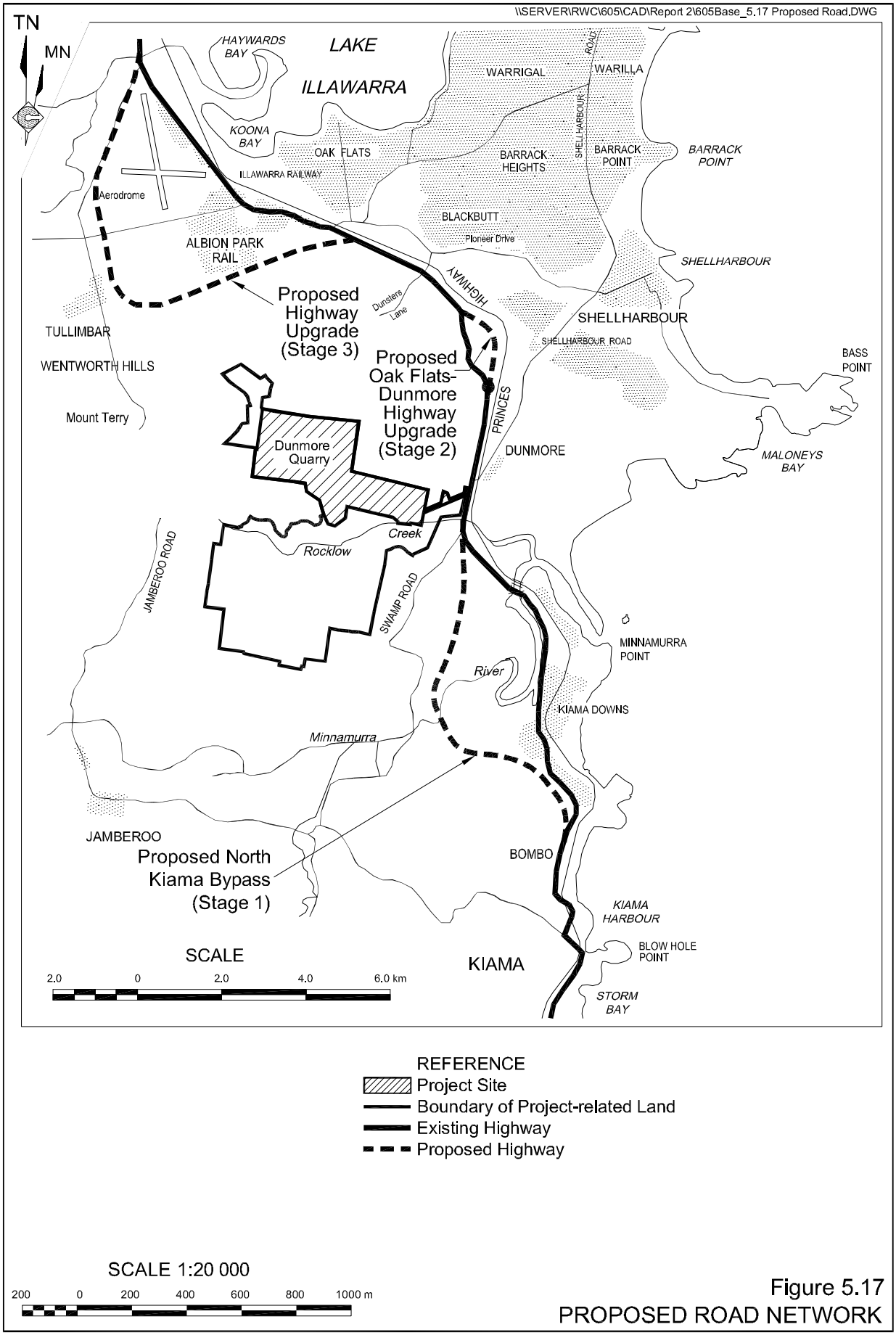


Figure 5.17
PROPOSED ROAD NETWORK

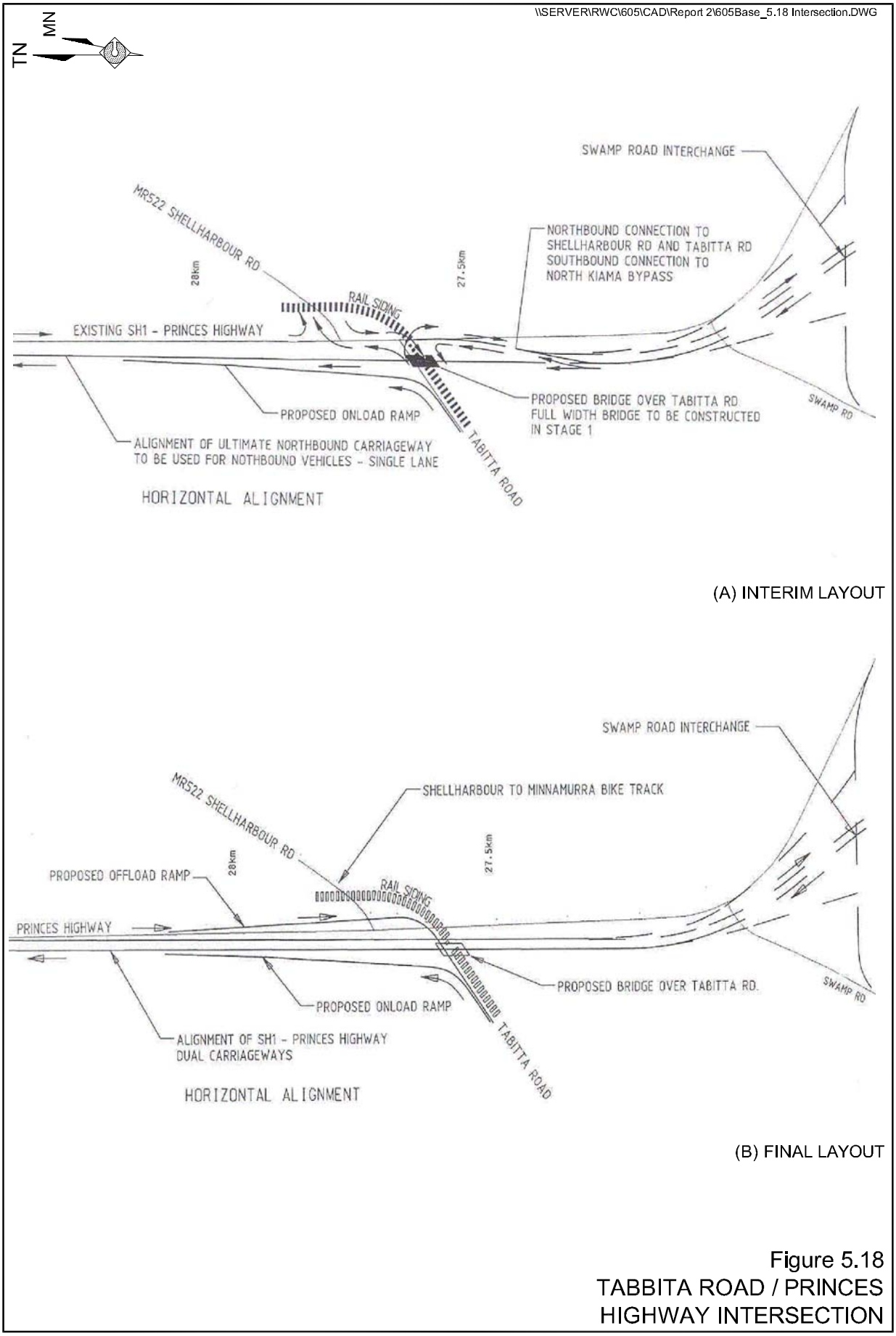


Figure 5.18
TABBITA ROAD / PRINCES HIGHWAY INTERSECTION

TABLE 5.28

Indicative Future Product Loads – Dunmore Quarry

Time	Product Distribution	Product Loads per hour	
		Average Day	85th percentile Day
5am – 6am	10%	12	15
6am – 7am	19%	24	27
7am – 8am	5%	6	7
8am – 9am	7%	9	10
9am – 10am	5%	6	7
10am – 11am	8%	10	11
11am – 12 noon	5%	6	7
12 noon – 1pm	3%	4	4
1pm – 2pm	6%	7	9
2pm – 3pm	6%	7	9
3pm – 4pm	8%	10	11
4pm – 5pm	3%	4	4
5pm – 6pm	2.5%	3	4
6pm – 7pm	2.5%	3	4
7pm – 8pm	2%	3	4
8pm – 9pm	2%	2	3
9pm – 10pm	2%	2	3
10pm – 11pm	2%	2	3
11pm – 12 midnight	2%	2	2
Total Daily	**100%**	**123**	**144**
Based on 280 days per year and average loads of 28.7 tonnes Note: one load generates two truck movements			
Source: Transport & Urban Planning – Table 3.1			

It is anticipated that there would be no change in the transport route used by the product trucks or the percentage of trucks travelling north (93%) and south (7%) on Princes Highway. The only changes that would occur to the transport network would be those arising from the RTA Princes Highway upgrade (Oak Flats to Dunmore).

5.6.3.4 Proposed Traffic Management and Safeguards

No specific traffic management or safeguards have been recommended for this proposal above the safeguards already in place at the Dunmore Quarry. These safeguards include using appropriately trained drivers and ensuring that all vehicles are well maintained and comply with EPA requirements for heavy vehicles.

All loads leaving the quarry must pass over the weighbridge to ensure that no truck is overloaded with product and all loads are secured prior to the truck leaving the Project Site.

Boral has recently commissioned a second rail terminal at Enfield in Sydney and a significant proportion of the additional product would be transported by rail. Boral would also increase rail product transport in preference to truck transport in the future, however, this would be limited by the number of customers that have access to appropriate rail facilities.

Based on the hourly truck distribution shown in **Table 5.28**, an additional 2 to 3 truck loads would be despatched per hour on an average day and 7 to 8 truck loads despatched per hour on the 85th percentile day.

Table 5.29 summarises the daily and maximum hourly increases in product truck loads using the road network due to the proposed development.

TABLE 5.29

Daily Product Truck Loads - 2005

	Tabbita Rd			Princes Highway north of Tabbita Rd			Princes Highway south of Tabbita Rd		
	Existing	Proposal	Increase	Existing	Proposal	Increase	Existing	Proposal	Increase
Average Day	62	123	**+61**	58	114	**+56**	4	9	**+5**
85th% Day	89	144	**+55**	82	134	**+52**	7	10	**+3**
Maximum Hour	13	24	**+11**	12	22	**+10**	1	2	**+1**
Maximum Hour 85th percentile Day	19	27	**+8**	18	25	**+7**	1	2	**+1**

Source: Transport & Urban Planning – Table 5.1

The increase in employee and/or maintenance vehicle trips due to the proposal is likely to be approximately 10 additional trips in/out per day resulting in a total of approximately 50 trips in / out per day, i.e. a total of 100 light vehicle movements.

The traffic growth forecast on the Princes Highway between Bombo and Kiama between 2001 and 2011 is 19%, which represents a growth rate of approximately 2% per year averaged over this period. These traffic growth forecasts are based on a medium growth scenario.

Applying these growth figures to the September 2003 peak hour traffic count data for the years 2004 (2% increase) and 2011 (16% increase) provides the estimated traffic volumes at the Princes Highway / Tabbita Road intersection (**Tables 5.30** and **5.31**).

The right turn volume from the Princes Highway in Shellharbour Road is also shown for the year 2009, as this traffic will be using the existing northbound Princes Highway carriageway under the interim traffic scheme.

5.6.3.5 Proposed Rail Traffic

An additional 600 000 tonnes to 800 000 tonnes of products are proposed to be transported by rail. This would be achieved by increasing the capacity of the two trains that currently transport products from the Dunmore Quarry. The recently commissioned rail siding at Enfield would also be increasingly used.

TABLE 5.30

Predicted Future AM Peak Hour Traffic Volumes

Movement	Traffic Volumes veh/hr		
	Existing 2003	2004	2011
Right turn into Shellharbour Road	450	459	-
Princes Highway northbound at Tabbita Road	1181	1205 *	1370 *
Princes Highway southbound at Tabbita Road	819	835	950 *
Right turn into Tabbita Road	6	6	7
Left turn into Tabbita Road	14	14	16
Right turn out of Tabbita Road	8	8	9
Left turn out of Tabbita Road	5	5	6
*on elevated road carriageway			
Source: Transport & Urban Planning – Table 4.5			

TABLE 5.31

Predicted Future PM Peak Hour Traffic Volumes

Movement	Traffic Volumes veh/hr		
	Existing 2003	2004	2011
Right turn into Shellharbour Road	217	221	-
Princes Highway northbound at Tabbita Road	1018	1038*	1180 *
Princes Highway southbound at Tabbita Road	1262	1287	1464 *
Right turn into Tabbita Road	3	3	3
Left turn into Tabbita Road	4	4	5
Right turn out of Tabbita Road	0	0	0
Left turn out of Tabbita Road	6	6	7
*on elevated road carriageway			
Source: Transport & Urban Planning – Table 4.6			

5.6.3.6 Vehicle Kilometres Travelled

The delivery of 1 million tonnes of products annually by road would generate approximately 34 500 truck loads. Assuming approximately 90% of loads are transported an average of 100km with the remaining 10% travelling 50km, the total vehicle kilometres travelled (vkt) would be in the order of 6.5 million vkt i.e. laden and unladen. It is noted, however, that standard industry practice often involves the use of trucks to backload other products.

The 1.5 million tonnes of products transported by train (3 100 tonnes/train) would generate approximately 480 train movements. Given the average train journey to Sydney is approximately 206km (round trip), the number of vehicle kilometres travelled (vkt) by train would be approximately 100 000 vkt.

A comparison of the vehicle kilometres travelled by road and rail clearly identifies that rail transportation is far more efficient. One thousand vehicle kilometres travelled by rail is effectively equivalent to approximately 100 000 vehicle kilometres travelled by road.

5.6.4 Assessment of Impacts

5.6.4.1 Road Traffic

Road Traffic Levels
The increase in vehicle movements due to the proposal is small in real terms and no change is expected to the traffic conditions on the road network due to the proposal in the shorter term. In the longer term, i.e. by 2010, following the completion of the RTA route improvements for the Princes Highway, traffic conditions and associated service levels in this section of the Highway through Dunmore should significantly improve.

The existing channelisation at the intersection of Princes Highway / Tabbita Road provides a safe intersection design which easily caters for the vehicle movements that use the intersection and safety and service levels at this intersection would improve further with the RTA's improvement works.

The increase of up to 11 additional truck movements per hour by 2005 would not affect the capacity of the intersection and/or road safety at the intersection. The intersection would continue to operate at an acceptable level of service operation which indicates good traffic conditions.

The increase of 10 truck movements per hour using Princes highway north of Tabbita Road would have no measurable impact on road capacity or traffic conditions. This section of the Princes Highway currently carries between 2100 and 2400 vehicles per hour (Monday-Friday), 10.5% of which are heavy vehicles.

Similarly, the increase of 1 additional truck movement per hour using the Princes Highway, south of Tabbita Road would have no measurable impact. An additional truck movement per hour would not alter the existing traffic conditions.

As noted previously, traffic conditions on the Princes Highway adjacent to Tabbita Road are satisfactory with good sight distance, moderate vehicle speeds and regular gaps in the Princes Highway traffic flow which allows vehicles arriving and departing Dunmore Quarry to safely turn into and out of the Princes Highway. In particular, these traffic conditions are likely to improve further with the RTA's improvement works.

On the wider road network for trips to either Sydney or Wollongong, the additional 11 truck movements per hour associated with the proposal would have no noticeable impact on the road network and are comparative to those truck levels realised up to until 1999 when all product was transported by road.

The likely impacts of increased road transportation of Boral's Dunmore Quarry products on the Princes Highway at Mt Ousley is projected to be in the order of an additional 52 trucks per 85th percentile day by 2005. With a recorded level of 18.5% of heavy vehicles on Mount Ousley, the current average number of trucks per day is estimated at 4 397 (ie 18.5% of 23 767 AADT). It is estimated that an 85th percentile day would generate approximately 134 truck movements from the Dunmore Quarry on the Princes Highway at Mount Ousley Road, comprising approximately 3% of the total heavy vehicle traffic. This level of increase is not considered to have an impact on Mount Ousley traffic flows.

Pavement Condition
Increased product transportation by road would impact on pavement condition and life. Boral ensures that all trucks leave Dunmore Quarry with legal loads to ensure there is no inappropriate loadings on the road pavement. The maintenance of the road pavement is the responsibility of the RTA. Funding for maintenance is drawn from a range of sources including the registration fees for trucks ($4000 to $8000 per truck depending on axle loadings) and diesel levies paid by trucking companies through their expenditure on fuel.

Transport and Urban Planning concluded that transportation of quarry products from Dunmore Quarry would have a comparatively negligible impact on the operation of the surrounding road network and particularly upon the cumulative impact of the additional heavy vehicle movements in the long run on Mount Ousley. In reality, the proposed increase in truck traffic levels as a result of the increase in production would be comparable to the levels generated by Dunmore and Kiama Quarries prior to the recommencement of rail transportation in late 1999. The RTA has acknowledged the importance of the section of the Princes Highway between North Kiama and Dunmore and has recently commenced improvement works which would readily accommodate an additional 11 trucks per hour (by 2005) from the proposed development.

5.6.4.2 Rail Traffic

The increase in capacity of the existing two trains is not anticipated to have a significant impact upon motorists travelling on the Princes Highway. The existing rail crossing on the Princes Highway is well managed with flashing lights and warning signs and is attended during crossings by either Pacific National or Boral employees. Current delays of two minutes per crossing are assessed to be acceptable. The most beneficial impact for motorists of the ongoing use of rail transportation would be the reduction in truck traffic using the Princes Highway. Each train carrying 3 100 tonnes of quarry product would replace 107 trucks.

It is noted that the upgrade of the Princes Highway would eventually remove the existing crossing as it will be positioned beneath an underpass and not interrupt the flow of through traffic.

The despatch of approximately 60% of the product by rail would have a very beneficial impact on the overall transport network, a factor recognised by the “Illawarra’s Action for Transport : 2002 – 2006” report.

5.6.4.3 Cumulative Impacts

Table 5.32 projects the cumulative additional traffic flows on Tabbita Road and Princes Highway due to the Boral proposal and the adjacent Dunmore Sand and Soil Proposal for Stages 2 and 3 (EIS in preparation).

TABLE 5.32

Combined Product Truck Movements due to the Boral and Dunmore Sand and Soil Proposals - 2009

	Tabbita Rd			Princes Highway north of Tabbita Rd			Princes Highway south of Tabbita Rd		
	Dunmore S&S *	Boral Quarry	Total Traffic	Dunmore S&S *	Boral Quarry	Total Traffic	Dunmore S&S*	Boral Quarry	Total Traffic
Average Day	66	123	**189**	56	114	**170**	10	9	**19**
85th% Day	76	144	**220**	65	134	**199**	11	10	**21**
Maximum Hour	13	24	**37**	11	22	**33**	2	2	**4**
Maximum Hour 85th% Day	15	27	**42**	13	25	**38**	2	2	**4**
* Dunmore Sand and Soil									
Source: Transport & Urban Planning – Table 5.2									

The Dunmore Sand & Soil Pty Ltd proposal is anticipated to create approximately half the traffic level of the Boral Dunmore Quarry on Tabbita Road and northbound on the Princes Highway and a similar level of traffic southbound on the Princes Highway.

As discussed in Section 5.6.2.2, the existing intersection of Tabbita Road and Princes Highway is in good condition and will be further improved with the Princes Highway improvement works in the vicinity. Therefore, it is not anticipated that the cumulative impact of Boral Dunmore Quarry and Dunmore Sand & Soil Pty Ltd traffic would be significant.

It is noted that the truck traffic generated by the Albion Park quarries operated by Readymix and Cleary Bros. enters onto the Princes Highway approximately 5km north of Dunmore. There are no cumulative impacts on the local roads. Whilst detailed truck traffic levels are not available for trucks entering and leaving these quarries, the cumulative assessment of impact is established through reference to the RTA traffic levels on the Princes Highway at Albion Park. In 2000, the AADT level on the Princes Highway at Albion Park, north of Tongarra Road, was 30 152 vehicles with an estimated 2864 heavy vehicles (9.5%). This is an increase in heavy vehicle movements of approximately 750 above the level immediately north of Shellharbour Road which would account for the additional traffic from a range of sources including the quarries referred to above.

5.7 ABORIGINAL& EUROPEAN HERITAGE

5.7.1 Aboriginal Heritage

5.7.1.1 Introduction

The Project Site comprises a number of areas subject to previous Development Consents and a variety of previous archaeology assessments for Aboriginal heritage. These investigations and their findings and recommendations are outlined in the following sub-sections.

The Illawarra region lies within the Wodi Wodi tribal area, which extends from the Shoalhaven River, north to Wollongong and west to Picton Vale, Marvian and Moss Vale (Robert Paton Archaeological Services Pty Ltd, 2003).

First contact with European settlers is attributed to two explorers, Francis Barralier and George Caley, in 1802. European settlement began in 1810 and the decade that followed saw a series of conflicts as the European colonies expanded. The hostilities decreased and by 1840, the Aboriginals were being employed by Europeans on farms or selling traditional items.

5.7.1.2 Previous Investigations

The following Aboriginal heritage assessments have been previously conducted on the Project Site.

- Rail Infrastructure Corporation Land - Development Consent No. 161/1986 – Brayshaw and Associates (1986).
- Croome Farm Development Consent No. 168/1994 – Navin Officer Archaeological Resource Management (1992).

The 1986 Brayshaw and Associates assessment indicated that there were no Aboriginal relics or sites on the part of the Project Site now referred to as the RIC extraction area.

