BORAL– Peppertree Quarry

ANNUAL ENVIRONMENT MANAGEMENT REPORT

January 2017– December 2017

Prepared for:

Boral Resources (NSW) Pty Ltd

March 2018

Boral Peppertree Quarry

Annual Environmental Management Report (Jan 2017 – Dec 2017)

Document Control

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Boral Peppertree Quarry

STATUS	DATE	DISTRIBUTION
DRAFT (Version No. 1)	21st March 2017	Angus Shedden (Boral Quarry Manager) Sharon Makin (Boral Stakeholder and Environment Advisor)
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Commonly Used Abbreviations and Acronyms

AEMR	Annual Environmental Management Report
AHMP	Aboriginal Heritage Management Plan
AMC	Aboriginal Management Committee
ANZECC	Australian and New Zealand Environment Conservation Council
AQMP	Air Quality Management Plan
AS	Australian Standard
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPL	Environment Protection Licence
DO	Dissolved Oxygen
DP&E	Department of Planning and Environment
Ha	Hectares
HSE	Health, Safety and Environment
HSEQMS	Health, Safety, Environmental Management System
HVAS	High Volume Air Sampler
kL	Kilolitres
LOR	Limit of Reporting
mgbl	metres below ground level
NATA	National Association of Testing Authorities
NBMP	Noise and Blast Management Plan
NSW	New South Wales
NTU	Nephelometric Turbidity Units
O&G	Oil & Grease
PIRMP	Pollution Incident Response Management Plan
PM_{10}	Particulate Matter (10 microns in diameter)
POEO Act	*Protection of the Environment Operations Act 1997*
RL	Reduced Level
TDS	Total Dissolved Solids
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
$\mu g/m^2$	micro grams per square metre
$\mu g/m^3$	micro grams per cubic metre
WMP	Water Management Plan

1.0 INTRODUCTION

Peppertree Quarry (the Quarry) is owned and operated by Boral Resources Pty Ltd (Boral). The hard rock quarry is located south-east of Marulan in the NSW Southern Tablelands, approximately 175 km south-west of Sydney (refer to Figure 1).

The Quarry was first granted planning approval in March 2009 under Part 3A of the Environmental Planning and Assessment Act 1979 following the preparation and display of an Environmental Impact Assessment. The project has since been the subject of four separate modification applications which were approved in March 2009, November 2011, October 2012 and most recently in August 2017.

The Quarry has an identified resource area of approximately 250 million tonnes, which dependent upon extraction rates, would allow quarrying for 70 years or more over an area of approximately 104 hectares (ha), within a 650 ha parcel of land.

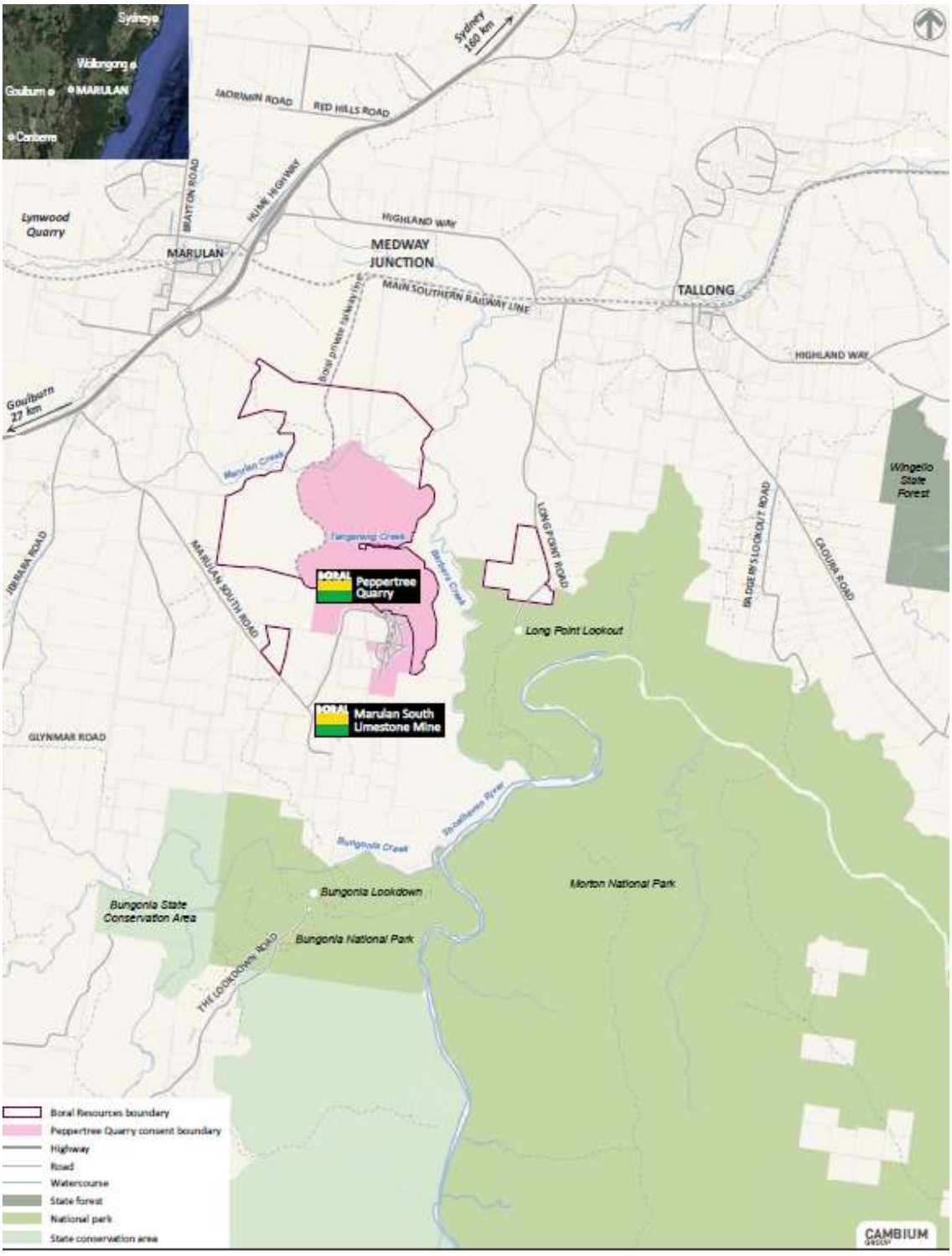
All quarry products and materials (granodiorite aggregate products and manufactured sand) are transported by rail to a number of Boral rail terminals for distribution by trucks into the Sydney metropolitan area.

This Annual Environmental Management Report (AEMR) provides a summary of the Quarry's activities, environmental performance, statutory compliance and community relationships between the period of 1st January 2017 to 31st December 2017 (the reporting period).

The AEMR has been prepared in accordance with the requirements of the Project Approval 06_0074 (Condition 10 - Schedule 5), which requires:

- Details on works (including rehabilitation) conducted in the previous calendar year and the proposed works planned for the next 12 months;
- A review of monitoring results and community complaint records;
- A review of compliance with statutory requirements in relation to specified limits, plans, programs and performance criteria;
- A summary of corrective actions required to address any non-compliances identified during the AEMR reporting period;
- Reporting monitoring results with an analysis of trends from previous years' results;
- A review of discrepancies between predicted and actual environmental impacts and an analysis of the potential cause of any significant discrepancies; and
- Measures to be implemented in the next 12 months to improve environmental performance.

Figure 1:


Sydney
Wollongong
Goulburn
MARULAN
Canberra
JACKMAN ROAD
RED HILLS ROAD
Sydney 160 km
BARTON ROAD
HUME HIGHWAY
Lynwood Quarry
MARULAN
HIGHLAND WAY
MEDWAY JUNCTION
MAIN SOUTHERN RAILWAY LINE
TALLONG
HIGHLAND WAY
Goulburn 27 km
Wingello State Forest
Marulan Creek
Tangarang Creek
Barbers Creek
LONG POINT ROAD
BRIDGE RIVER LOOKOUT ROAD
CROOKS ROAD
IDERABA ROAD
MARULAN SOUTH ROAD
BORAL Peppertree Quarry
Long Point Lookout
BORAL Marulan South Limestone Mine
GLYNMAR ROAD
Shoalhaven River
Bungonia Creek
Morton National Park
Bungonia Lookdown
Bungonia State Conservation Area
Bungonia National Park
THE LOOKDOWN ROAD
Boral Resources boundary
Peppertree Quarry consent boundary
Highway
Road
Watercourse
State forest
National park
State conservation area
CAMBIUM

1.1 REGULATORY FRAMEWORK

The Quarry operates under a number of regulatory approvals and licences which are summarised in the following Sections of the AEMR.

1.1.1 Planning Approval and Modifications

The initial Project Approval (06_0074) was granted by the Minister of Planning under Part 3A of the *Environment Planning and Assessment Act 1997* (EP&A Act) in February 2007. The Project Approval has since been the subject of the following four modifications:

- Modification No. 1 (2009), approved for exploratory blasting and test pitting in order to verify the design of the processing plant;
- Modification No. 2 (2011), approved for the construction of a new rail line rather than use the existing rail facilities to the Limestone Mine;
- Modification No. 3 (2012), approved the construction of a high voltage power line from an existing substation to the processing plant and to provide a rail siding near the junction with the Main Southern Railway Line; and
- Modification No. 4 (2017), approved the extension of in-pit operating hours and the establishment of a new overburden emplacement area (Southern Overburden Emplacement). The approved Modification introduced a number of additional Project Approval compliance conditions which are presented in Table 1a.

A copy of the Project Approval is available on request or can be accessed through the following Boral website:

http://www.boral.com.au/article/marulan_operations_planning_approvals.asp

1.1.2 NSW EPA Environment Protection Licence

The Quarry operations are regulated under a NSW EPA Environment Protection Licence No. 13088 (EPL). The EPL is issued for the scheduled activity of:

- Crushing, Grinding, Separation and Extractive activities for tonnages greater than 2 million tonnes per annum.

A variation was requested on the 4th October 2017 to update the EPL in line with Modification 4 requirements, in particular in pit operating hours and change in residential receivers details.

The Variations were approved and issued on the 10th November 2017 (notice 1557403).

A copy of the EPL is available on request or can be accessed through the following Boral website:

http://www.boral.com.au/article/nsw_poela_environmental_reporting.asp

1.1.3 Water Licences

The Quarry maintains a water licence (10WA102701) granted by the NSW Office of Water for the construction and use of a 110ML dam. In addition, a water bore licence (10WA116000) allowing an annual extraction of up to 15 ML. However, as in previous years the Quarry's main dam provided the required operational water supply during the reporting period and no extraction from this bore was necessary.

1.1.4 Regulatory Compliance

The key compliance requirements associated with the Project Approval and EPL are respectively summarised in Tables 1a and 1b with references to the relevant Sections of the AEMR that provide further detail on environmental management, performance and compliance at the Quarry.

Table 1a: Key Compliance Requirements – Project Approval

Compliance Condition	Compliance Requirement (Project Approval - 06_0074)	AEMR Section
Schedule 2: Administrative Conditions		
Schedule 2: Condition 6	No more than 3.5 million tonnes of product to be transported from site in any calendar year.	Section 2.2
Schedule 2: Condition 7	All quarry products must normally be transported from the site by rail unless with written approval of the Secretary, quarry products may be transported by road in an emergency or in other limited and exceptional circumstances.	Section 2.2
Schedule 2: Condition 11	All plant and equipment used at the site must be: (a) maintained in a proper and efficient condition; and (b) operated in a proper and efficient condition.	Note A
Schedule 3: Environmental Performance and Conditions		
Schedule 3: Condition 1A	(a) Prior to the commencement of construction of the Southern Overburden Emplacement Area, an independent registered surveyor to survey the boundary of the emplacement area and submit a survey plan of this boundary to the Secretary; and (b) The Southern Overburden Emplacement area must be clearly marked so that operating staff and inspecting officers can clearly identify its location.	Section 2.1.1
Schedule 3: Conditions 2, 3, 4 and 5	Prescribes maximum noise limits and receptor locations.	Sections 3.4
Schedule 3: Condition 9 & 10	Requires the preparation and implementation of a Noise Management Plan which includes appropriate	Section 3.4

Compliance Condition	Compliance Requirement (Project Approval - 06_0074)	AEMR Section
	noise mitigation considerations for compliance with relevant approval conditions.	
Schedule 3: Condition 11 & 11A	Table 3 prescribes operational hours for specified quarry activities. Condition 11A has RL restrictions on hours the in-pit crusher may be operated.	Sections 3.4
Schedule 3: Conditions 12 to 16	Requires the preparation and implementation of a Blast Monitoring Program Prescribes with limits and mitigation measures on Blasting Operations.	Sections 3.5
Schedule 3: Condition 17	Tables 6, 7 and 8 prescribe Air Quality criteria not to be exceeded.	Section 3.3
Schedule 3: Condition 18	Tables 9, 10 and 11 prescribe land acquisition criteria for particulate matter and dust deposits.	Note B
Schedule 3: Condition 20	Requires the preparation and implementation of an Air Quality Management Plan.	Sections 3.3
Schedule 3: Condition 21	Requirement to operate and maintain a meteorological station for the life of the project.	Sections 3.2
Schedule 3: Conditions 22 to 30	Surface and groundwater management and monitoring requirements.	Sections 3.6
Schedule 3: Condition 30A	Requirements for surface water management for the construction and operation of the Southern Overburden Emplacement Area.	Section 2.1.1
Schedule 3: Condition 30B	Requirements for a compliance audit of the Southern Overburden Emplacement Area construction in accordance with Mod 4 approval.	Section 2.1.2
Schedule 3: Condition 32A	Requirement to report unexpected encounters with archaeological relics.	Sections 2.9
Schedule 3: Condition 33 to 33A	Species (Flora & Fauna) and habitat management.	Sections 2.3
Schedule 3: Condition 34	Requirement for the implementation of a Biodiversity Offset Strategy in accordance with Mod 4 approval.	Sections 2.3 & 5.0
Schedule 3: Condition 34A	Requires the preparation and implementation of a Biodiversity and Rehabilitation Management Plan for managing native vegetation.	Sections 2.3
Schedule 3: Condition 37	Visual amenity and off-site lighting.	Sections 1.3 .1
Schedule 3: Condition 41	Monitor and minimise waste.	Sections 2.7
Schedule 3: Condition 42 to 45	Emergency and hazard management.	Section 2.8
Schedule 3: Condition 46	Monitoring and reporting of production data.	Section 2.2
Schedule 3: Condition 47	Quarry exit strategy.	Section 2.3

Compliance Condition	Compliance Requirement (Project Approval - 06_0074)	AEMR Section
Schedule 4: Additional Procedures		
Schedule 4: Condition 1	Notification of non-compliances with criteria prescribed in Schedule 3.	Section 4.1
Schedule 4: Condition 2 to 5	Requirement for an Independent Review.	Section 4.2
Schedule 4: Condition 6 & 7	Land acquisition considerations.	Note B
Schedule 5: Environmental Management, Reporting and Auditing		
Schedule 5: Condition 1	Implementation of an Environmental Management Strategy.	Section 3.1
Schedule 5: Condition 2	Preparation of Management Plans.	Section 3.1
Schedule 5: Condition 3	Revision of Strategies, Plans and Programs.	Section 2
Schedule 5: Condition 4	Requirement for Biodiversity and Rehabilitation Management Plan to be submitted by 28 February 2017.	Section 1.3 & 2.3
Schedule 5: Condition 5	Updating and Staging of Strategies, Plans or Programs.	Section 2
Schedule 5: Condition 6	Requirement for adaptive management of project-related risks to ensure that there are no exceedances of the criteria and/or performance measures in Schedule 3.	Section 2
Schedule 5: Condition 7	Requirement to maintain and facilitate a Community Consultative Committee.	Section 2.10
Schedule 5: Condition 8	Requiring for reporting of incidents.	Section 4
Schedule 5: Condition 9	Requirement to have environment performance reporting posted on website.	Section 2.10
Schedule 5: Condition 10	Requirement for an AEMR to be submitted by end of March each year.	Section 1.0
Schedule 5: Condition 11	Requirement for Independent Environmental Audits.	Section 4.2
Schedule 5: Condition 12	Information and documentation required to be posted on website by November 2017.	Section 2.10

Notes: Note A: A formal inspection and maintenance program of Quarry plant and equipment has been developed and implemented through Boral's Electronic Asset Management (EAM) program.

