Appendix A

Biodiversity offset strategy (Modification 8 and 9)

A.1 Introduction

Schedule 4, Condition 46(d) and (e) require the preparation of a biodiversity offset strategy outlining measures to offset impacts to biodiversity values arising from Modification 8 and Modification 9 for Boral's Dunmore Quarry.

This appendix provides this offset strategy, outlining impacts arising from Modification 8 and Modification 9, subsequent offset requirements and the measures proposed to offset these impacts, and how they have been incorporated into the overarching FFMP.

A.2 Impacts

Impacts rising from Modification 8 (EMM 2016a), which required offsetting, included:

- removal of 48 Illawarra Zieria (*Zieria granulata*) individuals; and
- removal of 1.94 ha of native vegetation, including:
  - 0.05 ha of disturbed Illawarra Subtropical Rainforest EEC;
  - 0.39 ha of regrowth Acacia scrub; and
  - 1.5 ha of planted Eucalypt forest.

Impacts arising from Modification 9 (EMM 2016b), which required offsetting, included:

- removal of 162 Illawarra Zieria.

A.3 Offset requirements

A.3.1 Native vegetation

The clearing arising from Modification 8 "largely relates to revegetated areas", and "the Offsets Policy and Framework for Biodiversity Assessment (FBA, OEH 2014) do not strictly apply" (OEH 2016). As such OEH (2016) supported a negotiated outcome that achieves "maintain or improve" with regards to biodiversity.

To offset impacts to native vegetation outlined above, an offset calculation was undertaken using the Framework for Biodiversity Assessment (FBA, OEH 2014). This assessment used vegetation mapping and plot data collected during the biodiversity assessment (EMM 2016a) to determine credit requirements arising from these impacts. Regrowth Acacia scrub and planted Eucalypt forest were assigned to vegetation Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion (SR545) biometric vegetation type, while Illawarra Subtropical Rainforest was assigned to Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion (SR662) biometric vegetation type.

This credit assessment determined that impacts to native vegetation arising from Modification 8.

Table A.1 Offset requirements for native vegetation, Modification 8

Vegetation community	Bioemtric vegetation type	Impact area (ha)	Credits required
Illawarra Subtropical Rainforest	Whalebone Tree - Native Quince dry subtropical rainforest (SR662)	0.05	1
Regrowth Acacia scrub	Forest Red Gum - Thin-leaved Stringybark grassy woodland (SR545)	0.39	15
Planted Eucalypt forest	Forest Red Gum - Thin-leaved Stringybark grassy woodland (SR545)	1.50	28

A.3.2 Threatened species

Credit calculations for Modification 9 were provided in the response to submissions (see Section 2.2.3 of EMM 2017a). These credit calculations determined that a total of 2,268 credits were required to offset impact to 162 Illawarra Zieria.

A.4 Proposed offsets

Offsets for impacts to native vegetation and threatened species arising from Modification 8 will be offset through the following measures:

- purchase and retirement of like-for-like credits; or
- payment into the Biodiversity Conservation Fund (BCF).

Evidence of the retirement of the suitable number of credits, or payment into the BCF, will be provided to DPE.

A.5 References

EMM 2016a, *Ecological Assessment Dunmore Hard Rock Quarry Modification 8*. Prepared for Boral Resources (NSW) Pty Limited by EMM Consulting Pty Ltd.

EMM 2016b, *Dunmore Quarry - Modification 9, Ecological Assessment*. Prepared for Boral Resources (NSW) Pty Ltd by EMM Consulting Pty Ltd.

EMM 2017a, *Response to Submissions Dunmore Quarry | Modification 9 Croome West Pit*. Prepared for Boral Resources (NSW) Pty Ltd by EMM Consulting Pty Ltd.

EMM 2017b, *Offset Area Threatened Species Plan*. Prepared for Boral Resources (NSW) Pty Ltd by EMM Consulting Pty Ltd.

EMM 2018, Dunmore Hard Rock Quarry Flora and Fauna Management Plan. Prepared for Boral Resources (NSW) Pty Ltd by EMM Consulting Pty Ltd.

OEH 2016, Re: Dunmore Hard Rock Quarry Modification 8 (DA 470-11-2003 MOD 8). Letter to Department of Planning and Environment from the Office of Environment and Heritage, dated 22 August 2016 (DOC16/419954).

Appendix B

Vegetation clearing protocol

B.1 Vegetation clearing protocol

B.1.1 Purpose and objective

The purpose of this pre-clearing and clearing procedure is to describe how Boral and its Contractors propose to manage clearing activities so as to minimise impacts on biodiversity.

The key objective of this procedure is to describe the management measures that will be implemented during pre-clearing and clearing activities so as to ensure that these activities are conducted with minimum impact to the environment.

B.1.2 Training

All personnel taking part in construction activities shall be informed through the site-specific induction, prestart briefing or other targeted training of the importance of clearing limits and the significance of the surrounding environment.

All personnel involved in the clearing activities would be subject to toolbox training and a prestart meeting which discusses the clearing for the day; limits of clearing; processes to follow; known or potentially occurring threatened species and sensitive areas; and the locations of significant habitat features within and adjacent to the construction areas.

B.1.3 Internal approval

Prior to undertaking any clearing, Boral employees and contractors will:

- call the Regional Environmental Manager;
- if requested, complete Part A of the Vegetation Clearing/Ground Disturbance Form (Appendix B.2); and
- the Vegetation Clearing/Ground Disturbance Form will be assessed and approved in Part B, C and D.

This approval must be in place prior to clearing. During clearing, Boral employees and contractors will implement all controls outlined in Part C o the approved form.

B.1.4 Pre-clearing

The following is to occur prior to clearing:

- An ecologist will be engaged for the project.
- The extent of clearing required for construction and permanent infrastructure shall be confirmed on a survey plan and approved by Boral.
- Clearing Limits/Exclusion Zones will be established at least prior to clearing commencing and will include the following:
    - For environmentally sensitive areas: ‘no-go’ zone fencing and signage is to be installed.
    - In other areas the clearing limits will be delineated using signage and highly visible barrier or tape such as flagging, bunting, nightline or other similarly robust and durable material with reflective strips periodically along its length.

- Tree protection zones (TPZs) will be set up around all trees retained within and adjacent to the disturbance footprint using signage and highly visible barrier or tape such as flagging, bunting, nightline or other similarly robust and durable material with reflective strips periodically along its length and designated as 'no-go' Zones.

- Delineation will be installed consistently through the project to mark boundaries and sensitive areas using signage and highly visible barrier or tape such as flagging, bunting, nightline or other similarly robust and durable material with reflective strips periodically along its length and designated as 'no-go' Zones to reduce the risk of error or misinterpretation of boundaries.

- An inspection identifying the species and locations of weeds will be undertaken by the project ecologist.
- Consultation with the ecologist will occur to determine the location of suitable habitat for fauna release.
- An ecologist will undertake a pre-clearing walk through the proposed clearing areas prior to the commencement of clearing. The ecologist will:

  - Check for the evidence of presence of threatened flora and fauna species.

  - Flag key habitat features, including (but not limited to) nests, hollow bearing trees or large logs using signage and highly visible barrier or tape such as flagging, bunting, nightline or other similarly robust and durable material with reflective strips periodically along its length and designated as 'no-go' Zones. GPS coordinates for all habitat trees identified will be recorded during the pre-clearing survey.

  - Confirm nearby habitat suitable for the release of any that may be encountered during clearing works.

- A check to ensure exclusion zones have been delineated and any vegetation to be retained are clearly marked using signage and highly visible barrier or tape such as flagging, bunting, nightline or other similarly robust and durable material with reflective strips periodically along its length and designated as 'no-go' Zones
- A check to ensure clearing limits and other delineation required to be installed prior to clearing, is in place.
- The project ecologists should capture and/or remove fauna that have the potential to be disturbed as a result of clearing activities. Relocate identified fauna into pre-determined habitat identified for fauna release.
- Inform clearing contractors of any changes to the sequence of clearing if required.
- Contact a wildlife carer or veterinarian to inform them of vegetation clearing works upcoming
- Prior to any disturbance of waterway banks, a thorough inspection by a qualified ecologist will be undertaken for aquatic fauna and frogs.
- The supervisor, operator and environmental advisor are to walk the clearing footprint prior to commencing clearing.
- The Vegetation Clearing/Ground Disturbance Form is to be approved prior to clearing commencing.

B.1.5 Vegetation clearing

A two-stage habitat removal process will be implemented and involve the following steps.

i Stage 1 – Non-habitat tree removal

Where no areas of habitat have been identified to be cleared, clearing can be undertaken in a single-stage process, and includes the under-scrubbing of non-habitat trees, shrubs and other vegetation.

When vegetation that may provide habitat for native fauna is proposed to be removed, the area will be surveyed by the project ecologist immediately prior to clearing, to:

- Obtain updated information on fauna and fauna habitat resources present:
  - inspection of trees for any new nests constructed since the pre-clearing surveys; and
  - inspection of hollow logs and wood debris for the presence of any sheltering fauna.
- Identify any fauna that may have moved into the project area since the initial pre-clearing inspection.
- Capture and relocate non-mobile fauna, such as reptiles and frogs and key habitat features such as active bird nests.
- If not already available, record the details for all Hollow Bearing Trees (HBTs) and trees containing threatened fauna and flora include GPS location, species, type of habitat feature, size of hollow and type of hollow.

All non-habitat vegetation should be removed first, and the area left for 24-48 hours to allow fauna to move on.

This allows respite between the initial disturbance and the final removal of habitat. The changed environment along with the disturbance should encourage resident fauna to individually relocate without human handling. The timing should allow resident fauna at least 24-48 hours after removal of non-habitat trees to vacate remaining habitat trees.

ii Stage 2 – Habitat tree removal

Following removal of all non-habitat vegetation, habitat vegetation can be removed in accordance with the following:

- Nests and on-ground logs will be carefully inspected by an ecologist. Logs should be carefully rolled and inspection beneath the log undertaken.
- Habitat trees (trees with hollows or nests) will be carefully lowered to the ground with minimal impact and nests and hollows inspected by the ecologist.
- Any fauna species are to be relocated to habitat identified during the pre-clearing process or, if injured, transported to a veterinarian or wildlife carer.
- Hollows will be placed in adjacent habitat until the following day for further inspection by a project ecologist to verify no fauna is present. Hollow bearing trees and any other cleared vegetation regarded as valuable for relocation and habitat creation/enrichment are to be retained.

- Records are to be kept of all fauna rescue events including locations to where fauna have been relocated. Provide GPS coordinates for such events
- Stockpiling/storage of cleared timber are to be in designated areas and outside the critical root zone of remaining trees.

B.1.6 Post clearing report

Post clearing reports will be compiled following any clearing and retained as a record that this vegetation clearing protocol has been followed. The completed reports will include:

- The name and qualifications of the ecologist or wildlife carer present during clearing.
- An assessment of the habitat and handling of fauna.
- Information on clearing operations, dates, procedures, areas.
- Live animal sightings, captures, any releases or injured/shocked wildlife.
- Any dead animals located.
- Photographs of rescued fauna.

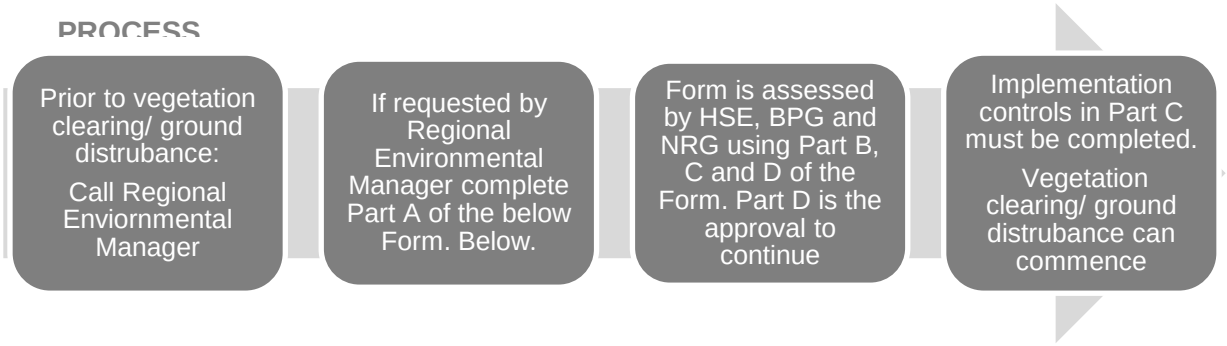
B.2 Vegetation Clearing/Ground Disturbance Form

Form

8-08 Ecosystems and Biodiversity Management

FORM 1. Vegetation Clearing / Ground Disturbance Form

PROCESS



PART A	Vegetation Clearing / Ground disturbance details	This section to be completed by: Site Manager
Site:		**{type text here]**
Requestor Name and Position:		
Date of request:		
Proposed timing of the vegetation clearing/ ground disturbance:		
Purpose of vegetation clearing/ ground disturbance:		
Description and location of vegetation clearing/ ground disturbance:		
Proposed clearing methods and controls. I.e.: • Method and equipment to be used • Survey, mark out vegetation and/ or peg area • Install Sediment and Erosion Controls • Engage Fauna Spotter and Catcher • Commission Aboriginal Cultural Heritage Survey		
Attachments (i.e. map, photos, plans)):		*[Insert text and images here or list larger images appended to this request]*

PART B	Approval Review Checklist	This section to be completed by: Environment, BPG and NRG

Checklist	Is the site compliant (yes/ no/ comments)	List action if required Refer PART C
NRG – QUARRIES ONLY		
Is the proposed clearing/ ground disturbance consistent with the approved Mine Operating Plan (MOP) or other mine regulator documentation?		
BPG		
Are the required approvals in place for the proposed clearing/ ground disturbance activities (local, state/ territory, federal government levels)? Refer to Attachment 2 for region specific approvals		
Is the clearing in accordance with the approved Clearing Plans?		
Have relevant pre-clearance consent conditions been satisfied?		
Are the clearing/ ground disturbance within the Boral property boundaries?	.	
Is there a requirement for Offsets? If so have the offsets been legally secured?		
Have we adequately discharged our Duty of Care under the Cultural Heritage legislation (i.e. agreement or Due Diligence) and have any pre-clearing conditions been satisfied?		
Environment		
Have relevant Environment approval and Environment Permit Planner (EPP) requirements been completed?		
Has Site proposed appropriate sediment and erosion control measures?		
Has Site proposed appropriate fauna/ protected flora management?	.	
Has Site proposed adequate method of vegetation clearing and appropriate disposal?		

PART C	Actions/Controls			This section to be completed by: Environment, BPG and NRG
No.	**Implementation Action/Control**	**Timing (prior to and post clearing)**	**Responsibility**	**Evidence required**
1				
2				

PART D	Authorisation	This section to be completed by: Environment, BPG and NRG	
Position	**Name**	**Signature**	**Date**
Regional Resources Manager, NRG			
Regional Environment Manager, HSE			
Planning and Development Manager, BPG			
Operations Manager or General Manager			

ATTACHMENT 1 - Process

The following process must be followed prior to undertaking any vegetation clearing or ground disturbance activities. Vegetation includes, but is not limited to, trees, shrubs, grasslands, wetlands and re-growth. Ground disturbance means undertaking activities that physically impact previously undisturbed areas. This process is managed by the Regional Environment Manager (REM).

Step	Responsible	Actions
1	Site Manager	1.1 Site Manager to **call** the Regional Environment Manager (REM)and explain what vegetation clearing and/ or ground disturbance is planned
2	Environment Manager	*2.1* REM to determine if the Vegetation Clearing/Ground Disturbance Assessment and Approval Form are required to be completed. *Most activities will require the form to be completed however some, such as clearing some weeds, will be exempt.* 2.2 If the form is **not** required the REM will advise the Site Manager they can commence vegetation clearing and/ or ground disturbance – and follow up with an email. 2.3 If a form **is** required, the REM shall provide Site Manager the form and explain the process (as outlined below) 2.4 REM to record all requests in the register
3	Site Manager	3.1 Site Manager to complete ***PART A*** of the form and send to the REM with any attachments
4	Environment Manager	4.1 REM to upload the form onto the collaboration page and email relevant BPG and NRG Managers that the form has been uploaded
5	Environment, BPG & NRG Manager	5.1 REM, BPG and NRG Managers to complete ***PART B, PART C*** and ***PART D*** of the form and notify Environment Manager when it is complete
6	Environment Manager	6.1 REM to send completed form to Site Manager and if required discuss the implementation actions (including any evidence required prior to commencing clearing/ ground disturbance)
7	Site Manager	7.1 Site Manager to **complete** any **implementation actions from PART C** as per the timing schedule and obtain evidence required. Evidence shall be provided to Environment Manager 7.2 Site Manager to complete vegetation clearing/ ground distance in accordance with the form.
8	Environment Manager	8.1 REM to file completed form and evidence

ATTACHMENT 2 – Region specific approval requirements

State	Approvals to be considered
ACT	• Clearing laws are regulated predominantly by the Nature Conservation Act 2014 (ACT). • Environment, Planning and Sustainable Development Direcorate - The Executive Director of Policy holds the office of the Conservator of Flora and Fauna. • Written approval from the Conservator required as a part of Development approval/variation.
NSW	• Department of Planning and Environment Development Approval • Local Land Services Clearing Approval • NSW Office of Water Controlled Activity Approval (CAA) for disturbance of any land within 40m of a watercourse • Local Council Vegetation Clearing Approval
NT	• Department of Primary Industry and Resources (DPIR) Mining Managament Plan. • Departmeent of Lands, Planning and the Environment Clearing Permit (Freehold land) • Pastoral Land Board Clearing Permit (Pastoral leases) • NT Environment Protection Authority (NTEPA) Ministerial Statement (State based assessment) • Department of the Environment and Energy (DoEE) National EPBC Approval
QLD	• MCU DA • OPW Vegetation Clearing • Local Law Permit Vegetation Clearing • NCA Permit or Exemption • EPBC Act/ Referral/ Exemption
SA	• Clearance approval under Section 28 of the Native Vegetation Act 1991 • Council / Local Laws / Permits for tree and vegetation removal
TAS	• Council / Local Laws / Permits for tree and vegetation removal • Certified forest practices plan to authorise land clearing for clearing forest or clearing and converting threatened native vegetation communities
VIC	• Council / Local Laws / Permits for tree and vegetation removal • EPBC Act/ Referral/ Exemption
WA	• Department of Mines, Industry Regulation and Safety (DMIRS) Mining Proposal (Tenements only) • Local Government Extravtive Industry Licence and Development Approval (Private land only) • Department of Water and Environment Regulation (DWER) Clearing Permit • Environment Protection Authority (EPA) Ministerial Statement (State based assessment) • Department of the Environment and Energy (DoEE) National EPBC Approval

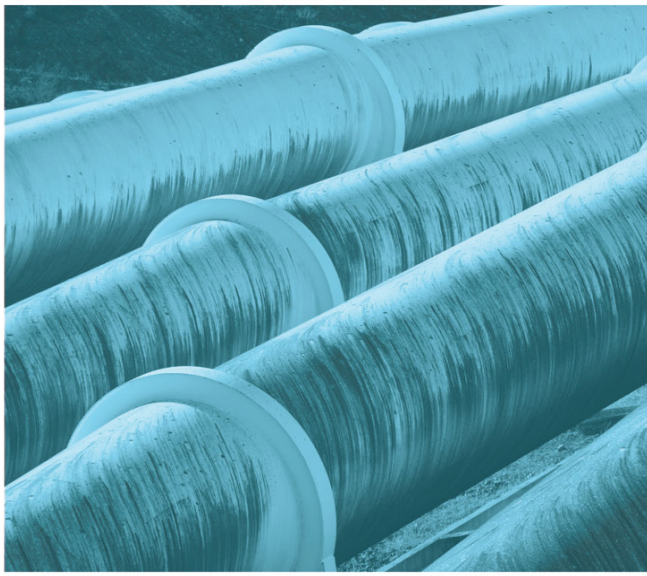
Appendix C

Rehabilitation management plan

Dunmore Hardcore Rock Quarry

Rehabilitation Management Plan

Prepared for Boral
June 2019



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Dunmore Hardcore Rock Quarry

Rehabilitation Management Plan

Report Number

B190242 RP1

Client

Boral

Date

14 June 2019

Version

v1 Final

Prepared by

Nardia Grant
Associate Rehabilitation and Closure
14 June 2019

Approved by

Michael Frankcombe
Associate Director
14 June 2019

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

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1 Introduction

1.1 Background

The Dunmore Hard Rock Quarry (DHQ), owned and operated by Boral Resources (NSW) Pty Ltd, is located at Tabbita Road Dunmore, approximately 12 kilometres north-west of Kiama in the Shellharbour Local Government Area. The quarry produces hard rock which is crushed to produce coarse aggregates and road construction materials, and fines that are used as manufactured sand or bedding material.

Development Consent (DA 470-11-2003), issued 19 November 2004 by the Minister for Infrastructure and Planning, authorises Boral to produce up to 2.5 million tonnes of hard rock a year (Mtpa), and transport it offsite by road and rail to local and regional markets.

The project approval requires the preparation and implementation of a number of management plans to guide the environmental management of the development throughout its operational life. In accordance with Condition of Approval (CoA) 54, a Flora and Fauna Management and Rehabilitation Plan (FFRMP) was prepared by Cumberland Ecology for Boral in 2009.

Since consent was issued in November 2004, there have been several approved modifications (with conditions), as detailed below:

1. Modification 1 - December 2005
2. Modification 2 – June 2006
3. Modification 3 – May 2008
4. Modifications 4 and 5 – November 2008
5. Modification 6 – Increased extraction area and road haulage, February 2014.
6. Modification 7 – Proposed Blending Plant – December 2015.
7. Modification 8 – November 2016
8. Modification 9 -September 2017
9. Modification 10-June 2017
10. Modification 11-September 2018 (Appendix A)

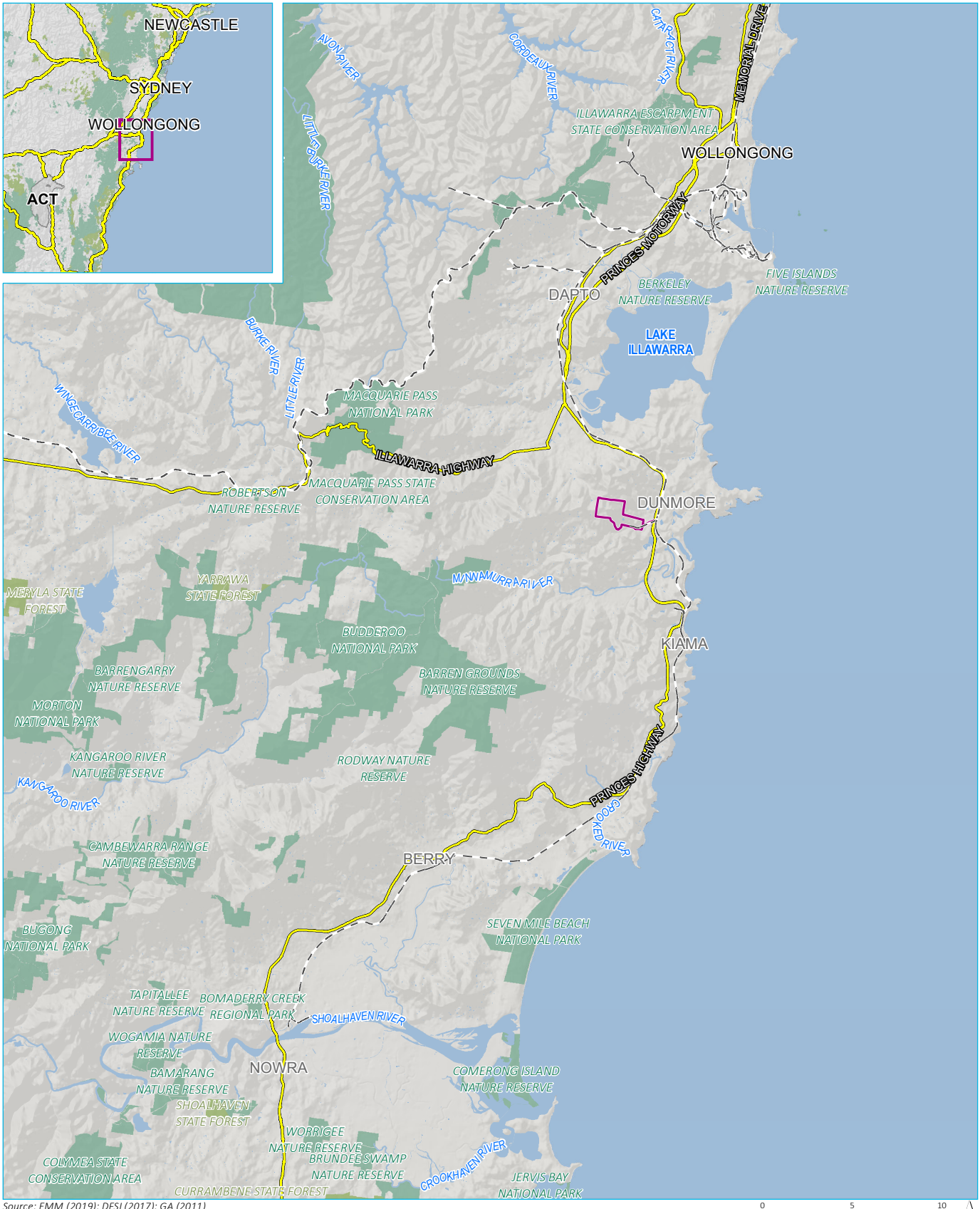
Boral have requested that the existing Rehabilitation Management Plan (previously included within the 2009 FFRMP) be updated, in accordance with the current quarry activities, existing management of vegetated areas and future rehabilitation of the site to support complementary landforms and landuses post quarrying operations. EMM consulting have updated an existing Rehabilitation Management Plan and acknowledge that the majority of this report is the work of Arcadis Australia Pacific (2016).

1.2 Project description

Dunmore Hard Rock Quarry (the site) covers approximately 245.4 hectares and is surrounded by private property, predominantly agricultural grazing land and tracts of remnant native vegetation, to the south, north and west (Figure 1.1). Dunmore Soil and Sand Quarry adjoins the site to the east.

DHQ produces hard rock from Bumbo Latite Member, a fine-grained intermediate volcanic rock similar to basalt, which is crushed to produce coarse aggregates, road construction materials and fines. Extraction occurs from four discrete areas: Original Quarry, Croome Farm Pit, Croome West Farm Pit and Rail Infrastructure Corporation land (RIC Slot). These areas are described in further detail in Section 3.1.

The extraction method involves drilling and blasting to produce broken rock, that is transported to the primary crusher feed bin. The primary-crushed rock is further reduced in size in a series of crushers, before being conveyed to the tertiary screen house where the crushed rock is sized according to product specifications. The sized products are then stockpiled within the various stockpile areas on site, until they are transported by road and rail to local and regional markets. A detailed description of DHQ's operations is provided by *Environmental Impact Statement for the proposed Dunmore Quarry Production Increase* (Corkery & Co 2003).



Source: EMM (2019); DFSI (2017); GA (2011)

0 5 10 km

GDA 1994 MGA Zone 56

N

Site locality

Project

Rail line

Main road

NPWS

State

Dunmore Hard Rock Quarry
Rehabilitation management plan
Figure 1.1

EMM
creating opportunities

\\Emmsvr1\emm\Jobs\2019\B190242 - Dunmore Quarry Rehabilitation plan update\GIS\02_Maps\G001_SiteLocality_20190611_01.mxd 11/06/2019

1.3 Purpose and Objectives of the Plan

The purpose of this Rehabilitation and Management Plan (RMP) is to meet the requirements of summary environmental management measures and Development Consent conditions applicable to rehabilitation. This RMP has been prepared in accordance with Schedule 3, Condition 54 of DA 470- 11-2003. The overall objectives of the RMP, as derived from these conditions, are to describe:

1. The disturbed area at the site

2. The short, medium and long term rehabilitation measures for the site that would be implemented

3. The measures that would be implemented over the next five years, including the procedures to be implemented for:

    - Ensuring compliance with the rehabilitation objectives and progressive rehabilitation obligations in this approval

    - Optimising the use of available weathered rock and soil as a substrate for vegetation.

4. A final stable landform able to support a range of suitable alternative final land uses

5. The management actions that will minimise the environmental impacts of site operations and to ensure the progressive rehabilitation is completed as soon as possible

6. Who would be responsible for monitoring, reporting, reviewing and implementing the plan.

Additionally, this RMP provides a single operational document that clearly identifies key management objectives and actions to be implemented, the proposed schedule for implementation or the monitoring and review of commitments.

1.4 Alignment with Other Plans

This document builds upon the information included in the former *Flora and Fauna Management and Rehabilitation Plan* prepared by Cumberland Ecology (2009) and existing Rehabilitation Management Plan prepared by Arcadis 2016.

A number of other management plans apply to the DHQ Site and the RMP including the Water Management Plan (EMM 2019) and Flora and Fauna Management Plan (FFMP) (EMM, 2019). The management actions in these plans complement these plans and as such management actions comprised within these require holistic consideration.

1.5 Document Structure

The structure of this Rehabilitation Management Plan (RMP) is outlined in Table 1.1.

Table 1.1 Structure of the Rehabilitation Management Plan

Section	Content
1	Provides an overview of the project, previous environmental assessments of the Project, and the purpose and scope of this plan.
2	Details the statutory requirements for the Plan as outlined in the Conditions of Approval issued by the NSW Department of Planning and Infrastructure and other legislative requirements.
3	Describes the existing environment of the site, including biodiversity values contained within the site and the various conservations areas in which management actions are proposed
4	Describes the management actions to be undertaken to effectively implement and manage the rehabilitation values of the study area.
5	Summarises the rehabilitation management actions to be undertaken
6	Specifies the environmental induction training delivered to all staff and subcontractors involved in the Project.
7	Outlines the requirement pertaining to contingency planning, including emergency incident reporting and management.
8	Outlines the monitoring, reporting and review requirements pertaining to rehabilitation management within the study area.

2 Relevant Legislation, Guidelines and Plans

2.1 Legislation

Key environmental legislation relating to rehabilitation management includes:

- Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
- NSW Threatened Species Conservation Act 1995 (TSC Act)
- NSW Fisheries Management Act 1994 (FM Act)
- NSW Environment Planning and Assessment Act 1979 (EP&A Act)
- NSW Protection of the Environment and Operations Act 1997 (POEO Act)
- NSW National Parks and Wildlife Act 1974 (NPW Act)
- NSW Noxious Weeds Act 1993 (NW Act)
- NSW Native Vegetation Act 2003 (NV Act)
- NSW Water Management Act 2000 (WM Act)
- Mining Act 1992
- Illawarra Regional Environmental Plan No. 1
- Shellharbour Local Environmental Plan 2013
- Shellharbour Rural Local Environmental Plan 2004

2.2 Guidelines

Department of Industry Resources and Energy *ESG3: Mining Operations Plan (MOP) Guidelines, September 2013* provides guidance in the preparation of Mine Operations Plans (MOP), Mine Closure Plans (MCP) and Annual Reviews (AR). The guideline document aims to enable mining activities throughout NSW to proceed safely, efficiently extract resources, protect the environment and deliver a rehabilitated landform at the completion of mining activities.

This Rehabilitation Management Plan aligns with the intent of this Guideline document.

The rehabilitation process requires the establishment of a performance framework in order to measure the success of the rehabilitation process and to facilitate a consistent approach. The ANZMEC (Australian and New Zealand Minerals and Energy Council) Strategic Framework (2000) provides a framework for rehabilitation and performance assessment for mining operations.

The performance framework should cover the following:

- Rehabilitation principles and objectives, including final land use;
- Decommissioning requirements;
- Community objectives and criteria;
- Consent criteria;
- Standards and issues related to whole-of-life considerations;
- Financial costing and provisioning;
- Legal requirements;
- Environmental and social management requirements; and
- Safety considerations.

2.3 Conditions of Approval

The quarry operates under a Ministerial consent granted on 19 November 2004 issued for the Development Application DA 470-11-2003. Since the consent was issued there have been several approved modifications (with conditions), as detailed below:

- Modification 1 - December 2005
- Modification 2 – June 2006
- Modification 3 – May 2008
- Modifications 4 and 5 – November 2008
- Modification 6 – Increased extraction area and road haulage, February 2014
- Modification 7 – Proposed Blending Plant – December 2015.
- Modification 8 – November 2016
- Modification 9 -September 2017
- Modification 10-June 2017
- Modification 11-September 2018

A number of the Ministers Conditions of Approval (MCoA) from the NSW Department of Planning and Infrastructure (February 2014) are relevant to this Plan and have been considered in its preparation. An overview of how this plan addresses MCoA requirements applicable to rehabilitation is outlined in Table 2.1

Table 2.1 Rehabilitation Management Plan MCoA Compliance Requirements

Condition of Approval	Condition Requirements	Where addressed in this document
Rehabilitation Management Plan		
3(54)	Within 6 months of the date of this consent, the Applicant must prepare, a Rehabilitation Management Plan for the site to the satisfaction of the Secretary. This plan must:	This Plan
	(a) identify the disturbed area at the site;	Section 3
	(b) describe in general the short, medium, and long- term measures that would be implemented to rehabilitate the site;	Section 4
	(c) describe in detail the measures that would be implemented over the next 3 years to rehabilitate the site; and	Sections 4 and 5
	(d) describe how the performance of these measures would be monitored over time.	Section 7
	The Applicant must implement the approved management plan as approved from time to time by the Secretary.	Section 7
Rehabilitation and Conservation Bond		
3(55)	Within 6 months of the date of this consent, the Applicant must lodge a rehabilitation and conservation bond with the Department to ensure that the conservation commitments and rehabilitation of the site are implemented in accordance with the performance and completion criteria set out in the relevant plans and the relevant conditions of this consent. . The sum of the bond must be an amount agreed by the Secretary and determined by: a) Calculating the full cost of implementing the compensatory habitat area (see Condition 49 above) and the offset areas (see condition 50A). b) Calculating the cost of rehabilitating all disturbed areas of the site, taking into account the likely surface disturbance over the next 3 years of quarrying operations (see condition 54) and Employing a suitably qualified quantity surveyor or the expert to verify the calculated costs.	Section 6

Table 2.1 Rehabilitation Management Plan MCoA Compliance Requirements

Condition of Approval	Condition Requirements	Where addressed in this document
3 (56)	The Rehabilitation and Conservation Bond must be reviewed and if required, an updated bond must be lodged with the Department within 3 months following an update or revision to the Flora and Fauna Management Plan or the Rehabilitation Management Plan, or following the completion of an Independent Environmental Audit. This review must consider the: a) effects of inflation; b) likely cost of implementing the compensatory habitat area and offset areas and rehabilitating all disturbed areas of the site (taking into account the likely surface disturbance over the next 3 years of the development); and c) performance of the implementation of the compensatory habitat area and offset areas and rehabilitation of the site to date.	Section 6

2.4 Licences and permits

2.4.1 Environmental Protection Licence

The Environment Protection Authority (EPA) issues environment protection licences to the owners or operators of the extraction industry under the *Protection of the Environment Operations Act 1997* (POEO Act). Licence conditions relate to pollution prevention and monitoring, and cleaner production through recycling and reuse and the implementation of best practice. All licence holders must:

- Comply with the conditions of their licence
- Prepare pollution incident response management plans
- Publish and/or make pollution monitoring data available.

Dunmore Quarry operates in accordance with Environmental Protection Licence No. 77. This licence is renewed annually (Anniversary Date is 31 August) and includes specific criteria that need to be satisfied with respect to blasting, dust and water monitoring, and annual environmental returns and reporting.