The 1992 Navin Officer assessment on the Croome Farm section used pedestrian transects along existing features as well as opportunistic assessment of specific features. An artefact scatter over an area of approximately 200m x 150m and a scarred tree located 60m south of the intermittent drainage line across the southern section of the Croome Farm extraction area were identified in that assessment.

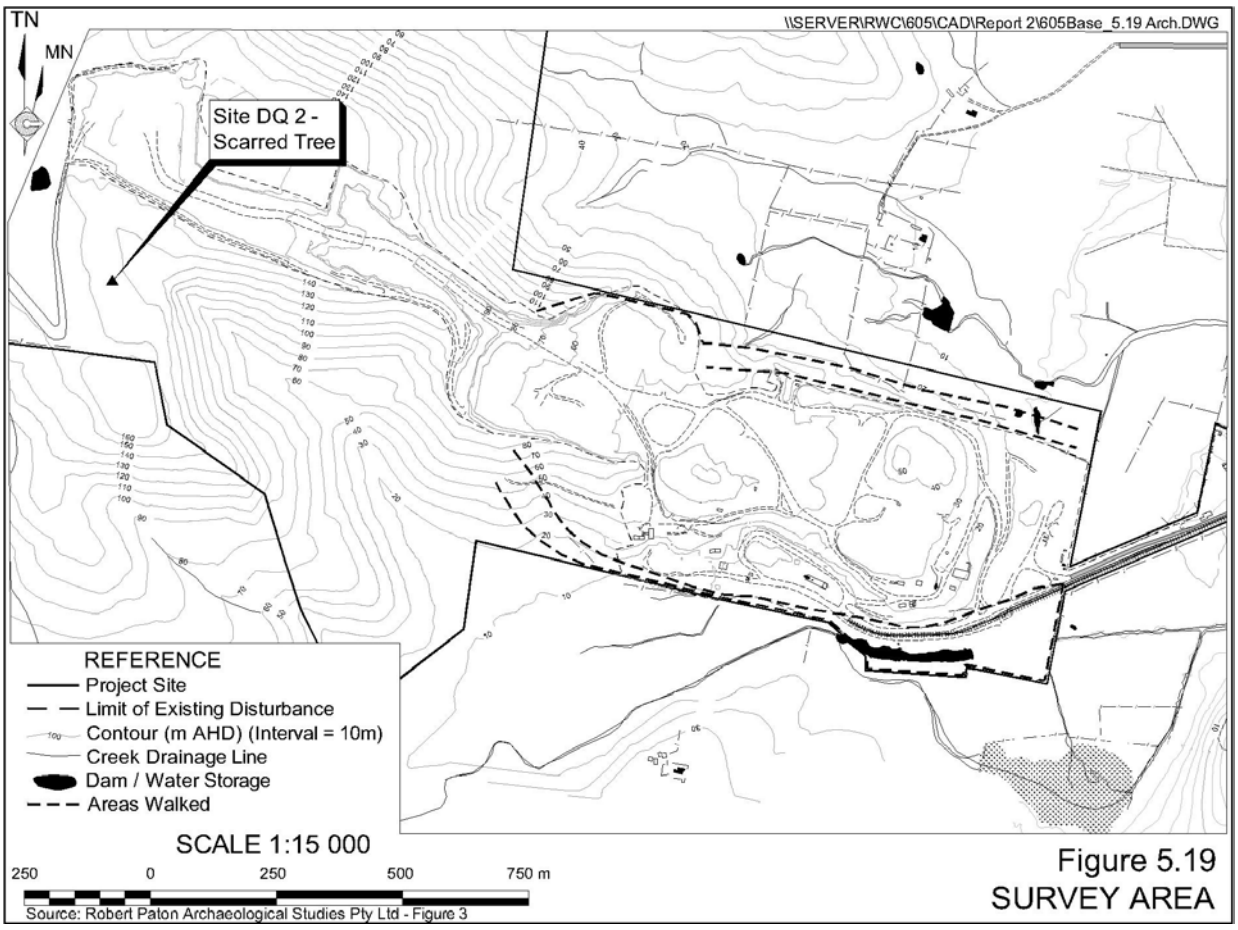
The artefact scatter was assessed as having a low significance due to the low density, disturbed nature of the area and the unremarkable geological context. A Consent to Destroy to remove the scatter was submitted to the then National Parks and Wildlife Service and subsequently approved on 22 March 1996.

The scarred tree has two scars at the base of the tree on either side of the trunk. At the time, the tree was assessed as having moderate to high archaeological significance.

The Development Consent issued for the Croome Farm extraction area included conditions requiring written consent from National Parks and Wildlife Service prior to impact on either the artefact scatter or scar tree (which was also to be fenced). Boral erected a wire fence around the scarred tree but determined that it would not formally apply to remove the tree until extraction had proceeded closer. In any event, an approval to remove the tree was only valid for a period of two years from the date of approval. Boral has recently lodged an Application for a Section 90 Consent to the Department Environment and Conservation (formally National Parks & Wildlife Service) for a Heritage Impact Permit to remove the tree (see Sections 5.7.1.3 and 5.7.1.4).

5.7.1.3 Recent Investigations

The most recent Aboriginal heritage investigation involved a survey of the original Dunmore Quarry by Mr Robert Paton of Robert Paton Archaeological Studies Pty Ltd accompanied by Mr Shane Trindal of the Wodi Wodi Elders Corporation. The original Dunmore Quarry had not been previously surveyed given its "existing use rights" status. Immediately following the survey of the original Dunmore Quarry, Mr Paton and Mr Trindal re-inspected the scarred tree within the Croome Farm extraction area (see **Figure 5.19**).



This recent investigation was carried out using a three stage methodology.

- Stage 1 comprised background research including discussions with the Illawarra Local Aboriginal Land Council (LALC) and the Wodi Wodi Elders Corporation.

- Stage 2 involved field work. A number of transects were walked and areas that had good visibility, or were modelled as prime site locations, were opportunistically viewed. Prime site locations were modelled based on previous findings in the area, i.e. sites are more likely on ridgelines, flatter areas, adjacent to stream banks and in close proximity to fresh water.

- Stage 3 involved an analysis of the assessment data.

The survey was undertaken with an average surface visibility of 15% to 20% and approximately 15ha of the 18ha of undisturbed land was inspected in some form.

This investigation did not identify any Aboriginal heritage sites or items on the part of the Project Site that was assessed. Correspondence from the Wodi Wodi Elders Corporation acknowledged this outcome and endorsed the 1986 and 1994 surveys (see **Appendix 3**).

A full copy of the report by Robert Paton Archaeological Studies Pty Ltd is included as Part 5 of the *Specialist Consultant Studies Compendium*.

The 2003 investigation also re-evaluated the scarred tree identified in the 1992 Navin Officer Archaeological Resource Management assessment. At the time of the 1992 survey, the tree was alive and healthy with a large and extensive crown. Since that time, fires have destroyed the centre of the tree, which is now hollow. Nevertheless, the tree is still alive and it has some active growth. In addition, a search of the AHIMS Register for the Wollongong 1:250 000 Map Sheet indicates that there are now 66 marked trees identified, a four hold increase since the 1992 assessment. These new observations suggest that the site is now of moderate significance at local and regional level.

5.7.1.4 Safeguards

An application under Section 90 of the *National Parks & Wildlife Act 1974* for permission to remove the scarred tree has been compiled by Robert Paton Archaeological Studies Pty Ltd on behalf of Boral and submitted to the Department Environment and Conservation in October 2003.

The reasons for applying for the Heritage Impact Permit were given as the current poor condition of the tree and the limited chance of survival once the area surrounding the tree is quarried. The Wodi Wodi Elders Corporation has provided correspondence in support of the submitted applications for the Heritage Impact Permit (see **Appendix 3**). The local Aboriginal community would like to see the tree remain in the local area and used as an educational tool. The tree would remain protected in the currently fenced area until permission to remove the tree is received from the Department of Environment and Conservation.

Apart from the scarred tree, no other sites or items of Aboriginal heritage have been identified on the Project Site. Should any objects be uncovered during extraction activities, work in that area would be stopped immediately and the Department of Environment and Conservation informed.

All employees at the quarry would also be made aware of the legislative requirements regarding the notification of any uncovered sites and the penalties for impacting on sites without consent.

5.7.1.5 Impact Assessment

An application for a Section 90 Consent has been submitted for the removal of the scarred tree. The salvage of this tree would ensure that it is preserved as a significant and educational artefact. Should the tree remain on site, although a fenced buffer has been established, the surrounding extraction activities may have a detrimental impact on the survival of the tree. As no other Aboriginal heritage sites have been identified on the Project Site, there would be no further impact.

5.7.2 European Heritage

5.7.2.1 Occurrence of Heritage Items

There are no known or recorded items of European heritage within the Project Site. The closest recorded European heritage item lies approximately 0.5km southeast of the Project Site on a property owned by Mrs M. Stocker. The former Peterborough School and principal's residence were built between 1868 and 1872 and are listed on the National Trust, Shellharbour LEP 2000 and Illawarra Regional Environmental Plan N^{o} 1.

5.7.2.2 Assessment of Impacts

The ongoing operation of the Dunmore Quarry would not have any adverse impacts upon the European heritage on the local area. Levels of ground vibration and airblast would be sufficiently low so as not to adversely affect the former Peterborough School and principal's residence.

5.8 VISIBILITY

5.8.1 Introduction

The proposal involves the increase of production from those areas of the quarry that have already received Development Consent for production. As the original footprint and production method from these areas have not been altered, the original visual impact assessment from the Dunmore Quarry Proposed Croome Farm Extension EIS (Sinclair Knight Merz 1994) still applies and has been heavily relied upon for this section.

5.8.2 Existing Visual Amenity

The Project Site is visible from a number of surrounding locations.

From the Princes Highway, travelling north, faces of the existing Boral Dunmore Quarry are visible, as are part of the existing product stockpiles and concrete batching plant. A minor lowering of the skyline has occurred on the RIC land and is slightly noticeable. Sections of the existing processing plant are visible from parts of the Princes Highway, although the green hue of the main structures limits the intrusiveness of the view.

The existing quarry is not visible from the Jamberoo Valley, even from the elevated vantage points such as the Jamberoo Recreation Park chair lift.

The nearest residential areas are Dunmore Village, Dunmore Lakes Estate and Kiama Downs on the northern outskirts of Kiama. The Dunmore Quarry is partially visible from these areas with the primary visible elements being the old Dunmore Quarry high wall and the plant and stockpile facilities. The uppermost faces of extraction on the RIC land is also visible from parts of these residential areas.

5.8.3 Visual Controls

A number of visual impact amelioration measures were noted in the 1994 EIS (Sinclair Knight Merz 1994) and as the development design has not been altered, the controls are applicable to this impact assessment.

Skyline retention was an important consideration in the design of the extraction areas where skyline intrusion would be visible from external viewing locations was minimised. The final design represented a compromise between maximising the recovery of the resource and maintenance of landscape character.

The bund wall and tree screens on the western side of the Croome Farm extraction area are designed to soften the form of the skyline when viewed from the west.

The bund wall proposed between the Croome Farm extraction area and the Jamberoo Valley would act as both a noise wall and visual barrier. The bund wall itself would have a visual impact, however this would be short term and minimised with subsequent tree planting.

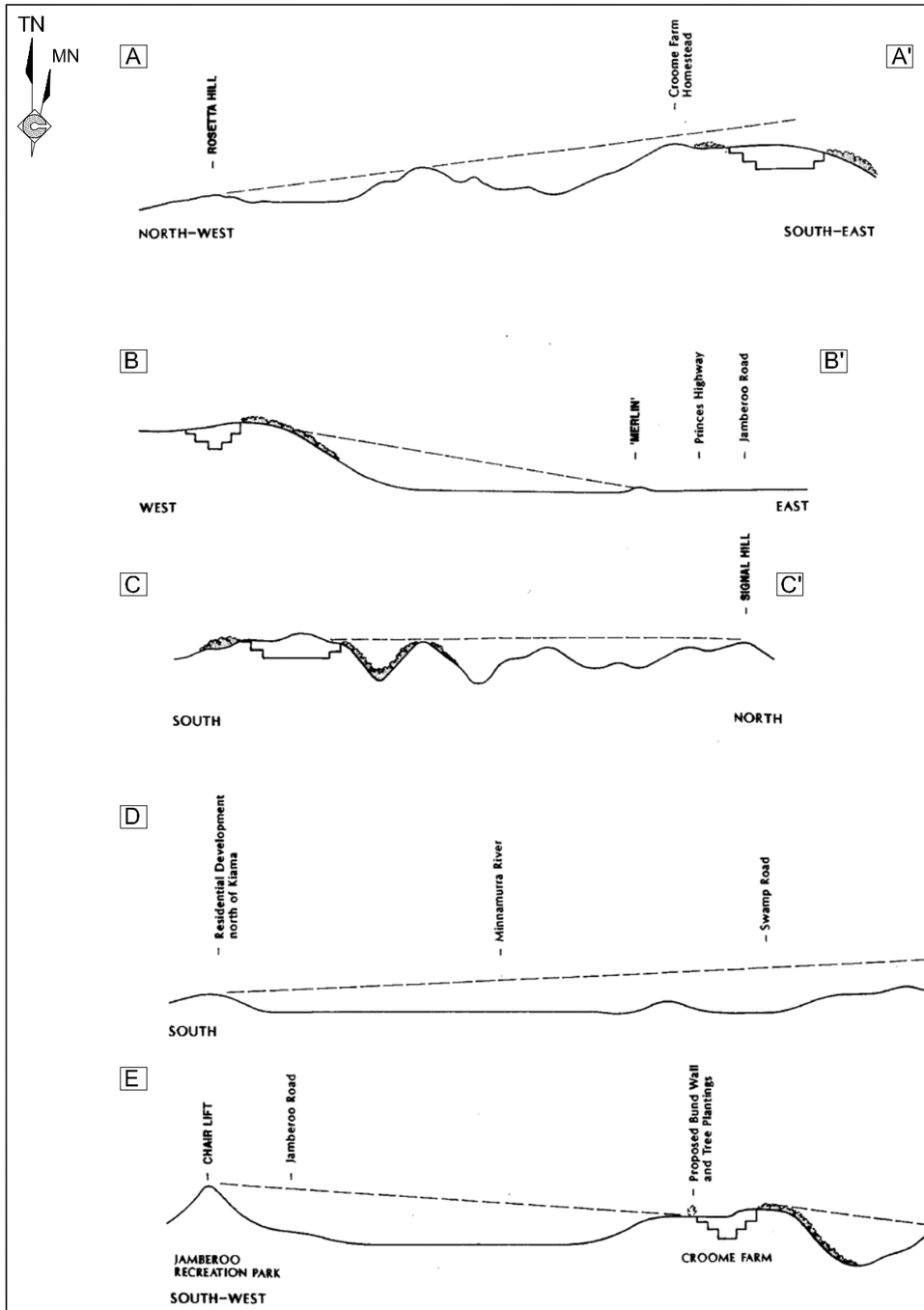
The minor extension to the tertiary crusher building would be clad in colour bond of the same green hue of the existing buildings.

5.8.4 Assessment of Impacts

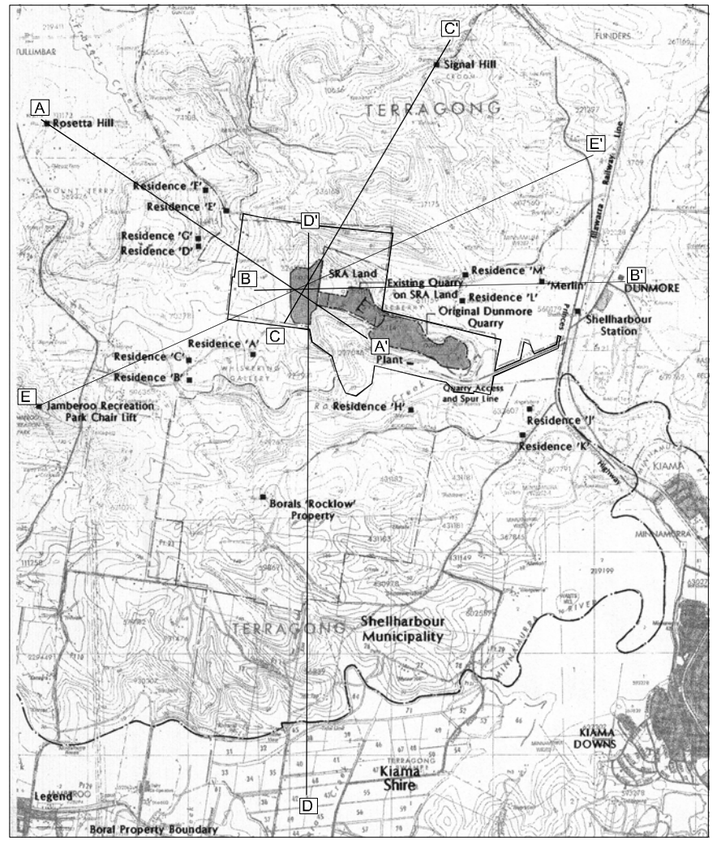
The visual impact already approved for the existing Dunmore Quarry would not alter under the proposed development.

The 1994 visual impact assessment of the Croome Farm extraction proposal considered a range of visual factors, including the amount of the proposed development that is visible and the distance over which it is being viewed, the number of viewers, their activity and the length of viewing (Sinclair Knight Merz, 1994).

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Source: Sinclair Knight Merz (1994)



REFERENCE
- Project Site
- Boundary of Project-related Land
- Limit of Existing Disturbance
- Proposed Extraction Area
- Vegetation
- 'MERLIN' Principle External View Points

MAP SCALE
1 0 1 2 3km

Figure 5.20
VISUAL IMPACT SECTIONS

A number of external viewing locations have been selected and the cross sectional views from these locations are presented in **Figure 5.20** (after Sinclair Knight Merz, 1994).

Rosetta Hill (A-A')
The extraction area would not be visible from Rosetta Hill. There would be no visual impact.

Merlin (B-B')
There would be no visual impact from the Merlin vantage point or the adjacent section of the Princes Highway.

Signal Hill (C-C')
The visual impact from this viewing location is primarily related to the removal of the top of Locking Hill, subsequently altering the skyline. Quarry faces would not be visible from this vantage point, however, due to intervening topography. The visual impact of the proposed development from this location would be minor.

Residential Areas North of Kiama (D-D')
There may be very limited views of quarry face 145mAHD from this location, otherwise interruption to the skyline would be minimal. The potential viewing times from residential areas can be prolonged and changes to the landscape can be viewed highly critically. Due to the minimal visual intrusion, however, impact is assessed as minor.

Princes Highway North (E-E' - right to left)
There would be very limited visual interruption from this viewpoint with negligible interference with the skyline beyond 2010. The viewers from this location would be motorists/passengers travelling along the new highway at 110km/h. Hence their viewing time would be extremely short, approximately 5 seconds, and the viewer activity would be concentrated on the road, reducing their viewing time even more. A viewer in this situation would be conditioned to seeing developments from highways. Therefore the visual impact from this location is assessed as negligible.

Jamberoo Valley (E-E' - left to right)

There would be limited visibility of the proposed development from elevated areas in the Jamberoo Valley. This is a recreational area and viewers are likely to be engaging in recreational activities and can be present for comparatively short periods of time.

The bund wall and tree planting would provide a visual screen from these vantage points and minimise any visual impact.

5.9 LAND USES

5.9.1 Existing Project Site Land Uses

The land uses within the Project Site comprise the following.

(i) Extraction, processing, product stockpiling, product despatch and various related activities (e.g. Laboratory).

(ii) Concrete manufacture – a plant operated by Boral Concrete and Quarried (Country) Pty Ltd.

(iii) Nature Conservation – approximately 30ha of native revegetation comprising a subtropical rainforest and Blue Gum – White Box Woodland/Forest.

(iv) A wildlife corridor is being established beyond the western margin of the Croome Farm extraction area.

(v) Grazing continues on the western part of the Croome Farm Property.

5.9.2 Existing Surrounding Land Uses

Figure 5.21 displays an aerial photograph of the Dunmore Quarry and its surrounds with a range of surrounding land uses identified.

The bulk of the land immediately surrounding the project Site is rural land used for grazing. Much of the land to the south of the Project Site is owned by Boral and forms part of the extensive buffer in that direction. Much of the land to the east and north of the Project Site is owned by Readymix and Dunmore Sand and Soil Pty Limited, both of which operate quarries nearby. This land is in effect a buffer to their own quarry operations.

It remains Boral's objective to acquire surrounding rural land as it becomes available for sale to progressively increase its buffer to surrounding land uses.

Apart from the rural/farming land discussed above the principal existing land use within 2km to 3km of the project Site are as follows.

1. Quarries operated by Readymix (Albion Park), Cleary Bros. (Albion Park) and Dunmore Sand & Soil Pty Limited.

2. Rural and Rural-residential housing including estates such as Dunmore Lakes Estate. – a rural residential estate comprising approximately 25 lots surrounding a lake created by a former sand extraction area. A number of the rural properties also carry horses and operate horse-riding or agistment enterprises.

3. Urban-residential areas within the Dunmore Village and Albion Park. The closest area at Albion Park has been developed within the past 5 years.