Note B: This condition was not triggered during the Reporting Period. No land acquisition was required under Project Approval conditions.

Table 1b: Key Compliance Requirements – EPA Environment Protection Licence

Compliance Condition	Compliance Requirement (EPL No. 13088)	AEMR Section
Conditions P1.1, M2.1 and M2.2	Dust Monitoring (EPL discharge points 1 to 5).	Section 3.3
Condition L1	Requirement to comply with section 120 of the *Protection of the Environment Operations Act 1997* – prohibition of the pollution of waters.	Sections 3.6
Condition L2 and L2.2	Prescribes maximum noise limits at nominated residential receivers.	Sections 3.4
Condition L3 and L3.1	Prescribes blasting criteria.	Sections 3.5
Conditions O1 and O2	Activities must be undertaken in competent manner (O1) and plant and equipment must be maintained and operated in a proper and efficient manner.	Note A

Notes:

Note A: A formal inspection and maintenance program of Quarry plant and equipment has been developed and implemented through Boral's Electronic Asset Management (EAM) program.

1.1.5 AEMR Distribution

Copies of the AEMR will be submitted to:

- NSW Department of Planning and Environment;
- NSW Environment Protection Authority;
- Water NSW;
- Department of Primary Industries – Water;
- Office of Environment and Heritage;
- Goulburn Mulwaree Shire Council;
- The Peppertree Quarry Community Consultative Committee; and
- Aboriginal Heritage Management Committee.

The report will also be available at the Boral website:

http://www.boral.com.au/article/marulan_operations_environment.asp

1.2 Site Contact Details

Key contacts associated with the management of the Quarry operations, environment, safety and stakeholder relationships are provided in Table 2.

Table 2: Key Contact Details – Peppertree Quarry

Contact Person	Position Title	Contact Details
Angus Shedden	Quarry Manager	Tel: (02) 4841 1701 Email: angus.shedden@boral.com.au
Sharon Makin	Stakeholder and Environment Manager	Tel: (02) 4841 1701 Email: sharon.makin@boral.com.au
Paul Jackson	Stakeholder Relations Manager	Tel: (02) 9033 5215 Email: paul.jackson@boral.com.au

1.3 Actions Required 2017 reporting period

1.3.1 AEMR

Table 3 lists specific actions from the 2016 AEMR to have been undertaken during the 2017 reporting period.

Table 3: Actions Required from 2016 AEMR

2016 AEMR actions	Status
Undertaken Dust Extraction trial at crusher building	• Trial undertaken during 2017 at crusher building. Extraction of dust from the building trialed as well as trial of extraction from point sources. Point source trial was most successful. Best options for a permanent solution being reviewed.
Undertake progressive Overburden stabilization and rehabilitation	• Ongoing. Biodiversity management plan in place and approved with detailed rehabilitation plans and monitoring. Overburden emplacements stabilized as part of ongoing construction.
Update Oil storage systems	• Order has been placed for new oil storage system following a review in 2017
Establish site water balance	• Flow meters installed at a number of sites and monthly data being obtained. Water balance to be

	undertaken by consultant in 2018.
Heritage & overburden campaign – construct Western bund & start Southern emplacement	• Both overburden emplacements commenced and heritage works continued.
Ongoing annual External review of weather data	• In place with monthly reviews by consultant
Waste accountancy	• Program established
Resolution of noise complaint	• Additional monitoring undertaken to understand nature of noise and the source. Voluntary Understanding in place with Department of Planning and Environment to minimize noise where possible.
Install additional Sediment control at the Train load out facility	• sediment basin installed
Install Storm water management system at the eastern end of the pit– (turkeys nest)	• in place
Implement Stakeholder Engagement plan for 2017 including assistance with Kite festival	• undertaken with key role in Kite Festival
Establish Bio bank area	• area to be established within 12 months of commencement of the southern overburden ie August 2018. Fencing and management being arranged
Pit expansion to the East	• pit developed to the east
Review aspects and impacts register post 1st year operating under Mod 4	• undertaken
Apply for variation of the EPL	• requested 4th October 2017 and approved 10th November 2017
investigate the other “industrial” noise emission identified during October 2016 quarterly noise monitoring,	• further monitoring work undertaken and discussed with the EPA.

1.3.2 Management plans

A number of actions were identified in the update of the Management Plan following the approval of Modification 4. These actions are outlined in Tables 4a through to 4e.

Table 4a: Actions Required from Aboriginal Heritage Management plan

Management action ref ID	Environmental management measure	Indicative timeframe	Status
PTQ-AHMP-22	Recovered artefacts to be Returned to Country by AMC on the Peppertree quarry site in the HMA	End of salvage program 2018	planning in place for end of financial year 2019 as salvage will not be completed till mid 2018
PTQ-AHMP-32	An Aboriginal Heritage Report to be prepared	At end of salvage – May 2018	planning in place for end of financial year 2019 as salvage will not be completed till mid 2018
PTQ-AHMP-33	Submission of AHMIS card on completion of salvage works and associated review of current cards with OEH		planning in place for end of financial year 2019 as salvage will not be completed till mid 2018

Table 4b: Actions Required from Water Management plan

Management action ref id	Environmental Management Measure	Indicative Timeframe	Status
PTQ-WMP-16	Maintain the water licences for Dam 1 and the production bore	2026	in place
PTQ-WMP-16	For Dam 1, a log book must be kept and maintained unless the work is metered and fitted with a data logger.	January 2017	in place
PTQ-WMP-42	a system to record water usage data on a monthly basis is to be established and additional metering requirements have been identified.	March 2017	in place
PTQ-WMP-54	Within 3 years of the date of the commencement of construction and every 3 years thereafter, unless the Secretary directs otherwise, the Proponent must commission and pay the full cost of an Independent Environmental Audit of the project	2018	To be conducted august 2018

Table 4c: Actions Required from Noise and Blast Management plan

Management action ref ID	Environmental management measure	Indicative timeframe	status
PTQ-NBMP-7	NBMP to be prepared and in place	November 2016	completed, approved and in place
PTQ-NBMP-38	The procedure for managing noise based on the alert levels is still being refined as to the appropriate trigger levels and the sensitivity of the Alerts. The procedure will be completed by early 2017 and staff trained in its use	January 2017	weatherzone forecast in place. proposal for real time noise management system being sought 2018
PTQ- NBMP -39	quarterly compliance monitoring, must include additional noise monitoring locations R4 and R17 and a more detailed low frequency noise assessment and reporting regime.	October 2016	in place
PTQ-NQMP-41	Frequency of noise monitoring to be reviewed at the end of 2017 to determine future monitoring requirements	December 2017	quarterly noise monitoring to continue
PTQ-NQMP-54	During site inductions for all operators (e.g. truck drivers, mobile plant operators), identify the closest and potentially most affected noise sensitive receivers in the vicinity of current works, present the applicable noise criteria for the site and identify the site culture of best operational practice; induction to be reviewed to include	January 2017	in place
PTQ-NQMP-64	Within 3 years of the date of the commencement of construction and every 3 years thereafter, unless the Secretary directs otherwise, the Proponent must commission and pay the full cost of an Independent Environmental Audit of the project	2018	To be conducted august 2018

Table 4d: Actions Required from Air Quality Management plan

Management action ref ID	Environmental management measure	Indicative timeframe	Status
PTQ-AQMP-35	Revise Peppertree Quarry Air Quality Management plan to include simple procedure to follow in the event of any measures non compliance	December 2016	completed and approved
PTQ-AQMP-36	Investigate the likely cause of high levels of organic matter in dust gauge D1 and move monitor if required.	March 2017	Review undertaken by Todoraski Air Sciences, identifying the need to relocate D1 to the boundary of the operations. Discussion required

Management action ref ID	Environmental management measure	Indicative timeframe	Status
			with the EPA and Dept of Planning and Environment.

Table 4e: Actions Required from Biodiversity and rehabilitation Management plan (taken from 3 year plan)

Management action ref ID	Environmental management measure	Indicative timeframe	status
PTQ-BRMP -01	Prepare weed management plan	September 2017	drafted and being implemented
PTQ-BRMP -02	establishment of benchmarks	November 2017	Cambium Group commissioned to prepare benchmark and monitoring plan. Completed
PTQ-BRMP -03	development monitoring program for all rehabilitation units	November 2017	first round of monitoring to be undertaken early 2018 to establish monitoring points
PTQ-BRMP -04	management of serrated tussock	October 2017	as part of ongoing weed management plan
PTQ-BRMP -05	arrange fencing of bio bank area	October , November 2017	delayed till 2018
PTQ-BRMP -06	arrange fencing of appropriate areas at southern overburden emplacement	October 2017	proposal obtained with fencing aimed for early 2018
PTQ-BRMP -07	arrange fencing of appropriate areas at eastern overburden emplacement	December 2017	proposal to over plant rather than fence.

2.0 QUARRY OPERATIONS

2.1 QUARRY DEVELOPMENT

2.1.1 LAST 12 MONTHS

The pit has continued to develop in a south-eastern direction with a further overburden campaign undertaken in during 2017, with the overburden being emplaced as an extension of the noise bund to the south and commencement of the Southern Overburden Emplacement.

The mobile primary crusher remained within the 1st bench (RL555) of the quarry pit throughout the reporting period.
Operations occurred within the prescribed hours of operation.

No exploration activities were undertaken at the Quarry during the reporting period.

The western and Southern Overburden emplacements commenced construction during the reporting period.

Drainage works were undertaken prior to the emplacements being established with one major sediment dam being installed to the east of the Southern overburden. This was in line with Condition 30A, Schedule 3.

Prior to these works, accredited surveyors pegged the boundary of the emplacement footprint. Details were issued to the DP&E as per Condition 1A, Schedule 3.

2.1.2 NEXT 12 MONTHS

Within the next two years, the pit will initially move in an easterly direction before progressing south again. The Southern overburden emplacement will extend further to the south and is expected to reach completion. The extension of the overburden will require the construction of 2 more sediment ponds as required by Modification 4. Following this, an audit of the surface water management system of the Southern Overburden will be undertaken as per Condition 30B, Schedule 3.

It is expected that the mobile crusher will also remain within the 1st bench (RL555) throughout 2018 but move in a more eastward direction, before moving southwards in 2019.

Major construction will be undertaken with the addition of a second air classifier unit to allow for more efficient sand production and the construction of a hopper at the surge stockpile to allow for the addition of material to the conveyors feeding the secondary crushing plant.

A new “stores” building is planned for construction at the rear of the workshop to provide undercover space for a number of spares.

Consideration is also being given to an application for a modification during 2018, in relation to additional overburden storage.

2.2 PRODUCTION, SALES AND TRANSPORT

2.2.1 LAST 12 MONTHS

2.2.1.1 Production

During the reporting period, the Quarry produced 2,269, 559 tonnes of aggregate (ref to Appendix 1) which is an increase of179 559 tonnes on 2016 production (refer to Figure 2). This increase is in line with the planned efficiencies in quarry operation to produce the approved tonnage of 3.5 Million tonnes per annum.

2.2.1.2 Transport

Project Approval Condition 7 (Schedule 2) requires all products to be transported from Peppertree by rail. For the 2017 calendar year 2652 168 tonnes of product was transported by rail to Boral terminals at Maldon, Enfield and St Peters. This is both Peppertree product and approximately 4000tonnes of Limestone sand.

Road transportation may be allowed on request to Department of Planning and Environment. During the reporting period, Boral made 3 requests to the Department for road transport of products for the use by adjoining properties and donations to local community groups. The Department approved the requests but with limitations on the transport and tonnage. The approvals are summarised in Table 5.