3 Site Context

3.1 Site Description

The site covers approximately 245.4 hectares and includes the existing hard rock extraction areas, processing plant, stockpiles of sized products, a workshop and maintenance area, the rail siding and product loading area, several dams, administration buildings, a carpark and weighbridge (Figure 3.1). The site also contains a concrete batching plant, which operates under a separate development consent granted by Shellharbour City Council on 4 December 1997. These operational areas are surrounded by a mosaic of large remnants of native vegetation and expanses of cleared and disturbed grassland.

Historically, extraction has occurred in an area known as the Original Quarry. Extraction operations are currently centred on the Croome Farm Pit and Croome West and Rail Infrastructure Corporation (RIC) Slot extraction areas (Figure 3.1). The addition of the Croome West Farm pit now includes an extraction area of 69.77 ha.

The project area relates to the lots subject to quarry's development consent (Development Consent 470-11-2003) containing five cadastral lots. Which include:

- Lot 2 in Deposited Plan (DP) 224597, containing the Croome Farm Pit;
- Lot 1 in DP 224597, the location of the Croome West Pit;
- Lot 1 in DP 1002951, the Rail Corp extraction area;
- Lot 4 in DP 227046, a heavily vegetated area south of the quarry; and
- Lot 3 in DP 1030504, the location of the Original Quarry, currently used for stockpiling and processing.

Lot 1 in DP 1002951 is owned by Rail Corp (Sydney Trains) with the remaining land owned by Boral.

3.1.1 Original Quarry

Extraction from the Original Quarry, located on Boral-owned land, commenced in 1921. The original quarry contains approximately 2.5 million m^3 of breccia- agglomerate above approximately 12 Mt of latite in the lower flow. Extraction involves 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. There is no limit on the extraction rate from the original quarry.

The existing extraction floor in the Original 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 Quarry have been retained to assist in screening exposed extraction faces and stockpiled by-products on the quarry floor (Corkery & Co 2003).

3.1.2 Croome Farm Pit

The western area, referred to as Croome Farm Pit extraction area, is owned by Boral. Extraction and commenced extraction in this area in 2000. Approximately 12Mt remains in the Croome Farm Pit extraction area. The resource within the Croome Farm Pit extraction area is calculated to the current approved depth of extraction of 107mAHD.

Extraction within Croome Farm Pit will continue to target the upper and middle latite flows. The design of the approved extraction area provides for the creation of three benches in the upper and middle flows in the Croome Farm Pit extraction area. Development Consent No. 168/1994 (am 1) allows an extraction rate of 750 000tpa (Corkery & Co 2003).

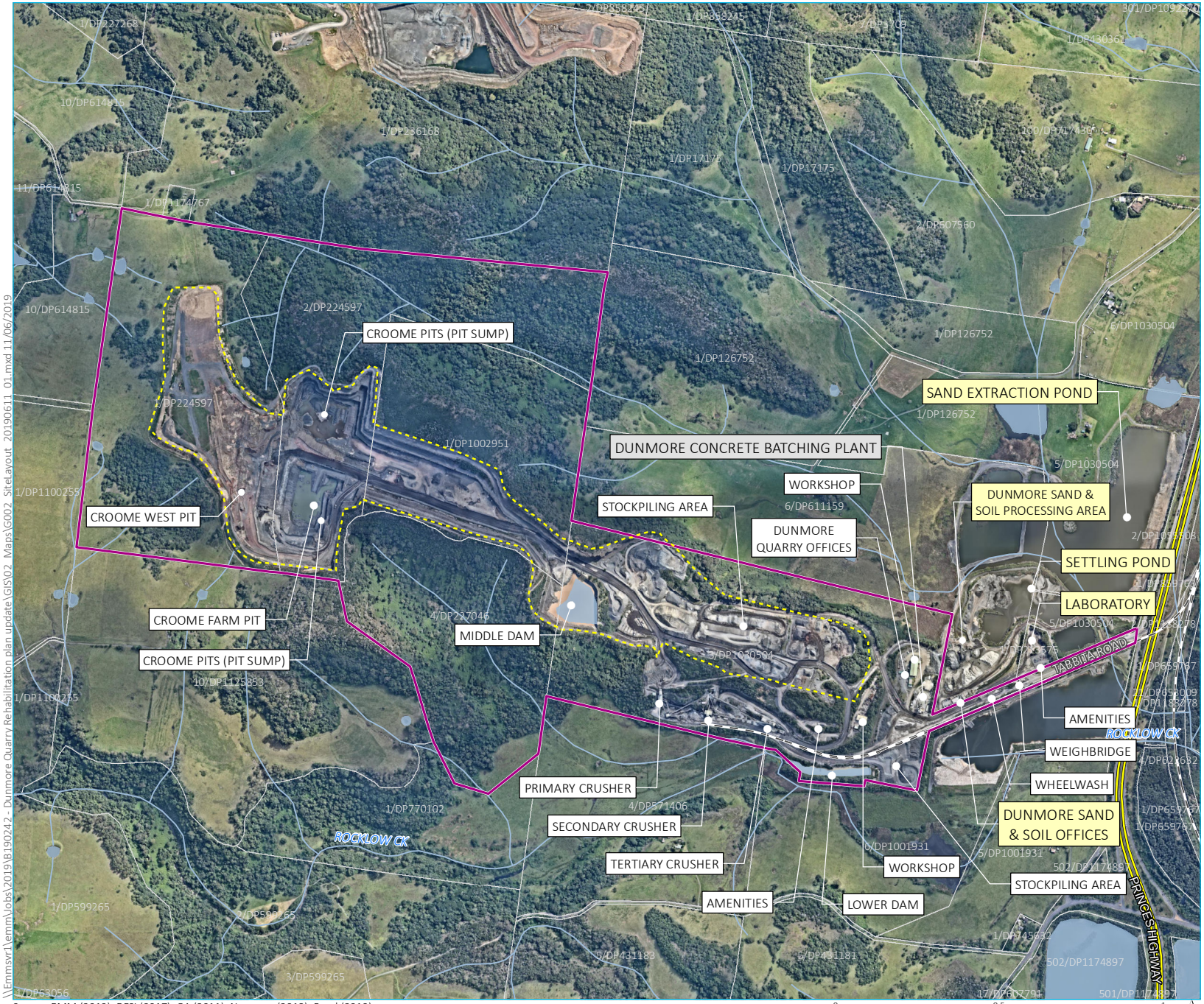
3.1.3 Croome West Pit

The Croome West extraction will take place according to forecast demand for hard rock and the first stage of the pit extension will include the removal of 34 Mt of rock and will proceed from the existing Croome Farm Pit, in a westerly direction. The design will have bench heights of 15 m consistent with bench heights within the Croome Farm Pit. The pit floor will range from 60 mAHD on the eastern side to 68 mAHD on the western side. The Environmental Authority for the Modification indicates approximately 130,000 cubic metres (m^3) of overburden (including 64,800m^3 free dig material and 62,200m^3 of weathered hard rock), located in the Croome West Area.

3.1.4 Rail Infrastructure Corporation (RIC) Slot

The central extraction area, referred to as RIC Slot extraction area, is 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 Pit extraction area. Extraction within RIC Slot land will continue to target the upper and middle latite flows, with approximately 5 Mt remaining in the RIC Slot extraction area. Development Consent No. 161/1986 allows an extraction rate of 450 000tpa.

The extraction floor levels within the RIC Slot 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 Pit extraction area. The extraction faces in the RIC Slot extraction area are typically 15 to 17m high. It should be noted, at the time of updating this plan, the agreement for Boral to rehabilitate the Rail and Infrastructure Corporation (RIC) slot no longer exists.



KEY

- Project area
- Approved extraction boundary
- Rail line
- Main road
- Watercourse/drainage line
- Waterbody
- Cadastral boundary

Note: Dunmore Concrete Batching Plant and Sand & Soil processing operations are not part of the quarry operation

Source: EMM (2019); DFSI (2017); GA (2011); Nearmap (2018); Boral (2019)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

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Site layout

Dunmore Hard Rock Quarry
Rehabilitation management plan
Figure 3.1

EMM
creating opportunities

3.2 Land Use

The majority of land surrounding the site is owned by Boral and Holcim, another other quarry company. A number of rural properties also adjoin the site. Land use in the surrounding locality includes:

- Agricultural land to the north and south, dairying is the major current agricultural enterprise in the locality (DECCW 2011).
- Commercial and industrial development, including Dunmore Sand and Soil Quarry immediately to the east, and Holcim Australia's Albion Park Quarry to the north.
- Residential development, including Dunmore Lakes Estate to the south, Shell Cove and Shellharbour to the north-east.
- Infrastructure development, including the Princes Highway and the South Coast Rail Line to the east.
- SEPP wetland no.374a, located on the eastern side of the Princes Highway.

3.3 Climate

Wind speed and direction data recorded at the quarry's meteorological station show the annual recorded wind pattern is dominated by south-westerly airflow with a less frequent north-easterly airflow also experienced. The strongest wind speeds recorded are most frequently experienced from the north-east. The average recorded wind speed for the analysed period was 2.9 m/s, with a frequency of calm conditions (wind speeds less than 0.5 m/s) occurring in the order of 13% of the time. Seasonal and diurnal variation in wind speed and direction is evident in the recorded data from the quarry's meteorological station.

Monthly mean minimum temperatures are in the range of 9°C to 18°C, with mean maxima of 17°C to 25°C, based on the long-term average record from the BoM Kiama Bowling Club weather station. Peaks occur during summer months with the highest temperatures typically being recorded between December and February. The lowest temperatures are usually experienced between June and August.

The area is characterised by high rainfall, with a mean annual rainfall of approximately 1,250 mm, and an annual rainfall range between 600 mm and 2,715 mm. Rainfall is most pronounced in late summer to early winter months, peaking in March. According to the long-term records, an average of 125 rain days occur per year.

3.4 Topography

The regional topography rises from coastal flats to the east of the quarry to the range where the quarry is situated. Further to the west, this range descends to a shallow and broad valley that lies at the foot of a larger rise to the Southern Highlands region of the Great Dividing Range. Macquarie Rivulet flows through this valley.

The site is located amongst the undulating topography of the lower slopes of the Illawarra escarpment, on two hills known locally as Locking Hill and Gooseberry Hill. The quarry is set on a north south-west trending range. The northern and southern boundaries of extraction activities align with the crests of steep slopes, which have been retained to reduce impacts on visual amenity into the site (Corkery & Co 2003).

The majority of the site has 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 area, and 2mAHD at the weighbridge and office complex (Corkery & Co 2003).

3.5 Geology and Soils

The quarry is situated in the south-eastern corner of the Permo-Triassic Sydney Basin. The Sydney Basin predominantly comprises Permian and Triassic aged sedimentary rocks. In the vicinity of the quarry the Triassic and Late Permian sedimentary rocks have been eroded and early Permian Gerringong Volcanics of the Shoalhaven Group dominate (*Geology of the Wollongong, Kiama and Robertson 1:50,000 Sheet,* Department of Mines 1974). Overburden in essentially weathered latite.

Landscape and soil characteristics are similar across the Croome Farm and Croome Farm West Pit area with the soils being Acidic-Sodic Eutrophic Dermosols. Soils are medium acid to strongly acid, with high to low levels of organic carbon (with depth), low salinity and a moderate fertility. The B horizons are moderately sodic and contained elevated exchangeable aluminium (consequence of strong acidity). Further details on soils can be found in the soils and land capability assessment in the EIS.

3.6 Hydrology

3.6.1 Local watercourses

The quarry is located centrally within the Rocklow Creek catchment. Rocklow Creek has an estimated 21 km^2 catchment area and generally flows in an easterly direction towards the Pacific Ocean (EMM 2017).

Downstream of the quarry, Rocklow Creek flows into an ephemeral waterbody prior to flowing beneath the Princes Highway and joining the Minnamurra River estuary, 1,500 m upstream of its outlet to the Pacific Ocean.

The western portion of the Croome West Pit is located within the upper extent of the Frasers Creek catchment, which drains west towards the township of Albion Park, before discharging to Macquarie Rivulet and Lake Illawarra.

3.6.2 Drainage and Sediment runoff

Drainage within the site is essentially subdivided into clean runoff from outside the extraction footprint and potentially sediment-laden runoff from within the extraction and infrastructure areas.

The catchment area for potentially sediment laden runoff for the site is defined by the area of disturbance, bund walls and topographic watershed lines. All dirty runoff from site components such as the product stockpile areas, workshop and maintenance area, processing area as well as the extraction area flows into one of three dams: the Croome Sumps, Middle Dam and Lower Dam. An overview of the dams is provided in the Water Management Plan (EMM, 2019). All clean runoff from the site flows into the tributaries of Rocklow Creek which is predominantly dry for most of the year (R.W. Corkery and Co., 2003).

3.7 Current Overburden Estimates and Requirements

The principal materials available for rehabilitation of all three extraction areas are shown in Table 3.1 as well as the estimated total area of benches to be rehabilitated. The figures are based on the final landform design discussed in section 4.1.1 and shown in Figure 4.1.

Table 3.1 Overburden available and required for rehabilitation

Area	Overburden Available for Rehabilitation	Recoverable Soil	Estimated Bench Length	Bench Rehabilitation Overburden Requirement
Original Quarry			4.3 km	20 000 m^3
Rail Corp Quarry Area [1]	8 960 m^3	4 200 m^3	1.5 km	8 000 m^3
Croome Farm Pit Quarry Area	110 000 m^3	10 000 m^3	6 km	30 000 m^3
Croome Farm Pit Quarry Extraction Floor				20 000 m^3
Croome West Pit Quarry Area	130 000 m^3	4,043 m^3	**1.7km**	
Whole Site (Total)	**240 000m^3**	**14,043m^3**	**12 km**	**132,200m**

[1] the RIC slot is now in ownership of RIC and not subject to rehabilitation by Boral, whole site total now reflects this.

3.8 Recent Rehabilitation Management

Most areas of the site are currently operational and as such rehabilitation is not able to commence on the majority of extraction areas until the completion of extraction activities. Progressive rehabilitation is, however, able to be carried out on areas such as final benches within the extraction areas and any disturbed areas beyond the final area of development limits. The progressive rehabilitation of the site has been undertaken in conjunction with on-going quarrying works. The rehabilitation works implemented aim to minimise risks to safely, stabilise the landform, minimise impacts upon water quality, maintain the land function capability and, where possible, create an environment comparable to the surrounding land to progressively meet the closure objectives for the site.

Rehabilitation activities undertaken to date have been in accordance with the Rehabilitation Management Plan and prepared by Arcadis in 2016 and the Flora and Fauna Management Plan also prepared for Arcadis in 2016. These plans supersede the Flora and Fauna Management and Rehabilitation Plan prepared by Cumberland Ecology (2009). Current locations of extraction include Croome Farm Pit South and Croome Farm Pit North. Concurrently, rehabilitation works have begun along the western wall of the Original Quarry and illustrated in Photographs 3.1 and 3.2 and are referred to in Figure 4.1 as 'Active rehabilitation'. Rehabilitation of the Site undertaken to date is limited to the Original Quarry. Landform construction on the western wall, adjacent the Middle Dam, is complete and soil placement has commenced.

Photograph 3.1. Looking at Rehabilitation area located in South Croome

Photograph 3.2 Looking at the South Croome Ramp area undergoing blasting and removal

4 Management Actions

4.1 Rehabilitation Management Objectives & Performance Criteria

The aim of the rehabilitation plan is to progressively encourage a sustainable vegetative cover in accordance with the rehabilitation objectives for the site as outlined in Table 4.1. Progressive rehabilitation work will be undertaken when reshaped, benched and topsoiled areas become available. Only small areas can currently be rehabilitated to avoid conflict with future extraction and sterilisation of resource production potential. Figure 4.1 provide an indication of progressive rehabilitation during operations from short-term, medium and long-term measures. Figure 4.1also shows the proposed final rehabilitation following closure of the quarry. Specific objectives associated with rehabilitation of the DHQ including the relative performance criteria are provided in Table 4.1. The performance criteria will be used to assess the progress of the rehabilitation management actions.

Table 4.1 Rehabilitation objectives and performance criteria

Time Period	Objective	Performance Criteria
Short term (< 3 years)	Minimise the environmental impact of the operation during the development and operational phases, ensuring that protection of water quality and erosion control works are key priorities, and to ensure progressive rehabilitation is completed as soon as practicable	Compliance with EPL, WMP and RMP
	Minimise visual impact of the operation during the operational phase as well as post-quarrying	Ensure visual impact controls outlined in 1994 EIS (Sinclair Knight Merz 1994) are maintained Construct Photo collection points and undertake an annual assessment.
	Ensure that site drainage and sedimentation structures remain stable and functional	No active erosion evidence, rilling, erosion, sediment deposition in drains and water retention basins
	Ensure that vegetative matter and topsoil is made available for the site rehabilitation as required	Seed and plant material required for propagation removed and appropriately stored Native vegetation topsoil stripped and stockpiled in accordance with EIS (Corkery & Co. 2002).
	Guarantee that the resource is extracted and the site rehabilitated in a manner that will ensure the quality of surface runoff at all times	No uncontrolled surface runoff or soil erosion that is unstable, degrading and/or comprises end land use objectives
Medium term (3-10 years)	Ongoing progressive rehabilitation of the benches of the quarry pit as permitted	As above
	Maintenance of established rehabilitation areas i.e. vegetation and drainage works	Vegetation established and rehabilitated areas stable Areas free of significant weed or feral animal problems

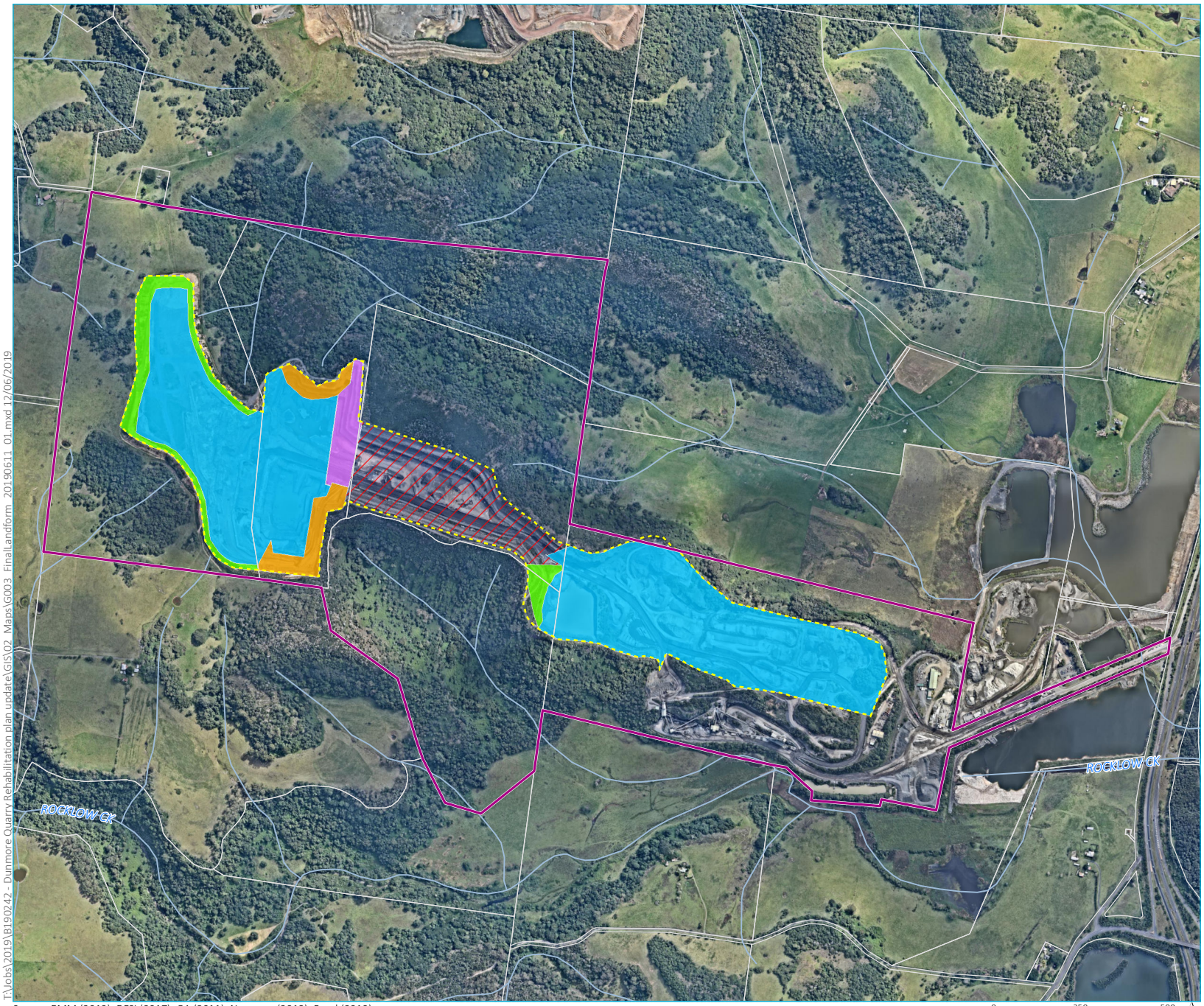
Table 4.1 Rehabilitation objectives and performance criteria

Time Period	Objective	Performance Criteria
Long term (10+years)	Produce a final landform that is geotechnically safe and stable that blends aesthetically into the surrounding landforms, yet as far as possible does not limit possible future land uses	Removal of infrastructure associated with mine related activities Safe and stable rehabilitation of final voids
	Landform design is integrated with existing landscape to provide visual continuity	

4.1.1 Final Landform

At the completion of extraction, the proposed final landform of the Project Site would comprise of a series of elongate benches, sloping extraction floors and potentially an area of the Original Quarry backfilled with breccia-conglomerate.

Once operations have ceased, all building and infrastructure will be removed from the site. These areas will be reshaped where necessary for topsoiling and revegetation. The quarry floor will be vegetated with appropriate native species in accordance with the FFMP (EMM 2019).



Project area
Approved extraction
Watercourse/drainage
Cadastral
RIC land
Active rehabilitation area
Medium-term rehabilitation (3-10 years)
Medium to long-term rehabilitation (3-10+ years)
No rehabilitation proposed as it may be extracted to recover resource in RIC/Sydney Trains land

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Source: EMM (2019); DFSI (2017); GA (2011); Nearmap (2018); Boral (2019)

0 250 500 m
GDA 1994 MGA Zone 56

N

Final landform

Dunmore Hard Rock Quarry
Rehabilitation management plan
Figure 4.1

EMM
creating opportunities

4.2 Prior to Quarry Operation

Vegetation and soil needs to be stripped in order to mine the resource. 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.

4.2.1 Vegetation Removal

Vegetation is typically removed by a bulldozer pushing and windrowing the pushed-up trees and shrubs beyond the limits of the extraction stage being cleared. This procedure is done in stages, as described in the Vegetation Clearing Protocol. The vegetation removed to date has been windrowed on the margins of the extraction area and within the regeneration area west of the Croome Farm extraction area for use in the compensatory offset or rehabilitation works.

4.2.2 Soil Removal

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

As far as possible, shallow soil and surface rock will be retrieved after removal of shrubland vegetation. This material will be transported and spread immediately on the prepared site in the CHMZ.

In the more heavily Lantana infested areas (especially under the open forest) where soil thickness exceeds 0.2m, it will be 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 will be used to assist in the revegetation of the acoustic bund wall that is being constructed progressively southwest of the Croome Farm extraction area. Any excess topsoil from the extraction areas would be stored in the original Dunmore Quarry until it is needed for rehabilitation activities.

4.2.3 Overburden Removal

Within the extraction areas, overburden is essentially weathered latite which, like the soil resources, is confined mainly to the Croome Farm and Croome Farm West extraction areas. Any overburden encountered is similarly pushed up by a bulldozer and loaded into a haul truck and transported to the nominated overburden stockpile areas. All excess overburden from the approved extraction areas 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.

4.3 Quarry Rehabilitation Procedures

The ongoing rehabilitation strategy for the quarry is to be an opportunistic progressive approach. Progressive rehabilitation will be undertaken, where possible, throughout the life of the quarry with a focus on rehabilitation of the out-of-pit emplacement areas. Rehabilitation on the majority of the extraction areas will not take place until the completion of extraction activities. Rehabilitation would be progressively undertaken, where practical, on areas such as final benches within the extraction areas and any disturbed areas beyond the final extraction area or development limits. Details of the proposed rehabilitation works during the operation of the quarry including a conceptual decommissioning plan are below. This approach will allow for rehabilitation to occur alongside excavation activities, resulting in vegetation being established in different areas of the site as areas become available following completion of excavation under the provision that these areas will not sterilise future production.

4.3.1 Overburden

All final benches will be rehabilitated through the placement of overburden and any available soil on the benches and revegetated in accordance with the FFMP (EMM 2019). The overburden will be placed on the benches in a random manner to encourage the retention of rainfall and seepage. Figure 4.2 conceptually shows the final vegetated benches.

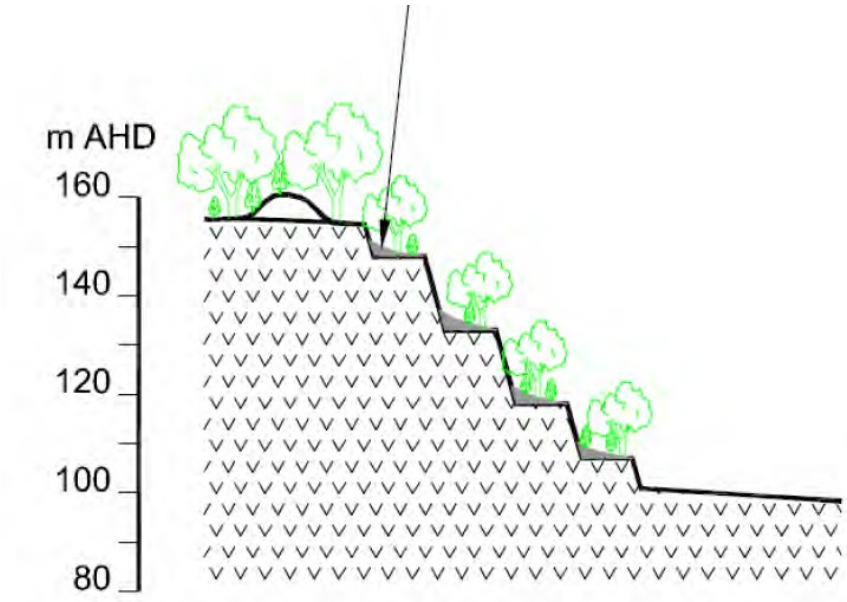

Figure 4.2 Cross Section of Extraction Bench Rehabilitation Topsoil Management

The EIS (R.W. Corkery & Co. 2005) identified that the natural soils within the remaining areas to be disturbed are confined solely to the Croome Farm Pit extraction area and of this, only 10 000m^3 of topsoil is suitable for recovery. In the Croome West Pit, only 4,043m^3 of topsoil is suitable for recovery based on the top 30cm is suitable. To ensure there are negligible impacts on the soil resources within the DHQ, the following topsoil management controls should be applied:

- Topsoil is to be carefully stripped in order to recover the seed-bearing and organic component without diluting the topsoil with subsoil, an indicative depth is 30cm.

- All stripped topsoil is to be stored onsite and relocated when appropriate.

- Soil stockpiles are typically less than 1.5m high and allowed to regenerate naturally to limit erosion and generation of sediment-laden runoff. It should be noted, that whilst the topsoil stockpiles are stored, these should be used as soon as possible for rehabilitation, or where possible to a direct return straight onto benches that required rehabilitation.

4.3.2 Surface Preparation

The ripping of soil is important in assisting rapid tree growth through deep root growth and enhanced soil -water infiltration. The ripping depth must be sufficient to penetrate any near-surface rock or clay. Inadequate site preparation and weed control are often the two biggest single factors responsible for tree revegetation failure. Thorough site preparation will be undertaken to ensure rapid establishment and growth of seedlings. All areas proposed for seeding will be deep ripped to an approximate depth of 400 – 500 mm. Where ripping on slopes is required, the ripping will be undertaken around the contour of the land at right angles to water flow.

4.3.3 Vegetation

The benches will be revegetated using species from the three vegetation communities represented on the site. In an ideal situation, higher benches in more exposed aspects would be revegetated as a simplified form of *Melaleuca Armillaris* Tall shrubland. Sheltered benches such as those with a southerly aspect would be revegetated as Illawarra subtropical rainforest, and other benches, particularly where soil is placed deeper would be revegetated as Illawarra Lowlands Grassy Woodland. The species used in revegetation works would be drawn down from Appendix B which lists species recommended in the replanting of each of the three communities.

i Illawarra Subtropical Rainforest

Illawarra Subtropical Rainforest of the site is characterised by dense canopy dominated by Coachwood (*Ceratopetalum apetalum*), Sassafras (*Doryphora sassafras*), Grey Myrtle (*Backhousia myrtifolia*) and a diversity of figs. The abundance of weeds is generally low, with the exception of localised infestations of Lantana (*Lantana camara*).

ii *Melaleuca armillaris* Tall Shrubland

Melaleuca armillaris Tall Shrubland on the site supports a low canopy dominated by *M.armillaris*, a shrub stratum is dominated by Lantana, Narrow-leaved Mint-bush (*Prostanthera linearis*), Illawarra Zieria (*Zieria granulata*), Prickly Beard-heath (*Leucopogon juniperinus*) and *Phyllanthus gasstroemii* and a groundcover dominated by Tussock Grass (*Poa labillardieri*), Weeping Grass (*Microlaena stipoides*), Golden Everlasting (*Xerochrysum bracteatum*), *Rytidosperma* spp. and Pale Fan-flower (*Scaevola albida*). Dense Lantana infestations are common along the margins of *Melaleuca armillaris* Tall Shrubland.

iii Illawarra Lowlands Grassy Woodland

Illawarra Lowlands Grassy Woodland of the site is characterised by a canopy dominated by Forest Red Gum (*Eucalyptus tereticornis*) and White-topped Box (*E. quadrangulata*), a sparse understorey dominated by Black Wattle (*Acacia mearnsii*), Sweet Pittosporum (*Pittosporum undulatum*), Veined Mock-olive (*Notelaea venosa*) and Red Ash (*Alphitonia excelsa*), a shrub layer dominated by Lantana, Green Native Cascarilla (*Croton verreauxii*), *Phyllanthus gasstroemii*, Coffee Bush (*Breynia oblongifolia*) and Illawarra Zieria and a groundlayer dominated by Creeping Beard Grass (*Oplismenus imbecillis*), Weeping Grass, Tussock Grass and Cape Ivy (*Delairea odorata*).

4.3.4 Direct Seeding Method

Direct seeding is preferred over tube stock planting as it enables a far greater success rate, limits the need for ongoing maintenance (e.g. watering) and is the most effective method in achieving a successful rehabilitation outcome. Not all native trees and shrubs are suited to direct seeding due to their innate germination requirements, therefore, it may be required to supplement with some tubestock to increase biodiversity. Hydromulching has been introduced at the site (Southern and Western areas of the bund) as a technique for slope stabilization which includes a formula of fertilizer (25g/m2 native species N:P:K=8::4:1), Native seed mix (1.0g/m2), cellulose fibre (200g/m2) crop cover (8.0g/m2), Tackifier – binder (Tackifier 5g/m2) and water to create a suitable medium for spraying onto the soil surface providing a wood fibre interlocking mat that retains moisture for seed germination.

i Native Trees and Shrubs

A mixture of native trees and shrubs endemic to the area will be sown onto the majority of the reshaped and benched pit areas following topdressing and site preparation. This tree and shrub seed will complement natural regeneration from seed contained within the soil seed bank. The seed mix used for revegetation of the disturbed quarry area will include many of the major tree and shrub species listed below:

Acacia mearsii	1.2kg
Eucalyptus amplifolia	0.3kg
Eucalytpus saligna/botroyoides	0.3kg
Indigofera australis	0.3kg
Lomandra longifolia	3kg
Melaleuca armillaris	0.3kg
Melaleuca decora	0.25kg

4.3.5 Erosion and Sediment Control

Sediment and erosion control measures will be implemented where necessary in accordance with the Water Management Plan (EMM 2019) until rehabilitation is complete. This will include any dispersion issues at the site.

4.3.6 Weed, Vermin and Feral Animal Control

Weed, vermin and feral animal control measures will be implemented in accordance with the FFMP (EMM 2019) until rehabilitation is complete.

4.3.7 Quarry Pit Rehabilitation

i Original Quarry

The main features of the final landform in the Original Quarry would include the following:

- A sloping floor covering approximately 13ha with elevations ranging from 25mAHD on the western end to approximately -20mAHD on the eastern end.
- Two to three sloping benches (5m to 10m in width) generally parallel to the sloping floor. Access ramps to these benches will be left at strategic locations within the area.

- An entry point would be created along the southern boundary of the area to provide long term access onto the final floor.

The extent of overburden placement on the floor of the Dunmore Quarry would be contingent to the ongoing land use within the area.

ii Croome Farm Pit Quarry Area

At the completion of extraction, it is envisaged that the floor of the Croome Farm Pit Quarry area would be covered with a thin veneer of overburden and revegetated in accordance with the tree and shrub species specified in the FFMP (EMM 2019) (Appendix B). This, however, would be verified once a final land use is identified.

iii Croome Farm West Pit Quarry Area

- A sloping floor covering approximately 13ha with elevations ranging from 60mAHD on the eastern side to 68mAHD on the western end.
- Two to three sloping benches (5m to 10m in width) generally parallel to the sloping floor. Access ramps to these benches will be left at strategic locations within the area.
- The Bench heights will be 15 m consistent with bench heights at the Croome Farm pit.

4.4 Safety

At quarry closure, one of the main priorities for the void will be to render it safe in terms of access by humans, livestock and wildlife. The following will be considered at the time of closure to ensure that the void is left in a safe manner. These include:

- All high walls are to be left geotechnically stable.
- A barrier at a safe distance from the perimeter of the void to prevent human access will be constructed. This is to provide an engineered barrier between the pit and the surrounding area.
- Suitable signs, clearly stating the risk to public safety and prohibiting public access will be erected at 50 m intervals outside the safety fence.
- Surface runoff from land surrounding the void will be diverted from entering the void so as to prevent the instability of the walls.

4.5 Conceptual Quarry Closure and Decommissioning Plan

Decommissioning of the processing plant is not envisaged at the completion of the extraction process as it is likely that other hard rock resources would be processed at the plant. The following sections summarise the key aspects related to decommissioning and closure of the site, infrastructure, plant and buildings when all hard rock resources have been exhausted. It assumes that all buildings and other infrastructure are demolished and removed from the site despite the potential for them being used after quarrying (subject to the landholders requirements). It is considered likely that at least some aspects of the existing infrastructure will be used post quarrying, however they are not able to be identified at this time.

4.5.1 Decommissioning of Plant and Equipment

All surface infrastructure including the office buildings, workshops, parking areas, crushing, screening and wash plants, and product storage areas will be demolished and removed, and the areas containing this infrastructure recontoured. The access road will also be removed. Where possible, assets may be transferred or sold to other operations. The reshaped areas will then be topsoiled and seeded in accordance with a native tree and grass species mix to establish woodland vegetation.

Any remaining items will be demolished, removed and transported from the site as required. All recoverable scrap steel will be sold and recycled, with the remaining non-recycable wastes being taken to a licenced landfill. Prior to disposal, all wastes will be assessed in accordance with *Waste Classification Guidelines (DECC, 2008).*

All remaining areas will then be reshaped, topsoiled and seeded with a native tree and grass species mix to establish woodland vegetation.

All haul roads will also be removed and water management controls either removed or modified to assist in stabilisation of the final landform and to capture any sediment runoff from the rehabilitated areas.

4.5.2 Closure Methodology – Earthworks and Rehabilitation

i Dams

There are three dams on site which collect sediment laden run-off: the Croome Sumps, Middle Dam and Lower Dam (illustrated in Figure 3.1). Special consideration should be given to the three dams when it comes time to design of the final land use of the quarry. Opportunities to retain the dams would be investigated closer to development of the final landform. There is potential that they could provide an ongoing erosion control, water management and/or ecological function for the site.