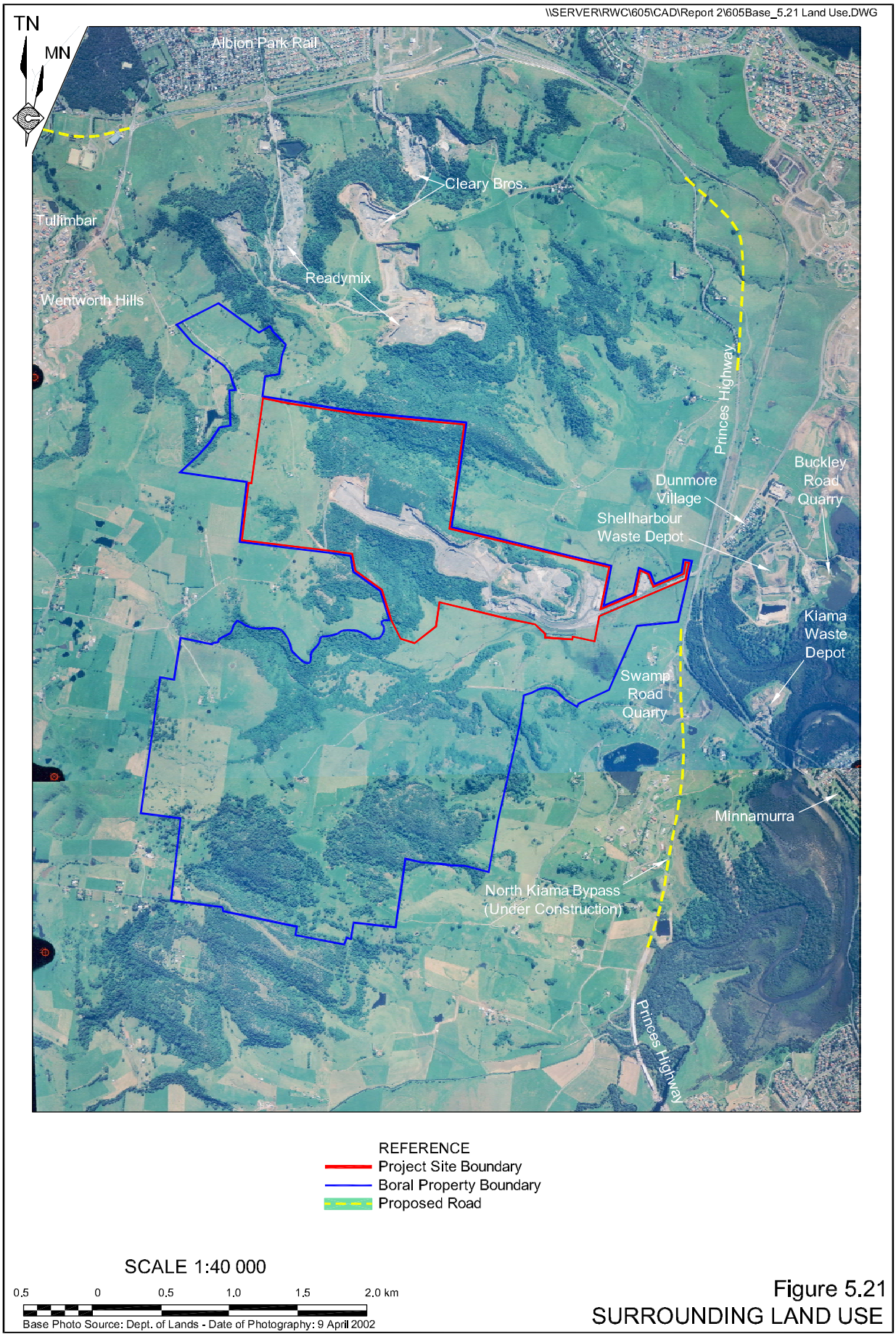


Figure 5.21
SURROUNDING LAND USE

4. Nature conservation areas including gazetted wetland areas adjacent to Rocklow Creek east of Prices Highway.

5. Kiama/Shellharbour Waste Disposal depots.

6. Various commercial establishments such as Jamberoo Recreational Park and a wedding venue at the former Peterbourgh School House, off Swamp Road, southeast of the Project Site.

5.9.3 Future Surrounding Land Uses

An understanding of the future land uses surrounding the Project Site is provided given the projected life of the proposed development is likely to be in excess of 20 years. The future land uses around the proposed site will be influenced by the controls and restriction arising from the planning being managed by Shellharbour City Council. Council is currently finalising the Shellharbour Rural Local Environmental Plan 2003 which effectively support ongoing agricultural activities and the preservation/enhancement of the visual rural landscape. It is noted that the plan recognises the rural nature of the buffer land owned by Boral, Readymix and Dunmore Sand & Soil Pty Limited – all of which is planned to remain rural and/or progressively developed (with approval) for extensions to existing quarrying operations. In the case of Dunmore Sand & Soil Pty Limited, it is understood that this Company is planning to lodge a Development Application for Stages 2 & 3 of the Dunmore Lakes Sand Extraction Project in late 2003. It is also understood Cleary Bros. also intends to extend its Albion Park quarry in the near future. It is acknowledged that the planning for future land use in the Dunmore/Albion Park/Jamberoo area should ensure that the important hard rock and sand resources at Dunmore are protected from encroaching competitive land uses.

5.9.4 Assessment of Impacts

The potential impacts of the ongoing operations at the Dunmore Quarry relate to a range of impacts already described in terms of noise (Section 5.3) air quality (Section 5.4) and visibility (Section 5.8).

It remains Boral's intention to maintain a dialogue with surrounding landowners and occupiers to ensure that it's ongoing activities within the Project Site do not adversely affect the surrounding land uses.

5.10 SOCIO-ECONOMIC CLIMATE

5.10.1 Existing Socio-economic Setting

5.10.1.1 Introduction

The socio-economic setting around Dunmore Quarry is described in this section to provide an overview of the interaction between the local and wider community and Dunmore Quarry.

Boral and its predecessor Company, BMG Resources, has been a corporate member of the local community for many years. During that time, the Company has endeavoured to contribute to the local community and promote both local employment and spending.

The following sub-sections provide a brief profile of the local and wider community upon which to assess the impacts of the ongoing operation of the Dunmore Quarry.

5.10.1.2 Local Setting

Dunmore Quarry is located near the southern suburbs of the greater Wollongong area within the Shellharbour local government area, which covers approximately 147km^2. The area has a rural setting given the substantial protection offered to date by Council's planning to avoid sterilising the important hard rock resources of the Albion Park/Dunmore area.

The geographic setting and fragmentation of the local community by the Illawarra railway line and Princes Highway has limited the opportunities for the Dunmore Quarry to develop close ties with the surrounding community(ies). The Company has, however, maintained close contact with its nearest neighbours.

From a regional perspective, the Company has close affinities with the wider community given the employment of local people and the use of local businesses and services throughout the Illawarra.

5.10.1.3 Population and Employment

The information provided in this sub-section has been sourced from the Australian Bureau of Statistics 2001 Census. The data presented consists of the Dunmore Collection District (CD 1193203) which covers 43.3km^2 as well as the broader Shellharbour Statistical Local Area (SLA 115056900) for comparison. The Shellharbour SLA covers an area of 147.4km^2.

Table 5.33 lists the recorded population in both areas.

The Dunmore CD contains less than one percent of the Shellharbour population in all age brackets and contains a total population of only 292 persons reflecting the sparse settlement pattern of the area.

Table 5.34 provides a broad socio-economic overview of the two areas.

The Dunmore CD population are generally slightly older and receive a higher income than those in Shellharbour. This is balanced, however, by the higher housing loan repayments in the Dunmore CD, most likely due to the majority of housing loans being large properties.

TABLE 5.33

Population Profile

	Dunmore CD			Shellharbour SLA		
Age Group	***Males***	***Females***	***Persons***	***Males***	***Females***	***Persons***
0-4	9	11	20	2,264	2,208	4,472
5-9	13	16	29	2,462	2,345	4,807
10-14	7	7	14	2,328	2,179	4,507
15-19	15	13	28	2,238	2,135	4,373
20-24	5	4	9	1,732	1,639	3,371
25-29	6	4	10	1,774	1,992	3,766
30-34	9	12	21	2,033	2,128	4,161
35-39	15	14	29	2,237	2,341	4,578
40-44	15	16	31	2,190	2,292	4,482
45-49	12	13	25	1,884	1,910	3,794
50-54	16	11	27	1,806	1,673	3,479
55-59	15	3	18	1,353	1,435	2,788
60-64	0	6	6	1,131	1,237	2,368
65-69	6	0	6	951	1,017	1,968
70-74	3	6	9	836	928	1,764
75-79	3	4	7	522	668	1,190
80-84	0	3	3	252	375	627
85-89	0	0	0	124	217	341
90-94	0	0	0	24	81	105
95-99	0	0	0	8	12	20
100 years and over	0	0	0	3	0	3
TOTAL	**149**	**143**	**292**	**28,152**	**28,812**	**56,964**
Source: ABS- June, 2001 Census						

TABLE 5.34

Socio-economic Overview

	Dunmore CD	Shellharbour SLA
Median age(b)	37	33
Median monthly housing loan repayments	$1,600-$1,799	$800-$999
Median weekly rent	$150-$199	$150-$199
Median weekly individual income	$400-$499	$300-$399
Median weekly family income	$1,000-$1,199	$800-$999
Median weekly household income	$800-$999	$700-$799
Mean household size	3	2.8
Source: ABS- June, 2001 Census		

Table 5.35 presents data on the employment levels and industry participation of the two areas.

TABLE 5.35

Employment Levels and Industry Participation

	Dunmore	Shellharbour
Employment (aged 15 and over)		
Employed(a):		
Full-time(b)	92	14,380
Part-time	54	7,738
Not stated(c)	10	684
Total	*156*	*22,802*
Unemployed(a)	3	2,377
Total labour force(a)	*159*	*25,179*
Not in the labour force(a)	73	16,577
Unemployment rate(a)	1.9%	9.4%
Industry Employment Percentages (aged 15 and over)		
Agriculture, Forestry and Fishing	9.32	0.52
Mining	3.73	1.11
Manufacturing	5.59	17.26
Electricity, Gas and Water Supply	1.86	0.75
Construction	8.07	9.16
Wholesale Trade	7.45	4.33
Retail Trade	16.15	18.64
Accommodation, Cafes and Restaurants	1.86	4.43
Transport and Storage	3.73	4.69
Communication Services	1.86	1.53
Finance and Insurance	1.86	2.72
Property and Business Services	11.80	8.82
Government Administration and Defence	5.59	3.60
Education	4.35	5.50
Health and Community Services	7.45	9.75
Cultural and Recreational Services	0.00	1.49
Personal and Other Services	7.45	3.70
Non-classifiable economic units	0.00	0.39
Not stated	1.86	1.60
Source: ABS- June, 2001 Census		

The unemployment rate in Dunmore CD is significantly lower than that of Shellharbour SLA.

With respect to industry employment, Shellharbour SLA residents are primarily employed in the retail trade, manufacturing and health and community services while Dunmore CD residents are largely employed in the retail trade, property and business services and agriculture, forestry and fishing.

5.10.2 Assessment of Impacts

The following impacts are predicted to occur within the local and wider community should proposed development proceed.

(i) Increased local employment would occur during the upgrade of the processing plant.

(ii) The 15 positions created during the trial period would remain providing a substantial level of local spending on housing, goods and services.

(iii) The Company's spending in the local community would also be sustained to support local businesses and services.

(iv) The building industry would continue to benefit from a cost-effective supply of high quality raw materials.

Boral intends through its ongoing dialogue with its surrounding neighbours to maintain regular contact with the local community.

5.11 PLANNING INSTRUMENT COMPLIANCE

5.11.1 Introduction

This section provides a response to each of the planning instruments discussed in Section 1.5 and demonstrates how the proposed production increase at Dunmore Quarry would address the requirements or the relevant objectives of each instrument.

5.11.2 State Planning Compliance

State Environmental Planning Policy No. 11 (SEPP 11) – Traffic Generating Development
Boral's development will be referred to the Roads and Traffic Authority (RTA) by the Department of Infrastructure, Planning and Natural Resources. In any event, Boral maintains periodic contact with the RTA.

State Environmental Planning Policy No. 14 (SEPP 14) - Coastal Wetlands
The surface water management planned for the Project Site would ensure that the quality of discharge from the Project Site would not adversely affect the SEPP 14 Wetlands adjoining Rocklow Creek east of Princes Highway.

State Environmental Planning Policy No. 44 (SEPP 44) - Koala Habitat Protection
The flora and fauna survey has confirmed that the Project Site is not potential Koala habitat.

State Environmental Planning Policy No. 71 (SEPP 71) – Coastal Protection
The responses to the relevant issues for consideration follow in italics.

(d) **the suitability of development given its type, location and design and its relationship with the surrounding area:** *The proposed development is located in its current location because of the occurrence of high quality latite. The proposed development has been designed to limit visual impacts (see Section 5.8).*

(f) **the scenic qualities of the New South Wales coast, and means to protect and improve these qualities:** *The emphasis on the overall design of the extraction areas has been to limit visual impacts from all directions. It has always been recognised that some visual impacts would be unavoidable (see Section 5.8).*

(g) **measures to conserve animals (within the meaning of the *Threatened Species Conservation Act 1995*) and plants (within the meaning of that Act), and their habitats:** *An eight-part test has established that the proposed development would not have any significant impact on any threatened animal or plants (see Section 5.5).*

(m) **likely impacts of development on the water quality of coastal water bodies:** *The surface water management planned for the Project Site would ensure that the quality of discharge from the Project Site would not adversely affect SEPP water quality in the Rocklow Creek east of Princes Highway.*

(n) **the conservation and preservation of items of heritage, archaeological or historic significance:** *It is intended to relocate a scarred tree within the Croome Farm extraction area for use as an educational tool for the local Aboriginal community. No European heritage items would be impacted upon (see Section 5.7).*

5.11.3 Regional Planning Compliance

The Project Site is covered by three attributes listed within the Illawarra Regional Environmental Plan N^{o} 1. The compatability of the proposed development with each of these attributes follows *in italics.*

Land of Prime Crop and Pasture Potential: *although technically located within the land defined as "Prime Crop and Pasture Potential" the access corridor to Dunmore Quarry has been in existence for many years and pre-dated the REP.*

Land Supporting Rainforest Vegetation Species: *the land supporting the rainforest vegetation within the Project Site has been excluded from the area of disturbance.*

Land containing Extractive Materials: *Boral's plans to recover the valuable hard rock resources within the context of the environmental constraints are in full accordance with this attribute.*

5.11.4 Local Planning Instruments

The existing approved extraction areas and the original Dunmore Quarry are located in zones within the Shellharbour Local Environmental Plan 2000 and the Draft Shellharbour Rural Local Environmental Plan 2003 that identifies extractive industry as a permissible use.

The access corridor, site offices, weighbridge and amenities are located in zones within the Shellharbour Local Environmental Plan 2000 and the Draft Shellharbour Rural Local Environmental Plan 2003 that prohibit such activities given that they are associated with an extractive industry. It is noteworthy that the commencement of all activities pre-dated local planning instruments and remain lawful given their existing use rights.

Boral is seeking Development Consent over these lands as reliance is placed on the current existing use rights status and the opportunity to seek approval to intensify an activity in such an area.

Section 6
Evaluation and Justification of the Proposed Development

PREAMBLE

This section concludes the EIS with an evaluation of the proposed development in terms of biophysical, economic and social aspects and consistency with sustainable development principles.

The proposed development and its likely impacts are then justified in terms of the need for increased quantities of quality coarse aggregates and the increased use of rail transportation.

The section concludes an outline of the consequences of not proceeding with the proposed development.

6.1 EVALUATION OF THE PROPOSED DEVELOPMENT

6.1.1 Introduction

This section evaluates the proposed development by drawing together and reviewing the full range of predicted impacts discussed in Section 5 of this document. The approach to the design of the proposal to increase production at Dunmore Quarry has been based upon the progressive introduction of best practice procedures and Boral's intention to operate the Dunmore Quarry in an environmentally responsible manner. At the outset, it was important to ensure that the design of the proposed development addressed issues raised by adjoining landholders, the local community and government agencies. Boral commissioned a team of five specialist consultants to investigate and then advise the Company, of the most effective manner in which to mitigate or manage the issues raised. Considerable emphasis has been placed upon the evaluation of the site activities during the current trial period as a means to demonstrate that the impacts arising from the proposed production increase are within government-specified criteria, goals or realistic community expectations.

The predicted impacts of the proposed development are evaluated in terms of biophysical, economic and social/cultural considerations. The evaluation of the proposed development concludes with a review of how the sustainable development principles discussed in Section 1.7.2 have been addressed by Boral in the project design and the environmental impact assessment process for the proposed development.

6.1.2 Biophysical Considerations

It is noted at the outset that all activities on site and the proposed area of disturbance are already approved. Boral is simply seeking to increase the level of production through increasing the hours of operation, mobile equipment upgrades and minor improvements to the existing processing plant. The assessed biophysical impacts of the proposed development upon the local environment are summarised below.

(i) The proposed development would involve the on-site management of surface water to ensure that:

- the maximum quantity of water is harvested for use in dust suppression - achieved through greater runoff retention in sub-catchments; and
- sufficient residence is achieved in the stormwater dam and nearby swampy area to ensure that discharges from the Project Site do not impact on downstream water quality.

(ii) The remaining on-site soils, principally within the Croome Farm extraction area, would be retained for site rehabilitation activities, and hence no adverse impact is likely on the soil resources.

(iii) Predicted noise levels at surrounding non-project-related residences would comply with the relevant noise goals for the proposed increased level of production under calm weather conditions during all times of the day. Compliance is also predicted under most adverse weather conditions except for a 1dB(A) exceedance during autumn and winter evenings at the Stocker Residence southeast of the Project Site. It is noteworthy that such an exceedance is deemed to be compliant under the Industrial Noise Policy as it would be less than 2dB(A) above the relevant noise goal.

It is noted that Boral has entered into negotiated agreements with most of the surrounding neighbours the consequence of which is their consideration in this assessment as project-related residences.

(iv) Predicted night-time noise levels confirm that sleep disturbance criteria would be satisfied at all non-project-related residences at night.

(v) The predicted cumulative noise levels arising from on-site quarry-related activities, the concrete batching plant and the proposed nearby sand extraction and processing operation would comply with all relevant noise goals.

(vi) Blast monitoring and predictions confirm that future airblast and ground vibration levels would comply with all relevant goals at surrounding residences. Compliance would continue to be achieved principally through appropriate blast designs.

(vii) Predicted levels of PM_{10}, TSP and deposited dust from future operations would comply with air quality goals at all surrounding residences. The monitoring results compiled to date indicate that, despite some dust being visible immediately surrounding the processing plant, Dunmore Quarry is only a small contributor to the overall dust levels in the Dunmore area. The high specific gravity of the dust particles enables them to settle close to its source.

(viii) There would be no significant impact arising from the ongoing extraction operations on the flora and fauna within and surrounding the Project Site, particularly upon threatened species. No clearing is proposed beyond the area already approved for extraction.

(ix) Future road traffic levels would increase, however, the level of increase would be small in real terms, particularly when compared with existing traffic levels. Trucks delivering products from Dunmore Quarry (at the maximum rate of 1 million tonnes per year) would account for marginally less than 2% of peak hour traffic and 1% of total daily traffic on the Princes Highway. The trucks travelling on the Princes Highway at Mt Ousley would represent approximately 3% of daily truck movements on that route.

It is noteworthy that the predicted level of truck traffic (at 1Mtpa) would be slightly less than the highest level of past truck traffic from Boral's Dunmore and Kiama quarries – i.e. before the recommencement of rail traffic.

(x) The transportation of approximately 1.5 million tonnes of products by rail from Dunmore Quarry is recognised to have numerous environmental, social and economic benefits vkt and greenhouse emissions. One train load of products equates to 107 truck loads. A comparative assessment of vehicle kilometres travelled by road and rail identifies that for every 1000 vehicle kilometres travelled by rail to deliver quarry products from Dunmore Quarry is equivalent to 100 000 vehicle kilometres travelled by trucks delivering products. It is also noted that rail transportation of products consumes approximately 20% of the diesel used to transport an equivalent quantity of quarry products by road.

Overall, the impacts on the biophysical environment around Dunmore Quarry have been assessed as acceptable and reflect an appropriate level of control to ensure that relevant goals are not only satisfied but that the approach to controls is consistent with industry best practice. The increase in production would be matched by an increased level of control and management to ensure that the high quality products from Dunmore Quarry are extracted, processed and delivered in an environmentally responsible manner.

6.1.3 Economic Considerations

The economic considerations relating to the proposed production increase include the following.

The Building Industry and its Consumers

(i) There would be ongoing benefits to the building industry and its consumers (i.e. the residents of Illawarra and the Sydney metropolitan area) through the cost-effective delivery of high quality raw materials and continuity of supply for many years.

(ii) The delivery of coarse aggregates to Sydney by rail will continue to be recognised as environmentally responsible compared with road transportation. However, it remains important for customers without rail access to receive deliveries by road.

(iii) The increased hours of operation for product deliveries would provide consumers with a greater level of flexibility when purchasing and/or collecting coarse aggregates. This flexibility invariably reduces the need for consumers to hold substantial aggregate stocks to avoid shortfalls arising from road delays regularly experienced during the day-time period.

Boral Employees and the Local Community

(iv) There would be increased and sustained economic benefits to both Boral employees and local businesses and services through permanent employment of an additional 15 local people and indirectly many more.

(v) Economic benefits would continue for the local and wider community through company spending and corporate sponsorship of community activities.

(vi) Local contractors and suppliers would benefit from Boral's $3 million capital expenditure to upgrade the processing plant, including mitigation measures.

A further economic consideration relates to the transportation of up to 1.5Mtpa of products by rail from the Project Site to Sydney markets. This would reduce the number of loads of aggregates transported by truck by almost 52 000 per year. Such a reduction would have noticeable economic benefits with less road congestion, improved air quality and potentially fewer road accidents.

Boral acknowledges that the cessation of the 9 month trial without the proposed development receiving Development Consent would cause 15 people to be retrenched and in turn cause economic hardship for a number of existing local families and businesses.

Boral has, and would continue to purchase adjoining and nearby properties to increase the area of its operational buffer around the Dunmore Quarry. Such an approach has enabled landholders desiring to sell with an opportunity to sell their properties quickly and at a realistic market value.

6.1.4 Social and Cultural Considerations

The principal social and cultural considerations relevant to the proposed development relate to the following.

- The production increase at the Dunmore Quarry would ensure those employment positions recently created for the trial period would be sustained longterm thereby underpinning the social benefits of full-time and indirect employment.