Table 5: Approval Requests for Road Transport

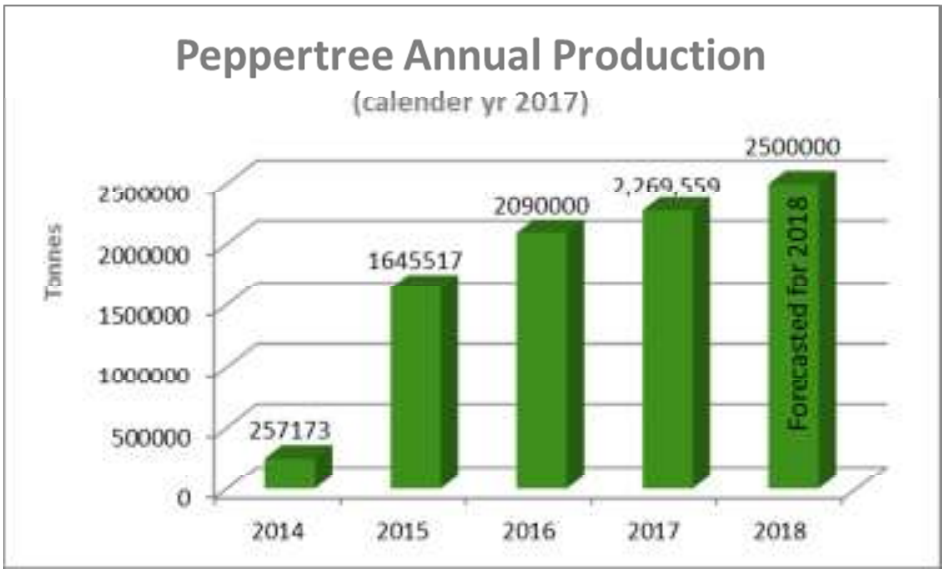
Date	Group	Material	Trucks	Complete
April 2016	Local Neighbour	Scalps for redressing internal property roads.	36	October 2017
April 2016	Tallong Focus Group	Scalps and overburden for upgrade of Tallong Memorial Park.	20	works complete as of November 2017
February 2017	Local neighbors	scalps for roads	12 truck loads	complete
June 2017	Boral employees	scalps and products	12 truckloads per year	1 load delivered
September 2017	Boral employee	crusher dust	20 trucks	aimed for march 2018

2.2.2 NEXT 12 MONTHS

2.2.2.1 Production

Predictions for the next few years are that economic growth will continue in NSW and the anticipated production for 2018 is of a slight increase to 2.5 million tonnes. However, actual realised tonnage will be dependent on continued market demand and the production levels at other Boral hardrock quarries.

Figure 2: Quarry Production Trends



2.2.2.2 Transport

For 2018, all products will be railed from the site. It is estimated that this will total 2.8 million tonnes, including Limestone sand.

Road approvals for donations may be sought as required.

2.3 LAND DISTURBANCE AND REHABILITATION

2.3.1 Land disturbance

During the 2017 AEMR period, a total of 127.88 ha of Quarry land remains disturbed. This was an increase of 49ha with the commencement of the southern and western overburden emplacements and the expansion of the pit footprint. Heritage salvage works were also extensive.

Figure 3 presents the locations and total estimated areas of disturbance to the end of the 2017.

2.3.2 Rehabilitation

A Biodiversity and Rehabilitation management plan was prepared and approved by the DP&E in April 2017 in accordance with Development Consent Condition 4, Schedule 5.

This plan was an extensive review of the previous management plan and details a number of Rehabilitation Management Units (RMU), (refer Appendix 2), ongoing monitoring for success and completion as well as the progressive rehabilitation planned for the next three year period.

A comprehensive weed management plan has been prepared for the management of weeds across the site, however monthly weed management has continued to occur with the older rehabilitated areas adjacent to the dam and creek.

Planting of the eastern overburden was planned for October 2017 however has been delayed due to the drought conditions experienced at the site. The area should be planted early to mid-2018.

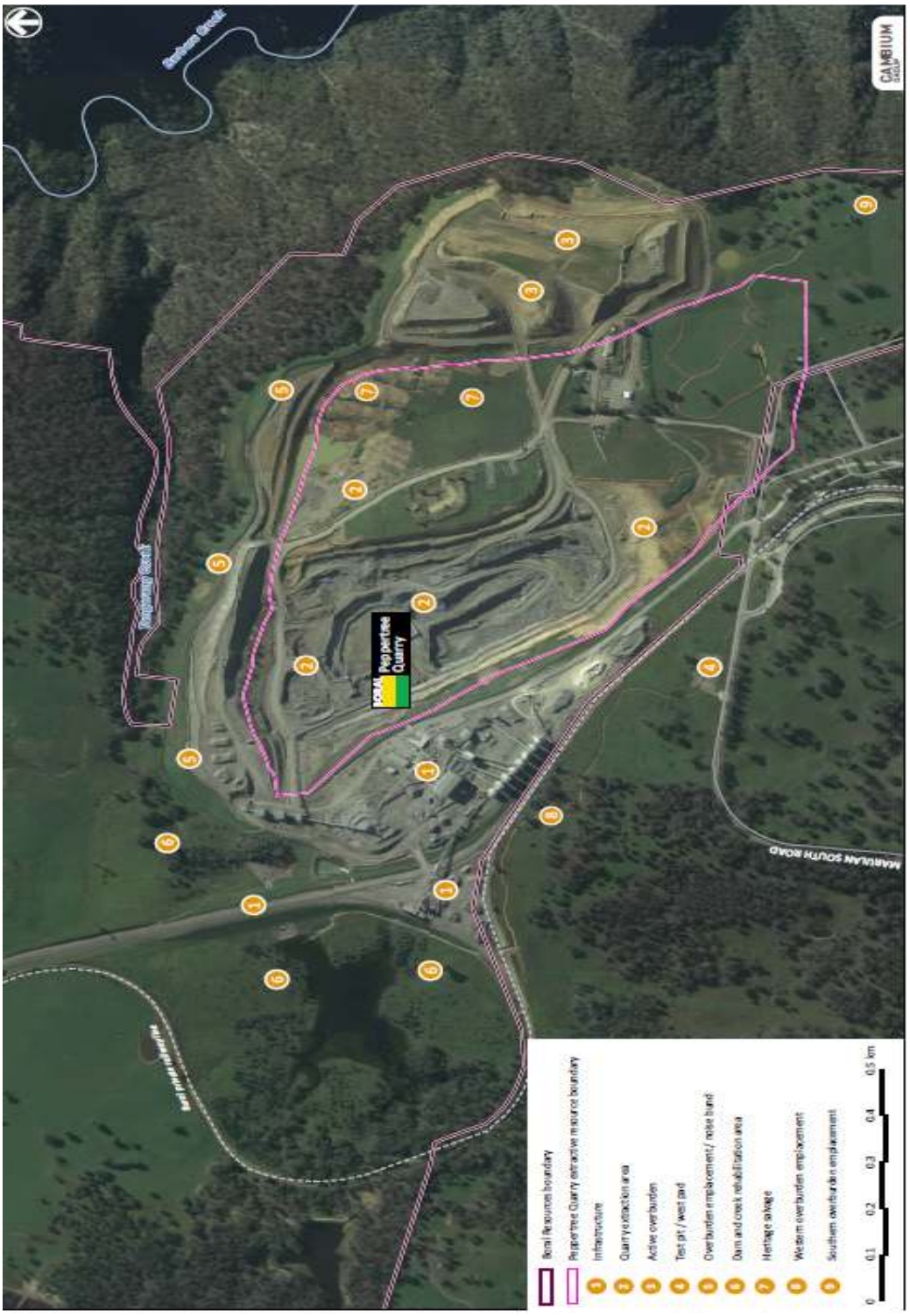
As part of the Modification 4 approval, studies identified the need for a bio banking offset area to be established 12 months after the commencement of the southern emplacement construction. Details are contained in Condition 34 and 34a, schedule 3 of the Approval. The Southern emplacement commenced in August 2017 so the offset will be established during 2018.

Cambium Group was commissioned at the end of 2017 to develop a monitoring program for all the RMUs so that assessment towards completion can be made on an annual basis and rehabilitation plans modified as necessary. Initial monitoring to establish the baseline will be undertaken in early 2018.

LEGEND - FIGURE 3

Map Reference	Disturbed Area (ha)	Rehabiltated Area (ha)
1: Infrastructure area – (Primary, STQ and TLO)	25	Not applicable till end of life
2: Quarry extraction area	40.28	No Rehabilitation in 2017
3: eastern overburden emplacement	29	No Rehabilitation in 2017
4: west pad	0.3	Not applicable as in quarry area
5: Overburden emplacement / Noise bund	No Disturbance	12.1
6: Dam and creek rehabilitation area	10	10.3
7. heritage salvage	13.1	not applicable as in quarry area
8. western overburden emplacement	4.3	only commenced 2017 so no rehabilitation to date
9. southern overburden emplacement	5.9	only commenced 2017 so no rehabilitation to date
Total area Disturbed / Rehabilitated	127.88	22.4

Figure 3: Disturbed Areas to End of 2017



2.4 Noise and Blasting

2.4.1 Noise

The Noise and Blast Management Plan (NBMP) provides the framework and guidance for the Quarry activities to be conducted in a manner that appropriate control measures are implemented to minimise the potential for adverse impacts on the amenity, property and safety of quarry neighbors and meet compliance requirements of the CoA of the Project Approval. A number of management actions have been put in place to assist in meeting these objectives with guidance on performance through a quarterly noise monitoring program.

The results and a general review of the quarterly noise monitoring program conducted during the reporting period are presented in Section 3.4.

2.4.2 Blasting

All blasts are conducted in accordance with the Noise and Blast Management Plan.

The Quarry conducted 42 blasts during the reporting period by certified contractors.

Monitoring of overpressure and ground vibrations at four nominated sensitive receptors is conducted during every blast.

The results and a general review of blast monitoring conducted during the reporting period are presented in Section 3.5.

2.5 Water Management

Surface and groundwater is managed in accordance with a Water Management Plan (WMP), recently revised and approved by the DP&E in July 2017. A number of management actions have been put in place to assist in the management of water and are outlined in the Water Management plan.

2.5.1 Surface Water Monitoring

Surface water quality is monitored on a quarterly basis at the discharge point of the main storage dam (Dam 1) and at upstream and downstream locations to confirm quarry operations are not adversely impacting the Tangarang Creek Catchment.

The ephemeral nature of Tangarang Creek resulted in no water samples from the upstream monitoring location during the reporting period. Sampling in all other locations (i.e. Quarry Dam and the downstream monitoring point) was conducted in accordance with the WMP and results with historic trends are presented in Section 3.6.

An additional monitoring point, Marulan south Creek, was introduced as part of the last sampling round in 2017. This creek is north of the quarry and not impacted by operations so will act as a benchmark for quality.

2.5.2 Groundwater Monitoring

In October 2015, 12 groundwater bores were installed with the first sampling event completed on October 2015. During the reporting period, the bores were sampled on a quarterly basis and Section 3.7 presents results and trends since commencement of sampling up until the end of the reporting period.

The early stages of groundwater sampling will provide baseline data on water levels, flows, and quality. As the groundwater monitoring program generates additional data, long-term trends and analysis will be reported in future AEMRs in accordance with Project Approval Condition 30 (Schedule 3).

2.5.3 Supply of Environmental Flow

In Project Approval Condition 24 (Schedule 3), 10% of the average daily flows into the Quarry Dam No. 1 is utilised in providing environmental flows to Tangarang Creek. The measurement of environmental flows is undertaken by monitoring of water level variations in Dam No. 1, with a downstream discharge flow meter and referenced against historically calibrated water balance data. Prior to the Quarry operations, flow in Tangarang Creek was extremely dependant on heavy and prolonged rainfall events and the environmental flows provided through Dam No.1 has provided more consistent flows, improving the health of downstream ecosystems.

2.5.4 Potable and Amenity Water

The Quarry has no potable water supply and the Site Office and amenity requirements are met with potable water being imported as required. On-site sewage comprises of a package treatment unit with the treated effluent being pumped to an absorption trench located to the south of the processing plant.

2.6 Air Quality Monitoring

The Quarry operates an air quality monitoring system in accordance with the Air Quality Management Plan (AQMP) approved in April 2017.Managment actions have been developed and are outlined in the AQMP.

2.6.1 Deposition Dust Monitoring

There are three dust deposition gauges used for monitoring of larger dust particles (typically >50µm) that settle out from the air and referred to as depositional dust.

The dust deposition gauges were sampled monthly (+/- 2 days) during the reporting with results comprising of the insoluble (mineralogical) matter and ash residue (organic). The results from each of the three gauges are presented in Section 3.3.

2.6.2 PM_{10} and TSP Monitoring

Two High Volume Air Samplers (HVAS) were operated during the reporting period to monitor the concentration of smaller dust particles (typically <50µm) suspended in the atmosphere. The samples

were taken over a 24 hour period every sixth day. One of the HVAS is operated to monitor Total Suspended Particulates (TSP), while the second records Particulate Matter less than ten microns in diameter (PM_{10}). Results for TSP and PM_{10} from the respective HVAS are provided in Section 3.3.

2.6.3 Meteorological Monitoring

An onsite automated weather station monitors barometric pressure, wind speed and direction, rainfall, relative humidity, temperature at 2m and 10m, as well as solar radiation. Data is uploaded to a secure web page on a weekly basis; however the data can be obtained on an hourly basis if required.

In addition a forecasting system via Weatherzone is in place to provide alerts to relevant site personnel on predicted significant weather events such high winds and extreme rainfalls so that appropriate actions and controls can be proactively implemented.

Further to a review of the operation of the onsite weather station in 2015, an air specialist continues to be engaged to review on a monthly basis the data from the weather station to ensure its reliability.

2.7 Waste Management

Boral is committed to continuing the minimization of waste from its operations, in accordance with the waste hierarchy and minimising the amount of waste sent to landfill. All liquid and solid wastes are classified and sorted so they can be appropriately reused and recycled. Table 6 outlines the identified waste streams and associated management.

Table 6: Peppertree Quarry Waste Stream and Management

Waste Stream	Source	Classification	Management
Oil absorbent pads	Oil spills	Solid general waste	General waste bins
Oil filters	Maintenance on vehicles	Solid general waste once oil has been drained	General waste bins
Oily rags / waste	Workshop	Solid general waste	General waste bins
Paper	Office	Solid general waste	recycled with contractor
Steel	General maintenance and capital works	Solid general waste	Recycled
Cardboard	Packaging	Solid general waste	Recycled
Food scraps	Lunch room	Solid general waste	General waste bins
Plastic / Glass bottles	Lunch room	Solid general waste	recycled
Aluminium cans	Lunch room	Solid general waste	recycled
Screen mats – Investigating recycling opportunities	Replacement at screens	Solid general waste	General waste bins

Conveyor belt - recycled	Split conveyor belts	Solid general waste	recycled
Oil drums	Spent oil	Solid general waste	Farm house depot - recycled
Tyres	Vehicle maintenance	Solid general waste	recycled

2.8 Dangerous Goods and Hazardous Materials Management

The Quarry has a Safety Data System (SDS) in place utilising the ChemAlert Program. A Hazardous and Dangerous Goods Register is in place which identifies each chemical stored onsite. The register is electronically filed with a physical copy kept within the Site Office.