Consideration should be given to the ongoing lifespan of the dams if any are to be retained. Any of the dams that are not being retained onsite would be removed and the original drainage paths re- established where possible.

ii Quarry Void

With the completion of quarrying, the benches within the pit will remain. They will be spread with top dressing material and native tree and shrub species will be sown directly into these areas. The main aim will be to ensure that the pit is left geotechnically stable.

At quarry closure, the final bench will be shaped and the pit floor re-profiled and revegetated in line with the final land use.

5 Summary of management actions

The objective of the final landform conceptual design is to cost effectively develop a sustainable, self- sustaining post quarry land use that effectively manages any potential adverse environmental impacts.

The final landform of the proposed quarry areas as set out in Figure 4.1 can only be considered conceptual as local variation in material may vary the final benching and batter design.

The floor of the DHQ extraction area comprising the Dunmore Original Quarry, Croome and RIC Slot extraction areas will be required for ongoing processing and stockpiling and as such will not be available for rehabilitation until the conclusion of excavation activities. The Croome West Extraction area, will prevent rehabilitation of this area for at least 10 plus years based on the estimated available resource. For the purpose of this plan rehabilitation is proposed for the quarry floor for the long term to include Croome West expansion modification that has now been approved.

It is anticipated that rehabilitation of the final landform in which:

- The quarry floors and terminal faces will be rehabilitated and revegetated.
- All quarry face batters are anticipated to be between grades of 1:1 or 1:2 or with vertical face heights of approximately 10-20 metres and benches that are up to approximately 5-10 metres wide.
- The extraction and operational floor and benches will be returned to native vegetation following cessation of quarrying activities.

The management actions for the RMP are summarised in Table 5.1.

Table 5.1 Summary of Management Actions

Site Section	Management Action Ref ID	Environmental Management Measure	Indicative Timeframe	Responsibility	Source
Progressive Rehabilitation – Whole Site					
Whole Site	DHQ-RMP	Undertake progressive rehabilitation in areas no longer required for extraction or access, focusing on rehabilitation of the out-of-pit emplacement areas	Ongoing	Site Manager or Delegate	Sch 4 Co. 53
Whole Site	DHQ-RMP-	Undertake extraction in compliance with extraction boundaries to prevent encroachment onto existing vegetation	Ongoing	Site Manager or Delegate	EIS
Whole Site	DHQ-RMP-	Store all stripped topsoil within the Original Quarry in the designated stockpile area and relocate when appropriate	Ongoing	Site Manager or Delegate	EIS
Whole Site	DHQ-RMP-	Soil stockpiles are to be a maximum of 1.5m in height in loose unconsolidated mounds and allowed to regenerate naturally to limit erosion and generation of sediment- laden runoff	Ongoing	Site Manager or Delegate	Sch. 4 Co. 24 and 42/EIS
Whole Site	DHQ-RMP-	Undertake all weed control in accordance with FFMP	Ongoing	Site Manager or Delegate	Sch. 4 Co. 48
Whole Site	DHQ-RMP-	Undertake all sediment and erosion control management actions in accordance with the Sediment and Erosion Control Plan found in the DHQ Water Management Plan. Including any dispersive soil issues associated with the SEC.	Ongoing	Site Manager or Delegate	Sch. 4 Co. 42/EIS
Short Term (< 3 years)					
Dunmore Original Quarry	DHQ-RMP-	Develop native seed blend to achieve revegetation goals for southern benches shown in Figure 4.1.	1-3 years	Site Manager or Delegate	EIS
Dunmore Original Quarry	DHQ-RMP-	The southern benches located between the Middle Dam and Croome Farm Pit extraction area will be rehabilitated through the placement of soil on the benches and revegetated. Placement methods that account for safety and effectiveness of vegetation establishment will be considered prior to commencement on account of the narrow benches and access limitations. For example, application of “eco-blanket” using a blower truck.	1-3 years	Site Manager or Delegate	EIS
Dunmore Original Quarry	DHQ-16	Establish drainage diversion works on benches (where practical) to minimise erosion hazards and avoid runoff of topsoil.	1-3 years	Site Manager or Delegate	EIS

Table 5.1 Summary of Management Actions

Site Section	Management Action Ref ID	Environmental Management Measure	Indicative Timeframe	Responsibility	Source
Dunmore Original Quarry	DHQ-RMP-	Access through the floor of the extraction area between the Croome Farm Pit extraction area and Original Quarry is to be maintained	Ongoing	Site Manager or Delegate	Good Practice
Medium Term (3-10 years)					
Croome Farm Pit Extraction Area	DHQ-RMP-	Rip northern and southern benches in Croome Farm Pit Extraction Areas prior to the application of fertile topsoil.	1-3 years	Site Manager or Delegate	EIS
Croome Farm Pit Extraction Area	DHQ-RMP	Develop native seed blend to achieve revegetation goals for northern and southern benches and apply via direct seeding method	1-3 years	Site Manager or Delegate	EIS
Croome Farm Pit Extraction Area	DHQ-RMP	Establish drainage diversion works on benches (where practical) to minimise erosion hazards and avoid runoff of topsoil	1-3 years	Site Manager or Delegate	EIS
Croome West Farm Pit Extraction Area	DHQ-RMP-	Rip northern, western and southern benches in Croome West Farm Pit Extraction Areas prior to the application of fertile topsoil.	1-3 years	Site Manager or Delegate	EIS
Croome West Farm Pit Extraction Area	DHQ-RMP	Develop native seed blend to achieve revegetation goals for northern, western and southern benches and apply via direct seeding method	1-3 years	Site Manager or Delegate	EIS
Croome West Farm Pit Extraction Area	DHQ-RMP	Establish drainage diversion works on benches (where practical) to minimise erosion hazards and avoid runoff of topsoil	1-3 years	Site Manager or Delegate	EIS
Long Term (>10 years)					
Whole Site	DHQ-RMP	All areas will be rehabilitated to provide compatibility with a variety of future long term uses of the site	> 10 years	Site Manager or Delegate	EIS
Whole Site	DHQ-RMP	All surface infrastructure including the office buildings, workshops, parking areas, crushing, screening and wash plants, and product storage areas will be demolished (in accordance with *AS 2601-2001: The Demolition Structures)* and removed, and the areas containing this infrastructure recontoured.	> 10 years	Site Manager or Delegate	Sch 3 Co.10

Table 5.1 Summary of Management Actions

Site Section	Management Action Ref ID	Environmental Management Measure	Indicative Timeframe	Responsibility	Source
Whole Site	DHQ-RMP	All recoverable scrap steel will be sold and recycled, with the remaining non-recyclable wastes being taken to a licenced landfill. Prior to disposal, all wastes will be assessed in accordance with *Waste Classification Guidelines (DECC, 2008).*	> 10 years	Site Manager or Delegate	Sch 4 Co. 70
Whole Site	DHQ-RMP	remaining areas will then be reshaped, topsoiled and seeded with a native tree and grass species mix to establish woodland vegetation.	> 10 years	Site Manager or Delegate	Good Practice
Whole Site	DHQ-RMP	All haul roads will also be removed and water management controls either removed or modified to assist in stabilisation of the final landform and to capture any sediment runoff from the rehabilitated areas.	> 10 years	Site Manager or Delegate	Good Practice
Monitoring, Reporting and Review					
Whole Site	DHQ-RMP	Include a rehabilitation management program progress report in the Annual Review.	Annual	Environmental Manager	Sch 4 C 58
Whole Site	DHQ-RMP	Complete an environmental incident report in the event a non-compliance is identified during monitoring	Ongoing	Environmental Manager	EPL 77 R2/R3
Whole Site	DHQ-RMP	Undertake a review of the RMP: • every five years; • where an audit recommends a review; • where there are repeat non-conformances; and as otherwise determined by the Environmental Manager	Ongoing	Environmental Manager	CoA Sch 4 Co. 54
Whole Site	DHQ-RMP	Review the adequacy of site-specific environmental safeguards and management measures on a monthly basis through the use of the site environmental checklist	Ongoing	Environmental Manager	Good Practice
Whole Site	DHQ-RMP	All staff and subcontractors involved in the Project must complete environmental induction training. Further details on the subject matter is discussed in Section 8,	Ongoing	Environmental Manager	EIS

Table 5.1 Summary of Management Actions

Site Section	Management Action Ref ID	Environmental Management Measure	Indicative Timeframe	Responsibility	Source
Whole Site	DHQ-RMP	Where identified as necessary, additional site-specific training will be delivered to relevant personnel/contractors as required regarding sensitive environmental issues. Further detail on specific training is discussed in Section 8.	Ongoing	Environmental Manager	EIS
Whole Site	DHQ-RMP	Site Incident Management Register (SIMS) will be maintained and include any outcomes from incidents.	Ongoing	Environmental Manager	Good Practice
Whole Site	DHQ-RMP	Pollution Incident Response Management Plan will be kept updated to respond to uncontrolled discharges of fuels, oil and chemicals/unforeseen events. Further detail on incident reporting is discussed in Section 8.	Ongoing	Environmental Manager	
Whole Site	DHQ-RMP	Contract a qualified rehabilitation and revegetation consultant to undertake rehabilitation activities.	Ongoing	Environmental Manager	

6 Financing and provisions

In accordance with CoA (3)56, Boral have estimated a new bank guarantee and will submit this to the Secretary within 3 months of submitting this plan. It should be noted that Boral established a Bond in April 2006 in the form of a Bank Guarantee for the HRQ. The condition requires the lodgement of a rehabilitation and conversation bond however the DG accepted the bank guarantee has an appropriate mechanism for security of the funds for possible default in rehabilitation by the company. This takes into account inflation, likely costs of implementing the compensatory habitat area and offset areas and rehabilitating all disturbed areas of the site (including surface disturbance of the site over the next 3 years of the development) and performance of the implementation of the compensatory habitat area and offset areas and rehabilitation of the site to date.

The rate at which the Bank Guarantee was formulated is based on the calculated rate of $2.50/ m_2 for the area of disturbance of the development over the next 3 years, including a calculated rate of $3.00 /$m_2$ for the area of the compensatory habitat.

7 Monitoring, reporting and review

7.1 Monitoring

This RMP will be reviewed periodically by suitably qualified persons to determine the efficacy of the Plan and ensure it continues to fulfil its intended purpose. This will allow for and promote adaptive management through progressive rehabilitation.

Rehabilitation management actions and environmental performance will be measured through regular environmental performance reviews. These will be based on the measurable outcomes identified in this management plan and key performance criteria outlined in Table 4.1. The reviews will be used to assess progress in meeting project rehabilitation objectives and performance criteria and will be undertaken by the Environmental manager:

- In response to new or revised Boral Project approvals.
- In response to major changes in site conditions or work methods.

Boral Project environmental performance is measured through compliance with the various environmental management plans including the OEMP/CEMP and sub-plans.

Should an environmental non-conformance be identified as a result of a monitoring result, a non-conformance report will be completed and archived by the Environmental manager.

7.2 Reporting

The Environmental manager is responsible for managing the environmental reporting program and arranging specialist consultants to prepare reports, as required.

7.2.1 Annual Review

The results of the rehabilitation monitoring program will be presented in the Annual Review (AR). This will include detailed assessment of monitoring results collected over the course of the annual monitoring program, an evaluation of any trends occurring across the site, any community/stakeholder complaints or non-conformances with licences/criteria and recommendations for management actions. Through the AR management actions may include:

- Refinement of rehabilitation management objectives and initiation of remedial action.
- Alteration to monitoring frequency, parameters or locations.

7.3 Review

7.3.1 Review of Monitoring Actions

Any non-compliance identified during monitoring actions, of management and mitigation measures, will be highlighted and an environmental incident report will be completed in the Site Incident Management System (SIMS). The non-conformance will be considered unresolved until:

- The non-compliance issue has been resolved;
- A new or revised procedure has been established and implemented;
- Training has been provided to relevant personnel/ sub-contractors; or
- Additional specific environmental management inspections are detailed in the site environmental checklist.

7.3.2 Review of Management Plan

This Plan will be reviewed on the following basis:

- Every three years to ensure its continuing effectiveness.
- Where an audit recommends a review.
- Where there are repeat non-conformances and these are not closed out within the agreed timeframe.
- As otherwise determined by the Environmental manager.

A review of the adequacy of site-specific environmental safeguards and management measures will be carried out by the Environmental manager on a weekly basis. This review will encompass site inspection and auditing reports as well as root cause assessments undertaken for any incidents reported.

8 Training

8.1 Environmental Induction

Environmental induction training will be delivered to all staff and subcontractors involved in the Project. This will be delivered by the relevant Boral personnel (e.g. Environmental Manager). This will include a component on environmental/what this Plan is for management and the associated controls and mitigation measures that will be implemented for the Project. All personnel will be required to sign an induction sheet, a copy of which will be maintained on site and appropriate records maintained.

Appropriate training and induction should include, but not be limited to:

- Raising awareness of on-site environmental management issues;
- Providing information on the location and importance of EECs, threatened fauna species (and habitat) known to occur within the site;
- Providing information on the boundaries for any proposed vegetation clearing;
- Training on procedures on encountering fauna (e.g snakes); and
- Training on weed identification and the appropriate guidelines for removing weeds, driving vehicles in weed infested locations and the disposal of weed infested topsoil.

8.2 Site-Specific Environmental Training

Where identified by the Environmental manager, additional site-specific training may be developed and implemented by the Project manager, delivered to relevant personnel/contractors as required regarding sensitive environmental issues. Specific training may include:

- Training in the use and location of spill kits.
- Management, and environmental incident response training.

8.3 Environmental Incidents Register

The Site Incident Management System (SIMS) will be maintained by the Environmental manager and will include any outcomes from incidents. These will feed into the inductions, toolbox meetings and pre-start meetings as necessary and appropriate.

9 References

Arcadis 2016, Dunmore Hard Rock Quarry, Rehabilitation Management Plan.

Boral Resources (NSW) Pty Ltd (2016) Project Management Plan– Rehabilitation on Southern RIC Wall.

Boral Resources (NSW) Pty Ltd (2015) Croome Reserve Remaining Dunmore Quarry

EMM consulting (2019) Water management plan.

EMM consulting (2019) Fauna and Flora management plan update.

Cumberland Ecology (2009) Dunmore Quarry Production Increase – Vegetation Offset Strategy (Development Consent Conditions 46-58) Flora and Fauna Management and Rehabilitation Plan 2009 Revision, Cumberland Ecology, Carlingord (NSW).

DECC (2008) Waste Classification Guidelines.

Environmental Sustainability Unit – Mineral Resources (2013), ESG3: Mining Operations Plan (MOP) Guidelines, NSW Department of Trade and Investment, Maitland (NSW)

R.W. Corkery and Co Pty Ltd (2003) Environmental Impact Statement for the proposed Dunmore Quarry Production Increase. Corkery and Co Pty Ltd, Orange (NSW).

Appendix A

Development Consent

Development Consent

Section 80 of the *Environmental Planning & Assessment Act 1979*

I, the Minister Assisting the Minister for Infrastructure and Planning (Planning Administration), approve the Development Application referred to in Schedule 1, subject to the conditions in Schedules 3 to 5.

These conditions are required to:

- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the on-going environmental management of the development.

This instrument includes changes made by Modification 1 in December 2005 (marked in blue)
This instrument includes changes made by Modification 2 in June 2006 (marked in red)
This instrument includes changes made by Modification 3 in May 2008 (marked in green)
This instrument includes changes made by Modifications 4 and 5 in November 2008 (marked in pink)
Modification 6 (January 2014) marked in purple
Modification 7 (October 2015) marked in maroon
Modification 8 (November 2016) marked in orange
Modification 10 (June 2017) marked in aqua
Modification 9 (September 2017) marked in light green
Modification 11 (March 2019) marked in yellow highlight

Diane Beamer, MP
Minister Assisting the Minister for Infrastructure and Planning (Planning Administration)

Sydney 2004 File No. S03/01960

SCHEDULE 1

Development Application:	DA 470-11-2003.
Applicant:	Boral Resources (NSW) Pty Limited (ABN: 51 000 756 507).
Consent Authority:	Minister Assisting the Minister for Infrastructure and Planning (Planning Administration).
Land:	See Appendix 1.
Proposed Development:	Increase production at the Dunmore Quarry from 1.2 million tonnes per annum (Mtpa) to 2.5 Mtpa, by: • increasing operating hours; • making minor changes to equipment types and configuration, mainly within the crushing and conveying circuit; and • increasing rail and road transportation of product.
State Significant Development:	The proposal is classified as State significant development, under section 76A(7) of the *Environmental Planning and Assessment Act 1979*, because it is an extractive industry where the proposed rate of production exceeds the threshold limits specified in the Ministerial declaration, dated 3 August 1999.
Integrated Development:	The proposal is classified as integrated development, under section 91 of the *Environmental Planning and Assessment Act 1979*, because it requires additional approvals under the: • *Protection of the Environment Operations Act 1997;*

- *National Parks & Wildlife Act 1974;*
- *Rivers and Foreshores Improvement Act 1948.*

Designated Development: The proposal is classified as designated development, under section 77A of the *Environmental Planning & Assessment Act 1979*, because it is for an extractive industry that would "obtain or process for sale, or reuse, more than 30,000 cubic metres of extractive material per year…". Consequently, it meets the criteria for designated development in schedule 3 of the *Environmental Planning & Assessment Regulation 2000*.

Note:

- *To find out when this development consent becomes effective, see Section 83 of the Environmental Planning and Assessment Act 1979* (EP&A Act);
- *To find out when this development consent is liable to lapse, see Section 95 of the EP&A Act; and*
- *To find out about appeal rights, see Section 97 of the EP&A Act.*

SCHEDULE 2
DEFINITIONS

Annual Review	Annual Review, as required under condition 9 of schedule 5
Applicant	Boral Resources (NSW) Pty Limited
BCA	Building Code of Australia
CCC	Community Consultative Committee
Council	Shellharbour City Council
Croome West Pit	Western extension of the extraction area approved in Modification 9
DA	Development Application
Day	Day is defined as the period from 7am to 6pm on Monday to Saturday, and 8am to 6pm on Sundays and Public Holidays
Department	Department of Planning and Environment
DoI – L&W	Department of Industry - Lands and Water
DRG	Division of Resources and Geoscience, within the Department
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPA	Environment Protection Authority
EPL	An Environment Protection Licence applying to the development, issued by the EPA
Evening	Evening is defined as the period from 6pm to 10pm
Feasible	Feasible relates to engineering considerations and what is practical to build or carry out
GTA	General Term of Approval
Incident	A set of circumstances that: • causes or threatens to cause material harm to the environment; and/or • breaches or exceeds the limits or performance measures/criteria in this consent
Land	Land means the whole of a lot in a current plan registered at the Land Titles Office at the date of this development consent
Laden trucks	Trucks transporting quarry products to or from the site
Material harm to the environment	Actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial
Minister	Minister for Planning, or delegate
Night	Night is defined as the period from 10pm to 6am on Monday to Saturday, and 10pm to 8am on Sundays and Public Holidays
OEH	Office of Environment and Heritage
Privately-owned land	Land not owned by the Applicant or its related companies or where a private agreement does not exist between the Applicant and the land owner
Quarrying operations	Includes the removal of overburden and extraction, processing, handling, storage and transportation of extractive material on the site
Quarry products	Includes all saleable quarry products, but excludes tailings, other wastes and rehabilitation material
Reasonable	Reasonable relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements
RMS	Roads and Maritime Services
Secretary	Secretary of the Department, or nominee
SEE	Statement of Environmental Effects
Shoulder	Time interval from 6am to 7am, Monday to Saturday
Site	Land to which the DA applies
TfNSW	Transport for NSW

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SCHEDULE 3
ADMINISTRATIVE CONDITIONS

Obligation to Minimise Harm to the Environment

1. The Applicant must implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.

Terms of Approval

2. The Applicant must carry out the development generally in accordance with the:
   (a) DA 470-11-2003;
   (b) EIS titled *Environmental Impact Statement for the proposed Dunmore Quarry Production Increase*, Volumes 1 & 2, dated November 2003, and prepared by R. W. Corkery & Company Pty Limited;
   (c) The letter from Boral Quarries to the Department dated 20 October 2005 about the application to modify Dunmore Quarry development consent DA 470-11-2003, and accompanying plans 4034032_01 issue E, and 4034032_EL issue B;
   (d) modification application MOD 59-4-2006 and letter from Boral Quarries to the Department dated 13 April 2006;
   (e) Modification Application 470-11-2003 Mod 3, letter to the Department dated 28 March 2008, and accompanying plans GE-DU-2961-02 Rev D; GE-DU-2962-01 Rev B; GE-DU-2963-01 Rev 0; and GE-DU-2964-02 Rev 0;
   (f) Modification Application 470-11-2003 Mod 4 and accompanying SEE titled *Statement of Environmental Effects for the proposed Dunmore Hard Rock Quarry Extension,* dated May 2008, and letter from Boral Quarries & Recycling to the Department dated 22 September 2008;
   (g) Modification Application 470-11-2003 Mod 5 and accompanying letter from Boral Quarries & Recycling to the Department dated 16 September 2008 (and accompanying plan GE-DU-2966-01 Rev E);
   (h) Modification Application 470-11-2003 Mod 6 and accompanying document titled *Environmental Assessment Dunmore Hard Rock Quarry– Modification 6,* prepared by EMGA Mitchell McLennan and dated 19 November 2012;
   (i) Modification Application 470-11-2003 Mod 7 and accompanying document titled *Proposed Blending Plant Dunmore Hardrock Quarry DA 470-11-2003 – Modification 7, Environmental Assessment*, dated December 2014;
   (j) Modification 470-11-2003 Mod 8 and accompanying document titled *Dunmore Quarry – Modification 8 Environmental Assessment,* dated August 2016 and accompanying Response to Submissions, dated 22 September 2016;
   (k) Modification Application 470-11-2003 Mod 10 and accompanying documents titled *Environmental Assessment: Dunmore Quarry Modification 10*, dated 23 May 2017, and supplementary Environmental Assessment titled *Environmental Assessment: Dunmore Quarry Modification 10,* dated 16 June 2017;
   (l) Modification Application 470-11-2003 Mod 9 and accompanying documents titled *Dunmore Quarry – Modification 9 Environmental Assessment*, dated 17 February 2017, and Response to Submissions titled *Dunmore Quarry – Modification 9 Response to Submissions*, dated 17 August 2017; and
   (m) Modification Application 470-11-2003 Mod 11 and accompanying document titled *Dunmore Quarry – Modification 11 Environmental Assessment*, dated 28 September 2018, Response to Submissions titled *Dunmore Quarry – Mod 11 Response to Submissions*, dated 7 November 2018, and additional information titled *Traffic Impact Assessment Addendum*, dated 24 January 2019.

2A. The Applicant must carry out the development in accordance with the conditions of this consent.

3. If there is any inconsistency between the documents in condition 2, the most recent document shall prevail to the extent of the inconsistency. The conditions of this consent shall prevail over the documents in condition 2 to the extent of any inconsistency.

4. The Applicant must comply with any reasonable requirement/s of the Secretary arising from the Department's assessment of:
   (a) any strategies, plans, programs, reviews, audits, reports or correspondence that are submitted in accordance with this consent (including any stages of these documents);
   (b) any reviews, reports or audits commissioned by the Department regarding compliance with this consent; and
   (c) the implementation of any actions or measures contained in these documents.

Quarrying Operations

5. The Applicant may carry out quarrying operations on the site until 30 September 2034.

Note: Under this consent, the Applicant is required to rehabilitate the site and carry out additional undertakings to the satisfaction of the Secretary. Consequently, this consent will continue to apply in all other respects other than the

right to conduct quarrying operations until the rehabilitation of the site and those undertakings have been carried out to a satisfactory standard.

6. The Applicant must not produce or transport more than 2.5 million tonnes of quarry products a calendar year from the development.

Transportation

7. A maximum of 2.5 million tonnes of quarry products may be transported from the site in any calendar year.

7A. The Applicant must not dispatch more than:
   a) 33 laden trucks from the site in any hour between 6 am and 9 am;
   b) 40 laden trucks from the site in any hour between 9 am and 3 pm;
   c) 23 laden trucks from the site in any hour between 3 pm and 6 am; and
   d) a total of 400 laden trucks from the site per day.

Note: In this condition, "day" means any 24-hour period.

Surrender of Consents

8. Deleted

Structural Adequacy

9. The Applicant must ensure that any new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA.

Notes:
- *Under Part 4A of the EP&A Act, the Applicant is required to obtain construction and occupation certificates for any building works.*
- *Part 8 of the EP&A Regulation sets out the detailed requirements for the certification of development*

Demolition

10. The Applicant must ensure that all demolition work is carried out in accordance with *AS 2601-2001: The Demolition of Structures,* or its latest version.

Protection of Public Infrastructure

11. The Applicant must:
   (a) repair, or pay the full costs associated with repairing, any public infrastructure that is damaged by the development; and
   (b) relocate, or pay the full costs associated with relocating any public infrastructure that needs to be relocated as a result of the development.

Operation of Plant and Equipment

12. The Applicant must ensure that all plant and equipment at the site, or used in connection with the development, are:
   (a) maintained in a proper and efficient condition; and
   (b) operated in a proper and efficient manner.

Compliance

13. The Applicant must ensure that all employees, contractors and sub-contractors are aware of, and comply with, the conditions of this approval relevant to their respective activities.

SCHEDULE 4
SPECIFIC ENVIRONMENTAL CONDITIONS

IDENTIFICATION OF BOUNDARIES

1. Within 6 months of the date of this consent and any subsequent modification involving a change to the approved limits of extraction, the Applicant must:
   (a) engage a registered surveyor to mark out the boundaries of the approved limits of extraction;
   (b) submit a survey plan of these boundaries to the Secretary; and
   (c) ensure that these boundaries are clearly marked at all times in a permanent manner that allows operating staff and inspecting officers to clearly identify those limits.

ACQUISITION UPON REQUEST

2. Upon receiving a written request for acquisition from the landowner of the land listed in Table 1, the Applicant must acquire the land in accordance with conditions 3 and 4 below.

Land Owner(s)	Land Identification
Creagan	Lot 5 DP1001931
Stocker	Lot 1 DP745632
McParland/ Fogarty	Lot 10 DP977931
Kimmorley Property	Lot 1 DP998321

Table 1: Land Subject to Acquisition on Request

Note: Land titled 'McParland/Fogarty' has been acquired and is now quarry-owned.

3. Within 6 months of receiving a written request from the landowner, the Applicant must pay the landowner:
   (a) the current market value of the landowner's interest in the land at the date of this written request, as if the land was unaffected by the development the subject of this DA, having regard to the:
      - existing and permissible use of the land, in accordance with the applicable environmental planning instruments at the date of the written request; and
      - presence of improvements on the land and/or any approved building or structure which has been physically commenced at the date of the landowner's written request, and is due to be completed subsequent to that date; and
   (b) the reasonable costs associated with:
      - relocating within the Shellharbour or Kiama local government areas, or to any other local government area determined by the Secretary; and
      - obtaining legal and expert advice for determining the acquisition price of the land and the terms upon which it is to be acquired; and
   (c) reasonable compensation for any disturbance caused by the land acquisition process.

   However, if within 6 months of receiving this written request, the Applicant and landowner cannot agree on the acquisition price of the land and/or the terms upon which the land is to be acquired, then either party may refer the matter to the Secretary for resolution.

   Upon receiving such a request, the Secretary shall request the NSW President of the Australian Property Institute to appoint a qualified independent valuer to consider submissions from both parties, and determine a fair and reasonable acquisition price for the land, and/or the terms upon which the land is to be acquired.

   If either party disputes the independent valuer's determination, the independent valuer must refer the matter back to the Secretary for resolution.

   If the landowner refuses to accept this offer within 6 months of the date of the Applicant's offer, the Applicant's obligations to acquire the land cease, unless otherwise agreed by the Secretary.

4. The Applicant must bear the costs of any valuation or survey assessment requested by the independent valuer or the Secretary, and the costs of determination referred to in Condition 3 above.

5. If the Applicant and landowner agree that only part of the land should be acquired, then the Applicant must pay all reasonable costs associated with obtaining Council approval for any plan of subdivision, and registration of the plan at the Office of the Registrar-General.

6. While the land listed in Table 1 is privately-owned land, the Applicant must comply with the requirements applying to this land in these conditions of consent.

ADDITIONAL MITIGATION UPON REQUEST

6A. Upon receiving a written request from the landowner of any residence on the land listed in Table 1 or Table 1A, the Applicant must implement additional mitigation measures at or in the vicinity of the residence, in consultation with the landowner. These measures must be consistent with the measures outlined in the *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Development* (NSW Government, 2014), as may be updated or replaced from time to time. They must also be reasonable and feasible and proportionate to the level of predicted impact.

If within 3 months of receiving this request from the landowner, the Applicant and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Secretary for resolution.

Receiver Locations	Mitigation Basis
Locations AA, D, F, G and Z	Noise

Table 1A: Land Subject to Mitigation on Request

NOISE

Noise Limits

7. [1]The Applicant must ensure that the noise generated by the development does not exceed the criteria specified in Table 2.

Receiver Locations	Noise Limits dB(A)					
	$L_{Aeq\ (15minute)}$				$L_{A1\ (1minute)}$	
	Day	Evening	Night	Shoulder	Night	Shoulder
Location K Stocker Residence	49	44	38	47	48	55
Location O Dunmore Lakes	49	44	38	47	48	55
Location J Creagan Residence	Negotiated Agreement in Place					
Location AA	38	38	38	38	45	45
Locations AB and T	36	36	36	36		
Locations D, F, G and Z	40	40	40	40		
Location S	37	37	37	37		
Other privately-owned residences	35	35	35	35		

Table 2: Noise Impact Assessment Criteria for the Development

Notes:

1. *Receiver locations are shown in Appendix 2.*
2. *The above table may be varied if the Applicant enters into a negotiated agreement with any of the affected residents, or if existing agreements become void.*
3. *Noise from the development is to be measured at the most affected point on or within the residential boundary or at the most affected point within 30m of the dwelling (rural situations) where the dwelling is more than 30m from the boundary, to determine compliance with the $L_{Aeq(15\ minute)}$ noise limits in the above table. Where it can be demonstrated that direct measurement of noise from the development is impractical, the EPA may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors presented in Section 4 of the NSW Industrial Noise Policy must also be applied to the measured noise levels where applicable.*
4. *Noise from the development is to be measured at 1m from the dwelling façade to determine compliance with the $L_{A1(1minute)}$ noise limits in above table.*
5. *The noise emission limits identified in Table 1 apply under meteorological conditions of:*
   - *Wind speed up to 3m/s at 10 metres above ground level; or*

[1] Incorporates EPA GTA

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

Noise Investigations

8. Deleted

Operating Hours

9. The Applicant must comply with the operating hours in Table 3:

Activity	Days of the Week	Time
Extraction and Processing	Monday – Saturday	6-00am to 10-00pm
Product Transfer to Stockpiles	Monday - Saturday	6-00am – Midnight
Maintenance	Monday – Sunday	24 hrs
Construction (including construction of the bund under Modification 8)	Monday – Saturday	7-00am to 6-00pm Monday to Friday 8-00am to 1-00pm Saturday

Table 3: Operating Hours for the Development

10. Deleted

Oversized Material

11. [2]The Applicant must not process any oversized raw feed material at the development during the shoulder period.

Note: For the purpose of this condition "oversized raw feed material" is defined as where more than 50% of the shot is over 900mm in diameter.

Noise Operating Conditions

11A. The Applicant must:

(a) take all reasonable steps to minimise the construction, operational and transport noise associated with the development;

(b) take all reasonable steps to minimise the noise impacts of the development during noise-enhancing meteorological conditions; when the noise criteria in this consent do not apply; and

(c) regularly assess noise monitoring data, and modify or stop operations on the site to ensure compliance with the relevant conditions of this consent,

to the satisfaction of the Secretary.

Noise Monitoring

12. Deleted

13. [3]Within 3 months of the date of this consent, and annually thereafter, unless directed otherwise by the Secretary, the Applicant must:

(a) commission a suitably qualified person to assess whether the development is complying with the noise impact assessment criteria in Table 2, in general accordance with the NSW Industrial Noise Policy and Australian Standard (AS) 1055-1997: "Description and Measurement of Environmental Noise"; and

(b) provide the results of this assessment to the EPA and Secretary within a month of commissioning the assessment.

Noise Management Plan

14. The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:

(a) be prepared in consultation with the EPA;

(b) be submitted to the Secretary for approval prior to commencing quarrying operations in the Croome West Pit, unless the Secretary agrees otherwise;

(c) describe the measures to be implemented to ensure:

- compliance with the noise criteria and operating conditions of this consent;

[2] Incorporates EPA GTA
[3] Incorporates EPA GTA

- best practice management is being employed;
- noise impacts of the development are minimised during stage 3 extraction of the Croome West Pit, particularly during the shoulder period; and
- noise impacts of the development are minimised during meteorological conditions under which the noise criteria in this consent do not apply;

(d) describe the proposed noise management system; and

(e) include a monitoring program to be implemented to measure noise from the development against the noise criteria in Table 2.

The Applicant must implement the Noise Management Plan as approved by the Secretary.

Reporting

15. Deleted

BLASTING AND VIBRATION

Airblast Overpressure Criteria

16. The Applicant must ensure that the airblast overpressure level from blasting at the development does not exceed the criteria in Table 4 at any residence or sensitive receiver on privately-owned land.

Airblast overpressure level [dB(Lin Peak)]	Allowable exceedance
115	5% of the total number of blasts over a period of 12 months
120	0%

Table 4: Airblast Overpressure Limits

Ground Vibration Criteria

17. The Applicant must ensure that the peak particle velocity from blasting at the development does not exceed the criteria in Table 5 at any residence or sensitive receiver on privately - owned land.

Peak particle velocity (mm/s)	Allowable exceedance
5	5% of the total number of blasts over a period of 12 months
10	0%

Table 5: Ground Vibration Limits

Blasting Restrictions

18. [4]Blasting operations at the site may only take place:

a) between 9am and 5pm Monday to Saturday inclusive;

b) are limited to 2 blasts each day; and

c) at such other times as may be approved by EPA.

Blast Operating Conditions

19. During blasting operations, the Applicant must:

(a) take all reasonable steps to:

(i) protect the safety of people in the surrounding area;

(ii) protect public or private infrastructure/property in the surrounding area from any damage; and

(iii) minimise blast-related dust and fume emissions; and

(b) operate a suitable system to enable members of the public to get up-to-date information on the proposed blasting schedule on the site,

to the satisfaction of the Secretary.

[4] Incorporates EPA GTA

Blast Management Plan

20. The Applicant must prepare a Blast Management Plan for the development to the satisfaction of the Secretary. This plan must:
    a) be submitted to the Secretary for approval within 6 months of Modification 8, or as otherwise agreed by the Secretary;
    b) describe the measures that would be implemented to ensure compliance with the blast criteria and operating conditions of this consent;
    c) include measures to manage and monitor the avoidance of impacts on the heritage values on the buildings on Lot 10 DP977931;
    d) include measures to manage flyrock;
    e) include a monitoring program for evaluating and reporting on compliance with the blasting criteria in this consent;
    f) include community notification procedures for the blasting schedule, in particular to nearby residences; and
    g) include a protocol for investigating and responding to complaints.

    The Applicant must implement the approved Blast Management Plan as approved from time to time by the Secretary.

    Note: Prior to the approval of the Blast Management Plan revised under Modification 8, the most recent approved version must continue to have full force and effect and must be implemented.

Blast Monitoring

21. [5]The Applicant must monitor the airblast overpressure and peak particle velocity impacts of the development at the permanent monitoring station as approved by the EPA, to the satisfaction of the EPA and Secretary, using the specified units of measure, frequency, sampling method, and location in Table 6.