- Boral's involvement with the relocation the Aboriginal scarred tree from the Project Site with representatives of the Wodi Wodi Elders Corporation and Local Aboriginal Land Council would provide the Aboriginal community with a managed cultural asset. This strategy would offset perceived cultural impacts of the proposed development. The local Aboriginal community is supportive on the proposed production increase.

6.2 EVALUATION OF SUSTAINABILITY

6.2.1 Introduction

Sustainable practices by industry, all levels of government and the community are recognised to be important for the future prosperity and well-being of the global environment. The principles of ecologically sustainable development (ESD) that have been recognised for over a decade (see Section 1.7.2) were based upon meeting the needs of the current generation while conserving our ecosystems for the benefit of future generations. In order to achieve sustainable development, recognition needs to be placed upon the integration of both long term and short term environmental, economic, social and equity considerations.

Throughout the design of the proposal to increase production at Dunmore Quarry, Boral has endeavoured to address each of the sustainable development principles. The following sub-sections draw together the features of the proposed development that reflect the four sustainable development principles.

6.2.2 The Precautionary Principle

The two main issues relevant to the application of the precautionary principle relate to the need to avoid serious or irreversible damage and the need to reduce risks of environmental harm.

Boral's approach to the above issues is based upon its experience at Dunmore Quarry for many years and most recently prior to and during the current trial period. The Company has developed a detailed understanding of the surrounding environment and the impacts of its activities on the local environment.

Examples of matters relating to the precautionary principle that were considered during the design of the proposed development are listed below.

- Significant environmental harm would continue to be avoided through the ongoing comprehensive environmental assessment and environmentally responsible approach to the design and operation of the proposed development. This is particularly relevant to the management of noise-related issues. Over the past 12 months, Boral and its consultants have undertaken substantial monitoring and evaluation of the site activities to ensure that the variables relating to noise propagation from the Project Site are well understood.

- A comprehensive consultation program with adjoining landholders, the local community and government agencies has been undertaken to ensure that all issues relevant to these stakeholders are identified and addressed in the design of the project components.

- Boral has implemented a range of mitigation measures over the past 12 months to progressively improve the certainty of compliance with relevant noise and air quality goals. The Company's program of continual improvement would also assist to maintain a high standard of control.

6.2.3 Social Equity

Social equity embraces value concepts of justice and fairness so that the basic needs of all sectors of society are met and there is a fairer distribution of costs and benefits to improve the well-being and welfare of the community. Social equity includes concerns for both inter- and intra-generational equity. Examples of matters relating to social equity relevant to the proposed development are listed below.

- The proposed development would maximise the use of rail for the delivery of products to Sydney markets near rail sidings, which would extend the availability of diesel for future generations.

- The atmospheric climate for future generations would be improved through Boral's preference for rail transportation for 60% of its products. The use of rail would reduce the emission of greenhouse gases by 80% compared to the same quantity of products being transported by road.

- The proposed development would ultimately create a landform that could be developed for other land uses which would continue to contribute to the economic base for future generations in Shellharbour City.

- The extent of planning and project design undertaken to expand production at the Dunmore Quarry would enable the future generation, i.e. for the next 25 years to be supplied with aggregates extracted, processed and delivered with an acceptable level of environmental impacts.

- Boral plans to continue its dialogue with its adjoining landholders and the local community to ensure that issues important for ongoing operations are identified and implemented.

- The final landform would be constructed in a manner that would maximise its use for a range of purposes, thereby providing the basis for jobs for future generations.

- The maintenance of substantial buffers around the Dunmore Quarry would provide future generations with access to rural land in close proximity to urban areas

Overall, the increase in production at Dunmore Quarry would ensure that both the existing and future generations in the Illawarra and the Sydney metropolitan area would have access to cost-effective high quality aggregates for the construction of houses, public facilities and infrastructure.

6.2.4 Conservation of Biological Diversity and Ecological Integrity

The protection of biodiversity and maintenance of ecological processes and systems are central goals of sustainability. It is important that all developments do not threaten the integrity of the system as a whole or the conservation of threatened species in the short or long term. Details of how the proposed development has been designed to achieve compliance with this principle are set out below.

- The boundaries of the current approved area of extraction have been positioned to limit adverse impacts upon a local rainforest community and a number of individual plants of the threatened *Zieria granulata*.

- All revegetation planned within the Project Site would be undertaken with species endemic to the Project Site. The wildlife corridor immediately west of the Croome Farm extraction area is being progressively improved through supplementary planting.

- Boral has recognised the agricultural/ecological benefits associated with the collection, promotion and sale of the fine dust collected on site. This material, marketed as Nusoil™, is used as a soil additive and conditioner. Boral has undertaken considerable research into the product to ensure that its properties are well understood and meet sustainability goals.

6.2.5 Improved Valuation, Pricing and Incentive Mechanisms

The main issues that form the basis of this principle relate to acceptance that the polluter pays, all resources are appropriately valued, cost-effective environmental stewardship is adopted and the adoption of user pays prices based upon the full life cycle of the costs. The reflections of these issues upon components of the proposed development are set out below.

6.2.6 Conclusion

The design of the proposed development has addressed each of the sustainable development principles, and on balance, it is concluded that the proposed development achieves a positive sustainable outcome for the local and wider environment.

6.3 JUSTIFICATION OF THE PROPOSED DEVELOPMENT

6.3.1 Introduction

Schedule 2(6) of the *Environmental Planning and Assessment Regulation 2000* requires this document to justify the proposed development in the manner proposed having regard to biophysical, economic and social considerations and sustainability issues. Whilst each of these issues have been addressed in Sections 6.1 and 6.2, an overview of the critical factors justifying the production increase are as follows.

6.3.2 The Need for Increased Quantities of Quality Coarse Aggregates

An important component in the justification of the proposed development is the demonstration of the need for the increased quantity of quality coarse aggregates from the Dunmore Quarry. The need for resources used throughout the Sydney metropolitan area is determined by examining the demands for quality coarse aggregates and the existing and potential sources capable of satisfying those demands in both the short term and long term.

Boral's markets for the quality coarse aggregates in the Sydney metropolitan area are currently supplied from Penrith Lakes, Prospect Quarry and to lesser extent Peats Ridge. As discussed in Section 1.4.2, Prospect Quarry has recently ceased production of high quality coarse aggregates and is due to cease production over the next four years. On the other hand, Penrith Lakes is projected to produce less high quality hard rock in the next four years contributing to a shortfall in production. Ultimately, Penrith Lakes would cease as a source of construction materials by the end of the decade. Boral is planning that Dunmore Quarry would increase production by 1.3Mtpa (to 2.5Mtpa) to partly replace the shortfall from these quarries as they reduce their production of high quality aggregates and ultimately close.

It is also noted that Boral is currently approaching a period of substantial sales given their involvement with both various large civil projects in the Illawarra area (e.g. the North Kiama Bypass) and in Sydney (e.g. the Western Sydney Orbital).

6.3.3 Rail Transportation

Dunmore Quarry is the only hard rock quarry operated by Boral in the hinterland of the Sydney metropolitan area that has access to rail for despatching products. Boral has developed two rail unloading sidings in Sydney, at St Peters and Enfield, and accordingly is seeking to benefit from the cost effective and environmentally preferable transportation of products by rail. Consideration of other existing quarries ahead of the Dunmore Quarry to supply the projected shortfall in the supply of high quality aggregates would increase the levels of trucks delivering quarry products to Sydney's inner suburbs.

6.4 CONSEQUENCES OF NOT PROCEEDING WITH THE PROPOSED DEVELOPMENT

Schedule 2(3) of the *Environmental Planning and Assessment Regulation 2000* requires this document to address the consequences of not proceeding with the proposed development. Section 3.12 has previously addressed the alternative of maintaining production at 1.2Mtpa. This is effectively the "do nothing" option or alternatively the main outcome if the current Development Application is not approved. The consequences that would arise if the Development Application is not approved are as follows.

1. The opportunity to replace production from other Boral quarries would be foregone, particularly from a source that would maximise the use of rail to deliver its products to the Sydney metropolitan sites that have access to rail unloading facilities.

2. The current 15 employment positions created at the commencement of the 9 month trial period would be withdrawn. Furthermore, the planned employment for local contractors to undertake the processing plant upgrade would not eventuate. The loss of employment opportunities would also have both social and economic implications for those persons directly and indirectly affected.

3. The opportunity to reduce the quantity of diesel used to deliver quarry products to the Sydney metropolitan area would be foregone together with the opportunity to reduce greenhouse gases by 80% for the delivery of up to 800 000 tonnes of product annually. Note: Boral would continue to deliver its products by train at existing rates, i.e. between 700 000 and 900 000 tonnes per year.

4. The opportunity would be foregone to compile a single comprehensive Development Consent covering all activities on the Project Site. Reliance would continue to be placed upon the three existing Development Consents and existing use rights.

5. The additional impacts described with respect to noise, air quality and product transportation would not eventuate.

6. Boral would need to consider expanding production at other Company-owned quarries none of which have rail access, or alternatively the development of a quarry at a greenfields site.

6.5 CONCLUSION

The proposal to increase production at Dunmore Quarry to 2.5Mtpa has been designed with an emphasis upon demonstrating that changes to the noise levels, air quality and product transportation satisfy relevant goals or realistic community expectations. The substantial investigations undertaken prior to and during the current 9 month trial have enabled Boral to progressively implement a range of controls consistent with best environmental practice to achieve a high standard of environmental performance. An important component of the proposed development would be the emphasis upon maximising the use of rail for the transportation of products.

This document and the range of specialist consultant studies undertaken have identified that the proposed development could proceed because it would:

(i) responsibly satisfy part of the shortfall that will arise as other quarries close;

(ii) have an acceptable impact on the biophysical environment with respect to noise, blasting, air quality, transportation and water quality; and

(iii) satisfy sustainable development principles.

Section 7
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Section 8
Glossary of Acronyms, Symbols and Technical Terms

ACRONYMS

AHD	Australian Height Datum; generally equivalent to mean sea level.
AS	Australian Standard
BMG	Blue Metal & Gravel Pty Ltd (now owned by Boral)
DIPNR	Department of Infrastructure, Planning and Natural Resources
DUAP	Department of Urban Affairs and Planning
DSRLEP	Draft Shellharbour Rural Local Environmental Plan
EIS	Environmental Impact Statement
EPA	Environment Protection Authority (NSW)
ESD	Ecologically Sustainable Development
IREP	Illawarra Regional Environmental Plan
INP	Industrial Noise Policy
LEP	Local Environmental Plan
RBL	Rating background level
SEPP	State Environmental Planning Policy
RIC	Rail Infrastructure Corporation
RTA	Roads and Traffic Authority
SRA	State Rail Authority

SYMBOLS

% percentage

'000 t multiples of one thousand tonnes

< less than

> greater than

Av average

^{o}C degrees Celsius

cm centimetre (unit of length)

dB decibel, unit used to express sound intensity

dB(A) the unit of measurement of sound pressure level typically heard by the human ear, expressed in "A" scale

ha hectare (100 m x 100 m).

hr hour

km kilometre (= 1 000 metres)

km^2 square kilometres

km/hr kilometres per hour.

kV thousand volts (unit of electrical potential).

L litre (=1 000 mL).

L_{A1} sound level exceeded 1 per cent of the sampling time.

L_{A10} sound level exceeded 10 per cent of the sampling time.

L_{A90} sound level exceeded 90 per cent of the sampling time.

L_{Aeq} the L_{Aeq} is the "equal energy" average noise levels, and is used in some instances for the assessment of traffic noise effects or the risk of hearing impairment due to noise exposures.

$L_{Aeq\ 1\ hour}$ the "equal energy" average noise level over 60 minutes – used for assessing impacts of motor vehicles

m metre

mAHD metres of elevation relative to the Australian Height Datum

m^2 square metre

m^3 cubic metre

ML megalitres

Mm/s millimetre (= 0.001 metres) per second

m/s metres per second

Mtpa million tonnes per annum

pH a measure of the degree of acidity or alkalinity of a solution; expressed numerically (logarithmically) on a scale of 1 to 14, on which 1 is most acidic, 7 is neutral acid, and 14 is most basic (alkaline)

PM_{10} particulate matter <10μm in diameter

t tonnes

tpa tonnes per annum

tph tonnes per hour

tsp total suspended particulate

μg/m^3 micrograms per cubic metre

μm micron, one millionth of a metre (one thousandth of a millimetre)

vkt vehicle kilometres travelled

vph vehicles per hour

TECHNICAL TERMS

aggregates – fragments of crushed rock with a defined size specified for use in the construction industry

air contaminant – a substance in ambient atmosphere, resulting from the activity of man or from natural processes, causing adverse effects to man and the environment (also called "air pollution")

ambient – relating to conditions outside the active project site

archaeology – the scientific study of human history, particularly the relics and cultural remains of the distant past

biophysical – relating to the biological and physical attributes of the environment

buffer – a physical barrier / structure or width of land that encloses, partially encloses, or defines a particular environment. A buffer serves to minimise the impacts of non-desirable external influences on the adjoining environment

bulldozer – an item of tracked mobile earth moving equipment fitted with a front blade and with rear rippers used for pushing and ripping soil and rock

conservation – the management of resources in a way that will benefit both present and future generations

ecology – the relationship between living things and their environment

Ecologically Sustainable Development (ESD) – using, conserving and enhancing the community's resources so that the ecological processes on which life depends, are maintained, and the total quality of life now and in the future, can be increased (Commonwealth of Australia 1992)

ecosystem – a functional unit of energy transfer and nutrient cycling in a given place. It includes all the relationships within the biotic community and between the biotic components of the system

emission – a discharge of a substance (e.g. dust) into the environment

environment – a general term for all the conditions (physical, chemical, biological and social) in which an organism or group of organisms (including human beings) exists

Environmental Impact Statement (EIS) – a document that describes a project and an assessment of its likely impact on the physical, social and economic environment. It includes an evaluation of alternatives and an overall justification of the proposal. An EIS is used as a vehicle to facilitate public comment and as the basis for analysing a proposal with respect to granting approval under relevant legislation

environmental policy – statement by the organisation of its intentions and principles, in relation to the overall environmental performance, which provides a framework for action and for the setting of its environmental objectives and targets

ephemeral – lasting only a short time e.g. creek flow

erosion – the wearing away of the land surface (whether natural or artificial) by the action of water, wind and ice

evaporation – the loss of water as vapour from the dam surface of a liquid

excavate – to dig into natural material using an excavator or other machinery

excavator – item of earth-moving equipment fitted with a bucket on an articulated boom used for digging material from a face in front of, or below the machine

extraction – the recovery of rock from its in-situ location by drilling and blasting and loading/hauling to the processing plant.

fauna – a general term for animals such as birds, reptiles, marsupials, fish etc

flora – a general term for plants

front-end loader – machine used to lift and place soil, earth, rocks, etc within an extraction site or to load products into trucks

grader – an item of rubber tyred earthmoving equipment, fitted with a centrally mounted blade and rippers used to shape and trim the ground surface

gradient – rate of change of a given variable (such as temperature or elevation) with distance

greenhouse – the heating of the earth's surface because outgoing long-wavelength radiation from the earth is absorbed and re-emitted by the carbon dioxide and water vapour in the lower atmosphere and eventually returns to the surface

groundwater – water contained in voids such as fractures and cavities in rocks and inter-particle spaces in sediments e.g. sand

habitat – the place where an organism normally lives; habitats can be described by their floristic and physical characteristics

heritage – the things of value which are inherited

hydrogeology – the study of groundwater

igneous – a rock or mineral that solidified from molten or partly molten material

impact – the effect of human induced action on the environment (modified from Westman, 1985)

infiltration – the process of surface water soaking into the soil or ground

infrastructure – the supporting installations and services that supply the needs of a project e.g. road or rail

inter-generational equity – the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations

intra-generational equity – the present generation should ensure that improved well-being and welfare are accessible to all sectors of society within Australia and that improved welfare within Australia does not result in decreased welfare in other nations

inversion – a weather term for a surface defining the boundary between two layers of air or different temperatures

landform – a specific feature of a landscape (such as a hill) or the general shape of the land

mitigation measures – measures implemented to reduce (mitigate) an impact (such as the construction of a perimeter bund to reduce sound emissions)

monitoring – the regular measurement of components of the environment to understand a feature of the environment and/or establish that environmental standards are being met

native – said of an organism or group of organisms that is restricted to a particular region or environment. A local inhabitant of a place

Pervious – permeability

pH – a measure of the degree of acidity or alkalinity of a solution; expressed numerically (logarithmically) on a scale of 1 to 14, on which 1 is most acid, 7 is neutral acid, and 14 is most basic (alkaline)

precautionary principle – where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation

processing – the size reduction of rock delivered from the extraction area and separation into final products of different size.

processing plant – a group of equipment (crushers and screens) used to process and separate quarried rock products into various sizes

progressive rehabilitation – rehabilitation of a disturbed area as soon as practicable after the final landform is achieved

Project Site – the area of land covered by the existing approved development and the current Development Application

rehabilitation – the preparation of a final landform after quarrying and its stabilisation with grasses, trees and/or shrubs

residence time – the time that inflowing water is retained in a wetland or basin before being discharged. The RT is related to the volume of the inflow versus the total storage volume of the basin or wetland

resource – an estimate of potentially usable material in a defined area based on preliminary geological information

revegetation – replacement of vegetation, principally grasses and legumes on areas disturbed by quarrying activities

runoff – that portion of the rainfall falling on a catchment area that flows across the land surface from the catchment past a specified point

sales related activities – includes sales-related activities comprise loading products from the product stockpiles areas into train wagons or trucks, weighing/documentation and despatch from site

social equity – embraces value concepts of justice and fairness so that the basic needs of all the sectors of society are met and there is a fairer distribution of costs and benefits to improve the well-being and welfare of the community, population or society

stormwater pond – a containment structure to collect sediment-laden runoff – also used a water storage dam

species – a taxonomic grouping of organisms that are able to interbreed with each other but not with members of other species

stockpile – a pile used to store material, typically products

stormwater – surface water runoff immediately after rainfall

surface waters – all water flowing over, or contained on, a landscape (e.g. runoff, channels, etc)

suspended solids – analytical term applicable to water samples referring to material recoverable from the sample by filtration

sustainable development – development that meets the needs of the present without compromising the ability of future generations to meet their needs (World Commission on Environment and Development 1990)

topography – the physical relief and contour of an area

topsoil – the surface layer of a soil profile containing the main percentage of organic material and viable life forms and seeds

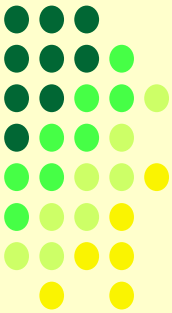
Appendices

(No of pages excluding Cover Pages = 43)

Appendix 1: Development Application

Appendix 2: Government Requirements

Appendix 3: Correspondence from the Wodi Wodi Elders Corporation



Appendix 1

(No of pages excluding Cover Pages = 17)

Development Application

Development application

Department of **Infrastructure, Planning and Natural Resources**

Date received: ____/____/____ DA no: _____

You can use this form to apply for development approval for proposals that needs the Minister Infrastructure Planning consent. The Minister's consent is needed to carry out certain developments such as those declared to be of state significance.

If you are proposing a development, please contact us to arrange a pre-lodgement consultation before completing this form. Phone our Planning Centre on 02 9762 8044.

The **DA Supplement** that accompanies this form will help you complete the application. To complete the form, please place a cross in the boxes ☐ and fill out the white sections.

To minimise delay in receiving a decision about your application, please ensure you submit all relevant information.

You can lodge your application at any of the listed Infrastructure, Planning and Natural Resources offices. Contact details are at the end of this form.

When your application has been assessed, you will receive a Notice of Determination.

1. Details of the applicant

NAME

Mr ☒ Ms ☐ Mrs ☐ Dr ☐ Other ☐

First name	Family name
Ion	Dumitru

Company/organisation	ABN
Boral Resources (NSW) Pty Limited	51 000 756 507

STREET ADDRESS

Unit/street no.	Street name
	Clunies Ross Street

Suburb or town	State	Postcode
PROSPECT	NSW	2148

POSTAL ADDRESS (or mark 'as above')

PO Box 42

Suburb or town	State	Postcode
WENTWORTHVILLE	NSW	2145

CONTACT DETAILS

Daytime telephone	Fax	Mobile
(02) 9624 9900	(02) 9624 9999	0401 895767

Email

ion.dumitru@boral.com.au

How would you prefer to be contacted?

Daytime telephone

2. Identify the land you propose to develop

Unit/street no.

Street or property name: Tabbita Road

Suburb, town or locality: Dunmore

Postcode: 2529

Local government area: Shellharbour

Lot/DP or Lot/Section/DP or Lot/Strata no.
Please ensure that you put a slash (/) between lot, section, DP and strata numbers. If you have more than one piece of land, you will need to separate them with a comma eg 123/579, 162/2.

Lot 1 DP 213575, Lots 3 and 4 DP 1030504, Lot 4 DP 227046, Lot 1 DP 1002951 and Lots 1 and 2 DP 224597

Note: You can find the lot, section, DP or strata number on a map of the land or on the title documents for the land, if title was provided after 30 October 1983. If you have documents older than this, you will need to contact Department of Lands for updated details.

3. Describe what you propose to do

Briefly describe your proposal, including all major components. See Section 2 of the DA Supplement.

Boral is proposing to progressively increase production at the Dunmore Quarry to 2.5 million tonnes per annum (Mtpa) from existing levels in the order of 1.2Mtpa. The progressive increase in production would take place over a period of approximately 2 years and would be achieved by a combination of increased operating hours, minor changes to equipment types and configuration, mainly within the crushing and conveying circuit, and an increase in rail and road transportation of product.