In accordance with Project Approval Condition 43 (Schedule 3), all dangerous goods and chemicals are handled and transported in accordance with the AS1940 and AS25956 and the Dangerous Goods Code.

The only Dangerous Goods Licence pertaining to the Quarry is for a 100 kL aboveground double skinned and bunded diesel tank for refuelling locomotives. The WorkCover Notification (NDG200221) is on behalf of an on-site contractor who operates and maintains the refuelling facility. The Contractor's operation and management of the facility is audited on a regular basis for compliance.

2.9 Heritage Conservation

The Aboriginal Heritage Management Plan (AHMP) updated in November 2016 reflects management associated with current quarry activities.

The AHMP continues to provide the framework for the identification, protection, conservation and presentation of Aboriginal cultural values at the Quarry with the primary objectives of the AHMP are to identify, protect, conserve, present and transmit the Aboriginal heritage values associated with the land, on which the Quarry activities are conducted.

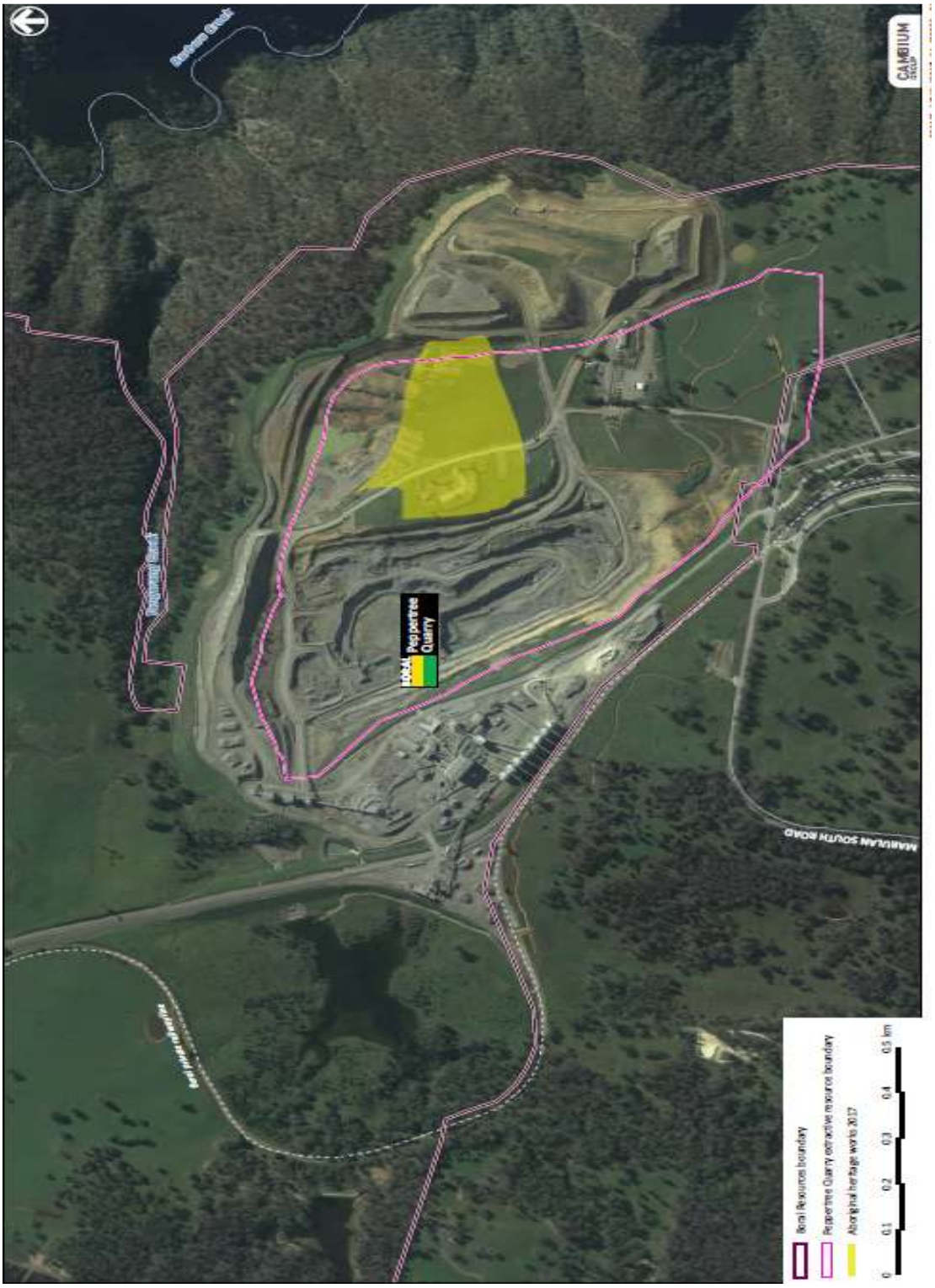
Salvage works continued in concentrated in occurred from July to December 2017 in areas earmarked for overburden removal and future pit expansion. (refer Figure 4).

During the reporting period 16 quadrants were salvaged with 1900 artefacts being collected.

In discussion with the AMC, the artefacts will be "returned to country" unless determined and agreed otherwise, with this planned for 2019 after cataloguing and assessment of the artifacts are undertaken through 2018.

AMC representatives alongside consultants also identified a scar tree in association with the review of the site for the Modification 4 proposal. Appropriate management of the site will be arranged to ensure the area is protected.

Figure 4: Topsoil Monitoring and Salvage Areas 2017



2.10 Environmental Complaints Management

The Quarry maintains an environmental complaint's register that identifies actions required to resolve issues and concerns raised by the community. A 24-hour telephone complaints line is in place and advertised through the monthly community newsletter and on the website. A list of the nature of any complaints is published to the Boral website on a regular basis.

The Quarry received 3 complaints, during the reporting period. These complaints were investigated and all appropriate actions taken at the time. Details are in Table 7.

As part of an ongoing noise assessment program managed during the reporting period, sixteen notifications had also been received from a local resident regarding noise. Boral are assessing the potential for the impact of noise at this residential premises and have requested that the owner provide notification when noise is audible. Targeted noise monitoring has been undertaken in line with weather observation to determine the source of the noise from the quarry. A Voluntary Understanding has been given to the DP&E to investigate ways of minimizing the impact. (Refer section 3.4.3 for more detail)

Boral will continue to develop and maintain relationships with the community and ensure their concerns are addressed to an acceptable outcome wherever possible. Complaints received during the reporting period are summarized in Table 7. Complaints received since the Quarry commenced production are presented in Figures 5 (2017) and 6 (2012- 2017).

Table 7: Complaints

Date - 2017	Nature of Concern	Outcome of investigation
16 April 2017	Employee – dust from operations	all controls were in place and operational
13 June 2017	Noise at residence	A Loader was found to be working on the surge stockpile pushing rock into conveyor. This was a short term operation and had ceased not long after the complaint was received. Temperature inversion in place with cold clear morning with slight breeze in direction of resident. Noise monitoring was subsequently conducted at the residence and showed compliance.
5 October 2017	Public - poor truck driver behavior on Marulan south road. – 2 incidents	Discussion held with other users of Marulan South Road (public road) and drivers reminded of required behavior on this road. One delivery driver could be identified associated with one of the incidents and was spoken to personally regarding his behavior. Speed warning signs installed by Council on the road for a period of time at Boral's request.

Figure 5: Complaints (2017)

Figure 6: Long term trend Complaints (2011 – 2017)

2.11 COMMUNITY CONSULTATION

The Quarry has actively engaged with the local community since the commencement of the 2006 Environmental Assessment for the project. The program has included:

- The establishment of a Community Consultation Committee;
- Regular community newsletters;
- Active participation in local events;
- Arranging site inspections and one on one consultation;
- Active engagement with key government and non-government organisations; and
- Maintenance of an environmental and community complaints register and actively managing and resolving community issues as they arise.

2.11.1 Community Engagement Plan (2015 – 2017)

During the reporting period, the Quarry and Marulan South Limestone Community Engagement Plan (2015 – 2017) continued to be implemented.

Boral Marulan south operations were awarded the CCAA's inaugural Community Leadership Award in September 2017 in recognition of the plan.

2.11.2 Community Consultative Committee

A Community Consultative Committee (CCC) has been established since 2011 in accordance with Condition 8 of Schedule 5 of the Project Approval. The CCC comprises of:

- Two representatives from Peppertree Quarry including the Environment and Community Adviser;
- One representative from Goulburn Mulwaree Council (the Mayor); and
- Three Local Community Representatives

Independently chaired, the role of the CCC is to offer the Quarry input from the community perspective on matters of environmental performance and stakeholder relations. Meetings include the review of environmental data and any feedback provided to the site from local community members. Issues of concern can be raised with the site by the CCC representatives.

The timing of the meetings is determined by the CCC and generally undertaken at least 6 monthly. The CCC meet 2 times during the 2017 calender year - April and November.

2.11.3 Community Newsletters

Community Newsletters are produced on a regular basis in order to inform local residents of the Quarry operations and activities as well as detailing Boral's involvement in local community events. These are distributed via the "Discover Marulan" newsletter issued to the local community. These can be found at:

http://discovermarulan.com.au/newsletters/

The newsletter is also posted on the Boral website. The first newsletter was circulated in 2011 and continued to be frequently issued during the reporting period.

2.11.4 Community Events

The Quarry staff are actively engaged with community events in the Marulan and Goulburn area. Community and stakeholder activities during the reporting period included:

- Charity Golf Day – Financial sponsorship, Quarry team representation and promotional goods giveaway;
- Tallong Apple Festival – Financial sponsorship;
- Marulan Kite festival – Financial sponsorship and committee involvement;
- Heritage and sustainability project (HSP) – Meeting and program support;
- Boral Youth Leadership program in partnership with Outward Bound; and
- CVA partnership with work at Marulan Public School, Glenquarry Public School and Tallong Pubic school.
- Marulan South reunion in partnership with the Marulan and District Historical Society

2.11.5 Blast Liaison

In accordance with the Development Consent, Condition 15 (Schedule 3), landowners and occupiers of residences within 2 kilometres of the Quarry pit are encouraged to register interest in order to be advised of any future blasts at the pit. Four parties are advised by email with 2 notified by phone.

2.11.6 Access to Information

Boral has a number of websites for each corporate division. Peppertree Quarry has its own site at:

http://www.boral.com.au/article/marulan_operations_homepage.asp

The site contains all public information in relation to Statutory approvals and development .

3 ENVIRONMENTAL MANAGEMENT AND MONITORING

The Quarry has a comprehensive monitoring program that collects information and data for the assessment of environmental impacts, regulatory compliance and performance against continual improvement objectives. Monitoring is undertaken in accordance with the respective activity specific Management Plans which define the framework for measuring environmental performance and compliance with statutory requirements.

3.1 BORAL INTEGRATED MANAGEMENT SYSTEM

Peppertree Quarry operates in accordance with the Boral integrated Health Safety, Environment and Quality Management System (HSEQ MS) which establishes a strategic platform for Regulatory compliance and continual improvement in environmental management. This system is documented in the Peppertree Quarry Environmental Management System plan approved by the DP&E in November 2017.

3.2 METEOROLOGICAL MONITORING

In accordance with Project Approval Condition 21 (Schedule 3), the Quarry continues to utilise the onsite weather station established since the commencement of the quarry development.

A Monthly review of the Weather station data is undertaken by a consultant to confirm that the station and the data is within operational compliance.

The weather forecasting dashboard used to identify potential adverse weather conditions, is also still in place. Without adequate planning and management controls, events such as high winds and extreme rainfall events can disrupt quarry operations and potentially be the cause of material environmental harm.

The triggers for the potential for noise and therefore its management have been added to the dashboard.

3.3 AIR QUALITY

3.3.1 Deposited Dust

The air quality monitoring system comprises of three dust deposition gauges (refer to Appendix 2). Two of the dust deposition gauges (D2 and D3) are located off-site for monitoring of potential impacts on the amenity of the neighboring community. The third (D1) is situated on-site and provides guidance on the effectiveness of controls being implemented in minimising the potential for off-site dust issues.

Condition 17 (Schedule 3) of the Project Approval requires that long term deposited dust emissions do not exceed an annual average criterion of 4 g/m^2/month at any neighboring residence or privately owned land.

The criterion allows for consideration towards extraordinary events such as fire incidents and dust storms which may cause exceedances beyond the actual dust contribution of activities associated with the Quarry. To account for such events, the ash content of the monthly deposition gauge samples is also analysed to identify organic matter which would not be typically be representative with the Quarry activities.

3.3.1.1 Deposition Dust Gauge Results

Table 8 presents the monthly results and annual averages during the reporting period from the three dust deposition gauges (D1, D2 and D3).

Figures 7 and 8 present the monthly trends and annual averages respectively of dust deposition and ash content at each of the three monitoring locations.