Parameter	Units of Measure	Frequency	Sampling Method	Measurement Location
Airblast overpressure	dB(Lin Peak)	During every blast	AS2187.2-1993[1]	Not less than 3.5m from a building or structure *(or as otherwise agreed by EPA)*
Peak particle velocity	mm/s	During every blast	AS2187.2-1993	Not more than 30m from a building or structure *(or as otherwise agreed by EPA)*

Table 6: Airblast overpressure and peak particle velocity monitoring

[1] Standards Australia, 1993, AS2187.2-1993: Explosives - Storage, Transport and Use of Explosives

AIR QUALITY

Impact Assessment Criteria

22. The Applicant must ensure that particulate matter emissions generated by the development do not cause exceedances of the criteria in Table 7 at any residence on privately-owned land.

Pollutant	Averaging period	Criterion	
Particulate matter < 10 µm (PM_{10})	Annual	[a,d] 25 µg/m^3	
Particulate matter < 10 µm (PM_{10})	24 hour	[b] 50 µg/m^3	
Particulate matter < 2.5 µm (PM_{10})	Annual	[a,d] 8 µg/m^3	
Total suspended particulates (TSP)	Annual	[a,d] 90 µg/m^3	
[c] Deposited dust	Annual	[b] 2 g/m^2/month	[a,d] 4 g/m^2/month

Table 7: Air Quality Impact Assessment Criteria

[5] Incorporates EPA GTA

Notes:
a Cumulative impact (ie increase in concentrations due to the development plus background concentrations due to all other sources).
b Incremental impact (ie increase in concentrations due to the development alone, with zero allowable exceedances of the criteria over the life of the development.
c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.
d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Secretary.

Air Quality Operating Conditions

23. The Applicant must:
    (a) take all reasonable steps to minimise dust, fume and greenhouse gas emissions of the development;
    (b) regularly assess meteorological and air quality monitoring data and relocate, modify or stop operations on the site to ensure compliance with the relevant conditions of this consent;
    (c) minimise the air quality impacts of the development during adverse meteorological conditions and extraordinary events (see Note d to Table 7 above); and
    (d) minimise any visible off-site air pollution,
    to the satisfaction of the Secretary.

Air Quality Management Plan

24. The Applicant must prepare an Air Quality Management Plan for the development to the satisfaction of the Secretary. This plan must:
    (a) be submitted to the Secretary for approval within 6 months of the determination of Modification 9, unless otherwise agree by the Secretary;
    (b) describe the measures to be implemented to ensure:
        - compliance with the air quality criteria and operating conditions of this consent;
        - best practice management is being employed; and
        - the air quality impacts of the development are minimised during adverse meteorological conditions and extraordinary events;
    (c) describe the proposed air quality management system;
    (d) include an air quality monitoring program that:
        - is capable of evaluating the performance of the development and informing day to day management decisions;
        - includes a protocol for determining any exceedances of the relevant conditions of consent; and
        - effectively supports the air quality management system.

    The Applicant must implement the approved Air Quality Management Plan as approved by the Secretary.

METEOROLOGICAL MONITORING

25. For the duration of the development, the Applicant must ensure that there is a suitable meteorological station operating in close proximity to the site that:
    (a) complies with the requirements in the *Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales* (DEC, 2007) (as may be updated or replaced from time to time); and
    (b) is capable of continuous real-time measurement of atmospheric stability category determined by the sigma theta method in accordance with the NSW Industrial Noise Policy (EPA, 2000), (as may be updated or replaced from time to time) unless a suitable alternative is approved by the Secretary following consultation with the EPA.

26. Deleted

SURFACE AND GROUND WATER

Pollution of Waters

27. Except as may be expressly provided by an Environment Protection Licence, the Applicant must comply with section 120 of the *Protection of the Environment Operations Act 1997* during the carrying out of the development.

Water Supply

28A. The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of quarrying operations to match its available water supply.

Note: Under the Water Act 1912 and/or the Water Management Act 2000, the Applicant is required to obtain the necessary water licences for the development.

Water Discharge Limit

28. The Applicant must comply with the discharge limits in any EPL, or with section 120 of the POEO Act.

Site Water Balance

29. In each Annual Review, the Applicant must:
    (a) recalculate the site water balance for the development; and
    (b) provide information on evaporative losses, dust suppression, dam storage levels and implications of obtaining any water supplies from off-site; and
    (c) evaluate water take against licensing requirements.

Storm Water Management System

30. The Applicant must ensure that the storm water management system for the development is designed, constructed and operated to capture and treat polluted waters from storm event(s) of up to and including the 5-day, 95th percentile rainfall event.

31. The Applicant must ensure that the basins in the storm water management system are managed in accordance with the operating principles within the revised Water Management Plan prepared by Evans and Peck, dated April 2008, or any subsequent Water Management Plan approved by the Secretary, to maintain the required storm water storage volume.

Offline Dam

32. By 18 May 2008, or as otherwise agreed to by the Secretary, the Applicant must:
    (a) modify the existing dam at the site to create increased capacity offline from Rocklow Creek;
    (b) construct dams within the site of sufficient capacity to ensure that the water quality criteria in condition 29 can be met for all rainfall events up to and including the 5-day duration 95th percentile rainfall event;
    (c) ensure the discharge and overflow points of the dams do not cause erosion at the point of discharge/overflow;
    (d) rehabilitate and stabilise the banks of the dams; and
    (e) ensure the integrity of the dams would not be compromised by flooding;
    to the satisfaction of the EPA and the Secretary.

33. Prior to carrying out any of these works, the Applicant must prepare a Dam Upgrade Plan in consultation with the EPA, and to the satisfaction of the Secretary. This plan must include:
    (a) the detailed design and specifications of the proposed works, which have been certified by a practicing registered engineer;
    (b) an erosion and sediment control plan for the proposed works, that is consistent with the requirements in the Department of Housing's *Managing Urban Stormwater: Soils and Construction* manual;
    (c) a vegetation and rehabilitation plan, setting out how the banks of the dams and other relevant pollution control features would be rehabilitated and stabilized;
    (d) an acid sulfate soil management plan that is consistent with the *NSW Acid Sulfate Soil* manual;
    (e) a construction program for the proposed works; and
    (f) a program setting out how the modified dam and associated revegetation works would be maintained during the life of the development.

    The Applicant must implement the approved management plan as approved from time to time by the Secretary.

34. Within 1 month of completing the construction works in the Dam Upgrade Plan, the Applicant must submit an as-executed report, certified by a practicing registered engineer, to the satisfaction of the EPA and Secretary.

Lower Dam Transition Plan

35A. Within 3 months of the determination of Modification 9, or as otherwise agreed by the Secretary, the Applicant must prepare a Lower Dam Transition Plan in consultation with the EPA and to the satisfaction of the Secretary. The plan must include a program to:
    (a) undertake a broader assessment of the site's water management system and potential water pollution impacts; and
    (b) investigate reasonable and feasible mitigation measures to improve water quality outcomes for the site, including altering the design of the Lower Dam or else transitioning away from its use, within two years.

The Applicant must not alter the Lower Dam until this plan is approved by the Secretary. The Applicant must implement the approved plan as approved by the Secretary.

Flocculant Management

35. The Applicant must not use flocculants on the site.

36. Deleted

Other Water Management Works

37. [6]Within 18 months of the date of this consent, the Applicant must carry out the following works:
    (a) Workshop and Fuel Storage Area
    - desilt drains and culverts upstream of the workshop to limit flooding;
    - construct a first flush collection basin to capture and store the first 13mm of run-off from the external service bays before it is treated by the oil/water separator; and
    - bund and roof the drum storage area;

    (b) Magazine Area
    - reinstate drain through access road to magazines to direct stormwater flows to the main drain;

    (c) deleted

    to the satisfaction of EPA and the Secretary.

Bunding

38. [7]Impervious bunds must be constructed around all fuel, oil and chemical storage areas and the bund volume must be large enough to contain 110 per cent of the volume held in the largest container. The bund must be designed and installed in accordance with the requirements of the EPA Environment Protection Manual Technical Bulletin *Bunding and Spill Management*.

Monitoring

39. The Applicant must:
    (a) measure:
    - the volume of water discharged from the site via licenced discharge points;
    - water use on the site;
    - water transfers across the site;
    - dam and water structure storage levels;

    (b) monitor the quality of the surface water:
    - discharged from the licence discharge point/s of the development;
    - upstream and downstream of the development;

    (c) monitor flows in Rocklow Creek; and
    (d) monitor regional groundwater levels and quality;
    to the satisfaction of the EPA and the Secretary.

    Note: On the provision of two years of monitoring data that shows negligible impact on the regional groundwater network, the Secretary may agree to suspend monitoring of regional groundwater levels and/or quality.

Site Water Management Plan

40. Within 12 months of the date of this consent, the Applicant must prepare a Site Water Management Plan for the development, in consultation with the DoI – L&W, and to the satisfaction of the Secretary. This plan must include:
    (a) the predicted site water balance;
    (b) an Erosion and Sediment Control Plan;
    (c) a Surface Water Monitoring Program
    (d) a Ground Water Monitoring Program; and
    (e) an Integrated Water Management Strategy.

    The Applicant must implement the approved management plan as approved from time to time by the Secretary.

41. The Erosion and Sediment Control Plan must:
    (a) be consistent with the requirements of the Department of Housing's *Managing Urban Stormwater: Soils and Construction* manual;
    (b) identify activities that could cause soil erosion and generate sediment;
    (c) describe measures to minimize soil erosion and the potential for the transport of sediment to

[6] Incorporates EPA GTA
[7] Incorporates EPA GTA

downstream waters;
(d) describe the location, function, and capacity of erosion and sediment control structures; and
(e) describe what measures would be implemented to maintain the structures over time.

42. The Surface Water Monitoring Program must include:
(a) detailed baseline data on surface water flows and quality in Rocklow Creek;
(b) surface water impact assessment criteria;
(c) a program to monitor surface water flows and quality in Rocklow Creek;
(c1) a program to monitor and minimise surface water and groundwater ingress into the Lower Dam and water egress into Rocklow Creek;
(d) a program to monitor bank and bed stability in Rocklow Creek; and
(e) a program to monitor the effectiveness of the Erosion and Sediment Control Plan.

43. The Ground Water Monitoring Program must include:
(a) detailed baseline data on ground water levels and quality, based on statistical analysis;
(b) ground water impact assessment criteria;
(c) a program to monitor regional ground water levels and quality; and
(d) a program to monitor groundwater inflows.

Note: On the provision of two years of monitoring data that shows negligible impact on the regional groundwater network, the Secretary may agree to suspend monitoring of regional groundwater levels and/or quality.

44. [8]The Integrated Water Management Strategy must:
(a) explore a range of options for a sustainable resource alternative for water supply to the site;
(b) identification of all possible and available sources of water;
(c) consistency with Government Water Reform initiatives and policies;
(d) quality of water to meet usage requirements including any possible effects on product;
(e) costs of supply;
(f) health and environmental impacts;
(g) legislative requirements;
(h) assessment of the feasibility, benefits and costs of options;
(i) a process to identify and evaluate preferred options for implementation; and
(j) the identification of a timetable for implementation of the selected options.

FLORA AND FAUNA

Vegetation Offset Strategy

45. The Applicant must:
a. establish, conserve, and maintain at least:
- 4.6 hectares of *Melaleuca armillaris* Tall Shrubland; and
- 8.2 hectares of Blue Gum-White Box Woodland/Forest,

on Boral-owned land adjacent to the development;
b. conserve, maintain, and enhance the vegetation in the area to the south of the development marked on the map in Appendix 3 as Remnant Vegetation Conservation Area;
c. conserve, maintain, enhance and establish the vegetation in the area to the south of the development marked on the map in Appendix 3 as Offset Area, in accordance with the letter from Boral to the Department dated 22 September 2008 titled *Dunmore Quarry – Revised Offset for Quarry Extension*;
d. within 12 months of the date of Modification 8, the Applicant must provide a biodiversity offset strategy outlining the measures to offset 48 Illawarra Zieria individuals and 1.94 ha of native vegetation clearing (including 0.05 ha of Illawarra Subtropical Rainforest EEC), to the satisfaction of OEH and the Secretary. The offset must demonstrate that the biodiversity values in the general vicinity of the site have been maintained or improved; and
e. within 12 months of the date of approval of Modification 9, the Applicant must provide a biodiversity offset strategy outlining measures to offset 162 Illawarra Zieria individuals by no less than 2,268 Illawarra Zieria credits, to the satisfaction of OEH and the Secretary. The offset must demonstrate that the biodiversity values in the general vicinity of the site have been maintained or improved.

Note: The Compensatory Habit Area established to address paragraph (a) is marked on the map in Appendix 3.

46A. Within 12 months of the date of Modification Application 470-11-2003 Mod 4, the Applicant must make suitable arrangements in consultation with the OEH to provide appropriate long term security for the biodiversity offset referred to in condition 46 (c), to the satisfaction of the Secretary.

46B. Within 12 months of the date of providing the biodiversity offset strategy required under condition 46(d), the Applicant must make suitable arrangements to provide long term security for this strategy, to the satisfaction of the Secretary.

[8] Incorporates EPA GTA

46C. Within 12 months of the date of providing the biodiversity offset strategy required under condition 46(e), the Applicant must make suitable arrangements to provide long term security for this strategy, to the satisfaction of the Secretary.

Note: Mechanisms to provide appropriate long term security to the land within a biodiversity offset strategy in accordance with the NSW Biodiversity Offset Policy for Major Projects 2014, include a BioBanking Agreement, Voluntary Conservation Agreement or an alternative mechanism that provides for a similar conservation outcome.

Flora and Fauna Management Plan

46. Within 12 months of the date of this consent, the Applicant must prepare a Flora and Fauna Management Plan for the development to the satisfaction of the Secretary. This plan must include:
    a. a Vegetation Clearing Protocol;
    b. a Compensatory Habitat Management Plan;
    c. a Remnant Vegetation Conservation Plan; and
    d. a Biodiversity Offset Management Plan.

    The Applicant must implement the approved management plan as approved from time to time by the Secretary.

47. The Vegetation Clearing Protocol must:
    a. delineate the areas of remnant vegetation to be cleared; and
    b. describe the procedures that would be implemented for:
        i. pre-clearance surveys;
        ii. progressive clearing;
        iii. fauna management;
        iv. conserving and reusing topsoil;
        v. collecting seed from the site;
        vi. salvaging and reusing material from the site; and
        vii. controlling weeds.

48. The Compensatory Habit Management Plan must:
    a. describe the compensatory habitat proposal to satisfy condition 46(a);
    b. justify why this area(s) is suitable for the compensatory habitat proposal;
    c. establish baseline data for the existing habitat in the proposed compensatory habitat area(s);
    d. describe how the compensatory habitat proposal would be implemented;
    e. set completion criteria for the compensatory habitat proposal; and
    f. describe how the performance of the compensatory habitat management proposal would be monitored over time.

49. The Remnant Vegetation Conservation Plan must:
    a. describe what measures would be implemented to satisfy condition 46(b);
    b. establish baseline data for the existing vegetation in the area;
    c. set completion criteria for the Remnant Vegetation Conservation Area; and
    d. describe how the performance of the Remnant Vegetation Conservation Area would be monitored over time.

50A. The Biodiversity Offset Management Plan must:
    (a) describe what measures would be implemented to satisfy condition 46(c);
    (b) describe the biodiversity offset strategies in conditions 46(d)-(e);
    (c) include a timetable for providing long term security of the offset areas;
    (d) set performance and completion criteria for the offset areas; and
    (e) include a program to monitor and report on the effectiveness of the implementation measures, and progress against the performance and completion criteria.

Reporting

50. The Applicant must include a progress report on the implementation of the Flora and Fauna Management Plan in the Annual Review.

Independent Audit

51. Within 3 years of the date of this consent, and every 5 years thereafter unless the Secretary directs otherwise, the Applicant must commission, and pay the full cost of an Independent Audit of the Flora and Fauna Management Plan. This audit must:
    a. be conducted by a suitably qualified, experienced, and independent person whose appointment has been endorsed by the Secretary;
    b. assess the performance of the Flora and Fauna Management Plan;
    c. review the adequacy of the Flora and Fauna Management Plan; and, if necessary,

d. recommend actions or measures to improve the performance and/ or adequacy of the Flora and Fauna Management Plan.

REHABILITATION

Rehabilitation

52. The Applicant must progressively rehabilitate the site to the satisfaction of the Secretary.

Rehabilitation Management Plan

53. Within 6 months of the date of this consent, the Applicant must prepare a Rehabilitation Management Plan for the site to the satisfaction of the Secretary. This plan must:
    a. identify the disturbed area at the site;
    b. describe in general the short, medium, and long-term measures that would be implemented to rehabilitate the site;
    c. describe in detail the measures that would be implemented over the next 3 years to rehabilitate the site; and
    d. describe how the performance of these measures would be monitored over time.

    The Applicant must implement the approved management plan as approved from time to time by the Secretary.

Rehabilitation and Conservation Bond

54. Within 6 months of the date of this consent, the Applicant must lodge a Rehabilitation and Conservation Bond with the Department to ensure that the conservation commitments and rehabilitation of the site are implemented in accordance with the performance and completion criteria set out in the relevant plans and the relevant conditions of this consent. The sum of the bond must be an amount agreed by the Secretary and determined by:
    a. calculating the full cost of implementing the compensatory habitat area (see condition 49) and the offset areas (see condition 50A);
    b. calculating the cost of rehabilitating all disturbed areas of the site, taking into account the likely surface disturbance over the next 3 years of quarrying operations (see condition 54); and
    c. employing a suitably qualified quantity surveyor or other expert to verify the calculated costs.

    Notes:
    - *Alternative funding arrangements for long term management of the offset areas, such as provision of capital and management funding as agreed by OEH as part of a BioBanking Agreement, or transfer to conservation reserve estate can be used to reduce the liability of the bond.*
    - *If capital and other expenditure required by the Flora and Fauna Management Plan or the Rehabilitation Management Plan is largely complete, the Secretary may waive the requirement for lodgement of a bond in respect of the remaining expenditure.*
    - *If the conservation commitments/or rehabilitation of the site area are completed (or partially completed) to the satisfaction of the Secretary, then the Secretary will release the bond (or relevant part of the bond). If the Biodiversity Offset Strategy and rehabilitation of the site are not completed to the satisfaction of the Secretary, then the Secretary will call in all or part of the bond, and arrange for the completion of the relevant works.*

55. The Rehabilitation and Conservation Bond must be reviewed and if required, an updated bond must be lodged with the Department within 3 months following an update or revision to the Flora and Fauna Management Plan or the Rehabilitation Management Plan, or following the completion of an Independent Environmental Audit. This review must consider the:
    (a) effects of inflation;
    (b) likely cost of implementing the compensatory habitat area and offset areas and rehabilitating all disturbed areas of the site (taking into account the likely surface disturbance over the next 3 years of the development); and
    (c) performance of the implementation of the compensatory habitat area and offset areas and rehabilitation of the site to date.

56. Deleted

Reporting

57. The Applicant must include a progress report on the Rehabilitation Management Plan in the Annual Review.

TRAFFIC AND TRANSPORT

North Kiama Bypass

58. The Applicant must facilitate access to the North Kiama Bypass along Tabbita Road in accordance with the terms set out in the Deed of Agreement between the Applicant and Dunmore Sand and Soil Pty Ltd, dated 29 July 2004.

Transport Management Plan

59. The Applicant must prepare a Transport Management Plan for the development to the satisfaction of the Secretary. This plan must:
    (a) be prepared by a suitably qualified traffic consultant, in consultation with RMS and Council, and submitted to the Secretary for approval by 31 May 2014;
    (b) include a drivers' code of conduct for the development;
    (c) describe the measures that would be implemented to ensure:
        - all drivers of development-related vehicles comply with the drivers' code of conduct; and
        - compliance with the relevant conditions of this consent; and
    (d) include a program to monitor the effectiveness of the implementation of these measures.

    The Applicant must implement the approved management plan as approved from time to time by the Secretary.

Cumulative Traffic Impact Study

60A. The Applicant must, in conjunction with the operators of the Bass Point Quarry and the Albion Park Quarry, cause to be prepared an independent Cumulative Traffic Impact Study. The study must:
    (a) be undertaken by a suitably qualified traffic consultant, whose appointment has been approved by the Secretary;
    (b) be commissioned by 30 June 2014, and completed by 31 October 2014, or as otherwise agreed in writing by the Secretary;
    (c) be co-funded by the operators of the Dunmore, Bass Point and Albion Park quarries, proportionate to the quarries' respective quarry product road transport limits, as approved at 30 June 2014;
    (d) include a comprehensive assessment of current and future projected cumulative traffic impacts of the three quarries on the classified road network, undertaken in consultation with the RMS; and
    (e) identify any reasonable and feasible measures that can be implemented to minimise the traffic and road safety impacts of quarry trucks on Mount Ousley Road, and the likely cost of implementing these measures.

60B. The Applicant must, in conjunction with the operators of the Bass Point Quarry and the Albion Park Quarry, prepare and implement a program to implement any reasonable and feasible measures identified in the Cumulative Traffic Impact Study not already undertaken by the Applicant, in an equitable manner with the two other quarry operators, to the satisfaction of the Secretary. The program must be submitted to the Secretary for approval by 28 February 2015, or as otherwise agreed in writing by the Secretary.

Transport Options Review

60C. Within three years of the determination of Modification 11, and every five years thereafter (if directed to do so by the Secretary), the Applicant must commission and pay the full costs of a Transport Options Review for the development. This review must:
    a) be conducted by a suitably qualified, experienced and independent expert/s whose appointment has been endorsed by the Secretary;
    b) be prepared in consultation with TfNSW, RMS and Council;
    c) review the economic, social and environmental costs and benefits of all reasonable and feasible options for the transport of quarry products from the site (including by rail and road);
    d) review and report on available rail terminal capacity;
    e) recommend any appropriate measures or actions to:
        i. reduce the economic, social and environmental costs associated with transport of quarry products by road from the site; and
        ii. maximise the use of rail deliveries from the site; and
    f) be conducted and reported to the satisfaction of the Secretary.

    Within three months of commencing this review, or within another timeframe agreed by the Secretary, the Applicant must submit a copy of the review report to the Secretary and any other NSW agency that requests it, together with its response to any recommendations contained in the review report.

Parking

60. The Applicant must provide sufficient parking on-site for all quarry-related traffic to the satisfaction of the Secretary.

Road Haulage

61. The Applicant must ensure that all loaded vehicles entering or leaving the site are covered.

62. The Applicant must ensure all loaded vehicles leaving the site are cleaned of materials that may fall on the road before they are allowed to leave the site.

ABORIGINAL HERITAGE

Aboriginal Cultural Heritage Management Plan

63. The Applicant must prepare an Aboriginal Cultural Heritage Management Plan for the development to the satisfaction of the Secretary. The plan must:

(a) be prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Secretary;
(b) be prepared in consultation with OEH and the Registered Aboriginal Parties;
(c) be submitted to the Secretary for approval prior to commencing quarrying operations in the Croome West Pit, unless the Secretary agrees otherwise; and
(d) include a description of the measures that would be implemented to:

- protect, monitor and manage known sites or potential areas of archaeological significance (including any proposed archaeological investigations or salvage measures);
- manage unanticipated finds including new Aboriginal objects and Aboriginal skeletal remains that are discovered during the development;
- store and display salvaged Aboriginal heritage items; and
- ensure ongoing consultation and involvement of the Registered Aboriginal Parties in the conservation and management of Aboriginal cultural heritage on the site.

The Applicant must implement the approved Aboriginal Heritage Management Plan as approved by the Secretary.

64. *Deleted*

VISUAL IMPACT

Visual Amenity

65. The Applicant must minimise the visual impacts of the development to the satisfaction of the Secretary.

66. Prior to carrying out any development that would be visible from the areas to the south west of the quarry, the Applicant must construct, and subsequently maintain, the proposed visual/ noise bund between the Croome Farm extraction area and the Jamberoo Valley to the satisfaction of the Secretary.

67A. The Applicant must:

(a) construct the blending plant in the location shown on the figure in Appendix 4; and
(b) ensure the maximum height of the blending plant is no greater than 15.2 m.

Lighting Emissions

67. The Applicant must take all practicable measures to prevent and/or minimise any off-site lighting impacts from the development.

68. All external lighting associated with the development must comply with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting*.

WASTE MANAGEMENT

Waste Minimisation

69. The Applicant must minimise the amount of waste generated by the development to the satisfaction of the Secretary.

Waste Classification

70. [9]All liquid and non liquid wastes resulting from activities and processes at the site must be assessed, classified and managed in accordance with the EPA's Environmental Guidelines*: Assessment, Classification and Management of Liquid and Non-liquid Wastes (1999),* or any other EPA document superceding this guideline.

Reporting

71. The Applicant must describe what measures have been implemented to minimise the amount of waste generated by the development in the Annual Review.

EMERGENCY AND HAZARDS MANAGEMENT

Dangerous Goods

72. The Applicant must ensure that the storage, handling, and transport of dangerous goods is done in accordance with the relevant Australian Standards, particularly AS1940 and AS1596, and the Dangerous Goods Code.

Safety

73. The Applicant must secure the development to ensure public safety to the satisfaction of the Secretary.

Emergency Management

74. [10]Within 6 months of the date of this consent, the Applicant must document, and subsequently implement measures to minimise the environmental impacts of any emergency situations that could arise as a result of the operation of the Dunmore Quarry to the satisfaction of the EPA. This documentation must:
    (a) identify any significant threats to the environment and/ or public health that could arise from activities associated with the operation of the quarry or construction works associated with the production increase. These threats may include excessive rainfall, problems during construction and operation, pump failures, excess flocculation, power or other utility failure, natural disaster, landslip, accidental spills and discharges, train derailment, spillage from trucks, fire etc;
    (b) identify any subsequent direct or indirect environmental effects as a result of the threats;
    (c) identify the pollution that would result due to these threats and impacts on operations and what impact the pollution would have on the health of the community and the environment;
    (d) develop actions to effectively respond to the disruption of operations so the risk of pollution is minimised;
    (e) develop a communications strategy for alerting relevant agencies and the potentially affected community in the event of the disruption to operations leading to significant pollution;
    (f) ensure that all relevant employees are familiar with the documentation; and
    (g) when developing this documentation identify any opportunities to integrate with Boral Emergency plans.

BUSHFIRE MANAGEMENT

75. The Applicant must:
    (a) ensure that the development is suitably equipped to respond to any fires on-site; and
    (b) assist the Rural Fire Service and Emergency Services as much as possible if there is a fire on-site.

76. Within 6 months of the date of this consent, the Applicant must prepare a Bushfire Management Plan for the development, to the satisfaction of Council and the Rural Fire Service.

PRODUCTION DATA

77. The Applicant must:
    a. provide annual production data to the DRG using the standard form for that purpose; and
    b. include a copy of this data in the Annual Review.

[9] Incorporates EPA GTA
[10] Incorporates EPA GTA

SCHEDULE 4A
ADDITIONAL PROCEDURES

NOTIFICATION OF EXCEEDANCES

1. As soon as practicable and no longer than 7 days after obtaining monitoring results showing an exceedance of any criteria in Schedule 4 the Applicant must:
   (a) provide to any affected landowners and tenants; and,
   (b) publish on its website the full details of the exceedance.

   Any exceedance of any criteria in Schedule 4 is an incident that must be notified to the Department in accordance with condition 7 of Schedule 5 of this consent.

   For any exceedance of the air quality criteria or air quality measures in Schedule 4, the Applicant must also provide to any affected landowners and tenants a copy of the fact sheet entitled *Mine Dust and You* (NSW Minerals Council, 2011) fact sheet (as may be updated from time to time).

INDEPENDENT REVIEW

2. If a landowner considers the development to be exceeding the relevant criteria in Schedule 4, they may ask the Secretary in writing for an independent review of the impacts of the development on their land.

   If the Secretary is satisfied that an independent review is warranted, within 2 months of the Secretary's decision, the Applicant must:
   (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to:
      - consult with the landowner to determine their concerns;
      - conduct monitoring to determine whether the development is complying with the relevant criteria in Schedule 3; and
      - if the development is not complying with that criteria, identify measures that could be implemented to ensure compliance with the relevant criteria; and
   (b) give the Secretary and landowner a copy of the independent review; and
   (c) comply with any written requests made by the Secretary to implement any findings of the review.

SCHEDULE 5
ENVIRONMENTAL MANAGEMENT, MONITORING, AUDITING AND REPORTING

ENVIRONMENTAL MANAGEMENT

Environmental Management Strategy

1. If the Secretary requires, the Applicant must prepare an Environmental Management Strategy for the development to the satisfaction of the Secretary. This strategy must:
   (a) be submitted to the Secretary for approval within 6 months of the Secretary requiring preparation of the strategy by notice to the Applicant;
   (b) provide the strategic framework for the environmental management of the development;
   (c) identify the statutory approvals that apply to the development;
   (d) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development;
   (e) describe the procedures that would be implemented to:
      - keep the local community and relevant agencies informed about the operation and environmental performance of the development;
      - receive, handle, respond to, and record complaints;
      - resolve any disputes that may arise during the course of the development;
      - respond to any non-compliance; and
      - respond to emergencies; and
   (f) include:
      - copies of any strategies, plans and programs approved under the conditions of this consent; and
      - a clear plan depicting all the monitoring required to be carried out under the conditions of this consent.

   The Applicant must implement any Environmental Management Strategy as approved from time to time by the Secretary.

Evidence of Consultation

1A. Where consultation with any State or local agency is required by the conditions of this consent, the Applicant must:
   (a) consult with the relevant agency prior to submitting the required document;
   (b) submit evidence of this consultation as part of the relevant document;
   (c) describe how matters raised by the agency have been addressed and any matters not resolved; and
   (d) include details of any outstanding issues raised by the agency and an explanation of disagreement between any agency and the Applicant.

Management Plan Requirements

2. The Applicant must ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include:
   (a) detailed baseline data;
   (b) a description of:
      - the relevant statutory requirements (including any relevant approval, licence or lease conditions);
      - any relevant limits or performance measures/criteria; and
      - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;
   (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;
   (d) a program to monitor and report on the:
      - impacts and environmental performance of the development; and
      - effectiveness of any management measures (see (c) above);
   (e) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;
   (f) a program to investigate and implement ways to improve the environmental performance of the development over time;
   (g) a protocol for managing and reporting any:
      - incidents;
      - complaints;
      - non-compliances with statutory requirements; and
      - exceedances of the impact assessment criteria and/or performance criteria;
   (h) a protocol for periodic review of the plan; and

(i) a document control table that includes version numbers, dates when the management plan was prepared and reviewed, names and positions of people who prepared and reviewed the management plan, a description of any revisions made and the date of the Secretary's approval.

Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.

Application of Existing Strategies, Plans or Programs

3A. The Applicant must continue to apply existing approved strategies, management plans, or monitoring programs that have most recently been approved under this consent, until the approval of a similar strategy, plan or program under this consent.

Updating & Staging Submission of Strategies, Plans or Programs

3. To ensure the strategies, plans or programs under this consent are updated on a regular basis, and that they incorporate any appropriate mitigation measures to improve the environmental performance of the development, the Applicant may at any time submit revised strategies, plans or programs to the Secretary for approval. With the agreement of the Secretary, the Applicant may also submit any strategy, plan or program required by this consent on a staged basis.

With the agreement of the Secretary, the Applicant may revise any strategy, plan or program approved under this consent without consulting with all the parties nominated under the applicable conditions of consent.

Notes:

- *While any strategy, plan or program may be submitted on a staged basis, the Applicant will need to ensure that the existing operations associated with the development are covered by suitable strategies, plans or programs at all times.*
- *If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage/s of the development to which the strategy, plan or program applies; the relationship of this stage/s to any future stages; and the trigger for updating the strategy, plan or program.*

Revision of Strategies, Plans & Programs

4. Within 3 months of the submission of an:
(a) incident report under condition 7 below;
(b) Annual Review under condition 9 below;
(c) audit report under condition 10 below; and
(d) any modifications to this consent,
the Applicant must review, and if necessary revise, the strategies, plans, and programs required under this consent, to the satisfaction of the Secretary.

Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the development.

Adaptive Management

5. The Applicant must assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures in Schedule 4. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation.

Where any exceedance of these criteria and/or performance measures has occurred, the Applicant must, at the earliest opportunity:
(a) take all reasonable and feasible measures to ensure that the exceedance ceases and does not recur;
(b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and
(c) implement remediation measures as directed by the Secretary,
to the satisfaction of the Secretary.

COMMUNITY CONSULTATIVE COMMITTEE

6. The Applicant must operate a Community Consultative Committee (CCC) for the development, to the satisfaction of the Secretary. This CCC must be operated in general accordance with the Department's *Community Consultative Committee Guidelines: State Significant Projects* (2016) (as may be updated or replaced from time to time).

Notes:

- The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent.

- In accordance with the guideline, the committee should be comprised of an independent chair and appropriate representation from the Applicant, Council, and the local community.
- The requirement for this CCC may be fulfilled by a regional CCC for any two or more of Boral's quarrying operations in the South Coast area.

REPORTING

Incident Reporting

7. The Applicant must immediately notify the Secretary and any other relevant agencies of any incident. Within 7 days of the date of the incident, the Applicant must provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.

Regular Reporting

8. The Applicant must provide regular reporting on the environmental performance of the development on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this consent.

Annual Review

9. By the end of September each year, or other timing as may be agreed by the Secretary, the Applicant must submit a report to the Department reviewing the environmental performance of the development to the satisfaction of the Secretary. This review must:
   (a) describe the development (including rehabilitation) that was carried out in the previous financial year, and the development that is proposed to be carried out over the current financial year;
   (b) include a comprehensive review of the monitoring results and complaints records of the development over the previous financial year, which includes a comparison of these results against the:
      - relevant statutory requirements, limits or performance measures/criteria;
      - requirements of any plan or program required under this consent;
      - monitoring results of previous years; and
      - relevant predictions in the documents listed in condition 2 of Schedule 3;
   (c) identify any non-compliance over the last financial year, and describe what actions were (or are being) taken to ensure compliance;
   (d) identify any trends in the monitoring data over the life of the development;
   (e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
   (f) describe what measures will be implemented over the current financial year to improve the environmental performance of the development.

   The Applicant must ensure that copies of the Annual Review are submitted to Council and are available to the Community Consultative Committee (see condition 6 of Schedule 5) and any interested person upon request.

INDEPENDENT ENVIRONMENTAL AUDIT

10. Prior to 1 April 2017, and every three years thereafter, unless the Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:
   (a) be conducted by suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary;
   (b) include consultation with the relevant agencies and the CCC;
   (c) assess the environmental performance of the development and whether it is complying with the relevant requirements in this consent and any relevant EPL and/or Water Licences (including any assessment, plan or program required under these approvals);
   (d) review the adequacy of any approved strategies, plans or programs required under the abovementioned approvals;
   (e) recommend appropriate measures or actions to improve the environmental performance of the development, and/or any assessment, plan or program required under the abovementioned approvals; and
   (f) be conducted and reported to the satisfaction of the Secretary.

   Note: This audit team must be led by a suitably qualified auditor and include experts in any fields specified by the Secretary.

11. Within 12 weeks of commencing this audit, or as otherwise agreed by the Secretary, the Applicant must submit a copy of the audit report to the Secretary and any other NSW agency that requests it, together with its response to any recommendations contained in the audit report.

ACCESS TO INFORMATION

12. By 31 December 2016, unless otherwise agreed by the Secretary, the Applicant must:

(a) make the following information publicly available on its website:

- the documents listed in condition 2 of Schedule 3;
- current statutory approvals for the development;
- approved strategies, plans or programs required under the conditions of this consent;
- a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs;
- a complaints register, updated quarterly;
- the Annual Reviews (over the last 5 years);
- any independent environmental audit, and the Applicant's response to the recommendations in any audit;
- any other matter required by the Secretary; and

(b) keep this information up-to-date,

to the satisfaction of the Secretary.