Will this involve:

- ☒ erecting, altering or adding to a building or structure
  - ➢ Is it a temporary building or structure? Yes ☐ No ☒
- ☐ subdividing land
  Please specify the no. of lots
- ☐ subdividing a building into strata lots
  Please specify the no. of lots
- ☐ demolition
- ☐ changing the use of land or a building or the classification of a building under the Building Code of Australia (without building, subdividing or demolishing)
- ☐ other work (without building, subdividing or demolishing)?

Please indicate the number of jobs this will create. This should be expressed as a proportion of full time jobs over a full year. See Section 2 of the DA Supplement.

Construction jobs (full-time equivalent)

Operational jobs (full-time equivalent)

4. Crown development

Specific Provisions apply to development by the Crown under Part 5A of the *Environmental Planning and Assessment Act 1979.*

Is this proposal Crown development in accordance with the provisions of the *Environmental Planning and Assessment Act 1979?*

Yes ☐➢ [ ] Identify Crown agency

No ☒

5. Staged development

You can apply for development consent for only part of your proposal now, and for the remaining part(s) at a later stage.

Are you applying for development consent in stages?

No ☒

Yes ☐➢ Please attach:

- information which describes the stages of your development
- a copy of any consents you already have for part of your development.

6. Plans of the land and development

You need to provide a number of different plans that show what you intend to do. Section 3 of the **DA Supplement** sets out which plans to provide and the details to include. Contact us to find out the number of copies of plans required.

Please attach:

- a site plan of the land, drawn to scale
- plans or drawings of the proposal, drawn to scale

and, where relevant:

- an A4 size plan of the proposed building and other structures on the site
- a plan of the existing building, drawn to scale.

7. Environmental effects of your development

To assess your proposal, we need to understand the impacts it will have. Depending upon the nature and scale of your proposal, you need to provide one or more of the statements listed below to explain the environmental effects of your proposal. See Section 4 of the **DA Supplement**.

Is your proposal **designated development**?

Yes ☒➢ Please attach an environmental impact statement.

No ☐➢ Please attach a statement of environmental effects.

Is your proposal likely to have a significant effect on **threatened species,** populations, ecological communities or their habitats?

Yes ☐➢ Please attach a species impact statement.

No ☒

8. Concurrences from state agencies

Do you need the concurrence of a state agency to carry out the development? See Section 5 of the **DA Supplement**.

No ☒

Yes ☐➢ Please list any agencies whose concurrence you need.

Please attach sufficient information for the agency(ies) to assess your application.

9. Approvals from state agencies

If you need a development consent and one or more of the approvals listed in **Attachment A** of the **DA Supplement**, your development is known as integrated development. The relevant state agency will be involved in the assessment of your proposal. See Section 6 of the **DA Supplement**.

Is your application for integrated development?

No ☐

Yes ☒ ➢ Please complete **Attachment A** of the **DA Supplement** and submit with your application. Please attach:

- sufficient information for the approval body(ies) to assess your application
- additional copies of your application for each agency. Contact us to find out the number of copies required.

10. Supporting information

You can support your application with additional material, such as photographs, including aerial photographs, slides and models to illustrate your proposal. Please list what you have attached:

No further attachments. All required supporting material is provided in the EIS and Specialist Consultant Studies Compendium.

11. Application fee

For development that involves a building or other work, the fee for your application is based on the estimated cost of the development.

If your application is for integrated development or requires concurrence from another state agency, you need to include an additional processing fee payable to the Department of Infrastructure, Planning and Natural Resources of up to $110. You may also need to include up to $250 for each agency that will need to look at your proposal. Cheques should be made out separately to each relevant agency, and lodged with your application. We will forward them on. Note: An agency may require less than $250 to consider your application or may waive their fee entirely.

If your development needs to be advertised to the public you may also need to include an advertising fee. Clauses 246 to 263 of the Environmental Planning and Assessment Regulation 2000 provide a schedule of fees.

Note: Advertising fees attract GST, all other fees do not. Contact us if you need help to calculate the fee for your application.

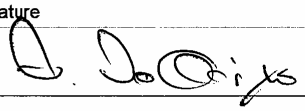
Estimated cost of the development	Total fees lodged
$3.8 million	$9,303.50

12. Signatures

The owner(s) of the land to be developed must sign the application.

If you are not the owner of the land, you must have all the owners sign the application. If the land is Crown land, an authorised officer of the Department of Infrastructure, Planning and Natural Resources (previously known as Department of Land and Water Conservation) must sign the application.

As the owner(s) of the above property, I/we consent to this application:

Signature	Signature
	
Name	Name
Ion Dumitru	
Date	Date
3 November 2003	

12. Continued...

The applicant, or the applicant's agent, must sign the application.

Signature

In what capacity are you signing if you are not the applicant

Name, if you are not the applicant

Date

13. Privacy policy

The information you provide in this application will enable us, and any relevant state agency, to assess your application under the *Environmental Planning and Assessment Act 1979* and other applicable state legislation. If the information is not provided, your application may not be accepted. If your application is for designated development or advertised development, it will be available for public inspection and copying during a submission period. Written notification of the application will also be provided to the neighbourhood. You have the right to access and have corrected information provided in your application. Please ensure that the information is accurate and advise us of any changes.

14. Lodgement

Before submitting your application, please ensure you have attached all the information the consent authority needs to assess your proposal. You can use the following checklist. Please place a cross in the box ☐ next to any items you have attached:

Land details

☐ A map that sets out the lot, DP/MPS and volume/folio no.s

☐ A schedule that sets out the lot, DP/MPS and volume/folio no.s

☐ A registered plan of lease boundaries

Staged development

☐ Information which describes the stages of the development

☐ A copy of any consents already granted for part of the development

Plans

☐ A site plan of the land — **required for all applications**

☐ Plans or drawings of the proposal — **required for all applications**

☐ An A4 size plan of the proposed building and other structures on the site

☐ A plan, drawn to scale, of the existing building

Environmental effects

☒ An environmental impact statement for a designated development proposal and an electronic version of the executive summary

☐ A statement of environmental effects — **required for all applications** that are not designated development

☐ A species impact statement

State agency concurrences and approvals

☐ Additional information required by the agencies from which you need concurrence

☒ Attachment A of the DA Supplement

☐ Additional information required by the agencies you have identified in Attachment A of the DA Supplement

☐ Additional copies of your application for each of those agencies

Supporting information

☐ Other material to support your application, such as photos, slides and models

Application fee

☒ Your application fee — **required for all applications.**

Are you lodging an application for a construction certificate with this development application?

Yes ☐

No ☒

Where to lodge your application

You can lodge your completed form, together with attachments and fees at any of the Department of Infrastructure, Planning and Natural Resources offices listed below.

15. Contact details

The Planning Centre
Ground floor, 20 Lee Street, SYDNEY 2000 (near Railway Square)
GPO Box 3927 SYDNEY 2001
t: 02 9762 8000
f: 02 9762 8713

e: information@planning.nsw.gov.au
w: www.planning.nsw.gov.au

Sydney West
Level 8, Signature Tower
2-10 Wentworth Street PARRAMATTA 2150
PO Box 404 PARRAMATTA 2124
t: 02 9895 7633
f: 02 9895 6270
e: sydneywest@planning.nsw.gov.au

Central Coast
Level 3, 107 Mann Street GOSFORD 2250
PO Box 1148 GOSFORD 2250
t: 02 4323 7000
f: 02 4323 6573
e: centralcoast@planning.nsw.gov.au

Hunter
Level 4, 251 Wharf Road NEWCASTLE 2300
t: 02 4926 2566
f: 02 4926 1529
e: hunter@planning.nsw.gov.au

Illawarra and South Coast
Level 2, 84 Crown Street WOLLONGONG 2500
PO Box 61 WOLLONGONG EAST 2520
t: 02 4224 9450
f: 02 4224 9470
e: wollongong@planning.nsw.gov.au

Kosciuszko Alpine Resorts *Assessments team*
Snowy River Avenue
PO Box 36 JINDABYNE 2627
t: 02 6456 1733
f: 02 6456 1736
e: alpineresorts_assessments@planning.nsw.gov.au

North Coast
49 Victoria Street
PO Box 6 GRAFTON 2460
t: 02 6642 0622
f: 02 6642 0640
e: northcoast@planning.nsw.gov.au

Western New South Wales *Subregional office*
32 Lowe Street
PO Box 728 QUEANBEYAN 2620
t: 02 6297 6911
f: 02 6297 9505
e: queanbeyan@planning.nsw.gov.au

DA supplement

A guide to the information you need to include with your development application

Department of **Infrastructure, Planning and Natural Resources**

1. How to use this guide

This guide provides information to help you to complete your development application. The sections of the guide relate to the parts of the development application (DA) form where you may need to attach additional information. If you need help in completing your application, please contact us on 02 9762 8044.

2. Describe what you propose to do

You need to include a brief description of the proposed development, detailing the major components of the development.

e.g. 'Construct and operate a solid waste landfill at the former [name] quarry. The proposal includes a private access road and administrative and support infrastructure. The proposed capacity of the site is 5 million tonnes of waste, and ABC Pty Ltd seeks approval to accept 100,000 tonnes per annum of inert putrescible and industrial waste from the [name] area.'

Provide an **estimate** of the full-time equivalent (FTE) jobs generated by the development. This includes during construction and operation.

e.g. a person employed full-time for 6 months would equal 0.5 of a full-time equivalent job, a person working for 20 hours per week for 6 months would approximate to 0.25 of a FTE job, six contractors working on and off over 2 weeks equate to 2 people working full-time for 2 weeks, which equals approximately 0.08 of an FTE job.

3. Plans of the land and development (Part 6 of the DA form)

You need to include a site plan of the land and the plans or drawings of the proposal to show what you intend to do.

The **site plan** is to be drawn to scale and show:

- the location of the land, the measurements of the boundaries of the land, the size of the land and which direction is north
- existing vegetation and trees on the land
- the location and uses of buildings that are already on the land
- the existing levels of the land in relation to buildings and roads
- the location and uses of buildings on sites adjoining properties.

The **plans or drawings** are be to drawn to scale and show, where relevant:

- the location of any buildings or structures on the land, any proposed extensions or additions, the boundaries of the land and any development on adjoining land
- the floor plans of the proposed buildings
- how high the proposed development will be in relation to the land
- each elevation of the proposed building(s)
- any changes that will be made to the level of the land by excavation, filling or otherwise
- the level of the lowest floor, the level of any yard or unbuilt area and the level of the ground
- the arrangements you have made for parking, where vehicles will enter and leave the site, and how vehicles will move about the site
- how the land will be landscaped or otherwise treated and what types of vegetation will be used (including their height and maturity)
- how you intend to drain the land.

You will need to attach these additional plans, if applicable:

- an **A4 size plan of the proposed building** and other structures on the site if you propose to erect, alter or add to a building, and your development does not need to be advertised to the public. We can tell you if your development must be advertised. The plan is to indicate the height and external shape of the proposed building as it will be erected on the site and include details of other buildings or structures on the site.
- a **plan of an existing building**, drawn to scale, if your application involves building work to alter, expand or rebuild the building. The plan will allow us to assess whether any existing buildings must be upgraded for safety reasons.

4. Assessing the environmental impacts of the proposal (Part 7 of DA form)

So that we can assess the impacts of your proposal, you need to attach one or more environmental reports to your application. The type of report/s required depend on whether your proposal is designated development or not, and the possible effects on threatened species.

For designated development

If your proposal will have a high potential risk to the environment and is listed in Schedule 3 of the Environmental Planning and Assessment Regulation 2000 or in a planning instrument made under the *Environmental Planning and Assessment Act 1979*, it is known as designated development. (Contact us if you need help in determining whether your proposal is designated development.)

If your development is designated development, please attach an environmental impact statement (EIS) to your application. The Director-General of the Department has a number of requirements for what must be included in an EIS. The requirements depend upon the nature of the proposed development. Contact the Department's Development and Infrastructure Assessment Branch on 02 9762 8044 to find out what you will need to include in your EIS.

You will also need to include an electronic copy of the executive summary of the EIS. This will be published on our website. The document is to be saved on a 3.5 inch floppy disk or CD-ROM. It should be in a format compatible with Windows 95 for PC or in Portable Document Format (PDF) compatible with Acrobat Reader Version 3.0 and above for PC.

For all other types of development

If your development is not designated development, please attach a statement of environmental effects (SEE). Table 1 sets out the information you need to include in your SEE.

Table 1 What to include in a statement of environmental effects

A statement of environmental effects of a proposal is to include information on the following:

- what you consider to be the environmental impacts of the development
- how you have identified the environmental impacts of the development
- the steps you will take to protect the environment or to lessen the expected harm to the environment
- any matters that must be included by any guidelines issued by the Director-General of the Department
- how you have addressed any other matters identified by the relevant planning instruments.

Where relevant, your statement of environmental effects may also need to include additional information:

For shops, offices, commercial or industrial development:

- the hours of operation
- the plant and machinery to be installed
- the type, size and quantity of goods to be made, stored or transported
- the loading and unloading facilities that will be available.

To change the use of a building (where you are not doing any building work):

You do not need to include these lists if the building will now be used as a single dwelling or a non-habitable building or structure (such as a private garage, carport, shed, fence, antenna or swimming pool).

- a list of Category One fire safety provisions relating to the proposed change
- a list of Category One fire safety provisions used in the existing building or on the land
- a list of fire safety measures currently used in the building

Each list is to describe the extent, capability and the basis of design of each of the provisions/measures.

For a subdivision:

- the details of the existing and proposed subdivision pattern (including the number of lots and the location of roads)
- the consultation you have carried out with the public authorities who provide, or will increase, the services you will need (eg water, road, electricity, sewerage)
- preliminary engineering drawings which show proposed roads, water, sewer, and earthworks
- both the existing and the proposed ground levels when the subdivision is completed.

For demolition:

- the age and condition of the building or structure you will demolish
- whether the building or structure has heritage value.

4. continued...

Table 1 continued

For advertisements:

- the size, type, colour, materials and position of the sign board or structure on which the advertisement will be displayed.

For development relating to an existing use:

- the details of the existing use
- a justification for the proposal having regard to the objectives of the zone.

For development in a wilderness area:

- a copy of a consent from the Minister for the Environment if the area is subject to a wilderness protection agreement or a conservation agreement. (You can contact the National Parks and Wildlife Service on 02 9585 6444 to determine if there is an agreement in place).

For building or demolition:

- the methods that will be used to protect the site during construction or demolition.

For DAs for residential flat development to which State Environmental Planning Policy No. 65 – Design Quality of Residential Flat Development applies:

- An explanation of the design in terms of the design quality principles set out in Part 2 of State Environmental Planning Policy No 65 – Design Quality of Residential Flat Development,
- Drawings of the proposed development in the context of surrounding development, including the streetscape,
- Development compliance with building heights, building height planes, setbacks and building envelope controls (if applicable) marked on plans, sections and elevations,
- Drawings of the proposed landscape area, including species selected and materials to be used, presented in the context of the proposed building or buildings, and the surrounding development and its context,
- If the proposed development is within an area in which the built form is changing, statements of the existing and likely future contexts,
- Photomontages of the proposed development in the context of surrounding development,
- A sample board of the proposed materials and colours of the façade,
- Detailed sections of proposed facades,
- If appropriate, a model that includes the context.

For proposals that may effect threatened species

Please use the test set out in Table 2 to work out whether your proposal is likely to significantly impact on threatened species, populations, ecological communities or their habitats. If you need help to do the test, please contact us (phone: 02 9762 8044), the National Parks and Wildlife Service (phone: 02 9585 6444) or NSW Fisheries (phone: 02 9527 8411).

If your development is likely to have a significant effect on threatened species, populations, ecological communities or their habitats, please attach a species impact statement (SIS) to your application. If you are also required to attach an EIS to your application, you can address the requirements of the SIS in your EIS. Contact the National Parks and Wildlife Service and/or NSW Fisheries about what you need to include in your SIS.

Table 2 Will your proposal impact on threatened species?

The following factors are to be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

- in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction
- in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised
- in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed
- whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community

- whether critical habitat will be affected
- whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region
- whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process
- whether any threatened species, population or ecological community is at the limit of its known distribution.

Source: section 5A *Environmental Planning and Assessment Act 1979.*

5. Concurrences from state agencies (Part 7)

You may need the agreement of a state agency to carry out your development. We can tell you whether the application needs to be referred. We will send a copy of your application to the relevant agencies to seek their agreement.

Please include sufficient information with your application for the agency(ies) to assess your proposal.

6. Approvals from state agencies (Part 8 of the DA form)

If, as well as development consent, you need one or more of the approvals listed in **Attachment A** of this Supplement, your development is known as integrated development. Integrated development means assessment of the proposal will be integrated. We will refer your application to the agency(ies) you identify. The agency(ies) will tell us whether or not it will approve your application and, if so, what the general terms of the approval will be. If your application is approved, the conditions of the consent will include those general terms.

Please complete Attachment A and include it with your application. If you need help to fill out the attachment contact us. Our details and those of other agencies are listed below.

Department of Infrastructure, Planning and Natural Resources (Previously known as Department of Land and Water Conservation)
Internet: www.dlwc.nsw.gov.au
Phone: 02 9228 6111
Email: infocentre@dlwc.nsw.gov.au

Environment Protection Authority
Internet: www.epa.nsw.gov.au
Phone: 02 9995 5000
Email: info@epa.nsw.gov.au

Mine Subsidence Board
Internet: www.minesub.nsw.gov.au
Phone: 02 4926 9750
Email: mail@minesub.nsw.gov.au

National Parks and Wildlife Service
Internet: www.npws.nsw.gov.au
Phone: 02 9585 6444
Email: info@npws.nsw.gov.au

NSW Fisheries
Internet: www.fisheries.nsw.gov.au
Phone: 02 9527 8411
Email: information-advisory@fisheries.nsw.gov.au

NSW Heritage Office
Internet: www.heritage.nsw.gov.au
Phone: 02 9635 6155
Email: heritageoffice@heritage.nsw.gov.au

NSW Rural Fire Service
Internet: www.rfs.nsw.gov.au
Phone: 02 9684 4411
Email: n.a.

Department of Infrastructure, Planning and Natural Resources (Previously known as PlanningNSW)
Internet: www.planning.nsw.gov.au
Phone: 02 9762 8044
Email: information@planning.nsw.gov.au

Roads and Traffic Authority
Internet: www.rta.nsw.gov.au
Phone: 02 9218 6888
Email: rta@rta.nsw.gov.au

Waterways Authority
Internet: www.waterways.nsw.gov.au
Phone: 02 9563 8511
Email: enquiries@waterways.nsw.gov.au

Attachment A Integrated development — approvals from state agencies

Some proposals need other kinds of approvals (eg licences, permits). Your proposal is known as integrated development if you need development consent and one or more of the approvals that have been set out in this attachment. Follow through each group of questions to decide whether you need any of these approvals. If you have identified you need one or more approvals, please include this attachment with your application. (Section 6 of this Supplement.)

Aboriginal relics and places

Will your development destroy, damage or otherwise harm an Aboriginal relic that is known to exist on the land you want to develop?

No ☐

Yes ☒➢ Are you going to do so in accordance with Aboriginal tradition?

Yes ☐

No ☒➢You need an approval under section 90 of the *National Parks and Wildlife Act 1974* from the National Parks and Wildlife Service

Will your development destroy, damage or otherwise harm land that has been declared to be an Aboriginal place?

No ☒

Yes ☐➢ You need an approval under section 90 of the *National Parks and Wildlife Act 1974* from the National Parks and Wildlife Service.

Aquaculture

Do you want to carry out aquaculture?

No ☒

Yes ☐➢ You need a permit under section 144 of the *Fisheries Management Act 1994* from NSW Fisheries.

Bushfires

Do you want to subdivide 'bushfire prone land' (1) that could lawfully be used for residential or rural residential purposes?

No ☒

Yes ☐➢ You need a bushfire safety authority issued under section 100B of the *Rural Fires Act 1997.*

Do you propose to develop 'bushfire prone land' (1) for a special fire protection purpose (2)?

No ☒

Yes ☐ ➢ You need a bushfire safety authority issued under section 100B of the *Rural Fires Act 1997.*

Notes

1. *Bush fire prone land*, in relation to an area, means land recorded for the time being as bush fire prone land on a bush fire prone land map for the area

2. *Special fire protection purpose* means the purpose of the following:

- a school
- a child care centre
- a hospital (including a hospital for the mentally ill or mentally disordered)
- a hotel, motel or other tourist accommodation
- a building wholly or principally used as a home or other establishment for mentally incapacitated persons
- housing for older people or people with disabilities within the meaning of State Environmental Planning Policy No. 5 – Housing for Older People or People with a Disability
- a group home within the meaning of State Environmental Planning Policy No. 9 – Group Homes
- a retirement village
- any other purpose prescribed by the Rural Fires Regulation 2002.

3. The above provisions do not include the carrying out of internal alterations to any building in 'bush fire prone land'

Dredging or reclamation

Do you want to carry out dredging or reclamation work in a waterway (a stream, river, lake, lagoon, estuary or marine waters)?

No ☒

Yes ☐ ➢ You need a permit under section 201 of the *Fisheries Management Act 1994* from NSW Fisheries.

Heritage

Does your development involve a building, a place or land that has a permanent conservation order, an interim conservation order or an interim heritage order protecting it, or which is listed on the State Heritage Register?

No ☒

Yes ☐ ➢ You need an approval under section 57 of the *Heritage Act 1977* from the NSW Heritage Office.

Marine vegetation

Will your development harm any mangroves or seagrasses in a public waterway or on the shore of a public waterway?

No ☒

Yes ☐ ➢ You need a permit under section 205 of the *Fisheries Management Act 1994* from NSW Fisheries.

Do you want to take sea lettuce or blackfish weed to use as bait from a public waterway or the shore of a public waterway?

No ☒

Yes ☐ ➢ You need a permit under section 205 of the *Fisheries Management Act 1994* from NSW Fisheries.