Table 8: Dust Deposition Results

Sample Identification		Monthly Dust Deposition (Insoluble Solids g/m2/month)												Annual Average Criteria: (4 g/m^2/m)
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
D1	Insoluble Solids	2.7	4.6	2.0	3.1	2.2	4.0	3.9	2.17	2.7	5.9	28.1	6.2	**5.8**
	Ash Content	1.3	2.6	1.7	2.1	1.6	3	2.3	1.6	1.8	3.2	8.5	4.2	**2.95**
D2	Insoluble Solids	4.8	4.1	1.2	3.3	2.6	4	2.2	1.8	2.6	4.1	3.7	2.4	**3.19**
	Ash Content	2.3	2.7	1.2	2.4	1.8	2.7	1.6	1.1	1.6	2.7	2.4	1.9	**2.16**
D3	Insoluble Solids	14.1	7.2	4.3	4.4	1.8	3.5	4.2	2	3.3	3	2.8	5.7	**4.71**
	Ash Content	4.3	2.2	1.8	1.9	0.9	2	2.7	1.3	1.9	1.7	1.5	2.4	**2.11**

Figure 7: Dust Deposition Monthly Trends

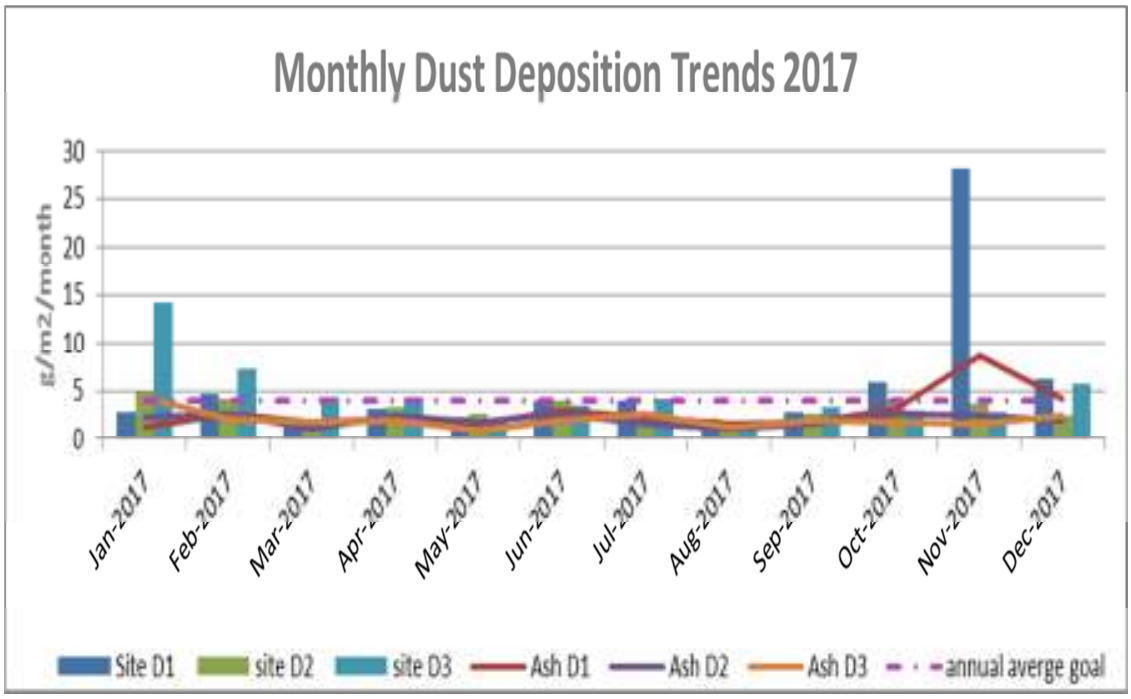
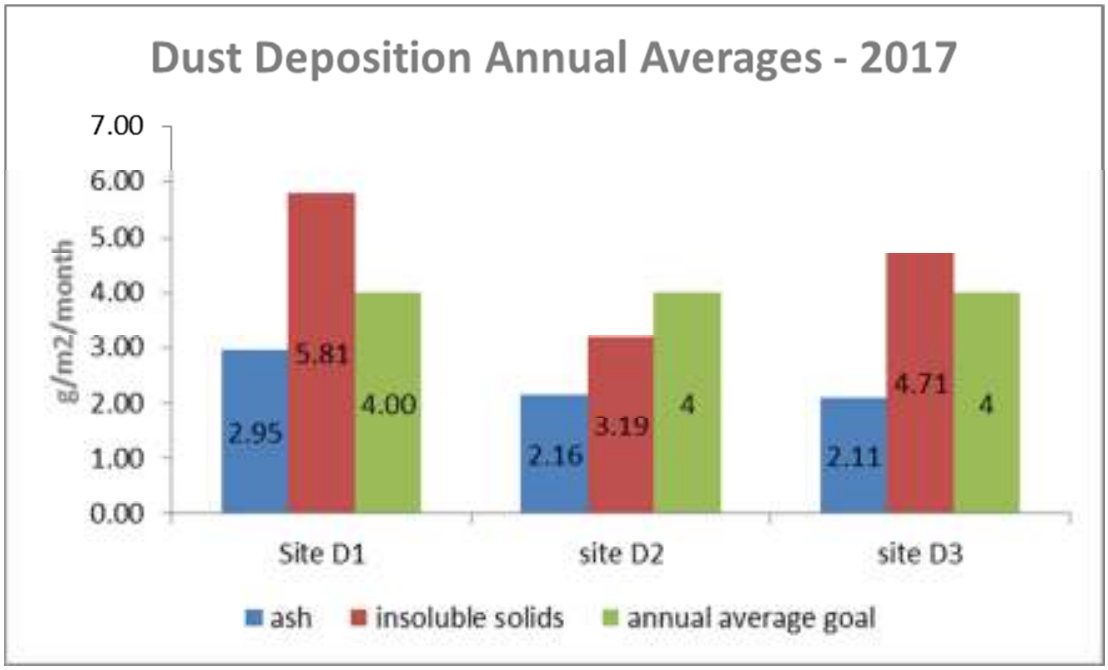


Figure 8: Dust Deposition Results – Annual Averages



3.3.1.2 Deposited Dust – Performance Review (2017)

Site D1 and Site D3, for the majority of the 2017 reporting period were below or just on the criteria of 4g/m2/month, with the levels increasing in the late Spring and summer month of October, November, December, January and February. For most of the samples, the analysis shows comparatively low ash content to the insoluble solids concentrations. This is an indication that the samples are likely to have had high levels of organic matter which is not generally representative of mineralogical based quarry dust. As an example, the January result for D3 reported an insoluble solid concentration of 14.1 g/m2/month, while the ash content was only 4.3 g/m2/month (refer to Table 8).

This is due to the organic portion (i.e. insects, leaves, bird droppings and algae) of the samples being combusted during laboratory analysis, leaving the mineralogical content as ash. In such instances, the reported ash content can often be more representative of dust from quarry activities than the insoluble solids concentrations. From observations of the bottles, D1 is impacted by birds with D3 from leaf letter.

A report has been commissioned by Todoroski Air Sciences to review both gauges with a final recommendation that both should be relocated to more representative boundary locations.

As such, the reported results for several months of the reporting period are likely to be conservative and actual dust deposition from quarry activities is likely to have been considerably lower.

D2 results were below the annual average criteria for the reporting period.

3.3.1.3 Long Term Trend Analysis and assessment (2014 – 2017)

Results for the 3 Dust Deposition gauges have been fairly consistent over the past 3 years (refer Figure 9).

Higher than usual levels have occurred during the Spring and Summer months for D1. In most cases, these are also associated with low levels of ash and therefore high levels of organics. The organic matter is primarily bird related.

D1 is located adjacent to the quarry and when results are extrapolated to the nearest residence dust levels comply.

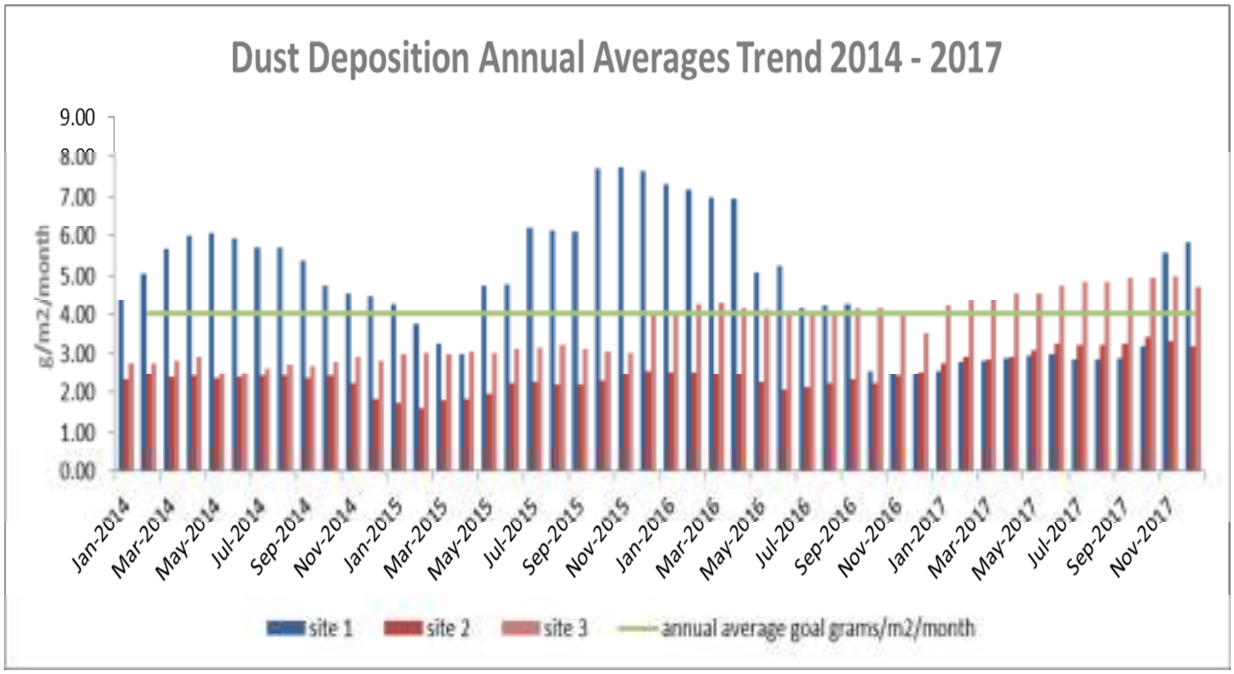
D2 has been consistently below the criteria since 2014 while D3 has shown a slight increase over time from 2016. Again organic matter is high in this bottle as a result of trees maturing near the bottle and shedding leaf letter.

Dust Deposition modelling for the EA (2006) was based upon conservative assumption and indicated that the annual average dust concentrations and deposition levels would be below relevant air quality criteria at the nearest residential properties.

The latest modification (August 2016) also modelled that the dust concentrations would remain below the relevant air quality criteria.

The Dust deposition results, when assessed at the boundary of the operations, and taking into account, the ratios of organic matter present, have been consistently below the criteria since operations commenced in 2014 and therefore are in line with the predictions of the EA and the latest Modification.

Figure 9 : Dust Deposition Results – Annual Averages trend 2014 - 2017



3.3.1.4 Deposited Dust Summary and opportunities for improvements

Analysis of the deposited dust records suggest that whilst there have been some exceedances at 2 sites, it is evident that the quarry contribution may be limited at the boundary of its operations.

As both D1 and D3 are impacted by organic matter, and not on the quarry boundary with possibly impacted neighbors, Todoroki Air Sciences recommend the relocation of this bottles. Discussion will be had with the EPA and DP&E in 2018 as to their relocation.

3.3.2 PM10 and TSP

The two HVAS are located off-site, paired together (refer appendix 3) for the measurement of particulate matter less than 10 microns in diameter (PM_{10}) and Total Suspended Particulates (TSP) and are programmed to operate on a continuous 24-hour period on six in seven-day cycle. The HVAS sampler flows are subject to bi-monthly calibration and other parameters calibrated on an annual basis.

Condition 17 (Schedule 3) of the Project Approval requires that the operation of the Quarry must meet PM_{10} and TSP criteria presented in Table 9 at any neighboring residence or privately owned land.

Table 9: PM_{10} and TSP Criteria

Pollutant	Averaging period	Criteria
TSP	Annual average	90 µg/m^3
PM_{10}	Annual average	30 µg/m^3
	24-hour average (short term impact)	50 µg/m^3

3.3.2.1 TSP AND PM10 RESULTS

Figures 10 and 11 show that the annual average of TSP and PM_{10} for the 2017 reporting period were both within the Project Approval criteria of 90 µg/m^3 and 30 µg/m^3 respectively.

On the following five occasions during the reporting period the short-term 24-hour average criteria of 50 µg/m^3 for PM_{10} emissions were marginally exceeded (refer to Figure 12):

- 16/1/17: PM_{10} recorded as 51.24 µg/m^3;
- 15/2/17 : PM_{10} recorded as 64.66 µg/m^3;
- 21/2/17: PM_{10} recorded as 52.19 µg/m^3;
- 11/3/2017: PM_{10} recorded as 61.15 µg/m^3; and
- 28/12/17: PM_{10} recorded as 80.86 µg/m^3.

On investigation, the PM_{10} exceedances were not considered representative of previous 24-hours of quarry activities. Investigations included assessing weather conditions and quarry operations as well as discussions with the resident where the samplers are placed.

Problems were experienced with the consistent operation at the PM10 sampler at the end of 2017. In an attempt to have the machine perform consistently it has been serviced and repaired, with a replacement machine being used over November, December and January.

Additional samples have been undertaken to ensure regular compliant data has been maintained.