APPENDIX 1
SCHEDULE OF LAND

Land to which the Development Application refers:

Local Government Area:

Shellharbour

Suburb, town or locality:

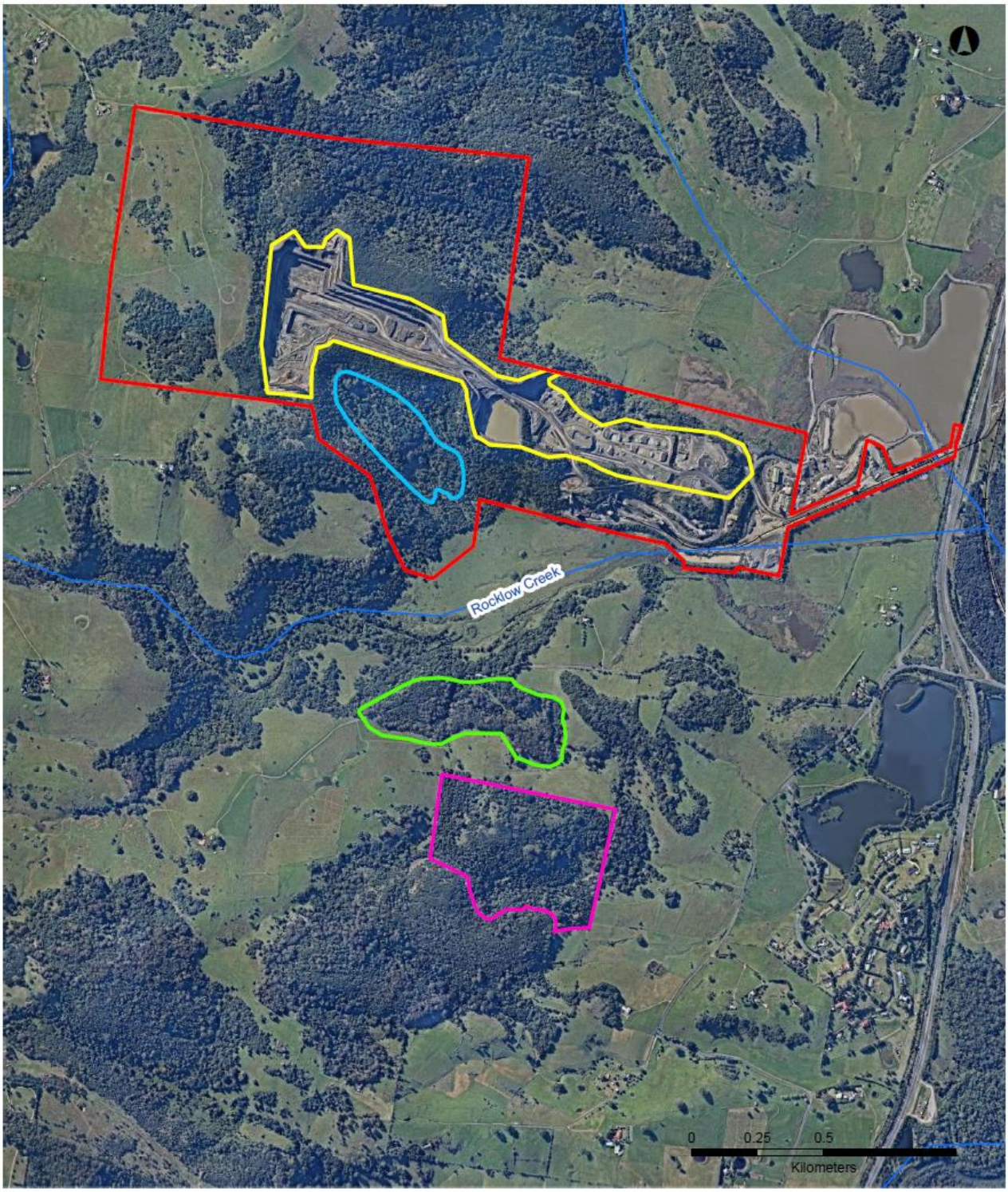
Dunmore

Land:

Lot No.	DP No.
Lot 1	DP 213575
Lot 3	DP 1030504
Lot 4	DP 1030504
Lot 4	DP 227046
Lot 1	DP 1002951
Lot 1	DP 224597
Lot 2	DP 224597
Lot 4	DP 571406
Lot 6	DP 1001931

APPENDIX 2
SENSITIVE RECEIVERS

APPENDIX 3
CONSERVATION AREAS



LEGEND

- Site Boundary
- Hard Rock Quarry
- Watercourse

Conservation Areas

- Compensatory Habitat Area
- Offset Area
- Remnant Vegetation Conservation Area

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ARCADIS

Conservation Areas (April 2016)

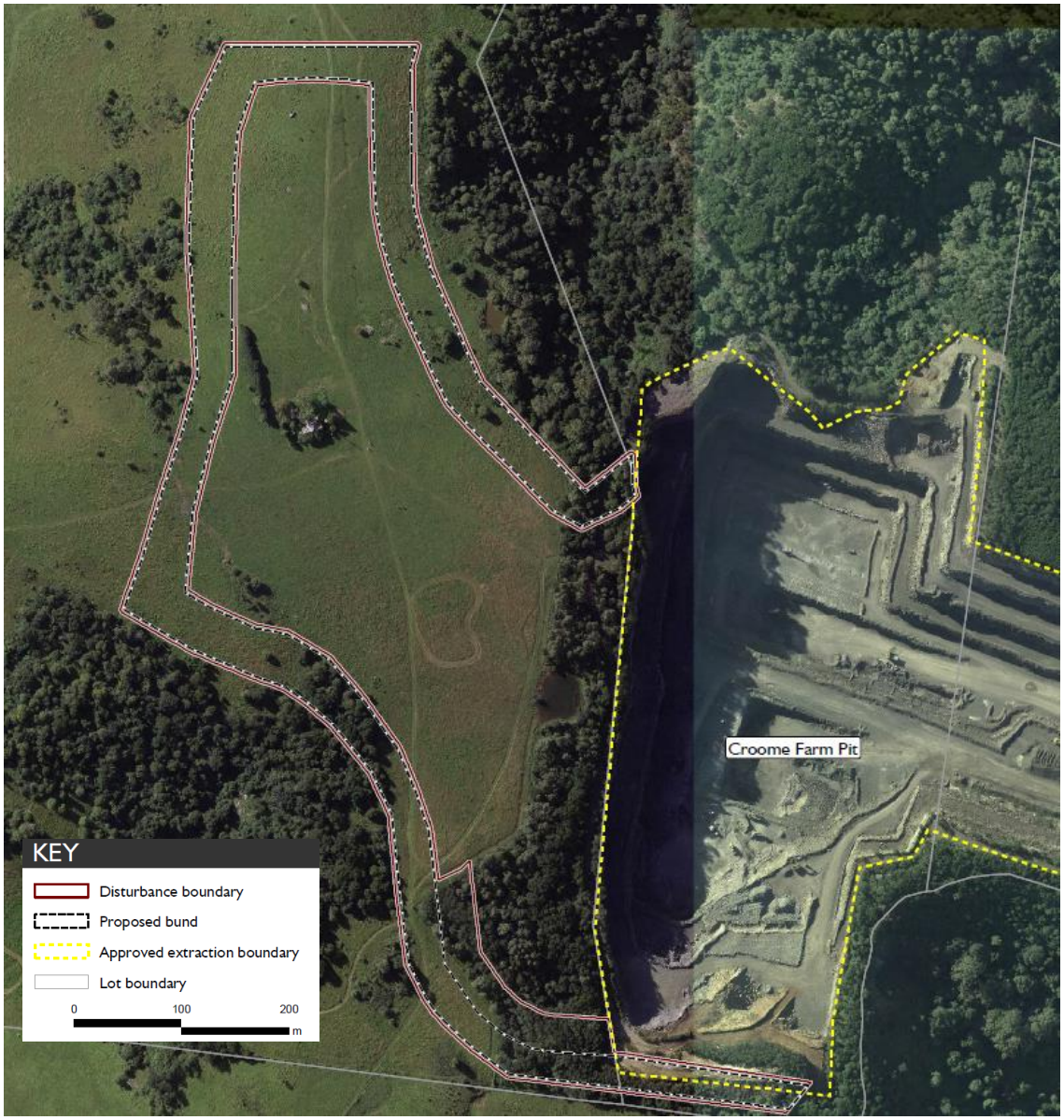
APPENDIX 4
LOCATION OF BLENDING PLANT

FIGURE 3
Blending plant location

DUNMORE HARD ROCK QUARRY - PROPOSED BLENDING PLANT

031043 F3 281014_V02

APPENDIX 5
LOCATION OF BUND



Appendix B

Flora Species list found on the site

Appendix B

Flora Species Lists for Vegetation Communities on the Subject Site

Table B.1 ABUNDANCE OF FLORA OF *MELALEUCA ARMILLARIS* TALL SHRUBLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
Trees				
Araliaceae	*Polyscias elegans*	Celerywood	2	Y
Ebenaceae	*Diospyros australis*	Black Plum	1	-
Fabaceae	*Acacia maideniii*	Maiden's Wattle	1-2	Y
	Acacia mearnsii	Black Wattle	1-2	Y
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	1-2	Y
	Melaleuca armillaris	Bracelet Honey-myrtle	3-7	Y
Oleaceae	**Olea europea* ssp. *africana*	African Olive	1-2	Y
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	1	Y
Proteaceae	*Stenocarpus salignus*	Beefwood	1	-
Rhamnaceae	*Alphitonia excelsa*	Red Ash	1-2	Y
Santalaceae	*Exocarpos cupressiformis*	Cherry Ballart	1	-
Shrubs				
Asteraceae	*Ozothamnus diosmifolius*	White Dogwood	1	Y
Celastraceae	*Maytenus silvestris*	Narrow-leaved Orangebark	1	-
Epacridaceae	*Leucopogon juniperinus*	Prickly Beard-heath	2-5	Y
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush	1-2	Y
	Phyllanthus gasstroemii	Blunt Spurge	1-4	Y
Fabaceae	*Indigofera australis*	Australian Indigo	1-2	Y
	Jacksonia scoparia	Winged Broom-pea		Y

Table B.1 ABUNDANCE OF FLORA OF *MELALEUCA ARMILLARIS* TALL SHRUBLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
Lamiaceae	*Prostanthera linearis*	Narrow-leaved Mintbush	1-5	Y
Malvaceae	*Hibiscus heterophyllus*	Native Rosella	1-4	Y
Myrsinaceae	*Rapanea variabilis*	Variable Muttowood	<4	-
Oleaceae	*Notelaea venosa*	Veined Mock Olive	1-3	Y
Pittosporaceae	*Bursaria spinosa*	Blackthorn	1-2	-
	Pittosporum revolutum	Yellow Pittosporum	1	-
Rutaceae	*Zieria granulata*	Illawarra Zieria	2-5	Y
	?*Phebalium* sp.		<2	-
Sapindaceae	*Dodonaea viscosa* ssp. *angustifolia*	a Hop Bush	1-3	Y
Solanaceae	**Physalis peruviana*	Cape Gooseberry	<1	Y
	**Solanum mauritianum*	Wild Tobacco	1-2	Y
Sterculiaceae	*Commersonia fraseri*	Brush Kurrajong	1-3	Y
Ulmaceae	*Trema aspera*	Poison Peach	<1	Y
Verbenaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum	1-3	Y
	**Lantana camara*	Lantana	1-6	Y
Herbs - Ferns				
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair Fern	<4	-
Aspleniaceae	*Asplenium flabellifolium*	Necklace Fern	<2	Y
Lindsaeaceae	*Lindsaea linearis*	Screw Fern	<1	-
Sinopteridaceae	*Cheilanthes distans*	Bristly Cloak Fern	<1	Y

Table B.1 ABUNDANCE OF FLORA OF *MELALEUCA ARMILLARIS* TALL SHRUBLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
	Cheilanthes sieberi	Rock Fern	1-4	Y
	Pellaea falcata	Sickle Fern	2-3	Y
Herbs - Dicots				
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower	<3	-
Apiaceae	*Hydrocotyle laxiflora*	Stinking Pennywort	2	Y
	Hydrocotyle tripartita		<1	-
	Hydrocotyle sp.		2-4	-
Asteraceae	**Bidens pilosa*	Cobbler's Pegs	1-5	Y
	Bracteantha bracteata	Golden Everlasting	2-4	Y
	**Cirsium vulgare*	Spear Thistle	<1	Y
	**Conyza* sp.	a Fleabane	1-3	Y
	Cotula australis		<2	-
	**Facelis retusa*		<2	-
	Helichrysum rutidolepis	Pale Everlasting	-	Y
	**Hypochaeris radicata*	Flatweed	1-3	Y
	**Hypochaeris* sp.	Flatweed	<1	-
	Pseudognaphalium luteo-album		<3	-
	Senecio hispidulus var. *dissectus*	Hill Fireweed	<1	-
	S. hispidulus var. *hispidulus*	Hill Fireweed	<1	Y
	**S. madagascariensis*	Fireweed	1-4	Y

Table B.1 ABUNDANCE OF FLORA OF *MELALEUCA ARMILLARIS* TALL SHRUBLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
	S. quadridentatus	Cotton Fireweed	<1	Y
	Sigesbeckia orientalis	Indian Weed	1-4	Y
	**Sonchus oleraceus*	Common Sow Thistle	1	Y
	**Tagetes minuta*	Stinking Roger	<1-5	Y
	**Taraxacum officinale*	Dandelion	1	-
	Vernonia cinerea	Trailing Speedwell	<1	-
Cactaceae	**Opuntia stricta*	Prickly Pear	1	-
Campanulaceae	*Wahlenbergia gracilis*	Small-flowered Bluebell	1-2	Y
Caryophyllaceae	**Cerastium glomeratum*	Mouse-eared Chickweed	1-4	Y
	Stellaria flaccida	Forest Starwort	<	Y
Chenopodiaceae	*Einadia hastata*	Saloop	1-3	Y
	Einadia polygonoides		<1	-
Convolvulaceae	*Dichondra repens*	Kidney Weed	1-2	Y
Euphorbiaceae	*Poranthera microphylla*		1	-
Fabaceae	*Acacia floribunda*	White Sally Wattle	1-2	-
	Acacia sp.		1	-
	Desmodium varians	Slender Tick Trefoil	1-2	Y
Gentianaceae	**Centaurium erythraea*	Common Centaury	1	Y
Geraniaceae	*Geranium homeanum*	Storksbill	<	-
	Pelargonium antrorsum		<	-

Table B.1 ABUNDANCE OF FLORA OF *MELALEUCA ARMILLARIS* TALL SHRUBLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
	Pelargonium australe	Native Stork's bill	-	Y
Goodeniaceae	*Scaevola albida*	Pale Fan-flower	1-4	Y
Lamiaceae	*Plectranthus graveolens*	Cockspur Flower	1-5	Y
	Plectranthus ?parviflorus	Cockspur Flower	<2	Y
	**Prunella vulgaris*	Self-heal	<1	-
Lythraceae	*Lythrum hyssopifolia*	Hyssop Loosestrife	-	Y
Oxalidaceae	*Oxalis ?exilis*		1-2	-
	Oxalis ?perennans	Wood Sorrel	-	Y
Phytolaccaceae	**Phytolacca octandra*	Inkweed	<1	Y
Plantaginaceae	*Plantago debilis*		<1	-
	**Plantago lanceolata*	Lamb's Tongue	1	Y
Polygonaceae	*Rumex brownii*	Swamp Dock	<1	-
Portulacaceae	*Calandrinia* sp.	Purslane	-	Y
Primulaceae	**Anagallis arvensis*	Scarlet Pimpernel	1-2	Y
Rubiaceae	*Galium propinquum*		2-3	-
Scrophulariaceae	*Veronica plebeia*	Trailing Speedwell	1-3	-
Solanaceae	*Solanum brownii*		<1	-
	**Solanum chenopodioides*	Hairy Nightshade	<1	-
	**Solanum nigrum*	Blackberry Nightshade	1	Y
Herbs - Monocots				

Table B.1 ABUNDANCE OF FLORA OF *MELALEUCA ARMILLARIS* TALL SHRUBLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
Anthericaceae	*Arthropodium sp. B*		1	-
Commelinaceae	*Commelina cyanea*	Blue Wandering Jew	2-3	-
Cyperaceae	*Carex inversa*	Knob Sedge	<2	-
	Carex longebrachiata	Bergalia Tussock	<	Y
	Cyperus sp.		<3	-
	Fimbristylis dichotoma	Common Fringe-sedge	1	-
	Lepidosperma laterale	Broad Sword-sedge	<2	-
Iridaceae	**Sisymbrium* sp.		1-2	-
Orchidaceae	*Microtis* sp.		<1	-
Poaceae	*Aristida ramosa*	Three-awned Grass	<1	-
	**Axonopus affinis*	Carpet Grass	1	-
	Chloris truncata	Windmill Grass	-	Y
	Cymbopogon refracta	Barb-wire Grass	1-3	-
	**Dactyis glomerata*	Cocksfoot	<1	-
	Danthonia sp. (fine)	a Wallaby Grass	1-5	Y
	Danthonia ?setacea		5	-
	Dichelachne micrantha	Short-haired Plume Grass	1-5	Y
	Digitaria parviflora	Small-flowered Finger-grass	1-5	-
	Echinopogon caespitosus	Hedgehog Grass	1	-
	Entolasia marginata	Margined Panic	2-5	Y

Table B.1 ABUNDANCE OF FLORA OF *MELALEUCA ARMILLARIS* TALL SHRUBLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
	Eragrostis brownii	Browns Love Grass	1-2	-
	**Eragrostis curvula*	African Love Grass	5	-
	Eragrostis leptostachya	Paddock Lovegrass	2-5	Y
	**Melinus repens*	Red Natal Grass	2	-
	Microlaena stipoides	Weeping Meadow-grass	2-6	Y
	Oplismenus aemulus	Australian Basket Grass	1-2	Y
	Oplismenus imbecillus	Pademelon Grass	1-4	Y
	Panicum effusum		2	-
	**Paspalum dilatatum*	Paspalum	<1	Y
	**Pennisetum clandestinum*	Kikuyu	<1	Y
	Poa affinis		1	-
	Poa labillardieri	Tussock Grass	1-7	-
	Poa sieberiana	Snow Grass	-	Y
	Sporobolus creber	Western Rat-tail Grass	1	-
	**Sporobolus indicus* var. *capensis*	Parramatta Grass	1	Y
	Themeda australis	Kangaroo Grass	1-6	-
Vines				
Asclepiadaceae	**Araujia sericifera*	Moth Vine	<1	Y
	Tylophora barbata	Purple Tylophora	<4	Y
Asteraceae	**Delairea odorata*	Cape Ivy	1-4	Y

Table B.1 ABUNDANCE OF FLORA OF *MELALEUCA ARMILLARIS* TALL SHRUBLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine	<1	Y
Convolvulaceae	*Polymera calycina*		<1	-
Dilleniaceae	*Hibbertia scandens*	Twining Guinea Flower	<	Y
Fabaceae	*Glycine clandestina*	Twining Glycine	1-4	Y
	Glycine microphylla		<2	-
	Glycine tabacina	Variable Glycine	3	Y
	Kennedia rubicunda	Dusky Coral Pea	1-2	Y
	Stephania japonica var. *discolor*	Snake Vine	<1	Y
Passifloraceae	**Passiflora subpeltata*	White Passionflower	<1	Y
Vitaceae	*Cayratia clematidea*	Slender Grape	1-3	Y
	Geitonoplesium cymosum	Scrambing Lily	1-2	Y
Mistletoe				
Loranthaceae	*Amyema congener*	Mistletoe	<1	Y
Epiphytes & Lithophytes				
Aspleniaceae	*Asplenium australasicum*	Bird's Nest Fern	<1	-
Polypodiaceae	*Pyrrosia rupestris*	Rock Felt Fern	<1	-
Crassulaceae	*Crassula ?sieberiana*	Stonecrop	<2	Y
Moraceae	*Ficus macrophylla*	Moreton Bay Fig	<1	Y

Key

Table B.1 ABUNDANCE OF FLORA OF *MELALEUCA ARMILLARIS* TALL SHRUBLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
Cover abundance in quadrats (**CE**: Cumberland Ecology study)				
1	Rare			
2	Occasional			
3	Common but less than 5% cover			
4	Very common but less than 5% cover			
5	5-25% cover			
6	26-50% cover			
7	51-75% cover			
8	More than 76% cover			
<	Recorded in only 1of 13 quadrats or in similar vegetation community on site			
*	Introduced species			
presence/absence (**KM:**, Kevin Mills 2003)				
Y	Present			
-	Absent or not recorded			

Table B.2 ABUNDANCE OF FLORA OF ILLAWARRA GRASSY WOODLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM

Table B.2 ABUNDANCE OF FLORA OF ILLAWARRA GRASSY WOODLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
Trees				
Araliaceae	*Polyscias elegans*	Celerywood	1	Y
	Polyscias sambucifolia	Elderberry Panax	-	Y
Celastraceae	*Cassine australis*	Berry Olive Berry	<2	-
Ebenaceae	*Diospyros australis*	Black Plum	<1	-
Fabaceae	*Acacia binervata*	Two-veined Hickory	-	Y
	Acacia floribunda	White Sally Wattle	1	-
	Acacia maideniii	Maiden's Wattle	1	Y
	Acacia mearnsii	Black Wattle	1-2	Y
Lauraceae	*Cryptocarya microneura*	Murrogun	<1	Y
Meliaceae	*Melia azedarach*	White Cedar	-	Y
Moraceae	*Ficus macrophylla*	Moreton Bay Fig	<	Y
	Ficus rubiginosa	Rusty Fig	<1	Y
	Streblus brunonianus	Whalebone Tree	<1	Y
Myrsinaceae	*Rapanea variabilis*	Variable Muttonwood	1-3	-
Myrtaceae	*Angophora floribunda*	Rough-barked Apple	<	-
	Callistemon salignus	Willow Bottlebrush	<1	-
	Eucalyptus quadrangulata	Coast White Box	1-5	Y
	Eucalytpus tereticornis	Forest Red Gum	5-6	Y
	Melaleuca armillaris	Bracelet Honey-myrtle	<1	Y

Table B.2 ABUNDANCE OF FLORA OF ILLAWARRA GRASSY WOODLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
Oleaceae	*Notelaea venosa*	Veined Mock Olive	1-5	Y
	**Olea europea* ssp. *africana*	African Olive	1-2	Y
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	1-5	Y
Proteaceae	*Stenocarpus salignus*	Beefwood	<1	-
Rhamnaceae	*Alphitonia excelsa*	Red Ash	1-2	Y
Rutaceae	*Acronychia oblongifolia*	White Lilly Pilly	<	-
	Geijera latifolia	Brush Wilga	2	Y
	Melicope micrococca	Hairy Doughwood	<1	-
Santalaceae	*Exocarpos cupressiformis*	Cherry Ballart	<1	-
Sapindaceae	*Alectryon subcinereus*	Native Quince	<1	-
	Guioa semiglauca	Guioa	1-2	-
Solanaceae	*Duboisia myoporoides*	Corkwood	-	Y
Sterculiaceae	*Brachychiton acerifolius*	Flame Tree	<	-
Shrubs				
Asteraceae	*Ozothamnus diosmifolius*	White Dogwood	<1	Y
Celastraceae	*Maytenus silvestris*	Narrow-leaved Orangebark	<	-
Epacridaceae	*Leucopogon juniperinus*	Prickly Beard-heath	1-3	Y
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush	1-2	Y
	Croton verreauxii	Green Cascarilla	1-5	Y
	Phyllanthus gasstroemii		1	Y

Table B.2 ABUNDANCE OF FLORA OF ILLAWARRA GRASSY WOODLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
Fabaceae	*Acacia* sp. (seedling)		<1	
	Indigofera australis	Australian Indigo	<2	Y
	Jacksonia scoparia	Winged Broom-pea	-	Y
Lamiaceae	*Prostanthera linearis*		<	Y
Pittosporaceae	*Bursaria spinosa*	Blackthorn	<1	-
	Pittosporum revolutum	Yellow Pittosporum	1	-
Rutaceae	*Zieria granulata*		2	Y
Santalaceae	*Santalum obtusifolium*		<1	-
Sapindaceae	*Dodonaea viscosa* ssp. *angustifolia*		<2-3	Y
Solanaceae	**Physalis peruviana*		<1	Y
	**Solanum mauritianum*	Tobacco Weed	<1	Y
Ulmaceae	*Trema aspera*	Poison Peach	<1	Y
Verbenaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum	<2	Y
	**Lantana camara*	Lantana	5-7	Y
Herbs - Ferns				
Adiantaceae	*Adiantum hispidulum*	Rough Maidenhair Fern	<	-
Aspidiaceae	*Lastreopsis decomposita*	Trim Shield Fern	<	-
Blechnaceae	*Blechnum cartilagineum*	Gristle Fern	<	-
	Doodia aspera	Common Rasp Fern	<	Y
Sinopteridaceae	*Pellaea falcata*	Sickle Fern	1-2	Y

Table B.2 ABUNDANCE OF FLORA OF ILLAWARRA GRASSY WOODLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
	Pellaea paradoxa		-	Y
Herbs - Dicots				
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower	2-3	-
Apiaceae	*Hydrocotyle laxiflora*	Stinking Pennywort	-	Y
Asteraceae	**Bidens pilosa*	Cobbler's Pegs	<2	Y
	Bracteantha bracteata	Yellow Everlasting	<1	Y
	**Cirsium vulgare*	Scotch Thistle	<	Y
	**Conyza* sp.	Fleabane	<1-2	Y
	**Gnaphalium* sp.	a Cudweed	<	Y
	Helichrysum rutidolepis	Pale Everlasting	-	Y
	**Hypochaeris radicata*	Flatweed	<	Y
	**Senecio madagascariensis*	Fireweed	1-2	Y
	Sigesbeckia orientalis		<1	Y
	Stellaria flaccida	Native Chickweed	1-2	Y
Campanulaceae	*Wahlenbergia gracilis*	Small-flowered Bluebell	1	-
Chenopodiaceae	*Einadia hastata*	Saloop	1-3	Y
	Einadia trigonos	Fishweed	<1	-
Convolvulaceae	*Dichondra repens*	Kidney Weed	1-3	Y
Fabaceae	*Desmodium varians*	Tick Trefoil	1-2	Y
Geraniaceae	*Geranium homeanum*	Storksbill	<2	-

Table B.2 ABUNDANCE OF FLORA OF ILLAWARRA GRASSY WOODLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
	Geranium solanderi	Austral Crane's bill	-	Y
	Pelargonium australe	Native Stork's bill	-	Y
Lamiaceae	*Plectranthus graveolens*		1-3	Y
Lythraceae	*Lythrum hyssopifolia*	Hyssop Loosestrife	-	Y
Malvaceae	**Sida rhombifolia*	Paddy's Lucerne	2-3	Y
Oxalidaceae	*Oxalis ?exilis*		<2	-
	Oxalis ?perennans	Wood Sorrel	-	Y
Plantaginaceae	**Plantago lanceolata*	Lamb's Tongue	<1-2	Y
Polygonaceae	*Muehlenbeckia gracillima*	Slender Lignum	1	Y
	Rumex brownii		1	Y
	Persicaria decipiens	Slender Knotweed	-	Y
Primulaceae	**Anagallis arvensis*	Scarlet Pimpernel	<	Y
Rubiaceae	*Galium propinquum*		<1	-
Scrophulariaceae	*Veronica plebeia*	Trailing Speedwell	1	-
	**Solanum nigrum*	Blackberry Nightshade	<1	Y
Urticaceae	*Urtica incisa*	Stinging Nettle	<	-
Herbs - Monocots				
Commelinaceae	*Commelina cyanea*	Blue Wandering Jew	1-3	-
	Pollia crispata	Pollia	<1	-
Cyperaceae	*Carex inversa*	Knob Sedge	<3	-

Table B.2 ABUNDANCE OF FLORA OF ILLAWARRA GRASSY WOODLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
	Carex longebrachiata	Bergalia Tussock	<2	Y
	Cyperus imbecillis		2	-
	Gahnia aspera	Rough Saw Sedge	<	-
Juncaceae	*Juncus usitatus*	Forest Rush	<	Y
	Juncus sp.		1-2	-
Poaceae	**Axonopus affinis*	Carpet Grass	<1-2	-
	**Bromus catharticus*	Prairie Grass	<1	Y
	Chloris truncata	Windmill Grass	-	Y
	**Cynodon dactylon*	Couch Grass	<	-
	Entolasia marginata	Margined Panic	2	Y
	Microlaena stipoides	Weeping Meadow-grass	3-5	Y
	Oplismenus aemulus	Basket Grass	<2	Y
	Oplismenus imbecillus		2-5	Y
	**Pennisetum clandestinum*	Kikuyu	<2	Y
	Poa labillardieri	Tussock Grass	<5	-
	Poa sieberiana	Snow Grass	-	Y
	?*Austrostipa* sp.	a spear grass	<2	-
Vines				
Apocynaceae	*Parsonsia straminea*	Common Silkpod	<2	Y
Asclepiadaceae	**Araujia sericifera*	Moth Vine	1-2	Y

Table B.2 ABUNDANCE OF FLORA OF ILLAWARRA GRASSY WOODLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
	Marsdenia rostrata	Milk Vine	<1	Y
	Tylophora barbata	Purple Tylophora	<	Y
Asteraceae	**Delairea odorata*	Cape Ivy	<2-4	Y
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine	1-3	Y
Fabaceae	*Glycine clandestina*		2	Y
	Glycine microphylla		<1-2	-
	Glycine tabacina	Variable Glycine	-	Y
	Hardenbergia violacea	Purple Coral Pea	<	-
Menispermaceae	*Sarcopetalum harveyanum*	Pearl Vine	<1	-
	Stephania japonica var. discolor	Tape Vine	1	Y
Moraceae	*Maclura cochinchinensis*	Cockspur Vine	2	Y
Passifloraceae	*Passiflora herbertiana*	Native Passionflower	<	Y
	**Passiflora subpeltata*	White Passionflower	1-2	Y
Rosaceae	*Rubus parvifolius*	Small-leaved Bramble	<	-
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry	1	Y
	Geitonoplesium cymosum	Scrambling Lily	2	Y
Smilaceae	*Smilax australis*	Wait-a-while	<2	-
Mistletoes				
Loranthaceae	*Amyema congener*		<	Y
Epiphytes &				

Table B.2 ABUNDANCE OF FLORA OF ILLAWARRA GRASSY WOODLAND IN QUADRATS SURVEYED (KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
Lithophytes				
Dicksoniaceae	*Calochlaena dubia*	False Bracken Fern	<	-

KEY

Cover abundance in quadrats (**CE**: Cumberland Ecology study)

1	Rare
2	Occasional
3	Common
4	Very common but less than 5% cover
5	5-25% cover
6	26-50% cover
7	51-75% cover
8	More than 76% cover
<	Recorded in only 1 of 4 quadrats or in similar vegetation community on site
*	Introduced species

presence/absence (**KM:** Kevin Mills & Associates 2003)

Y	present
-	Absent or not recorded

Table B.3 ABUNDANCE OF FLORA OF ILLAWARRA SUBTROPICAL RAINFOREST IN QUADRATS SURVEYED (QUADRAT 18 *BACKHOUSIA MYRTIFOLIA* CLOSED FOREST, KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
Trees				
Anacardiaceae	*Euroschinus falcata*	Chinaman's Cedar	<1	-
Araliaceae	*Polyscias elegans*	Celerywood	<1	Y
	Polyscias sambucifolia	Elderberry Panax	-	Y
Celastraceae	*Cassine australis*	Berry Olive Berry	2-5	-
Cunoniaceae	*Ceratopetalum apetalum*	Coachwood	<5	-
Cyatheaceae	*Cyathea australis*	Rough Fern Tree	-	Y
Ebenaceae	*Diospyros australis*	Black Plum	1-4	-
	Diospyros pentamera	Grey Persimmon	1	-
Elaeocarpaceae	*Elaeocarpus kirtonii*	Pigeonberry Ash	<1	-
Euphorbiaceae	*Baloghia inophylla*	Brush Bloodwood	2-5	-
Fabaceae	*Acacia binervata*	Two-veined Hickory	-	Y
	Acacia mearnsii	Black Wattle	<1	Y
	Pararchidendron pruinosum	Snowwood	<	-
Icacinaceae	*Citronella moorei*	Churnwood	1-2	-
	Pennantia cunninghamii	Brown Beech	<1	-
Lauraceae	*Cinnamomum oliveri*	Oliver's Sassafras	<	-
	Cryptocarya glaucescens	Jackwood	1	-

Table B.3 ABUNDANCE OF FLORA OF ILLAWARRA SUBTROPICAL RAINFOREST IN QUADRATS SURVEYED (QUADRAT 18 *BACKHOUSIA MYRTIFOLIA* CLOSED FOREST, KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
	Cryptocarya microneura	Murrogun	<1	Y
	Litsea reticulata	Bollywood	<1	-
Meliaceae	*Melia azedararch*	White Cedar	<1	Y
	Synoum glandulosum	Scentless Rosewood	1	-
	Toona ciliata	Red Cedar	<1	Y
Monimiaceae	*Doryphora sassafras*	Sassafras	5	-
Moraceae	*Ficus coronata*	Creek Sandpaper Fig	<5	-
	Ficus macrophylla	Moreton Bay Fig	5	Y
	Ficus obliqua	Small-leaved Fig	<5	-
	Ficus rubiginosa	Rusty Fig	<5	Y
	Ficus superba var. *henneana*	Deciduous Fig	<	-
	Streblus brunonianus	Whalebone Tree	1-2	Y
Myrsinaceae	*Rapanea howittiana*	Howitt's Muttonwood	<1	Y
Myrtaceae	*Acmena smithii*	Lilly Pilly	1-6	-
	Backhousia myrtifolia	Grey Myrtle	<7	-
	Eucalyptus saligna x botryoides	Blue Gum hybrid	<1	Y
	Eucalyptus tereticornis	Forest Red Gum	<1	Y
	Rhodamnia rubescens	Brush Turpentine	<	Y
	Syzygium australe	Brush Cherry	1	Y
Oleaceae	*Notelaea venosa*	Veined Mock Olive	1-3	Y

Table B.3 ABUNDANCE OF FLORA OF ILLAWARRA SUBTROPICAL RAINFOREST IN QUADRATS SURVEYED (QUADRAT 18 *BACKHOUSIA MYRTIFOLIA* CLOSED FOREST, KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
	**Olea europea* ssp. *africana*	African Olive	<1	Y
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	1-2	Y
Podocarpaceae	*Podocarpus elatus*	Plum Pine	1-5	-
Proteaceae	*Stenocarpus salignus*	Beefwood	1	-
Rhamnaceae	*Alphitonia excelsa*	Red Ash	1-5	Y
Rutaceae	*Acronychia oblongifolia*	White Lilly Pilly	<	-
	Melicope micrococca	Hairy Doughwood	<5	-
	Sarcomelicope simplicifolia	Yellowwood	1-5	-
Sapindaceae	*Alectryon subcinereus*	Native Quince	2-4	-
	Diploglottis australis	Tamarind	1	Y
	Guioa semiglauca	Guioa	1	Y
Sapotaceae	*Planchonella australis*	Black Apple	1-2	-
Solanaceae	*Duboisia myoporoides*	Corkwood	-	Y
Sterculiaceae	*Brachychiton acerifolius*	Flame Tree	1-5	-
Urticaceae	*Dendrocnide excelsa*	Giant Stinging Tree	2-5	-
Araceae	*Livistona australis*	Cabbage Tree Palm	1	Y
Shrubs				
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush	1-2	Y
	Claoxylon australe	Brittlewood	1-2	Y