Mine subsidence

Do you want to build, subdivide, make roads, paths or driveways, or put in any pipelines, water, sewage, telephones, gas or other service mains in a mine subsidence district, or alter any of these types of development in a mine subsidence district?

No ☒

Yes ☐➢ You need an approval under section 15 of the *Mine Subsidence Compensation Act 1961* from the Mine Subsidence Board.

Pollution

Is your development designated development?

No ☐➢ Will the development cause the pollution of water?

No ☐

Yes ☐➢ You can apply for a licence under section 43(d) of the *Protection of the Environment Operations Act 1997* from the Environment Protection Authority so that you cannot be convicted of an offence of polluting water.

Yes ☒➢ You are likely to need a licence from the Environment Protection Authority. Is your land already designed to carry out the activity?

No ☐➢You may need a licence under section 47 of the *Protection of the Environment Operations Act 1997* from the Environment Protection Authority.

Yes ☒➢You may need a licence under section 48 of the *Protection of the Environment Operations Act 1997* from the Environment Protection Authority.

Rivers and lakes

Is your development within 40 metres of a stream, river, lake or lagoon?

No ☒

Yes ☐➢ Are you going to excavate the land, remove material from the land or anything which will obstruct or detrimentally affect the water flowing in a stream, river, lake or lagoon?

No ☐

Yes ☐➢ You need a permit under Part 3A of the *Rivers and Foreshores Improvement Act 1948* from the Waterways Authority if the development will affect Sydney Harbour or its tributaries, Botany Bay (east of Captain Cook Bridge) or the Ports of Newcastle, Kembla, Eden or Yamba, and from the Department of Infrastructure, Planning and Natural Resources (previously known as Department of Land and Water Conservation) in any other case.

Roads

Will your development affect a public road, a Crown road, a highway, a main road, a freeway or a tollway?

No ☒

Yes ☐➢ You need a consent under section 138 of the *Roads Act 1993* from the Roads and Traffic Authority, the Department of Infrastructure, Planning and Natural Resources (previously known as Department of Land and Water Conservation) or the council.

Using water

NB: The following approvals are taken from the *Water Act 1912*. It is proposed that the review of the Water Act, which is currently taking place, will consolidate and reduce the number of these approvals.

➢ *Licences and permits for occupiers of land*

Is your development going to be used for conserving water, irrigation, water supply, drainage

or changing the course of a river?

No ☒

Yes ☐➢ Will your development affect the quantity or use of water in a river, lake or swamp, or water flowing into or from a river, lake or swamp?

No ☐

Yes ☐ ➢If you occupy the land on which you propose to build the development, you need a licence under section 10 of the *Water Act 1912* from the Department of Infrastructure, Planning and Natural Resources (previously known as Department of Land and Water Conservation) to build and use your development, and take, use and dispose of the water for any purpose.

➢If you own or occupy the land on which you propose to build the development, and you will be irrigating less than 4 hectares of land, you can apply for a permit under section 18F of the *Water Act 1912* from the Department of Infrastructure, Planning and Natural Resources (previously known as Department of Land and Water Conservation) to build and use your development and take, use and dispose of the water for anything other than irrigation.

➢ *Licence for non-occupiers of land*

1. Do you propose to build pumps (or the like) to obtain water, or build pipes (or the like) to carry water?

No ☐

Yes ☐➢ Is your development going to be used for conserving water, irrigation, water supply, drainage, changing the course of a river, or preventing the course of a river from changing?

No ☐

Yes ☐➢Go on to question 2

2 Will your development affect the quantity or use of water in a river, lake or swamp, or water flowing into or from a river, lake or swamp?

No ☐

Yes ☐➢Do you propose to use the water for household use, stock use or irrigation?

No ☐

Yes ☐➢Go on to question 3

3. Do you occupy the land on which you propose to build the pumps (or the like)?

Yes ☐➢ Go on to question 4

No ☐➢ Can you obtain occupation of the land?

No ☐➢ You need a licence under section 13A of the *Water Act 1912* from the Department of Infrastructure, Planning and Natural Resources (previously known as Department of Land and Water Conservation) to build the pumps and take and use the water.

Yes ☐➢ Go on to question 4

4. Do you occupy all the land on which you propose to build pipes (or the like) to carry the water from the pumps to the land where you will use the water?

Yes ☐

No ☐➢Can you obtain occupation of the land?

Yes ☐

No ☐➢ You need a licence under section 13A of the *Water Act 1912* from the Department of Infrastructure, Planning and Natural Resources (previously known as Department of Land and Water Conservation) to build the pumps and take and use the water.

➢ *Joint water supply scheme*

1. Is your development going to be used for conserving water, irrigation, water supply, drainage, changing the course of a river or preventing the course of a river from changing?
   - No ☐
   - Yes ☐ ➢ Will your development affect the quantity or use of water in a river, lake or swamp, or water flowing into or from a river, lake or swamp?
     - No ☐
     - Yes ☐ ➢ Go on to question 2
2. Is the development going to be used by two or more occupiers of land to supply water to their lands?
   - No ☐
   - Yes ☐ ➢ Go on to question 3

   Is the development going to supply water to irrigate land(s) other than the land on which the development is built?
   - No ☐
   - Yes ☐ ➢ Go on to question 3

   Will the development involve pipes (or the like) to carry water to irrigate your land and the land of other occupiers?
   - No ☐
   - Yes ☐ ➢ Go on to question 3
3. Will the development be built on land that is occupied by those who will use the water?
   - Yes ☐ ➢ Go on to question 4
   - No ☐ ➢ You need an authority under section 20B of the *Water Act 1912* from the Department of Infrastructure, Planning and Natural Resources (previously known as Department of Land and Water Conservation) to build and use the development and take and use the water.
4. Do the occupiers of land who will use the water wish to build and use the development to supply water for household use, stock water use or irrigation?
   - No ☐
   - Yes ☐ ➢ Do they occupy all of the land on which the development will be built, and the land on which the pipes (or the like) will be built?
     - Yes ☐
     - No ☐ ➢ Can they obtain occupation of the land?
       - Yes ☐
       - No ☐ ➢ You need an authority under section 20CA of the *Water Act 1912* from the Department of Infrastructure, Planning and Natural Resources (previously known as Department of Land and Water Conservation) to build the development and take and use the water.

➢ *Group licences*

Are you a Board of Management elected under the *Private Irrigation Districts Act 1973*?
- No ☐
- Yes ☐ ➢ Do you want to build and use the development to take water from a river or lake for occupiers of land in a private district to use?
  - No ☐
  - Yes ☐ ➢ You need a group licence under section 20L of the *Water Act 1912* from the Department of Infrastructure, Planning and Natural Resources (previously known as Department of Land and Water Conservation).

➢ *Bores*

Do you want to sink a bore or enlarge, deepen or alter a bore?
- No ☐
- Yes ☐ ➢ Is the work to be carried out by the Crown?
  - Yes ☐
  - No ☐ ➢ You need a licence under section 116 of the *Water Act 1912* from the Department of Infrastructure, Planning and Natural

Resources (previously known as Department of Land and Water Conservation).

➢ *River banks and floodplains*

1. Do you want to build an earthwork, embankment or levee, or a road, railway or bridge?
   No ☐
   Yes ☐➢Go on to question 2
2. Will the development be on land that is the bank of a river or lake, forms part of a bank of a river or lake or is within a floodplain?
   No ☐➢Go on to question 3
   Yes ☐➢Do you have a licence, authority, permit or consent under the *Water Act 1912*?
      Yes ☐
      No ☐➢You may need an authority under Part 8 of the *Water Act 1912* from the Department of Infrastructure, Planning and Natural Resources (previously known as Department of Land and Water Conservation).
3. Will the development affect the flow of water to or from a river or lake and prevent land being flooded by water?
   No ☐
   Yes ☐➢Do you have a licence, authority, permit or consent under the *Water Act 1912*?
      Yes ☐
      No ☐➢You need an authority under Part 8 of the *Water Act 1912* from the Department of Infrastructure, Planning and Natural Resources (previously known as Department of Land and Water Conservation).

Appendix 2

(No of pages excluding Cover Pages = 24)

Government Requirements from

- **Department of Infrastructure, Planning and Natural Resources**
- **Environment Protection Authority**
- **Roads and Traffic Authority**
- **Department of Mineral Resources**
- **National Parks and Wildlife Service**

Department of
Infrastructure, Planning and Natural Resources

Mr Ion Dumitru
Boral Resources (NSW) Pty Ltd
PO Box 400
WINSTON HILLS NSW 2153

Proposed Expansion - Dunmore Quarry
Our Reference: S03/01960

Thank you for your letter of 26 May 2003 seeking the Director-General requirements for the preparation of an Environmental Impact Statement (EIS) for the proposed expansion of the Dunmore Quarry.

Statutory issues

Attachment No. 1 outlines the statutory matters that must be included in any EIS under Clauses 71 and 72 of the *Environmental Planning and Assessment Regulation* 2000 (the Regulation).

Specific issues

Under Clause 73(1) of the Regulation, the Director-General requires you to address the following specific issues in the EIS:

- **Description of the proposal**: Describe and justify the proposal, clearly identifying the resource, the proposed site, the proposed works (including any rehabilitation works), the proposed intensity of operations, and the likely inter-relationship between these proposed operations and any existing or approved extractive industry operations in the area. ***(Section 3).***
- **Permissibility**: Demonstrate that the proposal is permissible with consent. ***(1.5)***
- **Environmental planning instruments**: Assess the proposal against the relevant provisions of *State Environmental Planning Policy No. 11 - Traffic Generating Developments, State Environmental Planning Policy No. 33 – Hazardous & Offensive development, State Environmental Planning Policy No. 55 – Remediation of Land, Illawarra Regional Environmental Plan No. 1, Shellharbour Local Environment Plan (LEP) 2000,* and any relevant Development Control Plan or Section 94 Contribution Plans. ***(1.5.1, 1.5.2, 1.5.3)***
- **Key Issues:** Assess the following potential impacts of the proposal during construction and operation, and describe what measures would be implemented to manage, mitigate, or off-set these potential impacts:
  (a) Noise; ***(5.3)***
  (b) Blasting and vibration; ***(5.3)***
  (c) Air quality; ***(5.4)***
  (d) Surface and groundwater; ***(5.1)***
  (e) Soil; ***(5.2)***
  (f) Traffic; ***(5.6)***
  (g) Social & Economic; ***(5.10)***
  (h) Visual – particularly from the housing to the south and from the highway/North Kiama bypass currently under construction; ***(5.8)***
  (i) Heritage – both indigenous and non-indigenous; ***(5.7)***
  (j) Fauna and flora – particularly on critical habitats, threatened species (including *Zieria granulata)*, populations, or ecological communities; ***(5.5)***
  (k) Hazards;
  (l) Waste management; and ***(2.11/3.9)***
  (m) Utilities & services. ***(2.9/3.7)***
- **Cumulative Impacts:** Assess the potential cumulative noise, blasting, air, surface and groundwater, traffic and rail transport impacts of the proposal, taking into account the existing or proposed operations of the surrounding quarries, including Dunmore Sand & Soil, and the CSR and Cleary Brothers hard rock quarries at Albion Park. ***(5.3.6.7, 5.4.5.6, 5.6.4.3)***
- **Environmental Monitoring & Management:** Describe in detail how the environmental performance of the proposal would be monitored and managed over time. ***(5.1.7, 5.3.6.9, 5.4.6)***

You should note that if the Development Application (DA) to which these requirements relate is not made within two years of the date of this letter, Clause 73(6) of the Regulation requires you to re-consult with the Director-General before you lodge the DA.

Guidelines

During the preparation of the EIS, you must consider the Department's EIS guideline on *Extractive Industries – Quarries*. ***(1.1)***

Integrated development

Under Section 91 of the *Environmental Planning & Assessment Act* 1979 (the Act), development is classified as 'integrated development' if it requires certain approvals in addition to development consent before it may be carried out. ***(3.2)***

In your form A, you indicated that the proposal would require additional approvals from the Environment Protection Authority (EPA) and the Roads and Traffic Authority (RTA). These approval bodies have provided the Department with their requirements for your EIS (see Attachment No. 2), and you must address these requirements in your EIS. ***(EPA – 5.1, 5.3, 5.4; RTA – not applicable)***

If further integrated approvals are identified before you lodge the DA, you must consult with the relevant agencies, and address their requirements in your EIS. ***(NPWS – 5.7)***

Surrender of Existing Consents

At present, operations at the Dunmore Quarry are regulated by three development consents and existing use rights.

The Department is keen to simplify this arrangement, and believes that the company should consider surrendering its existing development consents during the forthcoming assessment process, so that all operations at the quarry could be covered by one development consent. ***(3.2)***

The Department would be happy to discuss this with you in more detail before you lodge the DA for the proposal.

Environmental Monitoring & Management Plans

Given that the Dunmore Quarry has been operating for many years, and already has an environmental monitoring and management system in place, the Department would like you to consider any necessary changes to this system during the assessment process, rather than deferring this for future consideration.

To address this issue, you should provide specific details about the proposed monitoring program (including location, frequency, methods) and any mitigation measures in the EIS. ***(5.1.7, 5.3.6.9, 5.4.6)***

The Department would be happy to discuss this with you in more detail before you lodge the DA for the proposal.

Consultation

During the preparation of the EIS, you should consult with the relevant local, State, and Commonwealth government authorities, service providers and community groups in the area, and address any issues they may raise in the EIS. ***(1.6.1)***

In particular, you should consult the surrounding landowners and occupiers who are likely to be affected by the proposal. ***(1.6.2)***

The Department of Mineral Resources (DMR) has provided the Department with its requirements for the EIS (see Attachment 3), and you should consider these requirements in your EIS.

The EIS must include a report indicating who was consulted, what consultation occurred, and what issues were raised during this consultation. ***(1.6.1, 1.6.2)***

Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999

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

State Significant Development Requirements

For all State Significant Development proposals, the Director-General requires the Applicant to:

- Nominate a contact person (with telephone number) to answer public enquiries about the proposal;
- Provide the Department with an electronic copy of the Executive Summary of the EIS when you lodge the DA for exhibition on the Department's website; and
- Advise the Department of the relevant newspapers circulating in the area affected by the proposal.

Administration

You should notify the Department at least 3 weeks before you lodge the DA for the proposal, so that it can make the necessary arrangements to exhibit the DA and EIS.

When you lodge a DA for the proposal, you must include:

- At least 25 hard copies and 20 CD copies of the EIS ;
- An electronic copy of the Executive Summary of the EIS for the Department's website;
- A cheque for the DA fee and advertising (see Clauses 246 & 252 of the Regulation), made payable to the Department;
- A cheque for $715, made payable to the Department, for designated development;
- A cheque for $250, made payable to each of the integrated approval bodies; and
- A cheque for $110, made payable to the Department, for integrated development administration.

Enquiries

If you require any further information regarding the Director-General's requirements for the EIS, please phone me.

Yours sincerely

David Kitto
A/Manager – Mining and Extractive Industries
Major Development Assessment
As Delegate for the Director-General

Department of
Infrastructure, Planning and Natural Resources

ATTACHMENT NO. 1

STATUTORY REQUIREMENTS FOR THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT UNDER PART 4 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

In accordance with the *Environmental Planning and Assessment Act 1979* (the Act), an environmental impact statement (EIS) must meet the following requirements.

Content of EIS
Pursuant to Schedule 2 and clause 72 of the *Environmental Planning and Assessment Regulation 2000* (the Regulation), an EIS must include:

1. A summary of the environmental impact statement. ***(Summary)***
2. A statement of the objectives of the development or activity. ***(3.1.2)***
3. An analysis of any feasible alternative`s to the carrying out of the development or activity, having regard to its objectives, including the consequences of not carrying out the development or activity. ***(3.12/6.4)***
4. An analysis of the development or activity, including:
   (a) a full description of the development or activity; and ***(Section 3)***
   (b) a general description of the environment likely to be affected by the development or activity, together with a detailed description of those aspects of the environment that are likely to be significantly affected; and ***(Sections 4 and 5))***
   (c) the likely impact on the environment of the development or activity, and ***(Section 5)***
   (d) a full description of the measures proposed to mitigate any adverse effects of the development or activity on the environment, and ***(Section5)***
   (e) a list of any approvals that must be obtained under any Act or law before the development or activity may be lawfully carried out. ***(3.2)***
5. A compilation, (in a single section of the environmental impact statement) of the measures referred to in item 4(d). ***(Section 5)***
6. The reasons justifying the carrying out of the development or activity in the manner proposed, having regard to biophysical, economic and social considerations, including the following principles of ecologically sustainable development: ***(Section6)***
   (a) The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be
   (b) used as a reason for postponing measures to prevent environmental degradation.

   In the application of the precautionary principle, public and private decisions should be guided by:
      (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
      (ii) an assessment of the risk-weighted consequences of various options,
   (c) Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations,
   (d) Conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,
   (e) Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:
      (i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
      (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,
      (iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

An environmental impact statement referred to in Section 78A(8) of the Act shall be prepared in written form. The prescribed form to accompany the environmental impact statement must comply with the requirements of clause 71 of the Regulation and be signed by the person who has prepared it. ***(Form 2)***

Procedures for public exhibition of the EIS are set down in clauses 77 to 81 of the Regulation.

Attention is also drawn to clause 283 of the Regulation regarding false or misleading statements in EISs.

Note

If the development application to which the EIS relates is not made within 2 years from the date of issue of the Director-General's requirements, under clause 73(6) of the Regulation the proponent is required to reconsult with the Director-General.

ATTACHMENT NO. 2

Environment Protection Authority

Department of Infrastructure, Planning and Natural Resources
(Attention: David Kitto)
Major Development Assessment
GPO Box 3927
SYDNEY NSW 2001

South Coast

INTEGRATED DEVELOPMENT
DIRECTOR GENERAL REQUIREMENTS FOR THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT TO VARY PROCESSING TIMES AND INCREASE IN EXTRACTION RATES AT THE DUNMORE QUARRY - BORAL RESOURCES (NSW) PTY LTD

Dear Sir

We are writing in reply to your request dated 8 July 2003 for the requirements of the Environment Protection Authority (EPA) for an Environmental Impact Statement (EIS) for a proposal to vary processing times and increase extraction rates at the Boral Resources (NSW) Pty Ltd Dunmore Quarry.

The proposed development will result in the Dunmore Quarry being one of the largest hard rock quarry operations in NSW. As indicated at the Planning Focus Meeting on 23 June 2003 the EPA considers that the EIS will need to consider all air, water, noise and waste issues and document those environmental protection measures necessary to demonstrate that the quarry operations will achieve contemporary best management environmental standards.

The EPA has considered the details of the proposal as presented at the Planning Focus Meeting and has identified in Attachment A the environmental outcomes for the proposal and the information the EPA requires to develop its General Terms of Approval. The environmental assessment should address all environmental issues relating to the development and any ancillary activities.

Negotiated Agreements ***(4.4.1)***
The proponent is currently undertaking an approved nine month trial of extended hours of operation to obtain information to assist in the development of an EIS. A number of issues relating to noise were assessed in developing the trial conditions. One of these issues related to the use of negotiated agreements.

If the proponent intends to continue with the concept of negotiated agreement as a measure in addressing non-compliance with project specific noise goals, the EPA recommends that such an approach should be undertaken in accordance with the guidance in the EPA's Industrial Noise Policy. This guidance suggests that an agreement should also allow flexibility for the nearby residents to change their opinion with regard to noise at any time, if they choose to do so. Furthermore, the agreement should only be between the proponent and the affected party, and if circumstances change then the agreement would no longer be valid. The proponent may also wish to obtain advice from the Department of Infrastructure, Planning and Natural Resources (DIPNR) regarding this issue. We concur with DIPNR advice provided at the Planning Focus Meeting that documentary evidence of any proposed negotiated agreements should be provided with the EIS.

Reactive Management Relating to Wind Speed and Primary Plant Shut Down ***(5.3.5)***
The proponent originally proposed the use of a reactive plant shut down to address non-compliance with Project Specific Noise Levels under significant adverse meteorological conditions. EPA has strong reservations in relation to a "reactive management system", and would not support such systems as our experience in both the Illawarra and the Hunter is that they do not achieve compliance with the limits at all times as required by the Environment Protection Licence. They are prone to human error and selective operation, and their purpose in solving a noise problem may result in other environmental problems such as additional dust generated through the stopping and starting process. In addition there is also the difficulty of assessing compliance and ensuring their satisfactory performance.

Land Use Conflict ***(1.5.3, 5.9.3)***
The surrounding land use at the Dunmore Boral quarry is changing, in particular the pressure for future urban development or other sensitive land use types. The outcome will be increasing land use conflict.

We support the Company's initiative in actively purchasing adjoining properties to develop a buffer to ensure the quarry's long term viability. However, the EPA considers that an important element in ensuring the long term viability, of not only the Boral Quarry operations but other hard rock quarry operations in the Shellharbour City Council (SCC) area is progressing the strategic planning framework for the management of the hard rock resource in the SCC area proposed under the Section 117 Direction under the Environmental Planning and Assessment Act 1979.

The EPA understands that this framework will involve a review of the areas containing potential resources to reflect more accurately where future extraction is likely, as well as opportunities to address issues such as the adequacy and ownership of operational buffers for the management of land use conflict, resource management, rehabilitation and end use options for quarry sites. These issues are also critical in relation to the proposed development especially as the development relates to the future management of the hard rock resource at the Dunmore quarry site, it is important that the strategic planning framework is finalised soon.

The EPA requests that the proponent provide us with four copies of the Development Application/EIS. These documents should be lodged at the EPA address provided on the letterhead.

If you have any further queries or comments, please contact the above officer at this office.