Figure 10: TSP Annual Average results – 2017

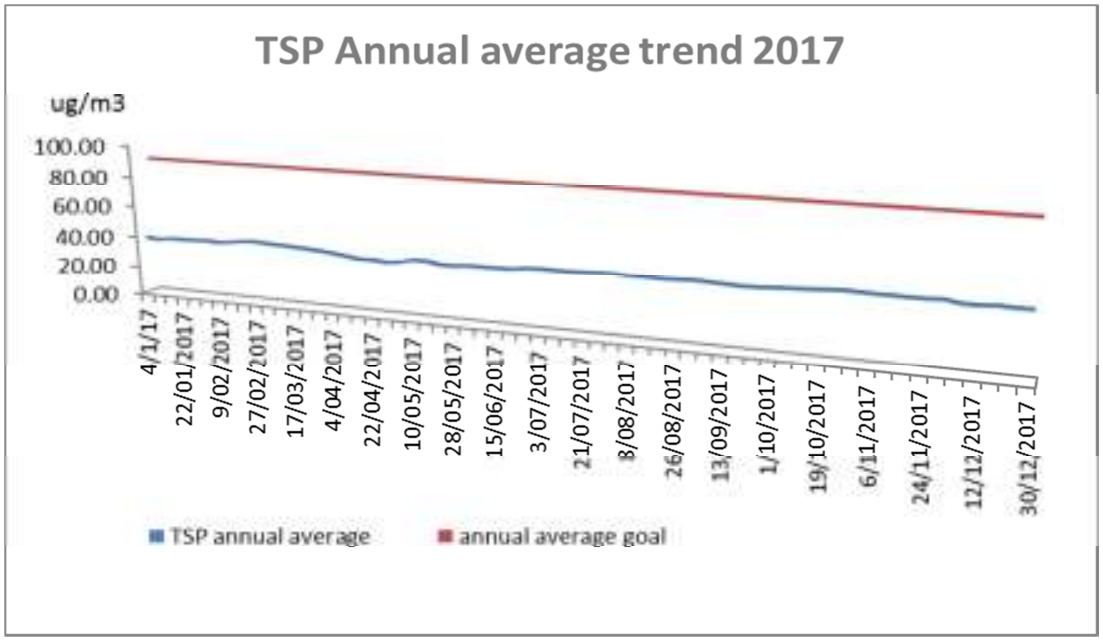


Figure 11: PM_{10} annual average results 2017

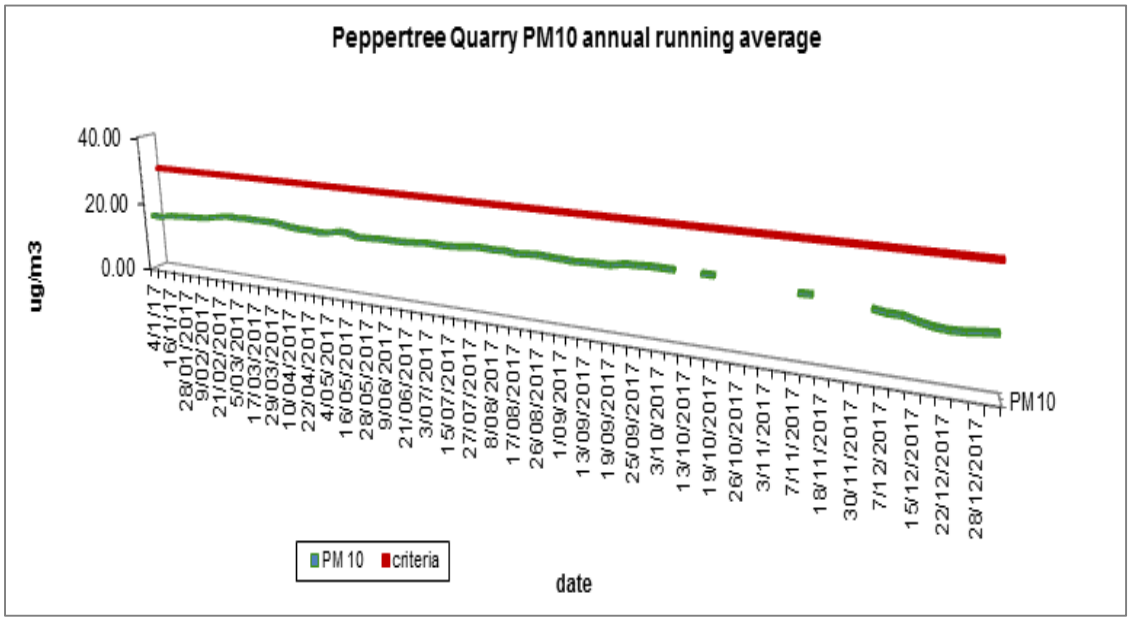
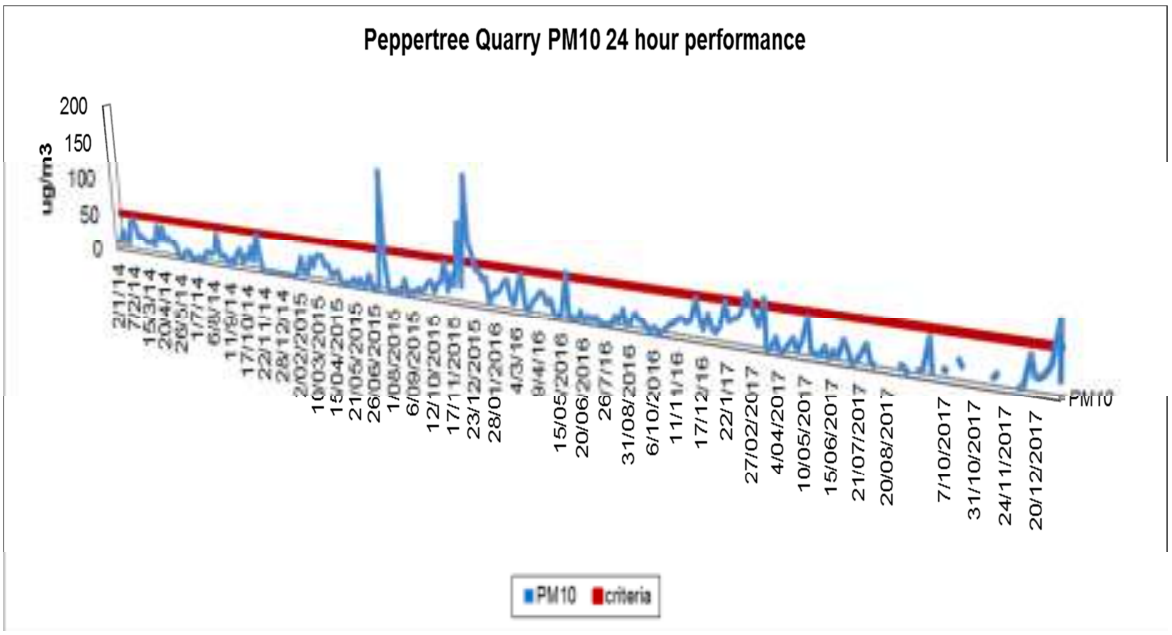


Figure 12: PM10 24 hour performance results – 2014 - 2017



3.3.2.2 TSP and PM10 – Performance Review (2017)

The Quarry complied with the respective Project Approval annual average criteria for TSP and PM10 (refer Figure 10 (TSP) & Figure 11 (PM10)).

On five occasions, PM10 concentrations exceeded the 24-hr short term average period (refer to Figure 12).

On investigation, the PM_{10} exceedances were not considered representative of previous 24-hours of quarry activities. This included assessing weather conditions and quarry operations as well as discussions with the resident where the samplers are placed.

3.3.2.3 Long Term Trend Analysis and assessment – TSP and PM10

The TSP monitoring results have all been under the average annual criteria of 90ug/m_3 (refer figure 13). The annual average of recorded results were 28.4 (2013), 40.2 (2014), 46.5 (2015), 38.9 (2016) and 41.89 (2017).

These results indicate that TSP dust levels are well below long term impact assessment criteria; consistent over the years; and consistent with the EA and modification 4 predicted annual average.

The PM10 results have all been under the 24 hours average with the exception of a number of specific events in 2015, early in 2016 and again for 5 times during 2017. (Figure 14)

The annual average of recorded results were 12.8 (2013), 15.5 (2014), 22.1 (2015), 16.8 (2016) and 15.35 (2017).

The Air Quality Assessment for the EA (2006) and the Modification 4 predicted compliance with the annual average criteria and the short term 24hr average.
The results indicate that PM10 dust levels are consistent with the EA predicted annual average and for the majority of time with the predicted maximum 24 hour PM10 concentration. Exceedances of this criterion are investigated and have not shown to be associated with Peppertree quarry operations.

Figure 13: Long Term TSP Trend – 2014 to 2017

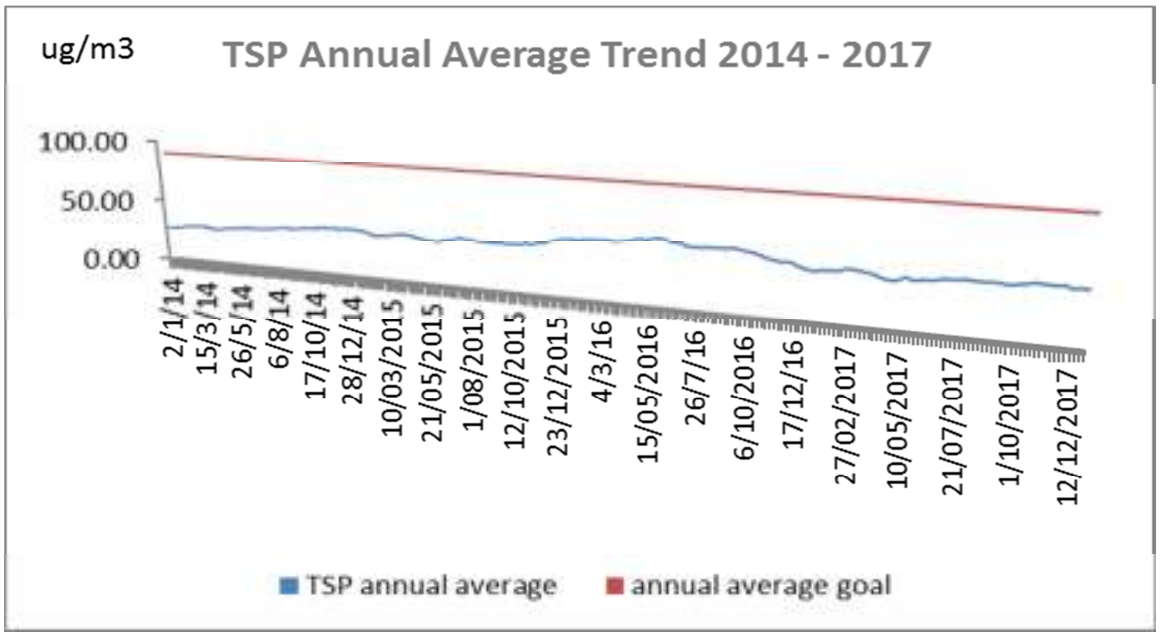
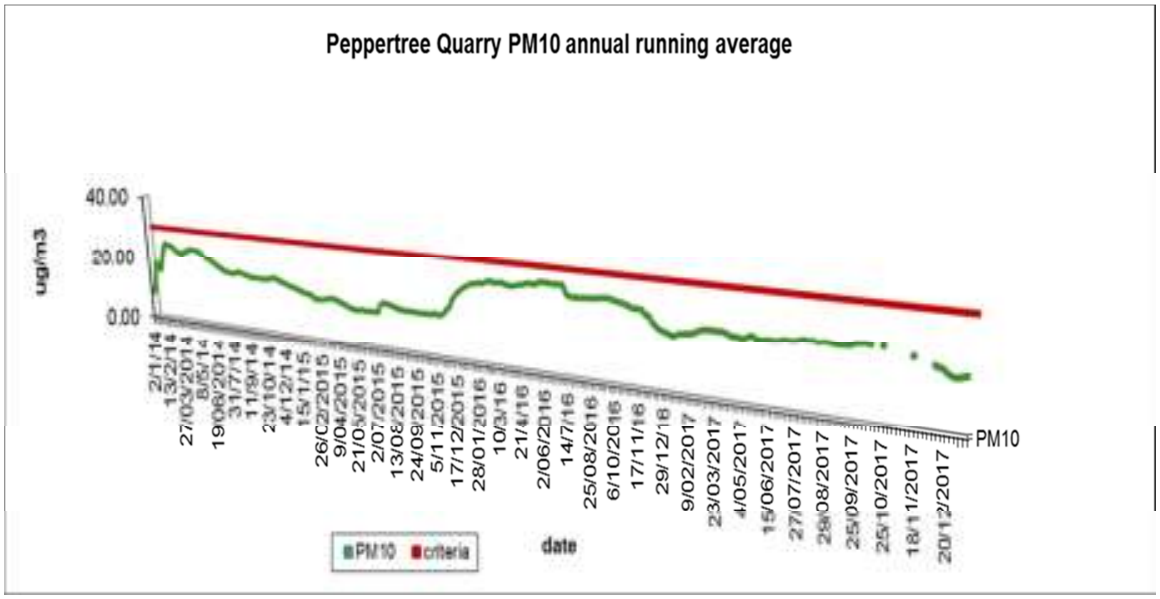


Figure 14: Long Term PM10 Trend – 2013 to 2017



3.3.2.4 PM10, TSP Summary and opportunities for improvements

Analysis of the TSP and PM10 records suggest that whilst there have been some exceedances of PM10 on a 24hourly basis it is evident that the quarry contribution is extremely limited for both TSP and PM10 at the boundary of its operations.

As there have been some difficulties with the PM10 sampler, investigations will be undertaken to replace the machine if it continues to be unreliable.

3.4 NOISE

In accordance with NBMP operational noise assessments are conducted on a quarterly basis. During the reporting period noise assessments were conducted in in February, May, July and December.

Usual quarterly monitoring in October was delayed till December as additional investigations into source noise was being conducted.

Attended monitoring is conducted during both day and night time periods to enable the measurement of operational noise from quarry activities conducted during the Project Approval permissible hours of operation. Unattended monitoring is generally continuous between the devices deployment and collection measuring noise levels for all assessment periods.

Operator attended noise measurements are conducted at or near the locations specified in Table 4 of Project Approval Condition 4 (Schedule 3). Appendix 4 shows the receiver locations required to be monitored.

In response to the perceived noise impacts from a residential receiver (refer table 8), continuous directional monitoring was undertaken at the premises. This monitoring showed some exceedances of noise criteria under inversion weather conditions, allowable under Appendix 7 of the Conditions of Consent.

Further monitoring in July 2017 confirmed the noise exceedance under inversion conditions, with advice given to the EPA and DP&E. A Voluntary Undertaking has been put in place to investigate ways to minimize the noise.

Table 10 presents the criteria for receiver locations required to be assessed in accordance with Condition 4 (Schedule 3) of the Project Approval and EPL Condition L2.

Table 10: Operational Noise Assessment Criteria

Residential Receiver Locations	Noise Assessment Criteria			
	Day (7am to 7pm) LAeq (15 min)	Evening (7pm to 10pm) LAeq (15 min)	Night (10pm to 7am)	
			LAeq (15 min)	LA1 (1Min)
R3	35	35	35	45
R2	35	35	35	45
R8	41	35	35	45
R4	35	35	35	45
R17	35	35	35	45

Project Approval Condition 4 (Schedule 3) was introduced as part of the Modification 4 approval and requires that the Noise Management Plan "includes a program to characterize and measure low frequency noise (dB(C)) emissions". Assessment of the low frequency noise is undertaken as part of the regular quarterly noise monitoring.

3.4.1 Noise Monitoring Results

Table 11 provides a summary of the maximum day and night time noise assessment measurements against the respective Project Approval compliance criteria for LAeq (15 minutes) noise levels (Condition 4 – Schedule 3). The noise measurements were conducted at five locations during the reporting period.

The assessment results found that the Quarry LAeq (15minutes) noise levels were in compliance at all receiver locations with the measured results considerably lower than the respective limits prescribed by the Project Approval (refer to Figure 15 - 19). The exception, however was at R3 during detailed monitoring in July, under inversion weather conditions, where levels of 38 and 44 were recorded at 7.17am and 7.44 am respectively.

Table 12 provides a summary of the maximum night time noise assessment measurements against the respective Project Approval compliance criteria for measured LA1 (1 minute) noise levels at all receiver locations. The assessment results found that the LA1 (1 minute) noise levels were in compliance at all receiver locations with the averaged levels being considerably lower than the respective prescribed limits (refer to Figure 20 - 24).