Table B.3 ABUNDANCE OF FLORA OF ILLAWARRA SUBTROPICAL RAINFOREST IN QUADRATS SURVEYED (QUADRAT 18 *BACKHOUSIA MYRTIFOLIA* CLOSED FOREST, KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
	Croton verreauxii	Green Cascarilla	1	Y
	Omalanthus nutans	Bleeding Heart	<1	Y
Eupomatiaceae	*Eupomatia laurina*	Bolwarra	1-2	-
Malvaceae	*Hibiscus heterophyllus*	Native Rosella	<1	Y
Monimiaceae	*Wilkiea huegeliana*	Veiny Wilkiea	1-5	-
Nyctaginaceae	*Pisonia umbellifera*	Bird Lime Tree	<1	-
Pittosporaceae	*Citriobatus pauciflorus*	Orange Thorn	1-4	-
	Pittosporum revolutum	Yellow Pittosporum	1	-
Solanaceae	*Solanum aviculare*	Kangaroo Apple	<1	-
	**Solanum mauritianum*	Tobacco Weed	<1	Y
Verbenaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum	1-2	Y
	**Lantana camara*	Lantana	2-3	Y
Herbs - Ferns				
Adiantaceae	*Adiantum formosum*	Giant Maidenhair Fern	1-5	-
	Adiantum hispidulum	Rough Maidenhair Fern	<	-
Aspidiaceae	*Lastreopsis decomposita*	Trim Shield Fern	3-5	-
Blechnaceae	*Blechnum cartilagineum*	Gristle Fern	1	-
	Doodia aspera	Common Rasp Fern	1-2	Y
Sinopteridaceae	*Pellaea falcata*	Sickle Fern	<2	Y
	Pellaea paradoxa		-	Y

Table B.3 ABUNDANCE OF FLORA OF ILLAWARRA SUBTROPICAL RAINFOREST IN QUADRATS SURVEYED (QUADRAT 18 *BACKHOUSIA MYRTIFOLIA* CLOSED FOREST, KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
Herbs - Dicots				
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower	3	-
Apiaceae	*Hydrocotyle laxiflora*	Stinking Pennywort	-	Y
Asteraceae	**Ageratina riparia*	Mistweed	<2	-
	Sigesbeckia orientalis		<2	Y
Boraginaceae	*Ehretia acuminata*	Koda	-	Y
Geraniaceae	*Geranium homeanum*	Storksbill	<1	-
Lythraceae	*Lythrum hyssopifolia*	Hyssop Loosestrife	-	Y
Malvaceae	**Sida rhombifolia*	Paddy's Lucern	<2	Y
Polygonaceae	*Muehlenbeckia gracillima*	Slender Lignum	-	Y
Scrophulariaceae	**Solanum nigrum*	Blackberry Nightshade	<1	Y
Urticaceae	*Urtica incisa*	Stinging Nettle	<	-
Herbs - Monocots				
Araceae	*Gymnostachys anceps*	Settler's Flax	1-2	-
Commelinaceae	*Aneilema acuminata*		2	-
	Aneilema biflora		<	-
	Commelina cyanea	Blue Wandering Jew	<1	-
	Pollia crispata	Pollia	<	-
Cyperaceae	*Carex longebrachiata*	Bergalia Tussock	<5	Y
Oxalidaceae	*Oxalis ?perennans*	Wood Sorrel	-	Y

Table B.3 ABUNDANCE OF FLORA OF ILLAWARRA SUBTROPICAL RAINFOREST IN QUADRATS SURVEYED (QUADRAT 18 *BACKHOUSIA MYRTIFOLIA* CLOSED FOREST, KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
Poaceae	*Oplismenus aemulus*	Basket Grass	<1	Y
	Oplismenus imbecillus		1-5	Y
	Poa sieberiana	Snow Grass	-	Y
Vines				
Apocynaceae	*Parsonsia straminea*	Common Silkpod	1-3	Y
Asclepiadaceae	**Araujia sericifera*	Moth Vine	<3	Y
	Marsdenia flavescens	Hairy Milk Vine	1-2	-
	Marsdenia rostrata	Milk Vine	1-3	Y
	Tylophora barbata	Purple Tylophora	<1	Y
Asteraceae	**Delairea odorata*	Cape Ivy	1-3	Y
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine	1-2	Y
Celastraceae	*Celastris australis*	Small Staff Climber	1-2	-
Cunoniaceae	*Aphanopetalum resinosum*	Gum Vine	1-4	-
Fabaceae	*Glycine microphylla*		1	-
	Glycine tabacina	Variable Glycine		Y
Menispermaceae	*Legnephora moorei*	Big-leaf Vine	1-2	Y
	Sarcopetalum harveyanum	Pearl Vine	<1	-
	Stephania japonica var. *discolor*	Tape Vine	1-2	Y
Moraceae	*Malaisia scandens*	Burny Vine	2-4	-
	Maclura cochinchinensis	Cockspur Vine	1	Y

Table B.3 ABUNDANCE OF FLORA OF ILLAWARRA SUBTROPICAL RAINFOREST IN QUADRATS SURVEYED (QUADRAT 18 *BACKHOUSIA MYRTIFOLIA* CLOSED FOREST, KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
Piperaceae	*Piper novae-hollandiae*	Pepper Vine	1	-
Ranunculaceae	*Clematis aristata*	Traveller's Joy	<1	-
Rosaceae	*Rubus rosifolius*	Rose-leaved Bramble	<	-
Rubiaceae	*Morinda jasminoides*	Jasmine Morinda	1-3	-
Vitaceae	*Cissus antarctica*	Simple-leaved water Vine	1-3	Y
	Cissus hypoglauca	Five-leaved water Vine	<1	-
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry	1-2	Y
	Geitonoplesium cymosum	Scrambling Lily	1-3	Y
Smilaceae	*Smilax australis*	Wait-a-while	1-3	-
Mistletoes				
Loranthaceae	*Amyema congener*		<1	Y
Epiphytes & Lithophytes				
Aspleniaceae	*Asplenium australasicum*	Bird's Nest Vine	<1	-
	Asplenium flabellifolium	Necklace Fern	<2	Y
Polypodiaceae	*Arthropteris tenella*	Climbing Fishbone Fern	1-3	-
	Microsorium scandens	Scented Fern	4-5	-
	Platycerium bifurcata	Elkhorn Fern	<1	-
	Pyrrosia rupestris	Rock Felt Fern	<2	-

KEY

Cover abundance in quadrats (**CE**: Cumberland Ecology study)

Table B.3 ABUNDANCE OF FLORA OF ILLAWARRA SUBTROPICAL RAINFOREST IN QUADRATS SURVEYED (QUADRAT 18 *BACKHOUSIA MYRTIFOLIA* CLOSED FOREST, KEY AT BOTTOM OF TABLE)

Family	Scientific Name	Common Name	CE	KM
1	Rare			
2	Occasional			
3	Common			
4	Very common but less than 5% cover			
5	5-25% cover			
6	26-50% cover			
7	51-75% cover			
8	More than 76% cover			
<	Recorded in only 1 of 7 quadrats or in similar vegetation community on site			
*	Introduced species			
presence/absence (**KM:** Kevin Mills & Associates 2003)				
Y	present			
-	Absent or not recorded			

Table B.4 ADDITIONAL SPECIES RECORDED BY KEVIN MILLS

Family	Scientific Name	Common Name	CE	KM
Fabaceae	*Acacia binervata*	Two-veined Hickory		R
Portulacaceae	*Calandrinia sp*	Purslane		Ma

Table B.4 ADDITIONAL SPECIES RECORDED BY KEVIN MILLS

Family	Scientific Name	Common Name	CE	KM	
Poaceae	*Chloris truncata*	Windmill Grass			
Cyatheaceae	*Cyathea australis*	Rough Fern Tree			R
Solanaceae	*Duboisia myoporoides*	Corkwood			R
Boraginaceae	*Ehretia acuminate*	Koda			R
Geraniaceae	*Geranium solanderi*	Austral Crane's-bill			Open forest
Fabaceae	*Glycine tabacina*	Variable Glycine			
Asteraceae	*Helichrysum rutidolepis*	Pale Everlasting			Woodland
Apiaceae	*Hydrocotyle laxiflora*	Stinking Pennywort			
Fabaceae	*Jacksonia scoparia*	Winged Broom-pea			Dry stony forests
Lythraceae	*Lythrum hyssopifolia*	Hyssop Loosestrife			
Meliaceae	*Melia azedarach*	White Cedar			R
Polygonaceae	*Muehlenbeckia gracillima*	Slender Lignum			Wet sclerophyll forest and gullies
Oxalidaceae	*Oxalis ?perennans*	Wood Sorrel			
Geraniaceae	*Pelargonium australe*	Native Stork's-bill			Sand dune scrubs
Adiantaceae	*Pellaea paradoxa*				R

Table B.4 ADDITIONAL SPECIES RECORDED BY KEVIN MILLS

Family	Scientific Name	Common Name	CE	KM	
Polygonaceae	*Persicaria decipiens*	Slender Knotweed			Marshes and beside creeks
Poaceae	*Poa sieberiana*	Snow Grass			
Araliaceae	*Polyscias sambucifolia*	Elderberrry Panax			R
Asteraceae	**Ageratina adenophora*	Crofton Weed			Disturbed areas
Fabaceae	**Albizia lophanatha*	Crested Wattle			
Poaceae	**Andropogon virginicus*	Whiskey Grass			
Papaveraceae	**Argemone ochroleuca*	Mexican Poppy			
Poaceae	**Arundo donax*	Bamboo			
Asteraceae	**Aster subulatus*	Bushy Starwort			
Brassicaeae	**Brassica* sp.	Brassica			
Poaceae	**Chloris gayana*	Rhodes Grass			
Asteraceae	**Chrysanthemoides monilifera*	Bitou Bush			Coastal sand dunes
Apiaceae	**Ciclospermum leptophyllum*	Slender Celery			
Cyperaceae	**Cyperus eragrostis*	Umbrella Sedge			Ditches and marshes

Table B.4 ADDITIONAL SPECIES RECORDED BY KEVIN MILLS

Family	Scientific Name	Common Name	CE	KM	
Boraginaceae	**Echium plantagineum*	Paterson's Curse			
Polygonaceae	**Emex australis*	Spiny Emex			
Fabaceae	**Erythrina* x *sykesii*	Coral Tree			
Euphorbiaceae	**Euphorbia peplus*	Petty Spurge			
Apiaceae	**Foeniculum vulgare*	Fennel			
Asteraceae	**Gnaphalium americanum*	American Cudweed			
Asclepiadaceae	**Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush			
Poaceae	**Holcus lanatus*	Yorkshire Fog			
Apiaceae	**Hydrocotyle bonariensis*	Pennywort			Coastal sand dunes
Convulvulaceae	**Ipomoea indica*	Morning Glory			Fences and waste areas
Asteraceae	**Lactuca serriola*	Prickly lettuce			
Brassicaceae	**Lepidium bonariensis*	Peppercress			
Oleaceae	**Ligustrum lucidum*	Large-leaved Privet			
Oleaceae	**Ligustrum sinense*	Small-leaved Privet			Moist gullies
Fabaceae	**Melitotus* sp.	Melliot			
Scrophulariaceae	**Misopates orontium*	Lesser Snapdragon			

Table B.4 ADDITIONAL SPECIES RECORDED BY KEVIN MILLS

Family	Scientific Name	Common Name	CE	KM
Malvaceae	**Modiola caroliniana*	Red Flowered Mallow		
Rosaceae	**Oenothera* sp.	Primrose		
Papaveraceae	**Papaver somniferum*	Opium Poppy		
Caryophyllaceae	**Petrorhagia nanteuilii*	Proliferous Pink		
Rosaceae	**Prunus* sp.	Plum		
Euphorbiaceae	**Ricinus communis*	Castor Oil Plant		
Rosaceae	**Rubus fruticosus*	Blackberry		
Polygonaceae	**Rumex crispus*	Curly Dock		
Lamiaceae	**Salvia verbenaca*	Wild Sage		
Fabaceae	**Senna pendulata*	Winter Senna		
Asteraceae	**Sonchus oleraceus*	Common Sow-thistle		
Tropaeolaceae	**Tropaeolum majus*	Nasturtium		
Scrophulariaceae	**Verbascum thapsus*	Green Mullein		
Verbenaceae	**Verbena bonariensis*	Purpletop		
Verbenaceae	**Verbena officinalis*	Common Verbena		
Fabaceae	**Vicia* sp.	Vetch		

Appendix C

Threatened Flora of the Shellharbour and Kiama Local Government Areas

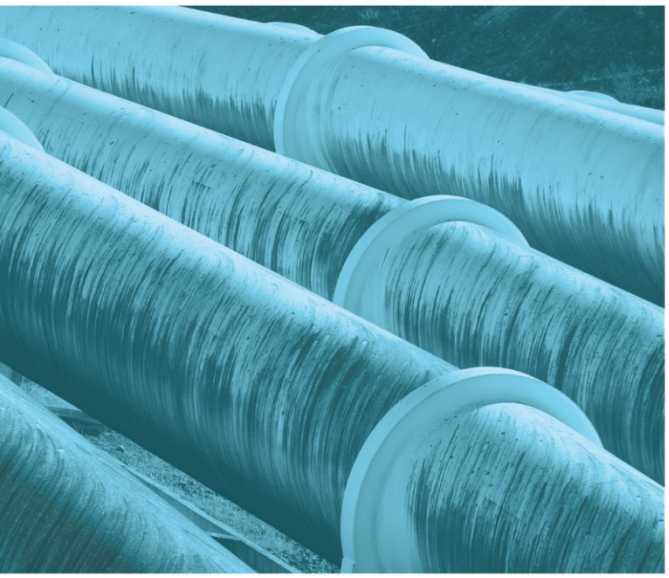
Table C.1 THE LIKELIHOOD OF OCCURRENCE OF THREATENED FLORA RECORDED IN THE SHELLHARBOUR AND KIAMA LOCAL GOVERNMENT AREAS ON THE SUBJECT SITE

Scientific Name	Common Name	EPBC Status	TSC Status	Count	Likelihood of occurrence
Caladenia tessellata	Thick-lipped Spider-orchid, Daddy Long-legs	Vulnerable		0	Occurs in sheltered, moist places in forest and scrub, in stony laterites on coastal tops. Usually only seen after fire. Possibly occurs on the subject site but is cryptic and hard to find.
Cryptostylis hunteriana	Leafless Tongue-orchid	Vulnerable		0	Occurs in swamp heath on sandy soils. Suitable habitat not present on the subject site, therefore not likely to occur.
Cynanchum elegans	White-flowered Wax Plant	Endangered	Endangered	22	Has been detected within locality but not on subject site. Species likely to occur on the subject site within subtropical rainforest and Lantana thickets[3].
Daphnandra sp. Illawarra (R.Schodde 3475)		Endangered	Endangered	27	Location of records not recorded on database. Newly described species, habitat unknown.
Grevillea parviflora			Vulnerable	1	Not recorded within the locality.
Grevillea rivularis			Endangered	5	Not recorded within the locality.
Irenepharsus trypherus	Delicate Cress, Illawarra Irene	Endangered	Endangered	19	Not recorded within the locality.

Table C.1 THE LIKELIHOOD OF OCCURRENCE OF THREATENED FLORA RECORDED IN THE SHELLHARBOUR AND KIAMA LOCAL GOVERNMENT AREAS ON THE SUBJECT SITE

Scientific Name	Common Name	EPBC Status	TSC Status	Count	Likelihood of occurrence
Kennedia retrorsa			Vulnerable	1	Not recorded within the locality.
Pimelea spicata		Endangered	Endangered	19	Occurs in open grassy forest. Viable population has been recorded within locality. Potentially could occur on the subject site.
Pterostylis gibbosa	Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood	Endangered	Endangered	1	Occurs in grassy understorey of open forest. Has been recorded within locality and could potentially occur on the subject site.
Pterostylis pulchella			Vulnerable	1	Not recorded within the locality.
Solanum celatum			Endangered	2	Not recorded within the locality.
Thesium australe	Austral Toadflax, Toadflax	Vulnerable			Occurs in grassland and woodland, often in damp sites. Potentially could occur on the subject site.
Zieria granulata	Hill Zieria, Hilly Zieria, Illawarra Zieria	Endangered	Endangered	160	Is present on subject site.






Appendix D

Bushfire management plan

ZERO HARM TODAY

Dunmore Quarry

Bushfire Management Plan

February 2019

Table 1 Document Control Table

Version	Date	Prepared by	Reviewed by	Distribution
1.	May 2005	Brett McLennan Environment and Community Relations Manager	Paul Martinkus Southern Operations Manager	- Shellharbour Council - NSW Rural Fire Service
2.	October 2007	Rod Wallace Environment & Community Advisor	Jason Williams Dunmore Quarry Manager	- Department of Planning - Shellharbour Council - NSW Rural Fire Service - Dunmore Quarry Community Consultative Committee
3.	May 2010	Mel Goodall Environmental Coordinator	Rod Wallace Planning & Development Manager	- Department of Planning - Shellharbour City Council - NSW Rural Fire Service - Dunmore Quarry Community Consultative Committee
4.	May 2013	Mel Goodall Environmental Advisor	Rod Johnson NSW/ACT Environment Manager Boral Property Group	
5.	August 2016	Ronnie Lawton Environmental Coordinator, Dunmore	Todd Kalajzich Quarry Manager, Dunmore	- Department of Planning - Shellharbour City Council - NSW Rural Fire Service - Dunmore Quarry website
6.	February 2019	Ben Williams Environmental Co-ordinator, Dunmore	Brodie Bolton Quarry Manager, Dunmore	- Department of Planning - Shellharbour City Council - NSW Rural Fire Service - Dunmore Quarry website

1 Introduction

This Bushfire Management Plan (BFMP) covers aspects of bushfire management for the Dunmore Quarry operation and adjacent land. This document falls under the Boral Health, Safety, Environment and Quality (HSEQ) management system.

1.1 Scope

The scope of this BFMP includes the following:

- Dunmore Quarry project site
- Local area including Boral owned land, property and infrastructure.

The plan was developed following consultation with the NSW Rural Fire Service with reviews of the plan undertaken on an as needs basis. Final copies of the plan were lodged with the NSW Rural Fire Service and Shellharbour Shire Council with amendments undertaken during the review process to be lodged with Department of Planning, Shellharbour City Council, NSW Rural Fire Service and an electronic version displayed on the Boral website.

Appendix A of this plan outlines the relevant area along with elements associated with bushfire management.

1.2 Requirements for Bushfire Management

Schedule 4 of the Dunmore Quarry Development Consent Conditions (Consent No. 470-11-2003 contains conditions 4(76 and 77) of the development consent state:

“76. The Applicant must:

> *(a) ensure that the development is suitably equipped to respond to any fires on-site; and*

(b) assist the Rural Fire Service and Emergency Services as much as possible if there is a fire on-site.

77. Within 6 months of the date of this consent, the Applicant must prepare a Bushfire Management Plan for the development, to the satisfaction of Council and the Rural Fire Service."

This plan has been developed to outline how Boral will satisfy the requirements of the above conditions.

2. Objectives for Bushfire Management

The objectives of bushfire management are to minimise the risk of bushfires and rapidly control outbreaks should they occur, in order to:

- Minimise potential for spread of bushfires within and surrounding Boral lease areas;
- Protect people, property and assets;
- Protect areas of heritage value; and
- Protect areas of threatened flora and vegetation communities.

3. Potential Causes and Impacts

The bushfire danger period in NSW generally occurs between 1 October and 31 March (inclusive) of the following year. The season may be varied depending upon the existing or forecast weather conditions and fuel states applicable at the time. Climatic conditions can contribute to the severity of a fire season. Very severe conditions usually result from:

- Wet, late summer and autumn promoting heavy fuel accumulation;
- Dry and windy winters with heavy frosts;
- Dry springs and the early onset of summer conditions;
- Occurrence of an extended drought period; or
- Lower than average rainfall throughout winter.

Whilst Dunmore Quarry operational activities may increase the risk of fires, it will also potentially provide effective fire breaks. Should a fire occur and be allowed to continue unchecked, it will pose a threat to:

- The safety and property of neighbouring land owners;
- Mining equipment and other company assets;
- Grass cover, exposing the land to soil erosion;
- Flora and fauna habitat; and
- Land productivity.

4. Control Measures

Detailed control measures for prevention and control of bushfires are presented in Table 1. They include:

- Grazing of pastures to minimise fuel build-up;
- Vegetation maintenance around infrastructure; and
- Ongoing communications with the NSW Rural Fire Service.

These measures aim to reduce the severity of a bushfire by reducing the amount of fuel available to burn, should one occur. This makes a bushfire easier to control and reduces the level of damage.

Control measures will be undertaken with regard to the impact on flora and fauna. Dunmore Quarry has known populations of threatened species that must be protected. Prior to any clearing of any land for firebreaks, a Request for Approval to Clear Vegetation form (HSEQ-8-08-F01) must be completed and approved.

Dunmore Quarry uses existing fire control infrastructure, with firefighting equipment at key points (that is serviced regularly), and an emergency response team to help reduce the impact of potential fires onsite.

Dunmore Quarry has access to two water carts with capacities of 50,000 litres. Following consultation with the NSW Fire Service, the water cart has been fitted with STORZ fittings, compatible with the NSW Fire Brigade and NSW Rural Fire Service.

A plan of Dunmore Quarry's holding area, infrastructure, access points, which will also serve as staging areas, key waterways and roads is attached in Appendix A. Occurrence of a fire will trigger Boral's emergency response procedures with the NSW Rural Fire Service being notified though the 000 emergency number. If Boral can control the fire or external assistance is not required, notification of all fires will still be undertaken. This will be done in accordance with Boral's procedure for managing external affairs when contacting external emergency services.

Table 2 Fire Hazard Controls

#	CONTROL MEASURE	RESPONSIBILITY	TIMING/FREQUENCY
1	All new employees and contractors to attend a Boral induction prior to commencement of work on site. Inductions will ensure awareness and understanding Boral objectives and emergency procedures.	All staff and contractors	Prior to commencement of work
2	All works onsite require a Safe Work Method Statement (SWMS) and Authority to Work (ATW) Permits prior to commencing tasks on site. This process identifies risks and implements controls in place to reduce risk.	Site Supervisor	Prior to commencement of work
3	Where possible, pasture in the buffer zone around the quarry will continue to be grazed to avoid the build-up of excessive fuels.	Site Manager	Ongoing
4	If necessary, in areas where grazing is not practical, other risk management measures will be taken, such as slashing, grading of fire trails or hazard reduction burning, except in areas where threatened flora and fauna are present.	Site Manager	Ongoing
5	Prior to the initial disturbance of undisturbed Boral land for firebreaks, a Request for Approval to Clear Vegetation form (HSEQ-8-08-F01) must be completed and approved.	All Staff and Contractors	As required
6	Permits for hazard reduction burning must be obtained from the Rural Fire Service during the fire danger period. In addition, a hazard reduction certificate will be obtained for hazard reduction works in the asset protection zone or strategic fire advantage zone.	Site supervisors/ Manager	As required
7	A regular slashing and maintenance program around quarry roads and infrastructure will be carried out.	Site Manager	Ongoing
8	Ongoing communications will be maintained with the NSW Rural Fire Service.	Environmental Coordinator	Ongoing
9	Currently approved fire control systems (including site communications, fire extinguishers and other equipment) will be maintained.	Site Supervisors	Ongoing
10	Site Emergency Response teams will service the site in the event of a fire, and the appropriate Statutory Authority will be contacted.	Site Manager/ Site Supervisor	Ongoing
11	Site Emergency Response teams will service the site in the event of a fire, and the appropriate Statutory Authority will be contacted.	Site Manager/ Site Supervisor	Ongoing
12	All fires on Boral land during the bushfire danger period will be reported to 000.	Site Manager/ Site Supervisor	As required
13	Access points will be used by Boral as staging areas. In the case of a fire requiring assistance, the fire service contacted will be informed of which access point/gate to stage at for briefing by Boral and will then be accompanied onto the site.	Site Supervisor	As required
14	Annual inspections will be made prior to the bushfire season (July/August) to ensure adequacy of fire control measures.	Site Supervisor	Annually (July/August)

5. Monitoring, Reporting and Reviewing

5.1 Monitoring

Annual inspections will be made prior to the bushfire season (July/August) as part of the ongoing land management inspections to ensure adequacy of fire control measures. A copy of the annual inspection checklist is included in Appendix 2. This will include an evaluation of last year's control measures, the assessment of stocking levels on pasture, identification of new and existing areas that require slashing, inspection of firebreak adequacy, and inspection of adequacy of firefighting equipment and facilities. Ongoing maintenance of bushfire controls will be carried out as required following regular inspections by supervisors.

5.2 Reporting

A summary of any bushfire management issues and actions arising throughout the year will be presented in the Annual Review report for the quarry, which will be distributed to relevant regulators and stakeholders.

Performance against the objectives of the BFMP will also be reported in the annual environmental report. The objective will be achieved if fire reduction and hazard control is carried out on a regular basis and regular consultation with the NSW Rural Fire Service is maintained.

5.3 Review

The BFMP will be reviewed and updated every 3 years, or as required following annual inspections. The review will include an assessment of the effectiveness of the established bushfire controls and their performance against the plan's objective.

Progressive amendments will be made to the BFMP as a result of Boral's continuous improvement process. Any amendments to the plan will be undertaken in consultation with the NSW Rural Fire Service.

To date the bushfire prevention measures put in place have been successful. The sites emergency response procedures, which include response to fire, involve emergency response drills that help to assess the ability and capacity of the quarry

to respond in such circumstances. These drills will continue and any improvements needed made upon review of the drill performance.

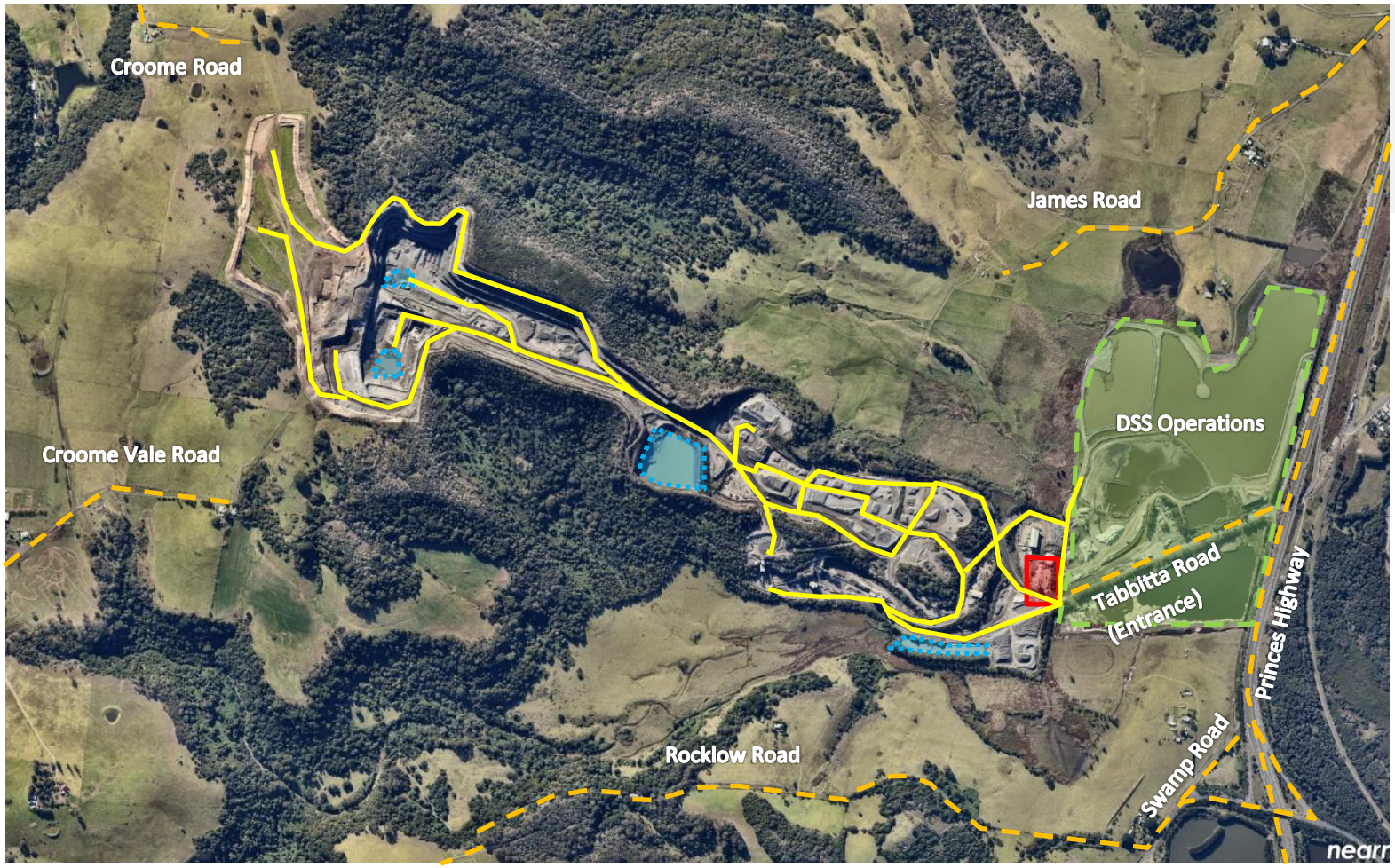
As information and processes improve in regard to fire management the bushfire management plan will be reviewed and site personnel updated on changes.

6. Responsibilities

The Dunmore Quarry Manager will be accountable for the implementation of the BFMP. Specific accountabilities are provided in Table. Key personnel involved in Bushfire management of Dunmore Quarry include:

Quarry Manager, Dunmore	Brodie Bolton	0401 896 866
Production Supervisor, Dunmore	Stuart McLean	0401 895 524
Afternoon Shift Supervisor	Sue Timbs	0401 896 017
Night Shift Supervisor	Wayne Kelly	0401 896 081
Environmental Coordinator, Dunmore	Ben Williams	0401 895 478
Please note that the controlled copy of the Bushfire Management Plan onsite notes the contact information for site personnel however this section is left blank for the public document.		

Appendix A Dunmore Quarry Site Overview



- Please note:
- Drawing not to scale
- Site roads are subject to change and are indicative only
- Water volumes in operational ponds at Dunmore Quarry and Dunmore Sand and Soil are variable in nature.

Appendix B Dunmore Quarry Annual Bushfire Preparation Inspection

Name of Inspector:	Position:	Signature:	Date of Inspection:

Item	Checklist Item	Status			Actions
		Y	N	N/A	
1.	Inspect site infrastructure (office, crib rooms, workshop, haul roads etc.) for overgrown vegetation, rubbish and other flammable material (pallets etc.) and ensure housekeeping is up to standard.				
2.	Review weed management requirements for the entire project site.				
3.	Inspect potential ignition sources throughout the site				
4.	Inspect flammable liquid stores and fuel bowser area.				
5.	Inspect site access points of emergency services and ensure they are suitable.				
6.	Inspect Storz fittings on water carts				
7.	Ensure backup systems for pumps, which could supply water for emergency services, are working and available (i.e. generators)				
8.	Review all site fire suppression inspections and ensure they are up to date.				
9.	Review validity of hot work permit template.				
10.	Review contact details of local emergency services and ensure they are up to date				
11.	Review validity of site inductions and emergency management plan.				
12.	*Add any further items as required....*				
13.					
14.					

Detail any items that require attention and/or remedial action. The Site Manager must monitor progress and completion of actions.

Actions/Comments					
Item No.	Comment	Action Taken	By Who	By When	SIMS No.

Appendix E

Conservation agreement

CONSERVATION AGREEMENT

BETWEEN

THE MINISTER ADMINISTERING THE NEW SOUTH WALES NATIONAL PARKS AND WILDLIFE ACT (1974)

AND

BORAL RESOURCES (NSW) PTY LTD ABN 51 000 756 507

For Dunmore Quarry

February 2011

Boral Resources (NSW) Pty Ltd

Boral Resources (NSW) Pty Ltd

Minister

CONSERVATION AGREEMENT UNDER PART 4 DIVISION 12 OF THE NATIONAL PARKS AND WILDLIFE ACT 1974

THIS AGREEMENT made the day of , Two thousand and ten, **BETWEEN** the Minister for the time being administering the *National Parks and Wildlife Act, 1974* (**"the Minister"** which expressions shall where the context admits, be deemed to include successors in office) of the one part and Boral Resources (NSW) Pty Ltd ABN 51 000 756 507 (“**the Owner**”) care of Boral Limited ‘AMP Centre’ Level 39, 50 Bridge Street Sydney NSW 2000 of the other part.

WHEREAS:

A The Owner is the registered proprietor of the following parcels of land being Lot 2, Deposited Plan 599265 and Lot 5 in Deposited Plan 431183, Parish of Terragong, County of Camden (**"the Land"**). That part of the Land shown by hatching on Diagram A annexed to this Agreement is the conservation area (“**the conservation area**”), being parts of Lot 5 DP 431183 and Lot 2 DP 599265. The conservation area covered by this Agreement equals 14.75 hectares.

B The Owner and the Minister recognise that the conservation area contains native vegetation communities including around 8 hectares of *Melaleuca armillaris* Tall Shrubland and around 7.8 hectares of land that includes Illawarra Lowlands Grassy Woodland, Illawarra subtropical rainforest and pasture containing native grasses.

Melaleuca armillaris Tall Shrubland in the Sydney Basin Bioregion, Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion and Illawarra Subtropical Rainforest in the Sydney Basin Bioregion are all listed as Endangered Ecological Communities on Schedule 1 of the *Threatened Species Conservation Act, 1995*

C The Owner and the Minister recognise that the conservation area contains populations of *Zieria granulata* listed as Endangered on Schedule 1 of the *Threatened Species Conservation Act, 1995.*

D The Owner and the Minister recognise that the conservation area may contain habitat suitable for the Grey-headed Flying-fox (*Pteropus poliocephalus)* and the Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis)* listed as vulnerable on Schedule 2 of the *Threatened Species Conservation Act, 1995* and which have been recorded in the local area.

E The Owner and Minister recognise that the Conservation Agreement satisfies condition 46A in Schedule 4 of development consent DA 470-11-2003 **Dunmore Quarry Development Consent** granted by the Minister Assisting the Minister for Planning and Infrastructure on 30 September 2004 as modified from time to time, for the long term security of the biodiversity offset referred to in condition 46(c) of the development consent.

F Accordingly, the parties hereby enter into the following Conservation Agreement under Section 69B Part 4 Division 12 of the *National Parks and Wildlife Act 1974.*

G The Owner and the Minister agree to take steps to protect and manage the conservation values of the conservation area as set out in Annexures B and C.