Yours sincerely

TREVOR JONES
Regional Manager South Coast

Att

(N:\IDA\DG Requirements\WOF9760 Boral Dunmore Development2.DOC)

ATTACHMENT

Issues to be addressed in the development of an Environmental Impact Statement for the proposed Dunmore Quarry Proposal - Boral Resources (NSW) Pty Ltd

The Environment Protection Authority (EPA) requests that the following issues be addressed in the Environmental Impact Statement (EIS) for the Boral Resources (NSW) Pty Ltd - Dunmore Quarry proposal to vary processing times and increase in extraction rates. The following issues also include those matters raised by the EPA during the Planning Focus Meeting that was held on 23 June 2003.

Preamble
To ensure the development's long term viability the EPA considers that there are opportunities for environmental improvement relating to such matters as noise, air, water etc which can be addressed in the proposed development. We understand that Boral has been working through some of these issues and in relation to noise, Boral and their consultants have had a number of meetings with the EPA to work through issues.

In response to Shellharbour City Council's approval of a nine month trial of extended hours of operation of the quarry, the EPA has recently issued a variation of the Environment Protection Licence (EPL) to address this trial period. The EPA considers that the information obtained from the trial in particular relating to noise monitoring will assist Boral in the development of an EIS for the proposed development and the EIS should document the outcomes of the trial.

We were advised at the Planning Focus Meeting that the proponent is investigating a third rail terminal in Sydney thereby increasing the number of rail movements at the site and reducing the reliance on heavy vehicle haulage. Improving the efficiency of freight journeys and reducing adverse environmental impacts is a key goal for the Illawarra's Action for Transport strategy. The EPA is supportive of the proponent's initiatives in maximizing rail haulage of material and reducing heavy vehicle haulage from the site and also suggest the Department of Infrastructure, Planning and Natural Resources encourage the proponent to implement this initiative.

The Environment Protection Authority (EPA) currently licenses the Boral Quarry operation for the following scheduled activities:
- crushing, grinding or separating works;
- hard rock quarrying;

and they are licensed to process and obtain 500,000 to 2,000,000 Tonnes per annum of material.

Based on the presented information, the EPA considers that if development consent is granted the EPL will need to be varied to address the construction and operational components of the development. The proponent will need to apply to the EPA to vary the existing licence.

The EPA recommends that the format of the EIS be such that the Environmental Outcomes in the following sections are highlighted at the start of each relevant section, with each section detailing how these objectives will be achieved.

1. Executive Summary

The executive summary should include an overview discussion of the extent to which the proposal achieves the specified environmental outcomes. ***(Summary)***

2. Reasons for the proposal

The EIS needs to clearly state:

2.1 The reasons for the proposed development; ***(3.1.2)***
2.2 The expected quantity of materials which will be extracted and processed at the premises;***(3.1.1)***
2.3 The proposal's relationship and linkages to the existing operations at the quarry; ***(Section 3)***
2.4 The staging and timing of the proposal and any plans for future expansion; ***(N/A)***
2.5 The proposal's relationship to any other industry; ***(2.7)***
2.6 Whether there are any alternatives to the proposal and the implications of such proposals such as the opportunities to install additional crushers; and ***(3.12.5)***

2.7 Whether there is justifiable demand for the extraction of such quantities of materials in terms of natural resource management. (Are there viable alternatives to this material such as slags etc or opportunities to integrate with other resources). ***(3.12.4)***

3. Description of the Proposal

3.1. The Location

Provide an overview of the location of the proposed development including the affected environment to place the proposal in its local and regional environmental context including:

3.1.1 Surrounding land uses ***(5.9.2)*** and any future changes in land uses surrounding the premises (potential synergies and conflicts); ***(5.9.3)***

3.1.2 Surrounding landuses ***(5.9)*** and planning zonings; ***(1.5)***

3.1.3 Describe all potential sensitive receptors ***(4.4.2)***, local surrounding environment ***(Section 4/5)***, source(s) of wastes ***(2.11, 3.9)***, local climatic conditions;

3.1.4 Define the premises (including any other premises associated with the proposed activity) relevant to the Development Application and details of the land use zoning, and any potentially affected areas. (Note: details will need to be documented on the contractual arrangement between Boral and Rail Infrastructure Corporation (RIC) in relation to use of the RIC land for access and extraction of material. ***(Confidential)*** Property details are also required as Boral will be the occupier of this land for the purpose of EPA Licensing);

3.1.5 Describe the existing quarrying operations ***(Section 2)*** including any existing pollution controls; ***(Section 5)***

3.1.6 Meteorological data (for example rainfall, temperature and evaporation, wind speed and direction); ***(4.3)***

3.1.7 Topography (for example landform element, slope type, gradient and length); ***(4.1)***

3.1.8 Soil types and properties to assist in understanding and assessing the performance of existing water pollution controls (including erodibility, engineering and structural properties, dispersibility and any soil issues such as acid sulfate soil) ***(5.2)***; and

3.1.9 Availability of services ***(2.9/3.7)*** and the accessibility of freight transport. ***(2.8/3.6)***

3.2 Scope of Works

Fully scope the development in the EIS including information on:

3.2.1 The size and type of the operation, the nature of the processes ***(3.4, 3.5, 3.6)*** and the products including material handling ***(2.6.4)***, by-products and waste produced (both for current operation and proposed future operation); ***(2.11, 3.9)***

3.2.2 All new equipment or activities which will be installed or undertaken at the premises as a result of the proposed development; ***(3.4.6, 3.5.2)***

3.2.3 A life cycle approach to the use or management of all materials and products; ***(1.7.4)***

3.2.4 An overview of actions to achieve cleaner production principles; ***(1.7.4)***

3.2.5 All works associated with the proposal including all linkages with existing activities and processes at the premises, truck cleaning and maintenance areas, storage/stockpile areas etc (a diagram of the layout of the site should also be included in the EIS); ***(Figure 2.1, Figure 2.5)***

3.2.6 All phases of the project cycle including construction ***(3.5.3)***, routine operation, start-up operations etc;

3.2.7 Any site contamination, treatment and prevention systems;

3.2.8 Anticipated land contours after mining; ***(3.11)***

3.2.9 Potential long-term use of the land after mining operations cease and its relationship to other lands within the regional context; ***(3.11)***

3.2.10 Any final Mine Closure Plan developed to address needs in accordance with the proposed final land use ***(Not Yet Applicable)***; and

3.2.11 Details on construction timetable and staging ***(3.5.3)***; hours of construction ***(3.5.3)***, environment protection measures, including water controls ***(5.1.4)***, noise mitigation measures ***(5.3.5)***, dust control measures ***(5.4.4)*** and waste management. ***(2.11/3.9)***

4. Identification and Prioritisation of Issues ***(1.4.4)***

4.1 Provide an overview of the methodology used to identify and prioritise issues. The methodology should take into account:

- relevant NSW government policies and guidelines;

- industry guidelines;
- relevant research and reference material;
- relevant preliminary studies or reports for the proposal; and
- consultation with stakeholders.

4.2 Provide a summary of the outcomes of the process including:
- all issues identified including local, regional and global impacts;
- key issues which will require a full analysis (including comprehensive baseline assessment);
- issues not needing full analysis though they may be addressed in the mitigation strategy;
- justification for the level of analysis proposed (the capacity of the proposal to give rise to high concentrations of pollution compared with the ambient environment or environmental outcomes is an important factor in setting the level of assessment).

5. Cumulative Impacts *(5.3.6.7 – Noise, 5.4.5.6 – Air, 5.6.4.3 - Transport)*

5.1 The EIS must assess the following issues in regard to cumulative impacts:
- the extent that the receiving environment is already stressed by existing development;
- infrastructure requirements flowing from the proposal (for example, water and sewerage services, transport infrastructure upgrades);
- likely impacts from such additional infrastructure and measures reasonably available to the proponent to contain such requirements or mitigate their impacts.

6. Air

Environmental Outcomes

The development must be designed, constructed, operated and maintained so that:
- There is no offensive odour beyond the boundary of the premises. ***(Not Applicable)***

In addition, the development must be designed, constructed, operated and maintained to minimise:
- Visible dust emissions from material handling, storage, processing, haul roads, transport and material transfer systems. ***(5.4.4)***
- Vehicular kilometres travelled. ***(5.6.3.6)***

The EPA considers that the following policies and guidelines need to be considered when taking into account air quality issues on site:
- NSW EPA, 2001, *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW.*
- NSW EPA 2001, *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW*.

Identification of potential pollutants and assessment of impacts

The assessment should consider all phases and ancillary activities and identify all activities likely to generate air impacts or have the potential to cause harmful effects on the environment including health and amenity, and all related environmental issues and identify those measures that will ameliorate those impacts. ***(5.4.3)*** (**A detailed dust inventory is included in Part 2 of the Specialist Consultant Studies Compenduim**).

In addition to relevant standards in regulations, for the purpose of assessment the criteria pollutants are dust deposition, TSP and PM10. ***(5.4.5)***

In comparison with current environmental standards, the EPA considers that this premises is not performing at an acceptable level in relation to dust management. A recent EPA audit, which included video surveillance, showed significant air quality impacts from multiple sources. The EPA recognises that Boral have recently installed new controls to reduce some dust emissions. However the EPA considers that additional dust mitigation measures are required at the premises to meet acceptable environmental standards for the existing operation. ***(5.4.4)***

Issues to be addressed

The EIS must demonstrate that the above outcomes will be achieved and, in particular, include information concerning the following:

6.1 Existing Environment ***(5.4.2)***

6.1.1 Describe existing air quality, using existing information and on-site monitoring. Any necessary air monitoring programs should be established as early as possible in the site evaluation and project formulation. This should be undertaken in accordance with the documents cited above. The following should be considered in developing a baseline monitoring program:
- Simultaneous meteorological data collection;
- Pollutants to be monitored;
- Number and location of sampling sites;
- Duration of survey;
- Sampling equipment;
- Sampling protocols; and
- Existing monitoring data.

6.2 Identification of potential pollutants and assessment of impacts ***(5.4.3)***

6.2.1 The assessment should consider all phases and ancillary activities and identify all activities likely to generate air impacts or have the potential to cause harmful effects on the environment including health and amenity, and all related environmental issues, including those detailed below.

6.3 Material Handling, Storage and Quarry site ***(3.4, 3.5, 5.4.4)***

6.3.1 Details of material handling, storage and transfer system.

6.3.2 Details of cleaning devices fitted to any conveyor systems.

6.3.3 Details of any pollution controls or mitigation measures and expected performance to suppress dust at transfer points, crushers etc as a result of material being processed and transferred around the premises. Note: All conveyors must be fully enclosed to prevent wind blown dust.

6.3.4 Details on any mobile crushing and associated pollution controls to meet the environmental performance objectives.

6.3.5 Details on the location and size of any stockpiles including their management to prevent wind blown dust.

6.3.6 Details of proposed techniques to suppress wind blown dust especially the quarry site and associated activities.

6.3.7 Information should be provided on strategies for dust suppression in relation to high wind early warning management.

6.3.8 Details of spillage response including details of sealed surface management to prevent windblown dust in particular truck and rail loading areas.

6.3.9 Details on truck and rail loading including details on dust suppression during loading operations.

6.4 Haul Road ***(3.4.5)***

6.4.1 Details on location of the haul road including information on its design, construction and management in satisfying the above environmental outcomes.

6.5 Emissions and Environmental Impacts

6.5.1 Identify all air pollutants likely to be generated, including but not necessarily restricted to odour, dust, dust deposition, total suspended particulates and PM10:
- Provide emission rates for those pollutants for the different activities being undertaken at the premises; ***(5.4.3)***
- Determine the resulting ground level concentration of pollutants. ***(5.4.5)***

6.5.2 Determine the effects of pollutant concentrations on the environment including human health and amenity. ***(5.4.5)***

6.5.3 Provide details of environmental monitoring required to demonstrate impact assessment criteria are not being compromised in the construction and operational phases. ***(5.4.6)***

6.5.4 Due to the close proximity of the premises to residential land uses, computer dispersion modelling must be undertaken to predict any impacts as a result of emissions. ***(5.4.5.3)***

6.5.5 The assessment must also assess local cumulative impacts and any regional cumulative impacts. ***(5.4.5.6)***

6.5.6 The modelling assessment must include information on: ***(5.4.5.3)***

- modelling technique and calibration protocols;
- topography and climatic influences on dispersion ;
- surrounding land uses – if there is the possibility of a health risk, note exact locations of dwellings or other sensitive land uses, provide a perspective view of the study area such as the terrain file used in dispersion models;
- all assumptions;
- relationship to air quality standards, goals and guidelines;
- recommendations for future monitoring during construction and operational phases; and
- details on the adequacy of pollution controls or mitigation measures to meet environmental objectives.

7. WATER

Environmental Outcomes

The facility must be designed, constructed, operated and maintained so that:

- The operation of the facility does not compromise the protection of aquatic ecosystems in receiving waters;
- There is no discharge of polluted waters to waters at any time;
- All polluted water (including process waters, wash down waters and polluted stormwater) is captured on the site and directed to reticulated sewer where available or else collected, treated and beneficially reused, where this is consistent with environmental and health guidelines and complies with Section 120 of the Protection Of Environment Operations Act;
- Bunding is in accordance with the EPA technical guidelines *'Bunding and Spill Management'* and designed for no-discharge.

The EPA is concerned with the existing water pollution controls at the premises as it involves an existing on-line structure in Rocklow Creek. Boral has been discussing this issue and water management at the premises in general with the EPA. The EIS would need to document the strategies and measures in response to these concerns.

The following policies and guidelines may need to be considered when taking into account water issues on site:

- ANZECC (2000).*Australian and New Zealand Guidelines for Fresh and Marine Water Quality;*
- The NSW State Groundwater Policy - Framework Document, Quality Protection Policy, Groundwater Quantity Management Policy and Groundwater Dependent Ecosystems Policy; and
- The relevant targets within the State Water Management Outcomes Plan.

Issues to be addressed

The EIS must demonstrate that the above outcomes will be achieved and, in particular, include information concerning the following:

7.1 Details are required on the surface and groundwater hydrological catchments including the existing water environment. ***(5.1.2, 5.1.3)***

7.2 Description of the potential sources of pollution and assessment of the pollutant characteristics. ***(5.1.1)***

7.3 As assessment of the adequacy of the design and management measures to minimise impacts, including those to prevent and control any discharges from the premises. ***(5.1.4)***

7.4 Details should provided on the adequacy of surface water pollution controls and the proposed strategy to handle collected waters so that there are:
   a) separate controls for defined dirty and clean areas of the site; and
   b) structures available for any successive rainfall events. ***(5.1.4)***

7.5 Details of surface water management and anticipated levels of performance ***(5.1.4)*** for:
   a) any equipment and maintenance areas, including wash down facilities, oil and water separation;
   b) open stockpiles;

c) extraction areas;
d) material processing and transfer areas;
e) loading facilities;
f) haul roads; and
g) any associated treatment and reuse systems.

8. NOISE

Environmental Outcomes

The facility must be designed, constructed, operated and maintained so that the facility:
- Does not cause intrusive noise at the nearest affected premises.
- Does not compromise local planning noise amenity goals.

The EPA considers that the following Noise Policies and Guidelines should form the basis for noise assessment and management for this development:
- Environmental Noise Management Series: *NSW Industrial Noise Policy, January 2000*.
- Environmental Noise Management Series: *Environmental Criteria for Road Traffic Noise, May 1999.*
- Chapter 171 Noise Control Guideline, *Construction Site Noise, Environmental Noise Control Manual, 1994*.
- *Technical basis for Guidelines to Minimise Annoyance due to Blast Overpressure and Ground Vibration, Australian and New Zealand Environment Council, September 1990*.
- Chapter 171 Noise Control Guideline, *Construction Site Noise, Environmental Noise Control Manual, 1994*.
- Chapter 163 Noise Control Guideline, *Rail Traffic Noise, Environmental Noise Control Manual, 1994.*

Issues to be addressed

The EIS must show that the above objectives will be achieved and, in particular, include information concerning the following:

8.1 A blasting impact assessment must be undertaken to assess any impacts to the nearest most affected residences including the identification of measures to prevent impact. ***(5.3.6.8)***

8.2 Describe the development and its operation identifying all noise sources from the development and proposed mitigation controls ***(Section 3, 5.3.5)***. This must include expected noise level and noise character (for example, tonality, impulsiveness, vibration) likely to be generated from noise sources and proposed mitigation measures during:
(a) operational phases including noise impacts associated operation of crushers, material transfer, reversing alarms, pumps, fans, conveyor systems, stockpile operation, transport of goods, product handling, etc;
(b) transport including rail and traffic noise generated by the proposal (Note; In relation to rail activities the impacts associated with night-time activities and shunting need to be assessed);
(c) other services.

8.3 If night time operation is proposed, specific measures to address noise impact during night time hours will need to be specified in the EIS. In addressing night time activity, sleep disturbance criteria apply. ***(5.3.6.5)***

8.4 Specify times of operation of rail activities and measure to address any associated noise impacts. (Note: The EIS should also include information regarding discussions with RIC in relation to night time haulage operations and the implications of any potential noise impacts and how these will be addressed). ***(2.8.2.2, 5.3.6.5)***

8.5 Specify the times of operation and all noise producing activities including number and times of truck movements and proposed truck routes to and from the proposed development. ***(3.4.6, 3.5.6)***

8.6 An assessment of cumulative noise impact and the implications of surrounding quarry operations, changes in surrounding land use and future highway upgrade. ***(5.3.6.6)***

8.7 Details on noise monitoring to assess compliance with the predictions. ***(5.3.7)***

9. WASTE

Environmental outcomes

The development must be designed, operated and maintained:

- In accordance with the principles of the waste hierarchy and cleaner production.
- To ensure that the handling, processing and storage of all materials used at the premises does not have negative environmental or amenity impacts.
- The beneficial reuse of all wastes generated at the premises are maximised including but not necessarily limited to slurries, dusts and sludges.
- No waste disposal occurs on site except in accordance with an EPA licence.

In addition:

- *Liquid and non-liquid waste residuals should be classified and managed according to the Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-Liquid Wastes (NSW EPA, 1999).*

Issues to be addressed *(2.11, 3.9)*

9.1 Characterisation of all wastes in accordance with relevant guidelines.

9.2 Outline cleaner production actions, including:
(a) measures to minimise waste
(b) proposals for use or recycling of by-products (including recycling of screenings)
(c) proposed long term management methods of solid and liquid waste

9.3 Provide details of liquid and non-liquid waste management at the facility, including:
(a) Identification and scale of all possible waste streams;
(b) Methods for handling/transportation of any wastes generated at the premises;
(c) Details of any stockpiling or storage of wastes and the time frame for reuse;
(d) The method for management of all wastes or recovered materials at the facility; and
(e) Characterisation and quantities of all wastes their destinations and management.

9.4 Provide details of the type and quantity of any chemical substances to be used or stored and describe arrangements for their safe use and storage.

9.5 Waste tracking and control. Identify all wastes that cannot be reused including their associated management. In the assessments of these wastes reasons must be provided on why these wastes cannot be reused.

9.6 Clearly detail all environmental impacts associated with waste management.

9.7 All other information necessary to demonstrate how the above environmental outcomes and policy requirements will be achieved.

10. ENVIRONMENTAL MANAGEMENT *(1.8)*

The EIS must show that these objectives will be achieved and in particular, include information concerning the following:

- Operational procedures to manage air and noise emissions and any potential water discharges.
- Measures to assess any pollution control failures, including appropriate alarms to alert operators.
- Reporting procedures for exceedences to the EPA.
- Environmental training program.
- Complaint handling mechanisms.
- Strategies to achieve acceptable emissions in responding to the event of exceedences and emergency management plans.

11. GENERAL

11.1 Details on progressive mine site rehabilitation (including the existing excavation site and the appropriate landuse for the existing site.) ***(2.11/3.11)***

11.2 Details on any site clearing and management of stripped topsoil to ensure it is available for rehabilitation of the site. ***(5.2.2)***

11.3 Details on overburden management including the identification of controls to prevent wind blown dust and contaminated stormwater pollution. ***(2.5.3.4)***

Roads and Traffic Authority

401.5314 03/6213

Fiona Ristovski - (02) 42212409

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Mr Ron Corkery
RW Corkery & Co
PO Box 80
ORANGE NSW 2800

Boral Resources Dunmore Quarry Proposed Production Increase

Dear Mr Corkery,

I refer to your letter dated 12 June 2003 and to the Planning Focus Meeting held on 24 June 2003 regarding the subject proposal.