Table 11: Noise Assessment Results (LAeq (15min))

Residential Receiver	Assessment Dates (2017)	Noise Level Assessment (LAeq (15min))		
		Compliance Criteria	Measured Noise Levels dB(A)	Compliance with Criteria
Receiver R3	Feb	Day: 35 Night: 35	28/29 29/30	Yes Yes
	May	Day: 35 Night: 35	19/21/27 33/24	Yes Yes
	July	Day: 35 Night: 35	29/38/43/26 32/33/33/34	NO Yes
	December	Day: 35 Night: 35	25/25/25 29/29/30/30	Yes Yes
Receiver R2	Feb	Day: 39 Night: 35	27/27 26/25	Yes Yes
	May	Day: 35 Night: 35	23/24/26 27/28	Yes Yes
	July	Day: 35 Night: 35	25 27/29	Yes Yes
	December	Day: 35 Night: 35	23/23/30	Yes Yes
Receiver R8	Feb	Day: 41 Night: 35	26/27 not monitored	Yes Yes
	May	Day: 41 Night: 35	19/17 33/32	Yes Yes
	July	Day: 41 Night: 35	27/28 31/32	Yes Yes
	December	Day: 41 Night: 35	26 21/18/31/29/26/28	Yes Yes
Receiver 4	Feb	Day: 35 Night: 35	12/22 26/26/27	yes yes
	May	Day: 35 Night: 35	26/17/17 26/27	yes yes
	July	Day: 35 Night: 35	27/28 35/27	Yes Yes
	December	Day: 35 Night: 35	23/26/30 27/27	yes yes
Receiver 17	Feb	Day: 35 Night: 35	20/21/22/23 16/17/19/21/22/23/24	Yes Yes
	May	Day: 35 Night: 35	9/11/17 13/14	yes yes
	July	Day: 35 Night: 35	16/23 16/18	yes yes
	December	Day: 35 Night: 35	19/20/27 20/21/22	yes yes