NOW THIS AGREEMENT WITNESSES:

1. INTERPRETATION

1.1 In this Agreement unless the contrary intention appears:-

"**Aboriginal Object**" has the same meaning as in Section 5 of the Act;

"**Aboriginal Place**" has the same meaning as in Section 5 of the Act;

"the **Act**" means the *National Parks and Wildlife Act, 1974* and any regulations from time to time in force thereunder;

"**conservation area**" means that part of the Land shown by hatching on the diagram annexed to this Agreement as Annexure A;

"**conservation values**" includes, without limitation, any native fauna and their habitats, native plants and their habitats, cultural heritage, and geo-heritage;

"**controlled burning**" means the controlled application of fire under specified environmental and weather conditions to a predetermined area and at the time, intensity and rate of spread required to attain planned resource management objectives;

"**critical habitat**" has the same meaning as in Section 4 of the *Threatened Species Conservation Act 1995;*

"**cultural heritage**" refers to the historic, archaeological, social, cultural and contemporary values of the physical evidence and traditions of peoples, including Aboriginal peoples;

"**damage**" means incurring injury that impairs the values or usefulness of the conservation area;

"the **Department**" means the NSW Government Department responsible for administering Section 69A to KA of the Act;

"**development**" has the same meaning as provided for in Section 69A of the Act;

"**Director-General**" has the same meaning as Section 5 of the Act;

"**fauna**" has the same meaning as in Section 5 of the Act;

"**geo-heritage**" means geological deposits and landforms that are considered to have conservation values;

"**indigenous fauna**" means all native fauna belonging naturally to the conservation area;

"**indigenous plants**" means all native plants belonging naturally to the conservation area;

"**Land**" means that parcel of land described in Recital A;

"**Management Scheme for the conservation area**" means management scheme prepared for the conservation area in consultation with the owner, annexed to this Agreement as Annexure C;

"**Minister**" means the Minister for the time being administering the Act and where not repugnant to the context includes the servants and agents of the Minister;

"**native fauna**" has the same meaning as "protected fauna" in Section 5 of the Act;

"**native plant**" has the same meaning as in Section 5 of the Act;

"**Owner**" has the meaning as in s69A of the Act and includes any successor in title to the owner within the meaning of s 69E of the Act;

"**pest animal**" means any non-native animal having, or with the potential to have, an adverse economic, environmental or social impact;

"**pesticide**" has the same meaning as in Section 5 of the *Pesticides Act* 1999 which includes herbicides, insecticides, fungicides, baits and rodenticides;

"**reasonable**" in relation to carrying out an activity, means using the best methods available and carrying out the activity in such a way as to have minimal impact on the conservation values of the conservation area;

"**road**" allows the passage of vehicles and persons;

"**threatened species, populations and ecological communities**" and "**threatened species, population or ecological community**" have the same meaning as in the *Threatened Species Conservation Act 1995;*

"**track**" allows non-vehicular access only;

"**trail**" allows the passage of vehicles and persons and is of minimal construction, being of limited width and minimal surface improvement;

1.2 Words importing the singular number shall include the plural and masculine gender the feminine or neuter and vice versa.

1.3 Any reference to a person shall be deemed to include a corporate body and vice versa.

1.4 Any covenant or agreement on the part of two or more persons shall be deemed to bind them jointly and severally.

2. USE OF THE CONSERVATION AREA

The Owner covenants with the Minister as follows:-

General responsibilities

2.1 Except as otherwise permitted by this Agreement, the Owner must not intentionally carry out any act or omit to carry out any act, or cause or permit any act to be carried out or any act not to be carried out which act or omission may harm the conservation values in the conservation area.

Development

2.2 Except as permitted in this Agreement the Owner shall not construct any new road, access track, building or internal fencing or any development that could adversely affect the conservation values of the conservation area.

2.3 The Owner shall be permitted to:

2.3.1 construct a fence along the boundary of the conservation area;

2.3.2 maintain all new and existing fences within the conservation area;

2.3.3 maintain existing access tracks and trails within the conservation area; and

2.3.4 remove pre-existing dumped rubbish/waste with in consultation with the Department.

Subdivision

2.4 The owner shall be permitted to consolidate those parts of Lot 5 DP 431183, Lot 4 DP 571406 and Lot 2 DP 599265 comprising the conservation area, into one lot, and maintain a right of way through the consolidated lot to maintain ongoing vehicle access along the existing track.

Threatened species, ecological communities, populations and their habitats and critical habitat

2.5 Consistent with the *Threatened Species Conservation Act 1995*, where threatened species, populations and ecological communities occur in the conservation area the Owner must manage the conservation area:

2.5.1 to protect and promote the recovery of threatened species, populations and ecological communities, and

2.5.2 to protect the critical habitat of those threatened species, populations and ecological communities that are endangered, and

2.5.3 to eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities, and

2.5.4 to ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed.

Fire

2.6 The Owner must not light a fire, or cause a fire to be lit on the conservation area unless it complies with the *Rural Fires Act 1997*, and:

2.6.1 the lighting of the fire is for the purposes of controlled burning and is carried out in accordance with any fire guidelines for controlled burning as provided for in Annexure C: Management Scheme for the conservation area; or

2.6.2 the lighting of the fire is a necessary component of bush fire hazard reduction work carried out in accordance with a notice served on the Owner under the *Rural Fires Act 1997* or other applicable legislation; or

2.6.3 life or property is in immediate threat by bush fire and the lighting of the fire is reasonably necessary to protect life or property; or

2.6.4 the fire is a camp fire, subject to the compliance with the Rural Fires Act 1997, or

2.6.5 the Director-General gives prior written consent to the lighting of the fire.

Cultural Heritage

2.7 In accordance with Part 6 of the National Parks and Wildlife Act 1974, the Owner must not cause damage to Aboriginal places and Aboriginal objects on the conservation area.

Control of non-indigenous plants and fauna

2.8 Except as permitted in this Agreement the Owner:

2.8.1 must use their best endeavours to control, and where possible remove all non-indigenous plants and non-indigenous fauna from the conservation area identified to have significant detrimental impacts on the conservation area; and

2.8.2 must take such reasonable measures in relation to the control of non-indigenous plants and non-indigenous fauna as specified in the Management Scheme (Annexure C).

3. MANAGEMENT OF THE LAND

3.1 The Owner must manage the conservation area in accordance with this Agreement.

3.2 The Owner must inform the Director-General as soon as practicable after becoming aware of the deterioration of any of the natural values or cultural values of the conservation area, or of any threat to these values.

3.3 This Agreement includes Annexure B describing and mapping the conservation values of the conservation area. An aerial photograph shows the location of the conservation area, the conservation values and photo-points. Photographs have been taken at the photo-points, at the time of entering into this Agreement. This provides baseline information and data for ongoing compliance monitoring and adaptive management of the conservation area.

3.4 This Agreement includes Annexure C, setting out the Management Scheme for the conservation area including the management of conservation values and other matters referred to in Annexure B.

3.5 Detailed management guidelines and actions for the conservation of the conservation area may be prepared, subject to the endorsement of the Owner and the Director-General and the terms of this Agreement.

4. USE OF THE LAND BY SERVANTS, AGENTS, LESSEES OR LICENSEES

The Owner must incorporate the terms of this Agreement in any lease or licence issued over the conservation area, and at all times use its reasonable endeavours to ensure that any servant, contractor, consultant, agent, lessee, licensee occupying the conservation area shall be aware of the relevant provisions of this Agreement.

5. CHANGE OF OWNERSHIP

The Owner must notify the Director-General in writing of any change of Ownership or control of the conservation area within 28 days after the change of ownership and control. The notice must include the name and address of the new owner.

6. RIGHT TO INSPECT

The Minister, the Director-General and their servants and agents may at any time upon first giving reasonable notice to the Owner, the Owner's agent, lessee or licensee, enter upon the conservation area to inspect the conservation area for the purposes of ensuring compliance with this Agreement.

7. OBLIGATIONS OF THE MINISTER

The Minister covenants with the Owner as follows: -

7.1 The Owner will bear the costs of, and incidental to, the preparation of this Agreement including payment of the Owner's reasonable legal costs connected with the execution of this Agreement and any necessary stamp duty and registration fees.

7.2 The Minister agrees to notify the Registrar General when this Conservation Agreement has been entered into, varied or terminated so that the Registrar General can carry out his or her responsibilities pursuant to section 69F of the Act.

7.3 The Minister will arrange for the provision of technical advice and any other assistance to the Owner as the Minister deems necessary to assist with the implementation of this Agreement.

7.4 The Minister agrees to the extent of his or her statutory responsibilities that the signing of this Agreement shall not render the Owner ineligible for any compensation and assistance which may, under future legislation, become available to landowners who enter into a conservation agreement pursuant to the Act or any other Act.

8. NON-COMPLIANCE

In the event that the Owner fails to comply with this Conservation Agreement, including, without limitation, damaging or causing damage to the conservation area, the Department may issue a written notice to the Owner requiring the Owner to remedy the non-compliance or damage within a specified time period. This clause does not affect any rights of the parties under section 69G of the Act.

9. DISPUTE RESOLUTION

If a party to the Conservation Agreement is dissatisfied with the conduct of the other party under this Conservation Agreement, that party must notify the other party in writing and if the dispute cannot be resolved by discussions between the parties it shall be referred to the Director-General who will establish a mechanism whereby the dispute can be resolved.

10. COMMENCEMENT AMENDMENT AND DURATION OF THIS AGREEMENT

This Agreement shall have effect from the day of execution.

IN WITNESS WHEREOF the parties hereto have executed this Agreement the day and year first above written.

SIGNED by The Minister administering the *National Parks and Wildlife Act, 1974* for the purpose of rendering liable the Government of the State of New South Wales (but not so as to incur any personal liability) hereunder in the presence of:

Robyn Parker
The Minister

27/06/2011
Date

Witness

SANDRA HARRIS
9/3 BLACKWALL PT RD
ABBOTSFORD. NSW. 2046.
Witness Name and address

27/6/2011
Date

Executed pursuant to s127 of the Corporations Act 2001 (Commonwealth)

SIGNED for and on behalf of
Boral Resources (NSW) Pty Ltd ABN 51 000 765 507
by its authorised representatives

G. PRICE
Name and position (Director)

23/2/11
Date

in the presence of

Witness signature

ROD WALLACE CLUNIES ROSS ST, PROSPECT
Witness Name and address

23/2/11
Date

DOMINIC MILLGATE
Name and position (~~Director~~/Secretary)

24/2/2011
Date

in the presence of

Witness signature

ROD WALLACE AMP CENTRE, SYDNEY
Witness Name and address

24/2/11
Date

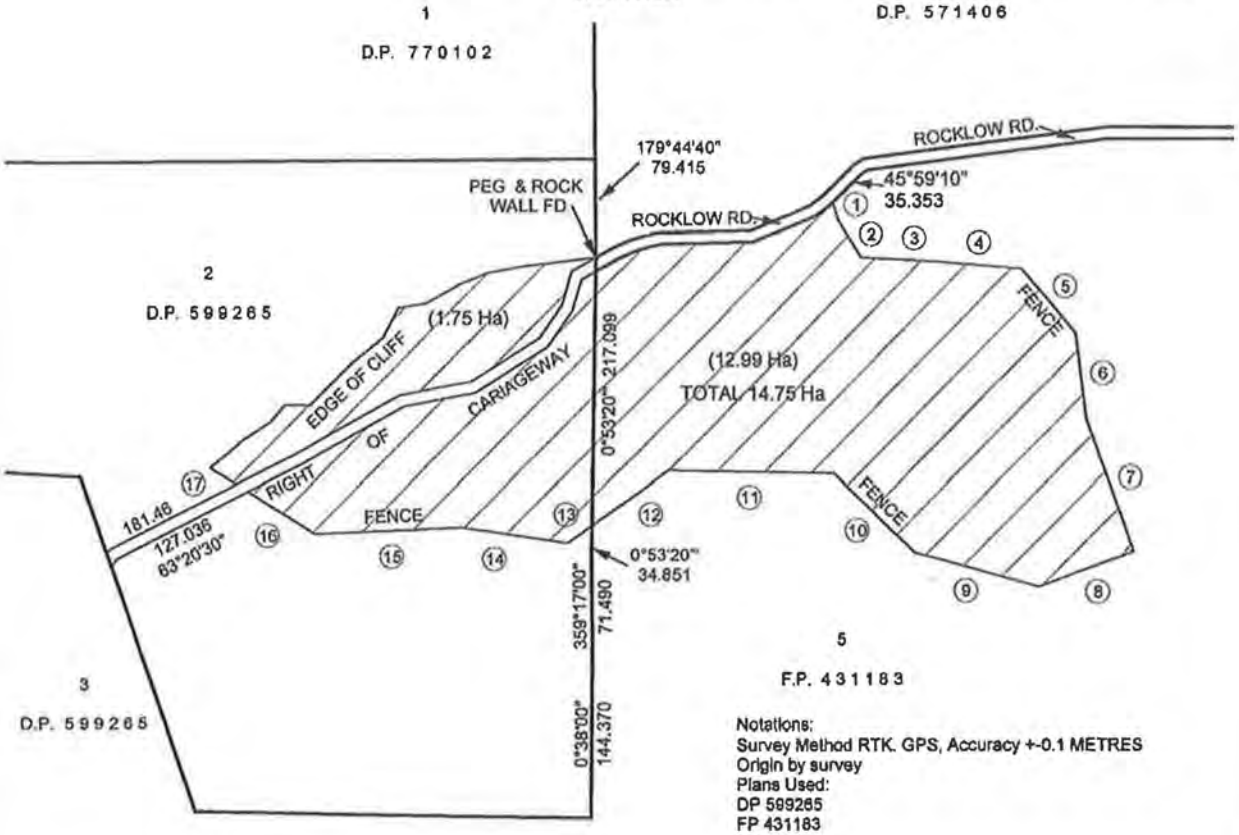
Landowners Name and address for service of notices:

Boral Resources (NSW) Pty Ltd
PO Box 42
Wetworthville NSW 2145

ANNEXURE A ; DIAGRAM A.

DIAGRAM OF CONSERVATION AREA
Parish of Terragong County of Camden

Lot 2 DP 599265 & Lot 5 FP 431183
Conservation area shown in hatch does not include the Right of Carriageway shown in DP 599266



Notations:
Survey Method RTK. GPS, Accuracy +-0.1 METRES
Origin by survey
Plans Used:
DP 599265
FP 431183
DP 571406

SCHEDULE OF SHORT LINES

Number	Bearing	Distance	Number	Bearing	Distance	Number	Bearing	Distance
1	344°20'08"	15.041	7	160°17'22"	120.813	13	54°23'03"	25.858
2	328°21'56"	39.081	8	249°49'13"	87.752	14	278°26'16"	92.458
3	272°55'17"	63.768	9	285°22'20"	111.101	15	87°26'27"	110.236
4	94°46'44"	76.311	10	313°42'35"	97.955	16	301°36'25"	68.539
5	319°31'15"	72.035	11	270°52'20"	145.003	17	121°36'25"	26.707
6	173°07'01"	73.592	12	54°23'03"	80.130			

I Matthew B. Smith of Craven Elliston & Hayes (Dapto) P/L a surveyor registered under the Surveying and Spatial Information Act 2002, certify that the survey represented in this plan is in accordance with clause 9 of the Surveying and Spatial Information Regulations 2006 and is a survey to be lodged on public record as referred to in that clause.

Boral Resources (NSW) Pty Ltd

Boral Resources (NSW) Pty Ltd

Robyn Parker
The Minister

0 225 450

CRAVEN, ELLISTON & HAYES (DAPTO) PTY. LTD. A.B.N. 81 056 544 604 CONSULTING LAND, ENGINEERING AND MINING SURVEYORS, TOWN PLANNERS	ANNEXURE TO CONSERVATION AGREEMENT DEALING	SCALE 1:6000

ANNEXURE B

CONSERVATION VALUES

1. CONSERVATION VALUES

The Owner and the Minister recognise that the conservation area contains the following conservation values. Conservation values are to be managed in accordance with Annexure C: Management Scheme for the conservation area.

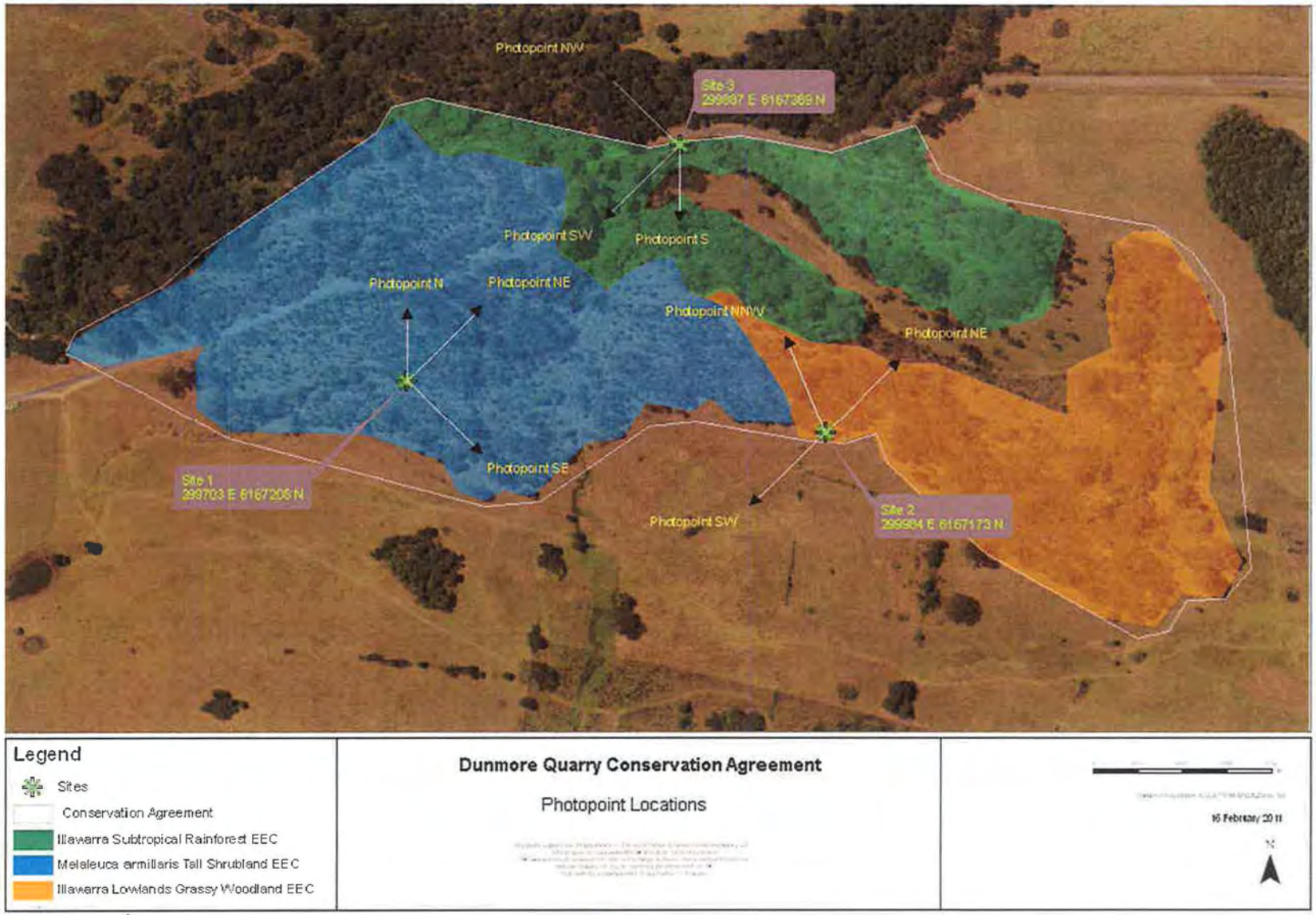
A. The conservation area contains native vegetation communities including around 8 hectares of *Melaleuca armillaris* Tall Shrubland (Zone 1) and around 7.8 hectares of land that includes Illawarra Lowlands Grassy Woodland, Illawarra subtropical rainforest and pasture containing native grasses.

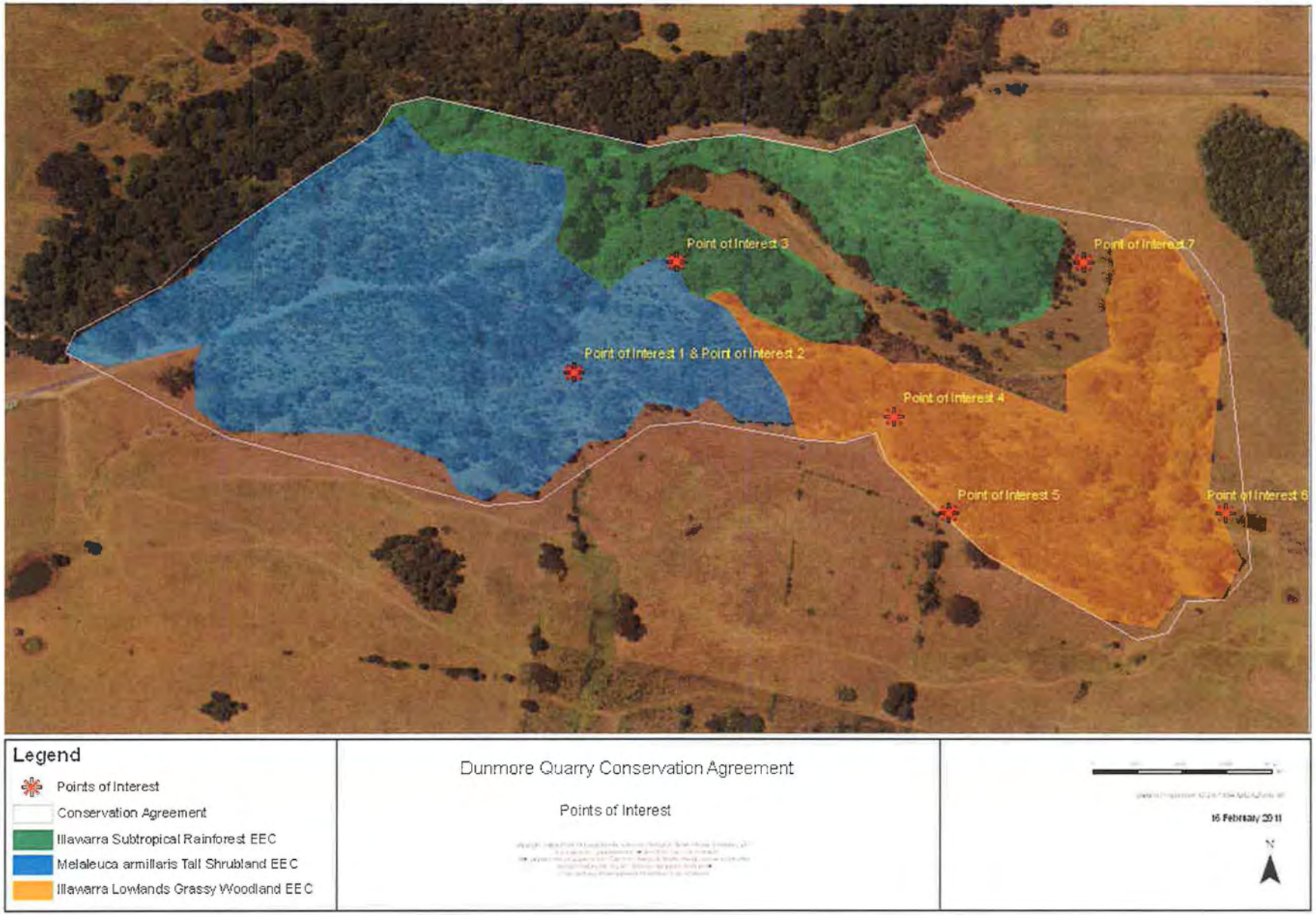
Melaleuca armillaris Tall Shrubland in the Sydney Basin Bioregion, Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion and Illawarra Subtropical Rainforest in the Sydney Basin Bioregion are all listed as Endangered Ecological Communities on Schedule 1 of the *Threatened Species Conservation Act, 1995*

B. The conservation area contains populations of *Zieria granulata* listed as Endangered on Schedule 1 of the *Threatened Species Conservation Act, 1995.*

C. The conservation area may contain habitat suitable for the Grey-headed Flying-fox (*Pteropus poliocephalus*) and the Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*) listed as vulnerable on Schedule 2 of the *Threatened Species Conservation Act, 1995* and which have been recorded in the local area.

2. AERIAL IMAGES




Point of Interest 3
Point of Interest 7
Point of Interest 1 & Point of Interest 2
Point of Interest 4
Point of Interest 5
Point of Interest 6
Legend
Points of Interest
Conservation Agreement
Illawarra Subtropical Rainforest EEC
Melaleuca armillaris Tall Shrubland EEC
Illawarra Lowlands Grassy Woodland EEC
Dunmore Quarry Conservation Agreement
Points of Interest
16 February 2011
N

3. PHOTOPOINT AND OTHER PHOTOS

Site 1 Melaleuca armillaris Tall Shrubland

Location: Easting: 0299703; Northing: 6167208

Next to unnamed creek line. To locate: enter via gate and walk directly to creek north from SW CA site gate.

Site 1_Photopoint SE

Site 1_Photopoint NE

Site 1_Photopoint N

Site 2 – Illawarra Lowlands Grassy Woodland

Location: Easting: 0299984 ; Northing: 6167173

Approximately 50 metres north of the southern access gate to the CA area in the vicinity of the fence line.

Site 2_Photopoint NE_

Site 2_Photopoint NNW

Site 2_Photopoint SW

Site 3 – Illawarra Subtropical Rainforest
Location: Easting: 0299887: Northing: 6167369
Adjacent to Rocklow Road Northern Boundary of CA Site

Site 3_Photopoint SW

Site 3_Photopoint S

Site 3_Photopoint NW

POINTS OF INTEREST

Point of Interest 1 - Geological Feature on Unnamed Creek - Basalt Flow Outcrop.
Easting 0299816: Northing 6167214

This Basalt outcrop also separates the vegetation communities, with the creek flowing down off this outcrop into the Illawarra Subtropical Rainforest

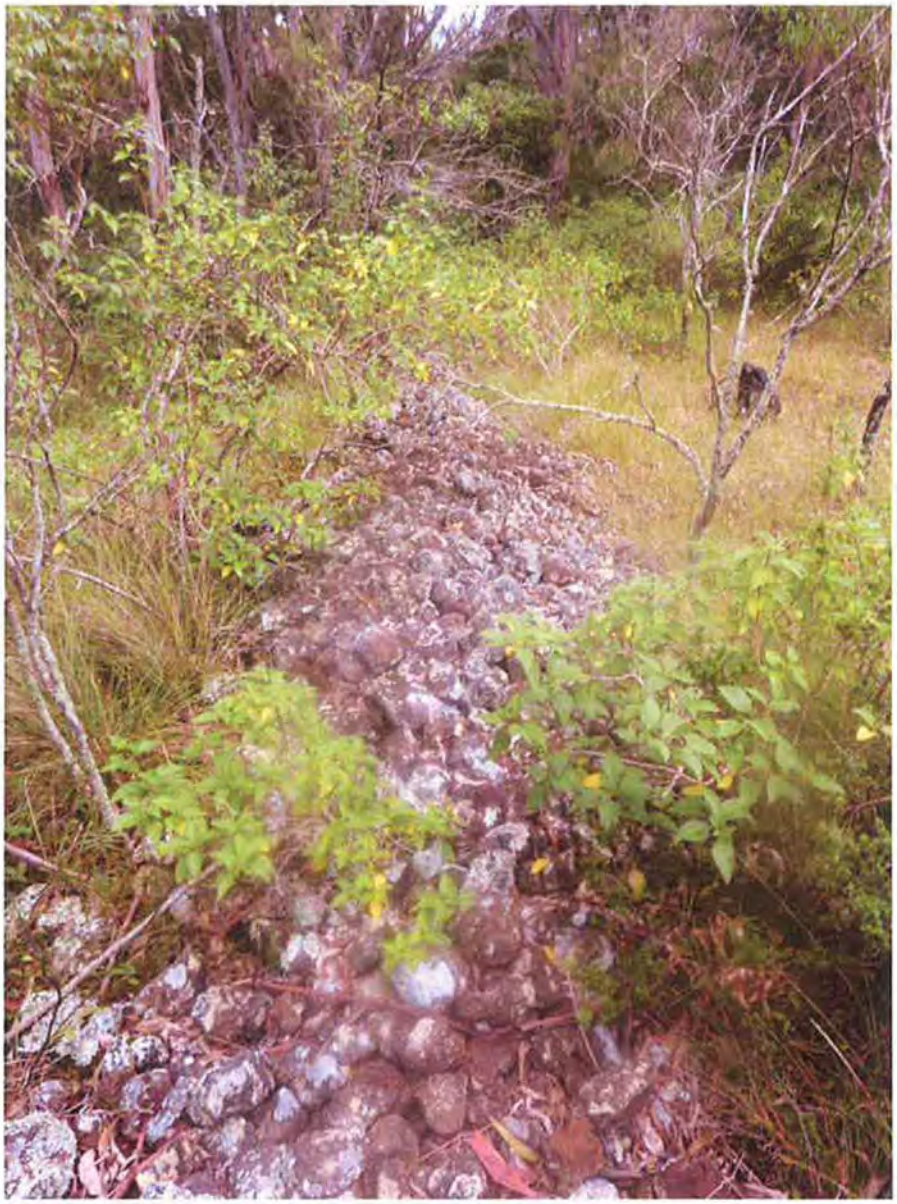
Point Of Interest 2 – Dry Stone Wall and Rock Dump
Easting 0299816: Northing 6167214

Point Of Interest 3 – Dry Stone Wall and Rock Dump
Easting 0299885 :Northing 6167289

Dry Stone Wall along top of Rainforest Gully. Poorly formed and corresponding rock dump

Point Of Interest 4 – Dry Stone Wall
Easting 0300031 : Northing 6167184

Basic rock stone wall with old rolled barb wire on top



Point of Interest 5 – Dry Stone Wall
Easting 0300068: Northing 6167117

Dry stone wall, best example on the CA site, well formed and relatively in tact for approximately 100 metres.

Photo 1

Photo 2

Point of Interest 6 – Dry Stone Wall
Easting 0300254: Northing 6167117

Dry Stone wall adjacent to unnamed creek line

Point of Interest 7 – Dry Stone Wall
Easting 0300159: Northing 6167289

Dry Stone wall with old barb wire short span less than 10m

ANNEXURE C

MANAGEMENT SCHEME FOR THE CONSERVATION AREA

The conservation values identified in Annexure B are to be managed in accordance with the principles and activities outlined below.

ITEM 1:
The following activities may be undertaken on, or in respect of, conservation area part 1 and conservation area part 2 (as relevant) in the manner specified as follows:

Weed control

a) Carrying out weed control using the appropriate control methods below and in accordance with the Dunmore Quarry Flora and Fauna Management Plan.
   - Use glyphosate based herbicide by direct application to cut surfaces (cut and paint or scrape and paint methods) and targeted spraying. This should be limited to according to the directions on the label and ensuring that there is no off-target damage.
   - Using appropriate control measures as recommended in the Department of Industry and Investment *Noxious and Environmental Weed Control 4th Edition 2009* or equivalent replacements for control of weeds, ensuring minimal off target damage.
   - Remove weeds by hand ensuring that all plant parts which can reproduce are removed and that soils do not become prone to erosion.
   - Other weed control methods may be undertaken with prior written permission of the Director-General.
   - Ensure control programs are commenced when timing and extent of weed removal will minimise adverse effects on wildlife (weeds may provide protection or habitat for native fauna).
   - Ensure removal of lantana is not undertaken during nesting periods for small birds which nest in lantana stands.
   - Continue to check for weed invasion and regrowth and treat any outbreaks.
   - Check adjacent areas and gardens for invasive plant species and remove, or control their spread.

Feral animal control

b) Monitoring impacts to the conservation area by pest animals and undertaking of on-going control programs for feral animals if appropriate.
   - Methods for monitoring pest animal activity can include;
     - observations and/or hearing calls,
     - the use of standard "sand plots",
     - the use of non-poisoned "bait stations",
     - scat counts, and
     - other quantitative techniques which can be designed in discussion with the Department or the Livestock Health and Pest Authority
   - Methods for control can include shooting, trapping and use of poisonous baits consistent with advice from the Department and the Livestock Health and Pest Authority.
   - Participate in community pest animal control programs, and encourage neighbours to implement pest animal control programs.

Fire

c) Suppression of all wildfires occurring in conservation area as quickly as possible with the aim of keeping fires to a small area.

d) Undertaking of fire hazard reduction to protect the natural assets of conservation area, in appropriate locations, with any required approvals and/or permits using:
- raking and hand clearing;
- pile burning; or
- fuel reduction burns.

e) Using fire hazard reduction burns and controlled burning which take into account the recommended fire intervals given in the ***Bush Fire Environmental Assessment Code for New South Wales*** (Rural Fire Service February 2006) and the guidelines contained in the ***Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code*** or equivalent replacements.

Current recommendations are:

Melaleuca armillaris Tall Shrubland: No fire more than once every 10 years
Illawarra Lowland Grassy Woodland: No fire more than once every 5 years for grassy woodland sub-community
Illawarra Subtropical Rainforest: No fire

No part of any vegetation type above is to be subjected to successive fires more frequently than the minimum fire interval, and at least 50 per cent of each of the vegetation types within the Conservation Area must exist in a state that has been burnt less frequently than the minimum fire interval.

Vehicle access

f) Vehicle access to formed trails for management purposes as approved by the Department, fire fighting or and any emergency requirements.

Threatened species

g) Implementing any reasonable measures included in recovery plans or other specific management advice from the Department for any threatened species or communities which are or may be found in the conservation area.

Restoration of indigenous vegetation

h) Restoration of native vegetation using the preferred method of encouraging and retaining natural regeneration.

i) Revegetation to establish indigenous plants to maintain the vegetation structure in keeping with the identified vegetation community, using species produced from material sourced locally and without fertilisers, where:
- the ability to regenerate naturally within a reasonable time frame has been lost, or
- to prevent soil erosion.

Revegetation methods can include:
- planting;
- brush mulching; or
- direct seeding.

Seed collection

j) Collection of seed for non-commercial use in keeping with Guidelines and Codes of Practice developed by Florabank (www.florabank.org.au), and the following limitations and permissions:

- Collect seed in the conservation area only if seed of the particular species and genotype is not available elsewhere, or if the seed collected is intended for seedlings that will be planted within the conservation area or adjacent to the conservation area.
- Seeds may be collected from within endangered ecological communities and
- Seeds may not be collected from species individually listed on schedules 1, 1A or 2 of the Threatened Species Conservation Act without prior written approval from the Director General, or under a licence granted under S132c of the *National Parks and Wildlife Act, 197* or S91 of the *Threatened Species Conservation Act 1995.*
- Seeds may be collected from any protected species listed under Section 131 (Schedule 13) of the *National Parks and Wildlife Act 1974.*
- Seeds may be collected from any other native species

Thinning of indigenous vegetation

k) Thinning of regenerating indigenous species which are altering the structure of the vegetation and/or reducing conservation values. Thinning should be planned in consultation with the Department.

Provision of habitat

l) Installation of habitat boxes for native fauna in strategic locations where suitable hollows for native fauna are limited or absent. Locations and number to be determined in consultation with the Department.

Cultural heritage

m) Recording and management of any newly identified Aboriginal objects, in consultation with the Department (and the Aboriginal community where applicable.)

Visitation and research

n) Visitation, research and community use at a level that does not adversely impact on the conservation values of the area or the amenity of the Owner. Research projects should be discussed with the Department.

Developments

o) Carrying out developments as described in Clause 2.4 of the Agreement, and maintaining developments (including existing fire trails and infrastructure) with the following conditions

- Trails will not be wider that 3 metres.
- Tracks will not be wider than 1.5 metres.
- Clear a corridor not greater than 3 metres wide during construction or for maintenance for the installation of fences or other agreed rural structures.
- Construct and maintain fences to ensure they are stockproof
- Remove fallen timber and any other obstructions to maintain access.
- Where clearing is necessary, undertake all works in a manner that minimises disturbance to soil and hydrological characteristics.
- Remove old fences and close unwanted tracks within the conservation area and facilitate restoration of native vegetation by allowing natural regeneration.

Monitoring

p) Annexure B contains dated aerial photographs/maps showing the location of the conservation area, the conservation values and photo-points. Photographs have been taken at these photo-points at the time of entering the agreement. This provides baseline information and data for ongoing monitoring and adaptive management of the conservation area.

q) Photographs at the identified photo-points should be taken from time to time in consultation with Department officers for the purposes of ongoing monitoring of the conservation values.

r) The Owner should from time to time, complete a monitoring report, including photo-point photos, noting changes occurring in the conservation area. This will form the basis for decisions about ongoing management actions. A copy of all monitoring reports should be forwarded to the Department.