As mentioned at the Planning Focus meeting, the RTA's primary concern is the timing and impact of the proposal in relation to the construction of the North Kiama Bypass and the Oak Flats to Dunmore Deviation. The impact that transportation of additional product by road will have on the safety and efficiency of the Princes Highway should also be addressed. The following issues should be given consideration when preparing the EIS:

- Completion of the North Kiama Bypass is currently expected at the end of 2005. It is not anticipated that construction of the Oak Flats to Dunmore Deviation will commence before North Kiama Bypass has opened to traffic. The completion of the Bypass will significantly improve safety and efficiency of turning movements in and out of Tabitta Road, especially to and from the north. Attached is a sketch detailing the vehicle movements that will be allowed once the Bypass is open to traffic and before the Oak Flats to Dunmore roadworks have been completed. The proponent should address the different routes that will be required to move product out of Tabitta Road in relation to the stages of construction for both North Kiama Bypass and Oak Flats to Dunmore Deviation. ***(3.6.3.1)***

- Detailed analysis of the impact of the potential traffic generated by the proposal on the Princes Highway, and in particular the Shellharbour, Tabitta and Swamp Road intersections, should be undertaken. This would include details of existing and additional traffic volumes at the intersections along with any necessary amelioration measures identified. The analysis should also include the mode split for the movement of product as well as details of the expected destinations of heavy vehicles delivering product including the proposed routes to be utilised. ***(5.6)***

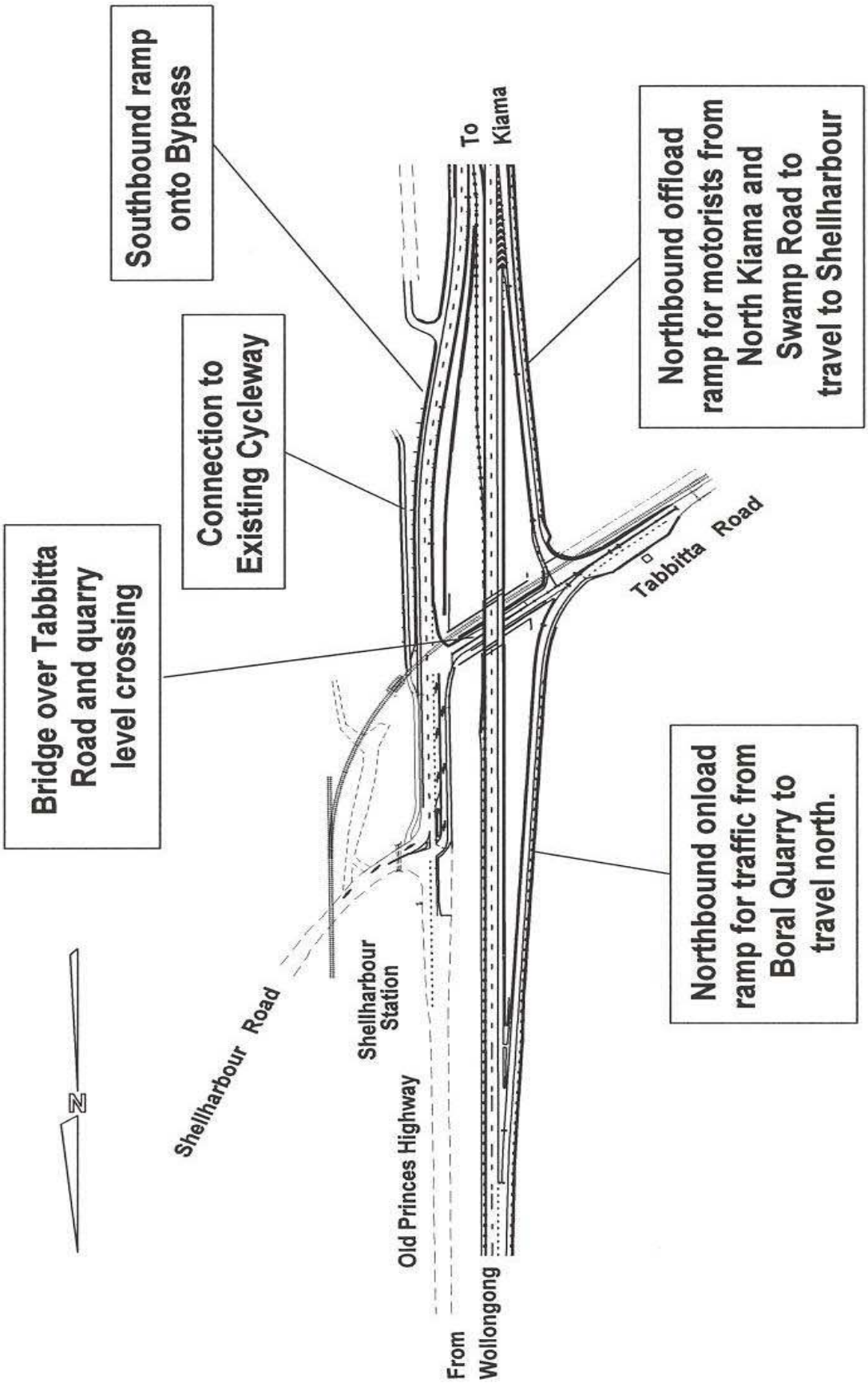
- The EIS should also include an assessment of the level of impact on pavement condition resulting from the existing and predicted heavy vehicle movements associated with proposal. The costs associated with the increased wear and tear on the pavement ie. the extent of the acceleration of damage and the need to rehabilitate the pavement should also be evaluated. ***(5.6.4.1)***

- Further information regarding the definition of "sales" and "processing" is required. As it is proposed that "sales" will be undertaken from the Dunmore site 24 hours a day, 7 days a weeks, there is some concern that this may impact on the safety and efficiency of the Princes Highway. This should be clarified in the EIS. (**Glossary**)

- The long term expectation for production and transport of quarry product from the Dunmore site should be addressed in detail. The impact this will have on the operation of the surrounding road network, particularly the cumulative impact of the additional heavy vehicle movements may have on Mount Ousley Road, should also be detailed. The possibility of setting a road haulage limit to encourage additional product movement by rail might also be given consideration. ***(5.6)***

Yours faithfully

R Watson
Development Manager
9 July 2003


Southbound ramp onto Bypass
Connection to Existing Cycleway
Bridge over Tabbitta Road and quarry level crossing
Northbound offload ramp for motorists from North Kiama and Swamp Road to travel to Shellharbour
Northbound onload ramp for traffic from Boral Quarry to travel north.
To Kiama
Tabbitta Road
Shellharbour Road
Shellharbour Station
Old Princes Highway
From Wollongong
N

ATTACHMENT NO. 3

Department of Mineral Resources

Mr Nick Agapides
Department of Infrastructure, Planning
and Natural Resources
PO Box 3927
SYDNEY NSW 2001

Our reference: L94/0534

Dear Sir

PROPOSED DUNMORE QUARRY PRODUCTION INCREASE

I refer to your letter of 8th July 2003 regarding the abovementioned proposal.

Coarse aggregate is not a prescribed mineral under the Mining Act, 1992. Therefore, the Department of Mineral Resources has no statutory authority over its extraction, apart from its role under the Mines Inspection Act, 1901 (as amended) concerning the safe operation of mines and quarries. Despite this the Department of Mineral Resources is the principal government authority responsible for assessing the State's resources of construction materials and for advising State and local government on their planning and management. With regard to safe operation of the quarry, the operator must observe all relevant requirements of the Mines Inspection Act, 1901 (as amended).

The Dunmore Quarry is identified in Illawarra Regional Environmental Plan No.1 as a regionally significant coarse aggregate resource and is subject of a Section 117(2) Direction No. G28 – Coal, other Minerals, Petroleum and Extractive Resources notification provided to Shellharbour City Council by the Department of Mineral Resources on 06/03/1996. The Dunmore Quarry, together with a number of other major quarries in the Shellharbour-Kiama area, was subject of a major investigation of planning issues relating to coarse aggregate resources in the northern part Illawarra region.

The Department of Mineral Resources standard requirements for an environmental impact statement (EIS) are provided in the accompanying information. In addition to the standard requirements, certain issues of particular concern to the Department need to be addressed in the EIS. These issues are discussed below.

The Department requires a detailed review of the available coarse aggregate resources at Dunmore Quarry. Total resources subject of the current proposal must be identified including the amounts to be extracted at each stage of the proposal. Options for any future extraction in other parts of the Dunmore Quarry, such as extraction of coarse aggregate from the old quarry area (Lot 1 DP571406) or extraction further to the west of the subject proposal (Lots 1 and 2 DP224597), should also be reviewed. Details of the methods (eg, drilling) used to determine quantities available for quarrying should be provided.

A detailed assessment of past (previous 5 financial years) and likely future production patterns should be provided. This should include a comprehensive analysis of the regional transport patterns identifying quantities and destinations of materials transported by road and by rail from Dunmore Quarry. This analysis should clearly identify quantities of coarse aggregate from Dunmore Quarry used, or likely to be used, in the Sydney, Illawarra and South East regions of NSW. Such an assessment is necessary to assist the Department in reviewing regional flow patterns of construction materials.

If you require clarification of this letter or additional information, please contact Mr Greg MacRae on 02-9901 8341.

Yours faithfully,

IBL Paterson
Acting Manager
Industrial Minerals & Land Use

11.07.03

DEPARTMENT OF MINERAL RESOURCES
EIS RESOURCE DATA

The Department of Mineral Resources considers that it is in the best interests of the proponent to fully assess the resources which are subject of the proposal. This means that a thorough geological assessment should be undertaken to determine the nature, quality and extent of the resource. Failure to undertake such an assessment could lead to operational problems and possibly failure of the proposal.

RESOURCE ASSESSMENT

The following issues need to be addressed in the environmental impact statement (EIS):

1. A summary of the regional and local geology including information on the stratigraphic unit or units subject of the proposal. ***(4.2)***
2. The amount of material available for extraction and the method or methods used to determine this amount (eg, drilling, trenching, geophysical methods). Plans and cross-sections summarising this data, at a standard scale, showing location of drillholes and/or trenches, and the area proposed for extraction, should be included in the EIS. Relevant supporting documentation such as drill logs should be appended. Major resource proposals should be subject to extensive drilling programs to identify the nature and extent of the resource. ***(2.4, 3.3)***
3. Characteristics of the material or materials to be produced:
   a) For clay/shale extraction proposals, ceramic properties such as plasticity, drying characteristics (eg, dry green strength, linear drying shrinkage), and firing characteristics (eg, shrinkage, water absorption, fired colour) should be addressed.
   b) For sand extraction proposals, properties such as composition, grainsize, grading, clay content and contaminants should be indicated. The inclusion of indicative grading curves for all anticipated products as well as the overall deposit is recommended.
   c) For hard rock aggregate proposals, information such as grainsize and mineralogy, nature and extent of weathering or alteration, and amount and type of deleterious minerals, if any, should be indicated.
   d) For other proposals, properties relevant to the range of uses proposed for the particular material should be indicated.

   Details of tests carried out to determine the characteristics of the material should be appended. Such tests should be undertaken by NATA registered testing laboratories.
4. An assessment of the quality of the material and its suitability for the anticipated range of applications should be given. ***(Reliant on past performance)***
5. The amount of material anticipated to be produced annually should be indicated. If the proposal includes a staged extraction sequence details of the staging sequence needs to be provided. The intended life of the operation should be indicated. ***(3.8.2)***
6. If the proposal is an extension to an existing operation, any past annual production data (by financial year) for all products should be supplied in support of the proposal. ***(DMR File)***
7. An assessment of alternative sources to the proposal and the availability of these sources. The impact of not proceeding with the proposal should be addressed. ***(3.12)***
8. Justification for the proposal in terms of the local and, if appropriate, the regional context. Identification of the subject site in relevant planning instruments such as regional environmental plans, should be noted. ***(1.5)***
9. Information on the location and size of markets to be supplied from the site. ***(1.4)***

10. Transport routes for the material to the market. ***(3.6)***
11. Disposal of waste products and the location and size of stockpiles. ***(2.113.9)***
12. Assessment of noise, vibration, dust and visual impacts, and proposed measures to minimise these impacts. ***(5.3, 5.4, 5.10)***
13. Proposed rehabilitation procedures during, and after completion of, extraction operations, and proposed final use of site. ***(3.11)***
14. Assessment of the ecological sustainability of the proposal. ***(6.2)***

SAFETY ISSUES

On the safety issues, the following points are made:

1. All operations are to comply with the Mines Inspection Act, 1901, as amended.
2. The company is to nominate a person (or persons) as General Manager and Production Manager as required by the Mines Inspection Act 1901, Section 5 and 5B.
3. The General Manager must appoint trained and competent shotfirers to conduct all blasting operations.
4. The company is required to contact the Regional Inspector of Mines for a list of guidelines and safety issues which are to be addressed and for the required competencies for a Production Manager.

MINERAL OWNERSHIP

The *Mining Act 1992*, and its precursors, apply to those minerals specified in the regulations of the Act. Many construction materials are not prescribed minerals under the Mining Act. In general terms, this means these materials are owned by the Crown where they occur on Crown land and by the landowner in the case of freehold land. A Mining title is not required for their extraction although a Crown Lands licence is required where they occur on Crown land.

Construction materials such as s*and (except for marine aggregate), loam, river gravel, and coarse aggregate materials such as basalt, sandstone, and granite* are not prescribed minerals under the Mining Act 1992. Therefore, the Department of Mineral Resources has no statutory authority over the extraction of these commodities, apart from its role under the Mines Inspection Act 1901 (as amended) with respect to safe operation of mines and quarries. However, the Department is the principal government authority responsible for assessing the State's resources of construction materials and for advising State and local government on their planning and management.

Minerals such as *structural clay (ie clay for brick, tile and pipe manufacture), dimension stone, quartzite, kaolin* and *limestone* are prescribed minerals under the Mining Act 1992. Minerals which are prescribed as minerals under the terms of the Mining Act may, in some cases belong either to the Crown or to the landowner, depending on a number of factors including the date on which the mineral was proclaimed and the date of alienation of the land. The proponent needs to determine whether the material is privately owned or Crown mineral (publicly owned). If it is privately owned, then either a notification under Section 8 of the Mining Act 1992 or, alternatively, a mining lease or mineral claim would be required. If it is a Crown mineral, an application for a mining lease or mineral claim will have to be lodged.

If you are unsure whether a mining title is required for your proposal you should contact the Department of Mineral Resources.

National Parks and Wildlife Service

Mr Robert Corkery
R.W. Corkery and Co. Pty Ltd
PO Box 80
ORANGE NSW 2800

Our Ref.: 96/765

Dear Mr Corkery

Re: Proposed Dunmore Quarry Increase - Shellharbour LGA

Thank you for your fax dated 29 August 2003 requesting the National Parks and Wildlife Service's (NPWS) requirements for the Environmental Impact Statement for a proposal to increase production at the Dunmore Quarry, owned by Boral Resources (NSW) Pty Limited.

The NPWS has a statutory responsibility for the protection and care of native flora, native fauna and Aboriginal objects and places. Accordingly the NPWS has an interest in ensuring that potential impacts to these attributes are appropriately assessed and managed.

It is understood that the proposal is to progressively increase production at the Dunmore Quarry to 3.5 million tonnes per annum from existing levels of approximately 1.2 million tonnes per annum. It is also understood that Boral seeks a new consent that would replace a number of existing consents that the Quarry currently operates under. Furthermore according to the Background Paper provided:

> *"….ecology and Aboriginal heritage is not planned to be evaluated in detail in the EIS. Each of these issues has been addressed in previous applications and their level of impact/management is unlikely to change because the proposed activities would be confined to the identical area previously approved."* (Page 9)

Following a conversation between yourself and Isabelle Connolly, (Conservation Planning Officer, NPWS) in late August, it is understood that Dr Kevin Mills will undertake a flora and fauna assessment concentrating on threatened species that have been listed on the Threatened Species Conservation Act since 1996. Furthermore an 8 part test will also be undertaken for relevant threatened species.

It is understood that the requirements of the Director-General of the Department of Infrastructure, Planning and Natural Resources were issued on 13 August 2003 and that the Department believes that the proponent should consider surrendering its existing development consents during the assessment process. In light of this information the NPWS has prepared a standard response in relation to its requirements for the assessment process in relation to impacts on native flora, fauna and Aboriginal objects and places.

Flora and fauna study *(5.5)*

The 8 part test should not only be conducted for species listed under Schedules 1 and 2 of the Threatened Species Conservation Act (TSC Act) since 1996, but all relevant species listed as well as endangered ecological communities.

The NPWS is concerned about the cumulative impact on native flora and fauna, particularly:

- Cynanchum elegans,
- Daphnandra sp. Illawarra,
- Zieria granulata,

and endangered ecological communities particularly:

- Illawarra Subtropical Rainforest,
- Illawarra Lowlands Grassy Woodland,
- Melaleuca armillaris Tall shrubland

due to numerous extraction activities in the study area and resulting changes to the hydrological regime.

It should be noted that the population of Zieria granulata known to exist on site is a significant population, being only one of four known to comprise thousands of individuals according to a report by Mark Robinson, 1999 called “Section 5A Assessment of the Endangered Zieria granulata at the proposed North Kiama By-Pass”.

The flora and fauna study should include an analysis of impacts on the threatened species and endangered ecological communities listed above. The study should also address a number of regionally significant species including Geijera latifolia, Alchornea ilicifolia, Canthium coprosmoides, Derringia amaranthoides, Cinnamomum oliveri, and Austromyrtus acmenoides, that are known to exist in remnant vegetation. As the cumulative impact of extraction activities in the area may result in the loss of some of these populations, the importance of the subject site to the conservation of these species also needs to be assessed.

This should include:

- A determination of the extent of known and potential habitat in the area.
- A determination of the likely extent of each population, including the age of the plants and available seed bank.
- Assessment of the significance of each population within a local and regional context.
- Justification of proposed buffer widths as sufficient to avoid impact on the remnant vegetation and threatened species.
- An assessment of any changes to the water regime on the species composition and long term viability of the remnant vegetation and habitat values considering long and short term impacts. This assessment should be based on data from hydrological modelling and other relevant information. Analysis should include any reduced overland and through water flow on wet sclerophyll forest and rainforest vegetation that requires a certain level of water to survive. This is also necessary as reduced soil moisture may encourage weed encroachment, potentially affecting the viability and maintenance of the forest.
- An analysis of potential sedimentation, erosion, drainage and discharge and the potential effectiveness of mitigation measures in minimising impacts on the remnant vegetation.

More generally, the flora and fauna study should comprise a description of vegetation communities on the site including:

- descriptive profile of each community;
- Threatened flora and fauna and Endangered Ecological Communities listed under the *Threatened Species Conservation Act, 1995* (including preliminary listings and/or determinations) and listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* and their conservation significance. The study should include
    1) those recorded on the site or in the vicinity of the site (see NPWS Wildlife Atlas)
    2) those with the potential to occur; and
    3) their conservation significance.
- an assessment of the conservation significance of the vegetation communities at both a local and regional scale;
- the extent and impact of proposed clearing (even though it is acknowledged that this has been given prior approval);
- the extent and impact of other disturbances;
- the habitat values of the vegetation, ie available habitat attributes and which threatened species or species of non-threatened fauna they relate to;
- the extent and nature of revegetation proposed once the quarry life has expired.

It is noted that an existing monitoring and environmental management programme exists for the site however no information in the Background Paper indicates that monitoring and management extends to native flora and fauna. It is advised that a vegetation management plan be prepared for the remaining vegetation on site to ensure that the impacts of quarrying activities on the natural values are appropriately managed in the long term.

Furthermore, the NPWS is of the view that the potential for rehabilitating the site on completion of extraction activities is important and would like to see the relevant issues thoroughly explored in the EIS as well as the development of procedures to undertake rehabilitation works. This should include but not be limited to an environmental management plan and monitoring programme, development of a stable final landform and hydrological regime, revegetation with endemic species, a proposed for soil characteristics and an assessment of the possibility of seed bank retention.

Aboriginal Heritage ***(5.7)***

Although approval has already been granted for the footprint of the proposed extraction area, it is advised that an assessment be conducted on the Aboriginal heritage values of the subject site and adjoining area. The study on archaeological potential and cultural significance should be conducted in accordance with NPWS guidelines contained in the NPWS' publication "Aboriginal Cultural Heritage: Standards and Guidelines", which may be purchased by contacting the NPWS' Cultural Heritage Conservation Division on (02) 9585 6571. The study should address the following:

- an archaeological assessment;
- an Aboriginal cultural heritage assessment;
- the likelihood of disturbance of Aboriginal sites;
- details of consultation with the local Aboriginal community; and
- proposed ameliorative measures.

Please find attached a copy of the NPWS "General Guidelines for Impact Assessment" that may be of assistance in the preparation of the Environmental Impact Statement.

Should you require any additional information please contact Isabelle Connolly, Conservation Planning Officer on 9585 6841 or email isabelle.connolly@npws.nsw.gov.au.

Yours sincerely,

Helen Mulligan
A/MANAGER, CONSERVATION PLANNING UNIT
Central Conservation Programs and Planning Division

CC. Mr David Kitto
A/Manager – Mining and Extractive Industries, Major Development Assessment
DIPNR
Fax: 9762 8707

Appendix 3

(No of pages excluding Cover Pages = 2)

Correspondence from the Wodi Wodi Elders Corporation



Wodi Wodi Elders Corporation,
484 North Cliffe Drive,
Berkeley, N.S.W. 2506

Phone: (02) 4272 9280

8 October 2003

Re: Site Survey of Lot 1 DP571406 Dunmore Hard Rock Quarry

As part of an archaeological investigation for this area, we inspected the above area.

This area is mostly mined and the small area around the edge of the mine which we inspected was highly disturbed and very rugged.

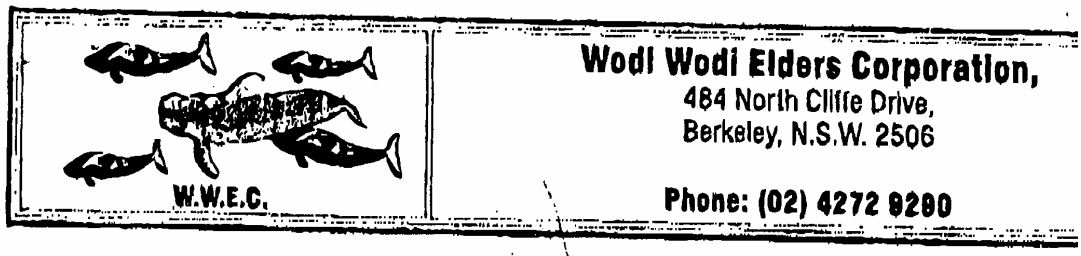
No sites were located.

We are happy for the development in this area to proceed and we endorse the previous surveys of the other areas.

J. L. Davis

Yours sincerely

JIM DAVIS - SENIOR SITES OFFICER.



8 October 2003

Re: NPWS S90 Application for Scarred Tree DQ2, Dunmore Hard Rock Quarry

As part of an archaeological investigation for this area, we inspected the scarred tree (DQ2) near Croome Farm with the archaeologist Rob Paton. We have read a copy of his report and agree with the findings.

The tree is in bad condition and if the quarry plans go ahead we would be agreeable to its salvage provided that:

1. A Conservator advise us, along with the archaeologist, about the best way to preserve the tree.

2. We have time to discuss where we would like the tree to be placed with the developer, the archaeologist and the NPWS. We consider the tree to have great educational value for the wider community.

Yours sincerely

JIM DAVIS