ITEM 2:
The landholders shall not undertake, consent to or permit (unless specified in Item 1 of Annexure C or with prior written consent of the Director-General)

a) the sowing or planting of trees, grasses or other plants in the conservation area

b) the introduction of any non-indigenous plants or non-indigenous fauna into the conservation area

c) the entry of domestic animals including pets and domestic livestock in the conservation area

d) the use or application of fertiliser or pesticides in the conservation area

e) the use of trail bikes, four wheel drive vehicles or any other vehicle in the conservation area off any formed road

f) any works in the conservation area, especially any revegetation work and developments, which have the potential to impact on any cultural features. (Seek advice from the Department if any are identified, prior to any work commencing)

g) the removal of any biological or inorganic component of the conservation area

h) any works which will adversely affect the natural flows and bodies of water.

Boral Resources (NSW) Pty Ltd

Boral Resources (NSW) Pty Ltd

Minister

Appendix F

Offset area threatened species plan

Offset Area Threatened Species Plan

Dunmore Quarry

Prepared for Boral Resources (NSW) Pty Ltd | 19 June 2017

Ground Floor, Suite 01, 20 Chandos Street
St Leonards, NSW, 2065

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E info@emmconsulting.com.au

www.emmconsulting.com.au

Offset Area Threatened Species Plan

Final

Report J17094RP1 | Prepared for Boral Resources (NSW) Pty Ltd | 19 June 2017

Prepared by	**Steve Williams**	Approved by	**Brett McLennan**
Position	Ecologist	Position	Director
Signature		Signature	
Date	19 June 2017	Date	19 June 2017

Document Control

Version	Date	Prepared by	Reviewed by
1	02/06/2017	S Williams	K. Diver B. McLennan
2	19/06/2017	S Williams	K. Diver B. McLennan

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www.emmconsulting.com.au

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1 Introduction

Dunmore Quarry (the quarry), owned and operated by Boral Resources (NSW) Pty Ltd (Boral) is located at Tabbita Road, Dunmore, approximately 12 km north-west of Kiama in the Shellharbour Local Government Area (Figure 1.1). The quarry extracts hard rock which is crushed to produce course aggregates and road construction materials, and fines that are used as manufactured sand or bedding material.

The development consent for the quarry (DA 470-11-2003) issued in November 2004 requires the preparation and implementation of a Flora and Fauna Management Plan (FFMP) to guide the environmental management of the development throughout its operational life. As part of the FFMP, Boral established an area to offset impacts of the quarry on threatened biodiversity.

The FFMP was prepared by Cumberland Ecology in 2009 and updated by Arcadis in November 2016. The FFMP incorporates a biodiversity offset area and a range of management activities for area.

Given the time since the mapping of the offset area was first undertaken (2009), Boral has commissioned EMM Consulting Pty Ltd (EMM) to perform a number of surveys to identify future management actions for the offset area. The surveys comprised:

- identifying locations and numbers of individuals of the threatened Illawarra zieria (*Zieria granulata*), using a GPS to mark the location and number of individuals;
- delineation of boundaries of vegetation communities including endangered ecological communities (EECs), using GIS to accurately mark out the communities;
- identification of location, type and number of hollow bearing trees within the offset area. GIS will be used to accurately map the habitat trees; and
- observation of weeds and any other issues related to the management of the offset area that can be incorporated into the management plan.

This document reports on the results of the surveys performed in the offset area and provides recommendations for the management and improvement of biodiversity values in the area.

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KEY

- Offset boundary
- Main road
- Local road
- Watercourse

Site location plan

Offset Area Threatened Species Plan

Dunmore Hard Rock Quarry

Figure 1.1

EMM

2 Methods

2.1 Desktop study

Aerial images of the offset area were studied prior to the field survey to identify the existing vegetation layout as well as potential plot locations. Maps obtained from the FFMP showing mapped EECs by Cumberland Ecology (2009) were also studied to determine areas that need to be investigated more closely.

The FFMP was reviewed to identify the likelihood of any threatened species and communities listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) to be present within the offset area and the existing management measures that are being implemented.

2.2 Field survey

Two EMM ecologists, Eugene Dodd and Steve Williams, surveyed the offset area on 9 to 10 May 2017. The survey comprised a variety of methods including a general meander, targeted species survey and quadrat assessments.

An initial meander of the site provided a general overview of the area and assisted with the identification of different vegetation communities and delineating their boundaries. The meander also allowed for the identification of suitable plot locations (Figure 2.1) to determine the plant community types (PCTs) and EECs present.

Four floristic plots, 20 m x 20 m in area, were surveyed for species presence and a modified version of the Braun-Blanquet scale was used to determine the projected foliage cover of each species.

A targeted survey was performed identifying the location of the hollow bearing trees and the threatened species Illawarra Zieria (Zieria granulata) which is listed under both the TSC and EPBC acts. This survey involved the recording of individual species by GPS and areas with numbers greater than 30 individuals were mapped. Lantana locations were also recorded, as well as any opportunistic observations.

2.3 Identification of vegetation and threatened ecological communities

PCTs were then able to be determined by cross referencing the species list with the NSW Office of Environment and Heritage's (OEH) Vegetation Identification System (VIS) classification 2.1 webpage. The final determinations and listing advices for each TEC were also reviewed.

KEY

- Plot locations
- Survey tracks
- Offset boundary
- Local road
- Watercourse

Survey effort and plot locations

Offset Area Threatened Species Plan
Dunmore Hard Rock Quarry
Figure 2.1

EMM

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3 Biodiversity values in the offset area

3.1 Desktop review

A review of the existing environment outlined in Section 4.1.3.1 of the FFMP show five vegetation communities identified in the offset area:

- 1.35 ha Illawarra Subtropical Rainforest (IRS);
- 3.5 ha Illawarra Lowlands Grassy Woodlands (ILGW);
- 8 ha of Melaleuca armillaris Tall Shrubland (MATS);
- mosaic of Eucalyptus Open Forest and Lantana thickets; and
- largely cleared/pastures.

Other significant ecological values identified in the offset area include:

- populations of *Zieria granulata* (locations not specified); and
- habitat suitable two threatened mammal species: Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*).

3.2 Field survey

A total of seventy-five plant species were identified within the offset area, comprising fifty-four native and twenty-one exotic species (Appendix 1). Vegetation recorded within the offset area was grouped into three different plant community types (Figure 3.1) and each of these communities are categorised into two condition classes, in accordance with the BioBanking Assessment Methodology (OEH 2014), comprising:

- moderate to good condition (unhatched); and
- moderate to good_poor condition (hatched).

These condition classes have been delineated by the level of management intervention required. Patches in moderate to good condition require a small amount of management, while patches in moderate to good_poor condition require a higher level of management, due to the presence of a large Lantana (*Lantana camara*) infestation (Figure 3.2).

Table 3.1 Native vegetation community extent in the offset area

Vegetation community	Mod-good condition (ha)	Mod-good_poor condition (ha)	Total (ha)
Bracelet Honey-myrtle Australian Indigo dry shrubland on volcanic, southern Sydney Basin Bioregion (EEC – Melaleuca armillaris Tall Shrubland)	3.08	0.77	3.85

Table 3.1 Native vegetation community extent in the offset area

Vegetation community	Mod-good condition (ha)	Mod-good_poor condition (ha)	Total (ha)
Forest Red Gum – Thin-leaved Stringybarkk grassy woodland on coastal lowlands, southern Sydney Basin Bioregion (EEC – Illawarra lowlands grassy woodland)	2.93	6.25	9.18
Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion (EEC – Illawarra subtropical rainforest)	0.94	1.22	2.16
Exotic grassland	0.21	0	0.21

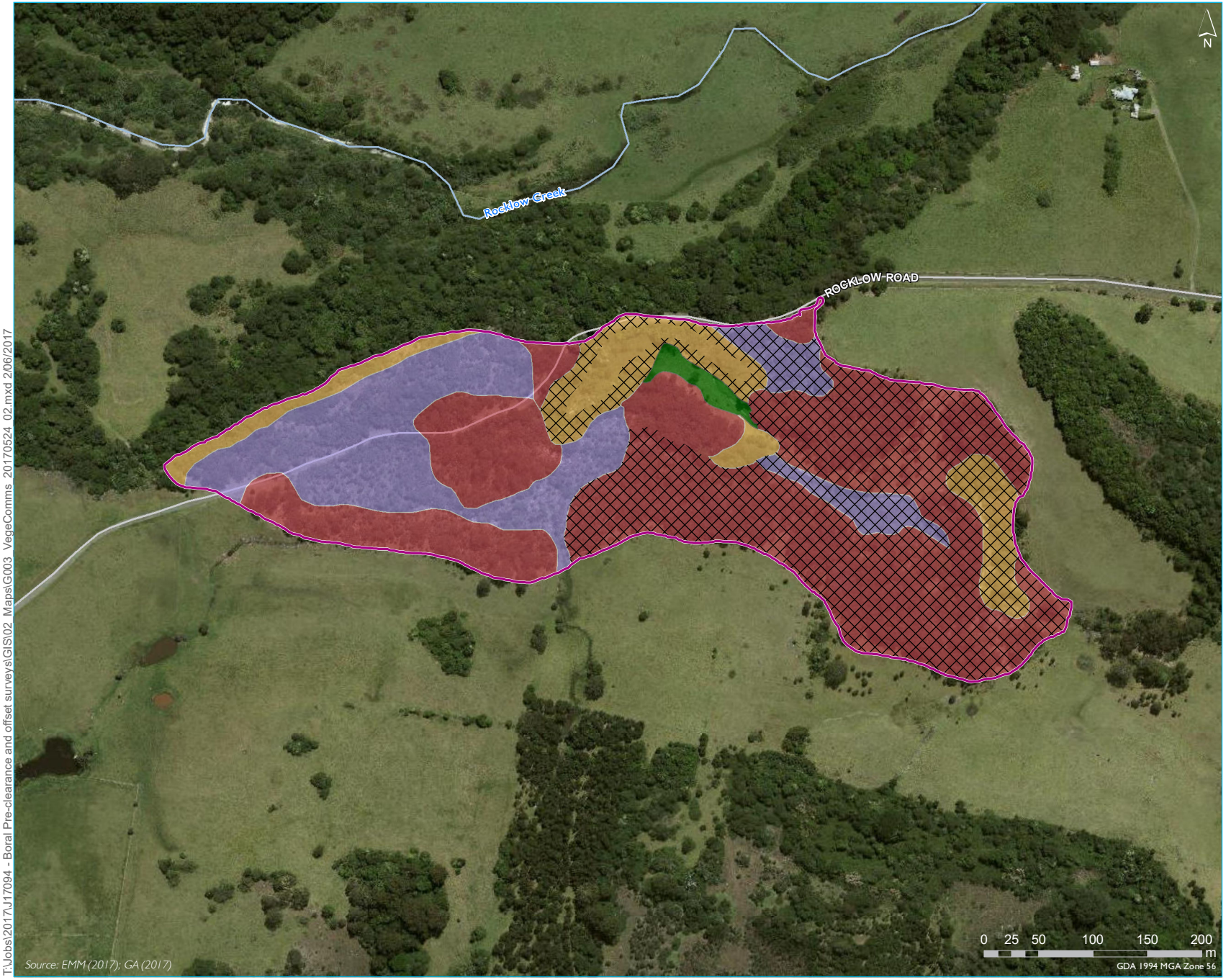
3.3 Plant community types

i Bracelet Honey-myrtle – Australian Indigo shrubland on volcanic, southern Sydney Basin Bioregion

The majority of the 3.85 ha of this community is found along the ridge top to the west of the offset area running adjacent to Rocklow Road; this is the highest point within offset area (Figure 3.1). The community extends from just short of the cliff face on the western boundary crossing the road, ending in a narrow finger near the centre of the offset area along the unnamed stream. A small pocket of this community is also found in the north east of the offset area.

Bracelet Honey-myrtle (*Melaleuca armillaris)* is the dominant canopy species, with a small number of Forest Red Gum (*Eucalyptus tereticornis*) scattered throughout. Illawarra Zieria and juvenile Bracelet Honey-myrtle and Forest Red Gum comprise a fairly open midstorey with some patches of Lantana, while the shrub layer is dominated by Prickly Beard Heath (*Leucopogon juniperinus*). Native groundcovers include Tussock Grass (*Poa labillardierei*) and Weeping Grass (*Microlaena stipoides*). Other exotic ground species recorded include Cobblers Pegs (*Bidens pilosa*), Panic Veldtgrass (*Ehrharta erecta*), Purple Deadnettle (*Lamium purpureum*), Fireweed (*Senecio madagascariensis*) and Stinking Roger (*Tagetes minuta*).

This community is attributed to PCT 720 *Bracelet Honey-myrtle – Australian Indigo dry shrubland on volcanic, southern Sydney Basin Bioregion* and represents *Melaleuca armillaris tall shrubland* EEC listed under the TSC Act given the presence of characteristic plant species.



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KEY

Vegetation community

- PCT 720 Bracelet Honey-myrtle – Australian Indigo dry shrubland on volcanic, southern Sydney Basin Bioregion (EEC – Melaleuca Armillaris tall shrubland) mod – good condition
- PCT 720 Bracelet Honey-myrtle – Australian Indigo dry shrubland on volcanic, southern Sydney Basin Bioregion (EEC – Melaleuca Armillaris tall shrubland) mod-good_poor condition
- PCT 838 Forest Red Gum – Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion (EEC – Illawarra lowlands grassy woodland) mod – good condition
- PCT 838 Forest Red Gum – Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion (EEC – Illawarra lowlands grassy woodland) mod-good_poor condition
- PCT 1300 Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion (EEC – Illawarra subtropical rainforest) mod – good condition
- PCT 1300 Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion (EEC – Illawarra subtropical rainforest) mod-good_poor condition
- Exotic grassland
- Offset boundary
- Local road
- Watercourse

Vegetation communities within offset area

Offset Area Threatened Species Plan
Dunmore Hard Rock Quarry
Figure 3.1

EMM

KEY

- *Lantana camara*
- Offset boundary
- Local road
- Watercourse

Extent of *Lantana camara* infestation in native vegetation communities

Offset Area Threatened Species Plan
Dunmore Hard Rock Quarry
Figure 3.2

EMM

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Photograph 3.1 **Bracelet Honey-myrtle – Australian Indigo shrubland on volcanic, southern Sydney Basin Bioregion**

ii Forest Red Gum – Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion.

A large portion of the offset area is covered with this community (9.18 ha). The dominant canopy species is Forest red gum with some Bracelet honey-myrtle found throughout. Broad leaved paper bark (*Melaleuca quinquenerva*) was also recorded in areas close to the small stream that meanders through the offset area.

Maiden's wattle (*Acacia maidenii*) and Sticky Hop Bush (*Dodonaea viscosa var. angustifolia*) dominate the midstorey. With some large patches of Illawarra zieria as well as scattered individuals. Prickly beard heath is the most recorded shrub found in with a ground cover dominated by Weeping Grass and with other native ground cover species including Wombat Berry (*Eustrephus latifolius*), Kidney Weed (*Dichondria repens*) Mulga Fern (*Chelianthies sieberi*) and Australian Basket Grass (*Oplismenus aemulus*).

This community can be divided into two categories, areas with lantana and areas without or small amounts of lantana. The areas that have a small amount of lantana have had some management action carried out and are found closer to Rocklow Road where access is easiest while the areas that have lantana present the coverage is quite high (Photograph 3.3) at the southern and eastern sides of the offset area.

While the high numbers of lantana has influenced the number of the native species normally present within the midstorey, the canopy layer remains of good condition with a healthy foliage cover. There is a slight reduction in the number of ground cover species recorded but the stratum remains comparable with areas of low lantana coverage. Other exotic species include Cobblers Pegs, Panic Veldtgrass, Fireweed and Purple Deadnettle.

The PCT attributed to this community is PCT838 *Forest red gum – Thin-leaved stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion* and represents *Illawarra lowlands grassy woodland EEC* listed under the TSC Act as well as the *Illawarra and south-coast lowland forest and woodland community* EEC listed under the EPBC Act given the presence of characteristic plant species.

Photograph 3.2 **Forest red gum – Thin-leaved stringybark grassy woodland on coastal lowlands with low coverage of lantana**

Photograph 3.3 Forest red gum – Thin-leaved stringybark grassy woodland on coastal lowlands with high coverage of lantana

iii Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes

This community covers the smallest area (2.16 ha) and is found on the rocky slopes within the offset area. The closed canopy consists of a number of figs species including Port Jackson Fig (*Ficus rubiginosa*), Small-leaved Ffig (*Ficus oblique*) and Sandpaper Fig (*Ficus coronate*). Other canopy species include Giant Stinging Tree (*Dendronide excels*) and White Beech (*Gmelina leichhardtii*). A diverse midstorey was recorded with Sweet Pittosporum (*Pittosporum undulatum*), Native Rosella (*Hibiscus heterophylus*) Whalebone Tree (*Streblus brunonianus*) and Black Plum (*Diospyros australis*).

Vines and climbers are common components of this type of community and include Wombat Berry (*Eustrephus latifolius*), Common Silkpod (*Parsonsia straminea*), Native Grape (*Cayratia clematidea*), Wonga Wonga Vine (*Pandorea pandrana*), Scrambling Llily (*Geitonoplesium cymosum*). A number of fern species are present such as Sickle Fern (*Pellaea falcate*), Necklace Fern (*Asplenium flabellifolium*), Rock Felt Fern (*Pyrrosia rupestris*) and Prickly Rasp Fern (*Doodia aspera*).

Lantana was recorded within the community but is confined mainly to the fringes, most notably adjacent to the road verge of Rocklow Road and along the stream running through the offset area. Other exotic species include Cape Ivy (*Delairea odorata),* Panic Veldtgrass, Common Morning Glory (*Ipomoea purpurea*) and Purple Deadnettle.

The vegetation within this community meets the description of PCT 1300 Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes and meets the description of *Illawarra subtropical rainforest EEC* listed under the TSC Act given the presence of characteristic plant species.

Photograph 3.4 Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes

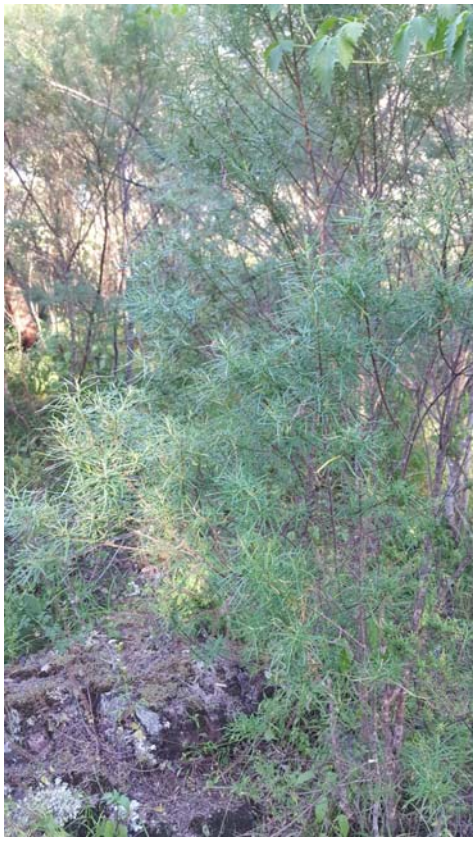
iv Illawarra Zieria (*Zieria granulata*)

Illawarra Zieria is listed as an endangered species under both Commonwealth (EPBC Act) and State (TSC Act) levels. It is a tall bushy shrub growing to 6 m. The entire plant is densely covered with glandular tubercles (small wart-like outgrowths) that give a strong aroma when crushed. Its leaves consist of three narrow leaflets that are dull green above, pale green below and have downward curved margins. Its small white flowers grow in dense many-flowered clusters. The fruit is a dry, light brown capsule (OEH 2016).

The preferred habitat is confined to the Illawarra region on dry ridge tops and rocky outcrops on shallow volcanic soils. It is less frequently found on the moist slopes of the Illawarra escarpment and in low-lying area on Quaternary sediments (OEH 2016).

The targeted survey for Illawarra Zieria shows the species to be growing throughout the offset area as either individuals or in large patches (Figure 3.3). It is determined that there are approximately 1,400 individuals growing in the offset area. Some Illawarra Zieria individuals were recorded growing amongst large patches of Lantana. Lantana is currently being managed in the offset area in accordance with the Dunmore Hard Rock Quarry Flora and Fauna Management Plan.

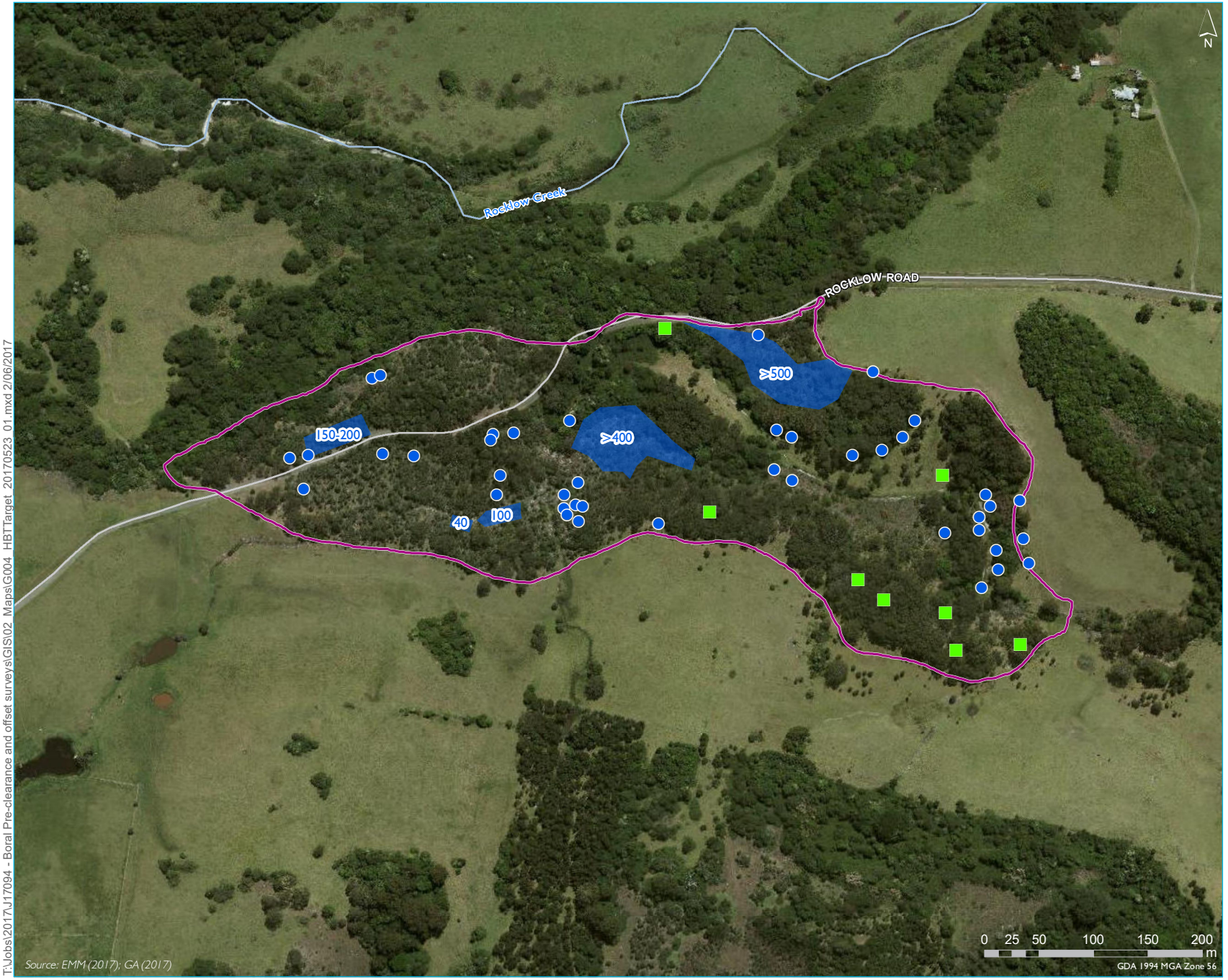
Photograph 3.5 **Illawarra Zieria (*Zieria granulata*) patch recorded within the offset area**



Photograph 3.6 **An individual of the target species Illawarra Zieria**

v Hollow bearing trees

Nine hollow bearing trees were recorded (Figure 3.2) and all were identified as Forest red gum. The majority of these trees were located within the Forest Red Gum – Thin-leaved Stringybark grassy woodland on coastal lowlands community, in the area were a high density of lantana is present. The hollows ranged from small to large and some trees had multiple hollows present.



KEY

- Individual *Zieria granulata*
- *Zieria granulata* patch (est. number of individuals shown on figure)
- Hollow bearing tree
- Offset boundary
- Local road
- Watercourse

Zieria granulata and hollow bearing tree locations

Offset Area Threatened Species Plan
Dunmore Hard Rock Quarry
Figure 3.3

EMM

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4 Management recommendations

4.1 Existing management

The existing primary management objectives of the offset area as per the FFMP are:

- protect and promote the recovery of threatened species, populations and ecological communities;
- protect the critical habitat of those threatened species, populations and ecological communities that are endangered;
- eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities; and
- ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed.

Management actions already undertaken in the offset area include:

- installation of fencing to exclude cattle and to facilitate natural regeneration outside of the active management zone; and
- some management of Lantana.

Some management actions have been implemented. However, some sections of the offset area are not fenced, while other sections are damaged, allowing livestock to enter the area. Livestock contribute to a number of negative impacts including the breakdown and erosion of soils, assist with the spreading of weeds and grazing on shoots of threatened flora species. Lantana has been recorded on more than half the offset area (8.23 ha) and therefore requires additional management.

4.2 Recommendations for future management

Several management actions are recommended to be carried out to protect and improve biodiversity values in the offset area. These actions include weed management, fencing and of rubbish removal.

A description of threats and recommendations for future management is provided in the following sections.

4.2.1 Weed management

i Threats

The infestation of weeds, in particular Lantana, directly impacts native plant species and communities through competition for space, light and nutrients. A healthy population of Illawarra Zieria is present in the offset area, but as the species prefers to grow in open areas, is in danger of being smothered by Lantana should the infestation increase in extent. Senescent hollow-bearing trees were also recorded in this area that is surrounded by Lantana. Weed management actions are proposed to minimise threats on these biodiversity values in the offset area.

ii Recommended management measures

Key recommendations designed to maintain and enhance biodiversity values in the offset area comprise:

- engaging a land management or bush regeneration contractor with experience in removing weed infestations when threatened native species are present. This will minimise the risk of inadvertent removal of Illawarra Zieria during weed removal;
- a contractor induction prior to any works in the offset area that outlines the objectives of the management plan, as well as describing the characteristics and look of the Illawarra Zieria to all personnel involved in the clearing process;
- minimise herbicide spraying, and maximise the use of targeted weed control methods (ie scrape or cut and paint) to avoid the risk of herbicide spray drift onto Illawarra Zieria and EECs;
- removal of all Lantana cleared from site and disposal of at an appropriate green waste facility; and
- follow up weed maintenance to control any resprouting.

4.2.2 Fencing

i Threats

Livestock contribute to a number of negative impacts on native plant species and communities including soil degradation and erosion, overgrazing and the spread of weeds. While the fence along the southern and eastern boundaries are of good repair the northern and western areas where Rocklow Road runs through is old, rusting and in poor condition. Measures are proposed in the following section to minimise the risk of adverse impacts on biodiversity values in the offset area.

ii Recommended management measures

To protect and improve biodiversity values in the offset site, it is recommended that:

- all fence lines are inspected to ensure they are in good condition; and
- new fencing should be installed in areas where the fence is broken or deteriorating to exclude cattle.

4.2.3 Rubbish

i Threats

Not only is illegal dumping an eyesore it also has negative impacts on native vegetation. This includes the potential for unknown pollutants to spill and seep into the ground, leeching of metals and elements and outcompetes vegetation for space.

Some illegal dumping has occurred with piles of household rubbish and building materials were observed on the verge of Rocklow Road. Scraps of metal, disregarded water tanks and a car body were also observed within the offset area.

ii Recommended management measures

It is recommended that these piles of rubbish on the road verge be removed to ensure it doesn't scatter and the installation of illegal dumping prohibited signs. If possible, it is recommended the car body be removed as well as any other large pieces of rubbish to ensure leeching potential harmful elements is kept to a minimum.

5 Conclusion

The purpose of this document is to outline the future management actions required to ensure the conservation values of the proposed offset area are maintained and improved on where possible.

To identify the management actions required, EMM were engaged by Boral to perform a survey of the offset area identifying:

- vegetation communities and their boundaries;
- presence and abundance of the threatened flora species Illawarra Zieria (*Zieria granulata*);
- locations of hollow bearing trees; and
- presence and extent of exotic species.

Four PCTs were identified with three of these communities sharing the same affinities listed EECs:

- Forest Red Gum – Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion (EEC – *Illawarra lowlands grassy woodland*);
- Bracelet Honey-myrtle Australian Indigo dry shrubland on volcanic, southern Sydney Basin Bioregion (EEC – *Melaleuca armillaris Tall Shrubland*);
- Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion (EEC – *Illawarra subtropical rainforest*); and
- Exotic grasslands.

A healthy population of Illawarra Zieria was identified made up of scattered individuals as well as several dense patches and nine hollow bearing trees. Hollow-bearing trees were mainly recorded in the Forest Red Gum – Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion EEC, where large Lantana infestations were present.

Over half the site (8.23 ha) is infested by the exotic species Lantana, the management of this species will have a considerable improvement on the biodiversity value within the offset area and is identified as a priority action.

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Appendix A

Plot data

Table 5.1 Plot and incidental data

			Cover abundance[1]				
Family	**Scientific name**	**Common name**	**Plot 1**	**Plot 2**	**Plot 3**	**Plot4**	**Incidentals**
Acanthaceae	**Thunbergia alata*	Black-eyed Susan			1		
Apocynaceae	**Araujia sericifera*	Moth Vine		1			
Asteraceae	**Ageratina adenophora*	Crofton Weed					X
Asteraceae	**Bidens pilosa*	Cobblers peg	4	2	2		
Poaceae	**Chloris gayana*	Rhodes Grass					X
Asteraceae	**Conyza bonariensis*	Flaxleaf Fleabane			2		
Asteraceae	**Delairea odorata*	Cape Ivy				2	
Poaceae	**Ehrharta erecta*	Panic Veldtgrass	3			2	
Fabaceae - Faboideae	**Erythrina x sykesii*	Coral Tree					X
Apocynaceae	**Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush					X
Convolvulaceae	**Ipomoea purpurea*	Common Morning Glory				2	
Lamiaceae	**Lamium purpureum*	Purple deadnettle	3	1	2	2	
Verbenaceae	**Lantana camara*	Lantana	2	6	3	2	
Oleaceae	**Olea europaea subsp. cuspidata*	African Olive				1	
Cactaceae	*Opuntia stricta var. stricta*	Common Prickly Pear					X
Plantaginaceae	**Plantago lanceolata*	Lamb's Tongues	2				
Asteraceae	**Senecio madagascariensis*	Fireweed	2	2	2		
Malvaceae	** Sida rhombifolia*	Paddy's Lucerne		1			
Solanaceae	**Solanum mauitianum*	Wild tobacco bush	1			1	
Poaceae	**Stenotaphrum secundatum*	Buffalo Grass					X
Asteraceae	**Tagetes minuta*	Stinking roger	2				
Amaranthaceae	*Nyssanthes diffusa*	Barbwire Weed				2	
Anthericaceae	*Arthropodium milleflorum*	Pale Vanilla-lily	1				
Apocynaceae	*Parsonsia straminea*	Common Silkpod				3	
Araliaceae	*Hydrocotyle laxiflora*	Stinking pennywort	2				
Aspleniaceae	*Asplenium flabellifolium*	Necklace Fern				2	
Asteraceae	*Cassinia aculeata*	Common Cassinia			2		

Table 5.1 Plot and incidental data

			Cover abundance[1]				
Family	**Scientific name**	**Common name**	**Plot 1**	**Plot 2**	**Plot 3**	**Plot4**	**Incidentals**
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga vine			1	2	
Blechnaceae	*Doodia aspera*	Prickly Rasp Fern				2	
Chenopodiaceae	*Einadia hastata*	Berry Saltbush			1		
Commelinaceae	*Commelina cyanea*		2	3	3		
Convolvulaceae	*Dichondra repens*	Kidney weed	2	2	2		
Cyperaceae	*Cyperus polystachos*		1				
Ebenaceae	*Diospyros australis*	Black Plum				2	
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash				2	
Ericaceae - Epacridodeae	*Leucopogon juniperinus*	Prickly beard-heath	3	2	3		
Euphorbiaceae	*Alchornea ilicifolia*	Native Holly				3	
Fabacea - Mimosoideae	*Acacia longifolia*						X
Fabacea - Mimosoideae	*Acacia maidenii*	Maiden's wattle	1	2	2		
Fabaceae - Faboideae	*Acacia mearnsii*	Black wattle		1			X
Fabaceae - Faboideae	*Glycine clandestina*		2	2	2		
Lamiaceae	*Gmelina leichhardtii*	White beech				4	
Luzuriagaceae	*Eustrephus latifolius*	Wombat berry	2	2	1	2	
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily				2	
Malvaceae	*Hibiscus heterophyllus subsp. heterophyllus*	Native Losella				2	
Meliaceae	*Melia azedarach*	White cedar					X
Menispermaceae	*Legnephora moorei*	Round-leaf Vine				1	
Moraceae	*Ficus coronata*	Sandpaper Fig					X
Moraceae	*Ficus obliqua*	Small-leaved Fig				3	
Moraceae	*Ficus rubiginosa*	Port Jackson Fig				3	
Moraceae	*Maclura cochinchinensis*	Cockspur Thorn				2	
Moraceae	*Streblus brunonianus*	Whalebone Tree				2	
Myrtaceae	*Eucalyptus tereticornis*	Forest red gum	1	5	5		
Myrtaceae	*Melaleuca armillaris*	Bracelet honeymyrtle	5	2			

Table 5.1 Plot and incidental data

			Cover abundance[1]				
Family	**Scientific name**	**Common name**	**Plot 1**	**Plot 2**	**Plot 3**	**Plot4**	**Incidentals**
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved paperbark			3		
Oleaceae	*Notelaea longifolia f. longifolia*	Large Mock-olive		1	1	2	
Phyllanthaceae	*Breynia oblongifolia*	Coffee bush	1	2	1		
Pittosporaceae	*Pittosporum multiflorum*	Orange Thorn				2	
Pittosporaceae	*Pittosporum undulatum*	Sweet pittosporum	1			3	
Poaceae	*Aristida ramosa*	Purple Wiregrass					X
Poaceae	*Cymbopogon refratus*	Barbed wire grass	2		2		
Poaceae	*Echinopogon caespitosus var. caespitosus*	Tufted hedgehog grass	3	2	1		
Poaceae	*Microlaena stipoides*	Weeping grass	3	4			
Poaceae	*Oplismenus aemulus*	Australian basket grass	2	3		2	
Poaceae	*Poa labillardieri*	Tussock	5		4		
Polypodiaceae	*Pyrrosia rupestris*	Rock Felt Fern				2	
Primulaceae	*Myrsine variabilis*	Muttonwood				2	
Pteridaceae	*Cheilanthes sieberi*		2	2	2		
Pteridaceae	*Pellaea falcata*	Sickle fern				2	
Rutaceae	*Zieria granulata*	Illawarra zieria	1		2		
Santalaceae	*Exocarpos cupressiformis*	Cherry Ballart			1		
Sapindaceae	*Dodonaea viscosa subsp. angustifolia*	Sticky hop-bush	1	2	2		
Tectariaceae	*Arthropteris tenella*			1			
Urticaceae	*Dendrocnide excelsa*	Giant Stinging Tree				4	
Verbenaceae	*Verbena bonariensis*	Purpletop					X
Vitaceae	*Cayratia clematidea*	Native Grape				2	

Notes 1. Cover abundance – 1= <5%, few individuals, 2= <5%, many individuals, 3= 5-25%, 4= 26-50%, 5=51-75%, 6=76-100%

*2. *denotes exotic species*

** donates exotic species*