Figure 15a: Off-Site Noise Level Trends (LAeq 15) – 2017 R17

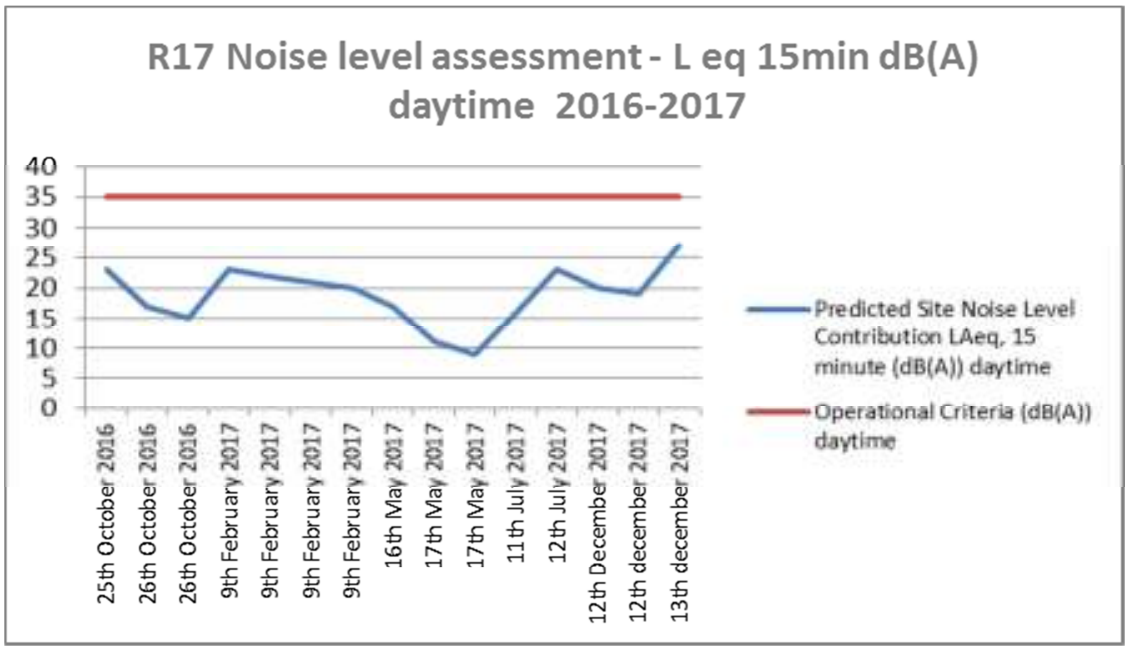


Figure 15b: Off-Site Noise Level Trends (LAeq 15) – 2017 R17

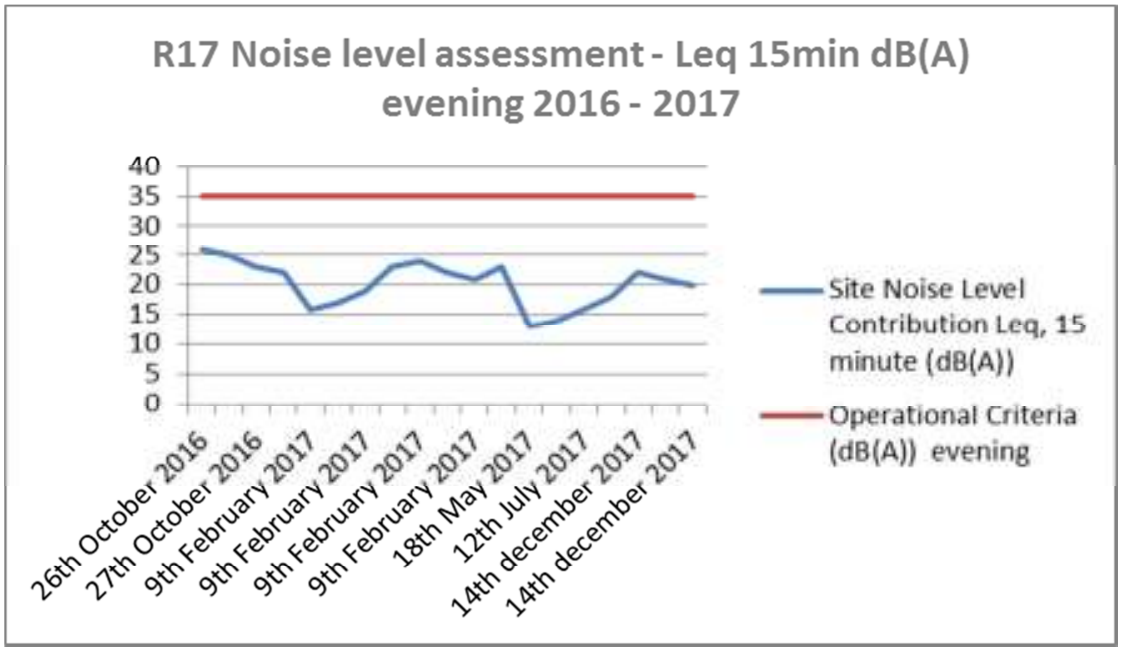


Figure 16a: Off-Site Noise Level Trends (LAeq 15) – 2017 R3

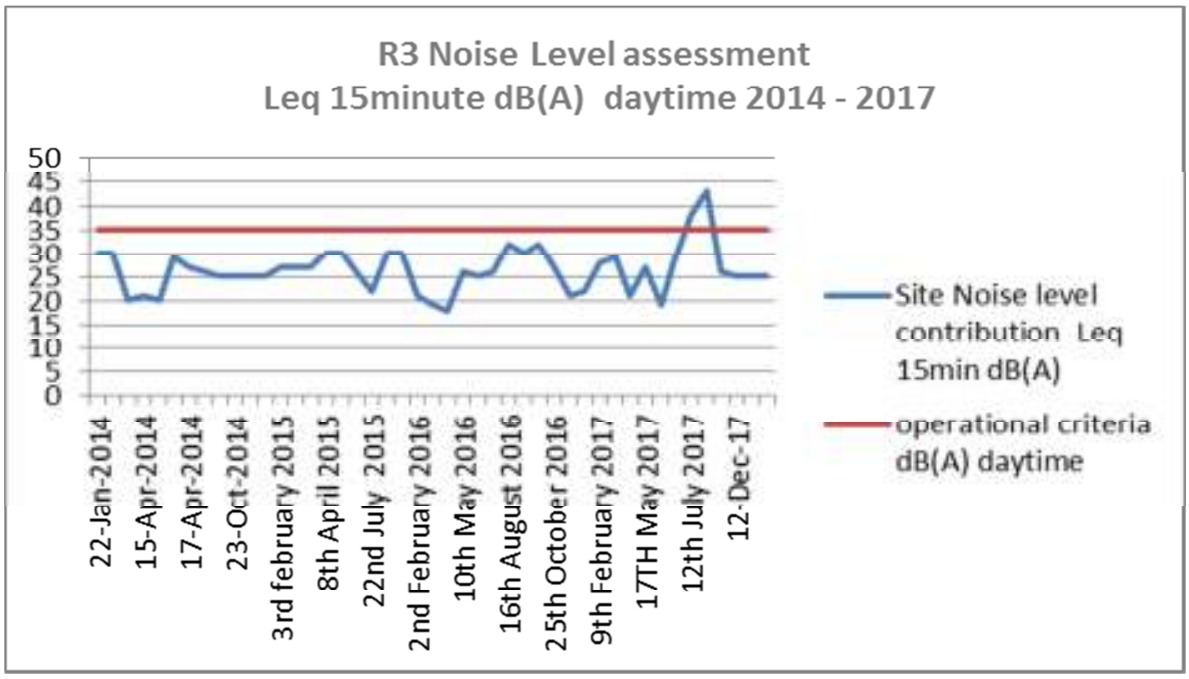


Figure 16b: Off-Site Noise Level Trends (LAeq 15) – 2017 R3

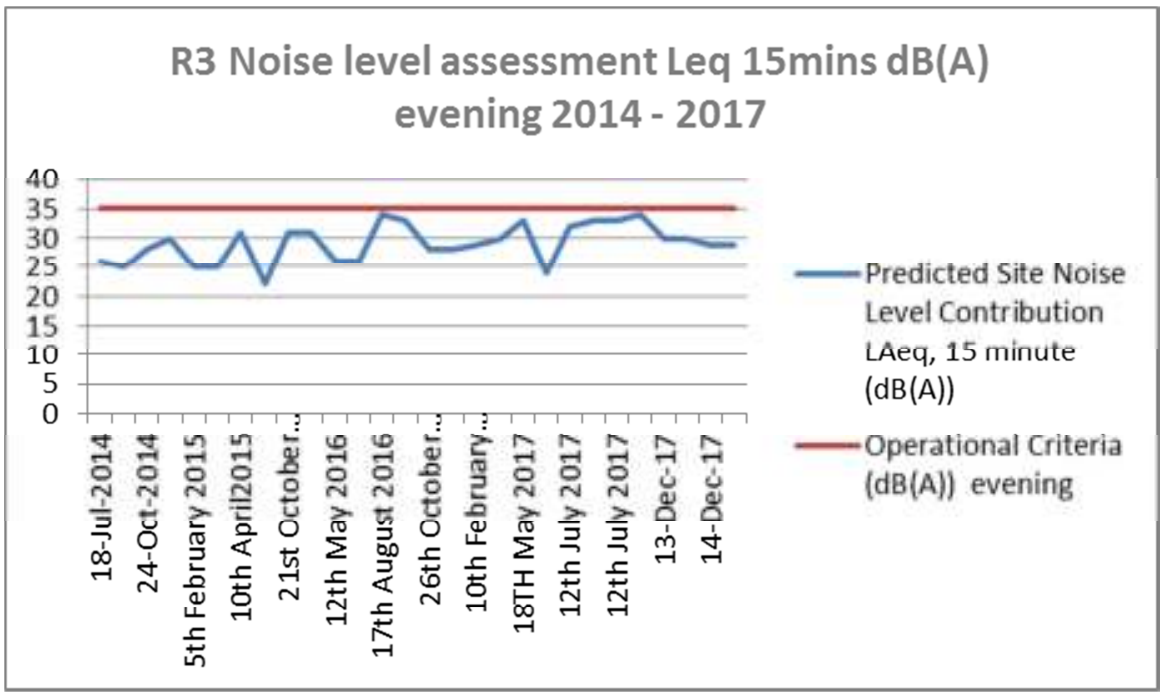


Figure 17a: Off-Site Noise Level Trends (LAeq 15) – 2017 R2

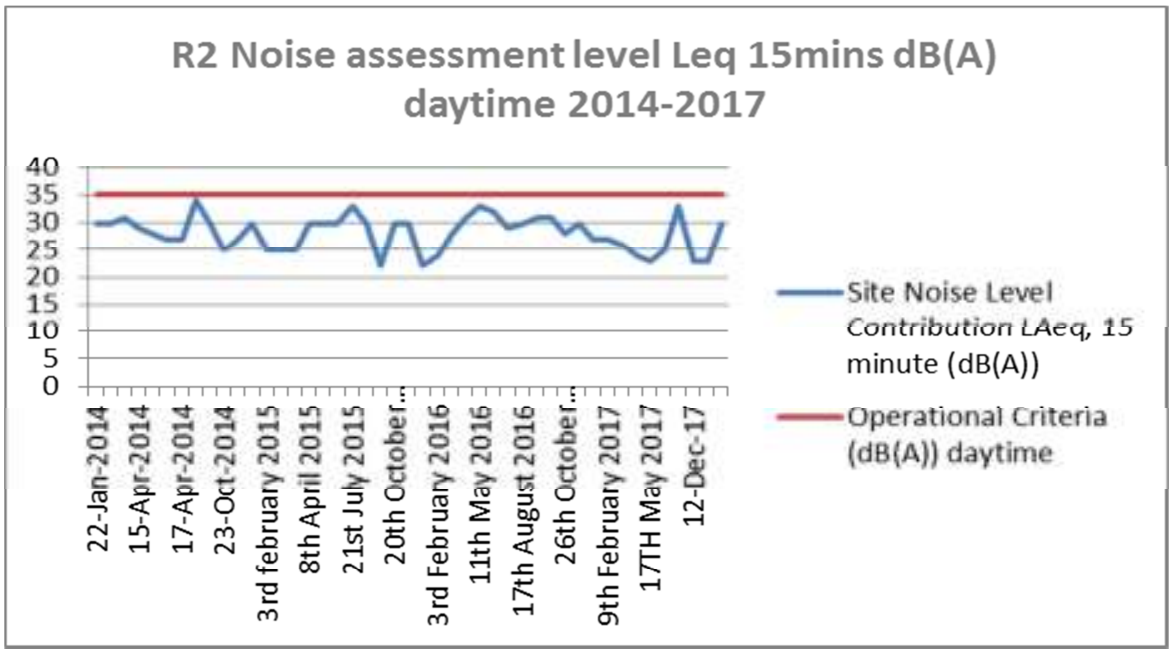


Figure 17b: Off-Site Noise Level Trends (LAeq 15) – 2017 R2

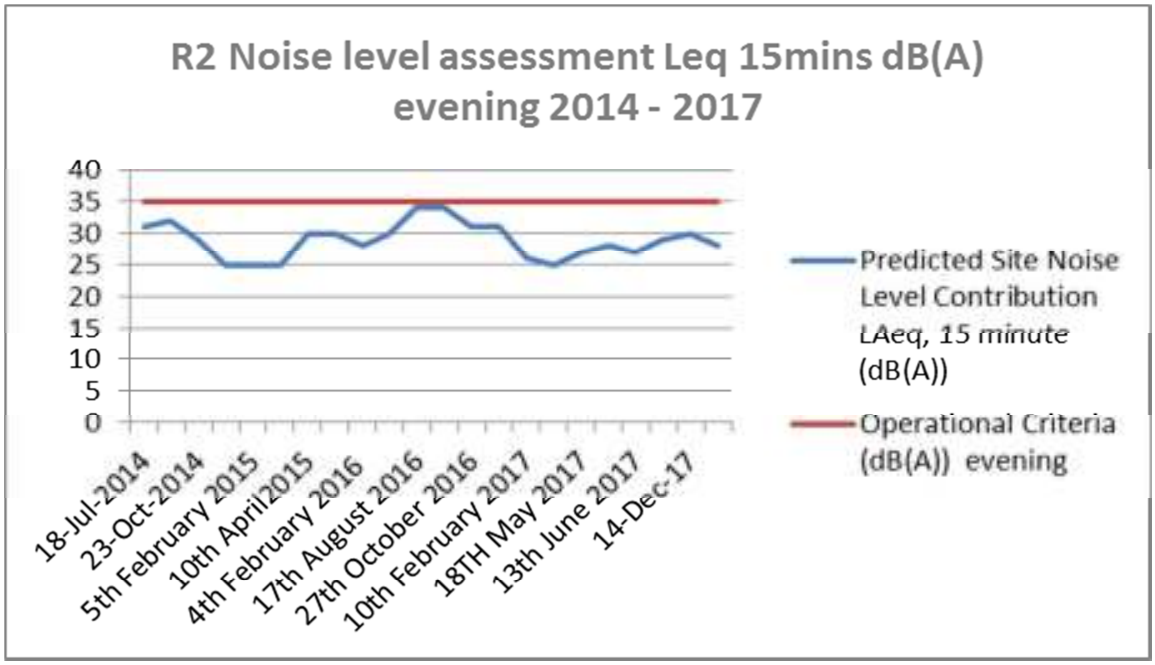


Figure 18a: Off-Site Noise Level Trends (LAeq 15) – 2017 R4

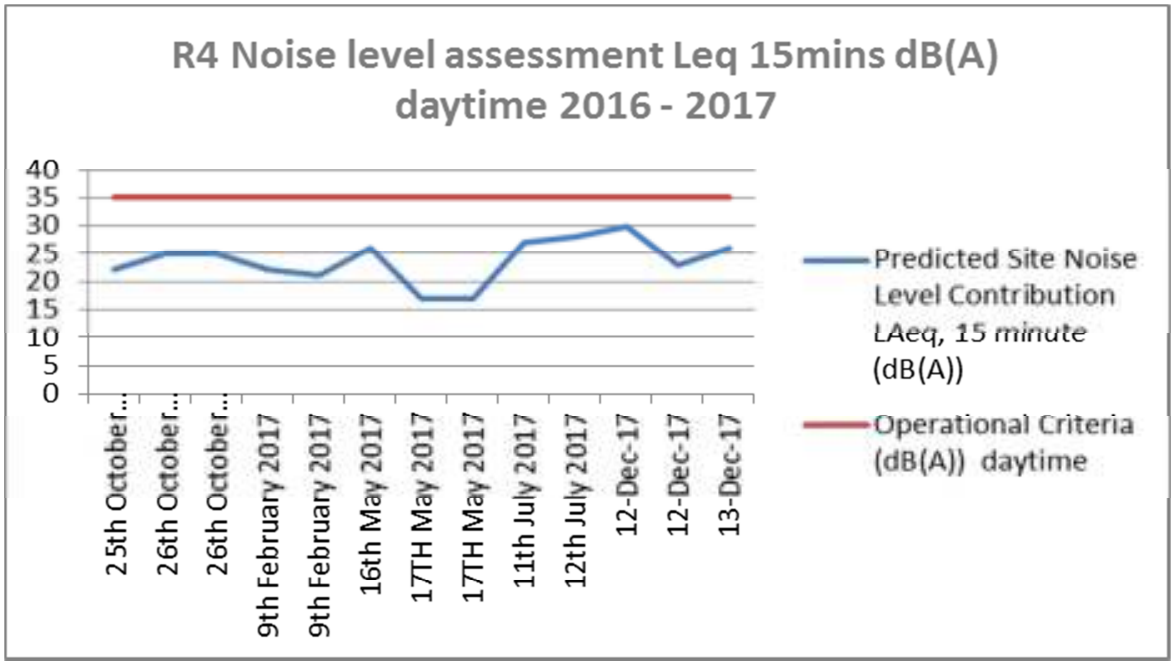


Figure 18b: Off-Site Noise Level Trends (LAeq 15) – 2017 R4

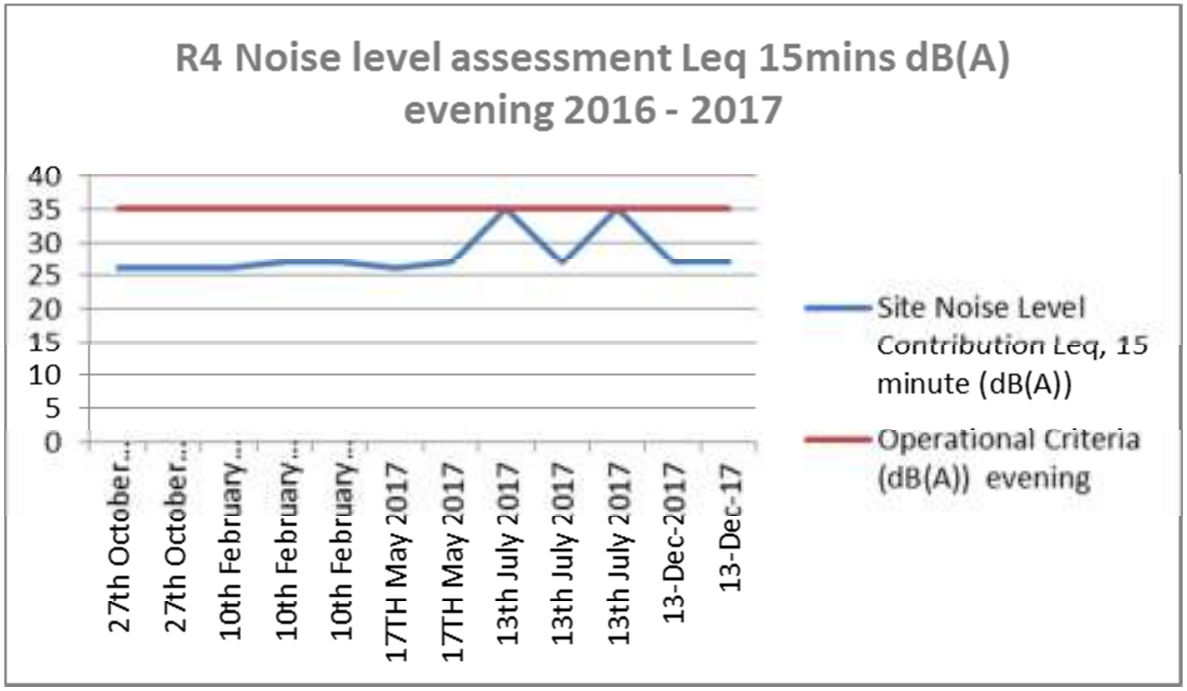


Figure 19a: Off-Site Noise Level Trends (LAeq 15) – 2017 R8

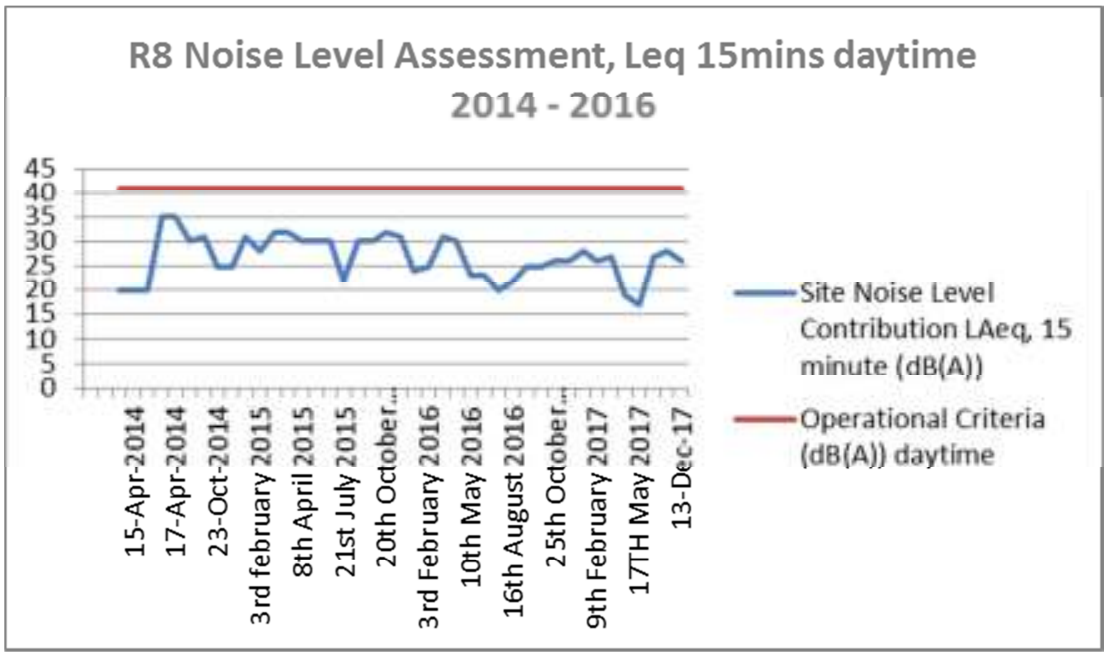


Figure 19b: Off-Site Noise Level Trends (LAeq 15) – 2017 R8

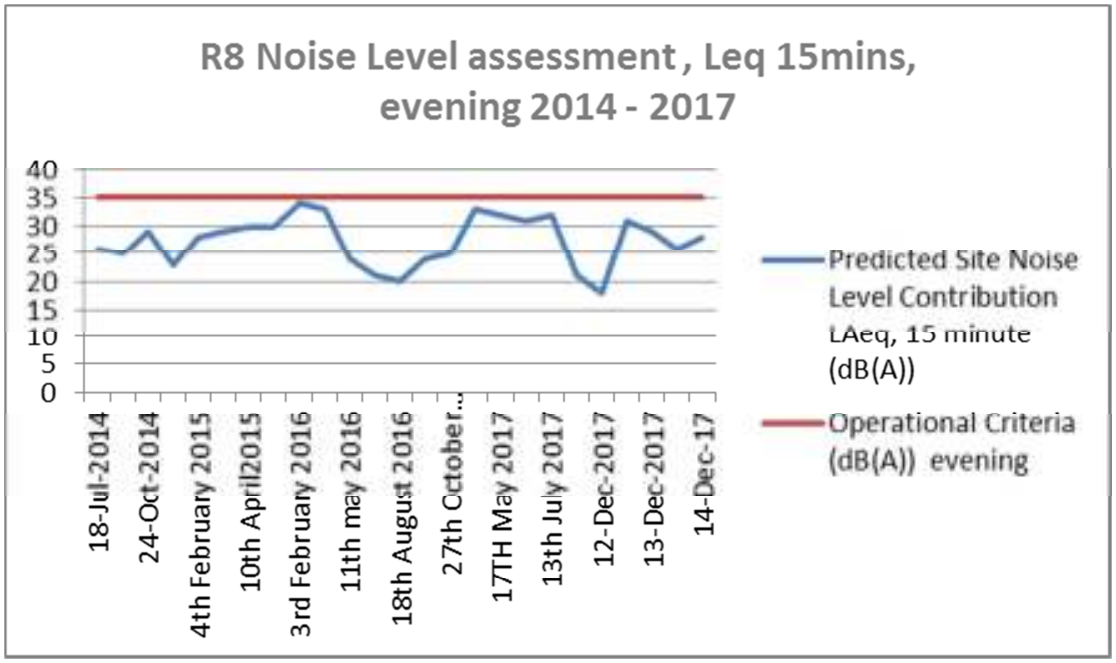


Table 12: Noise Assessment Results (LA1 (1min))

Residential Receiver	Assessment Dates (2017)	Noise Level Assessment ($L_{A1\ (1min)}$)		
		Compliance Criteria	Measured Noise Levels dB(A)	Compliance with Criteria
Receiver R3	Feb	45	34	Yes
	May	45	42/25	Yes
	July	45	36/37/38/39	Yes
	December	45	33/34/34/33	Yes
Receiver R2	Feb	45	30/31/35	Yes
	May	45	27/28	Yes
	July	45	31/33	Yes
	December	45	26/32	Yes
Receiver R8	Feb	45	no monitoring	Yes
	May	45	35/34	Yes
	July	45	35/36	Yes
	December	45	31/32	Yes
Receiver 4	Feb	45	26/26/27	Yes
	May	45	26/27	Yes
	July	45	31/39/39	Yes
	December	45	31/34	Yes
Receiver 17	Feb	45	34/32/36	Yes
	May	45	13/14	Yes
	July	45	20/21	Yes
	December	45	24/25/30	Yes

Figure 20: Noise Level Trends (LA1, 1minute) – 2017 R17

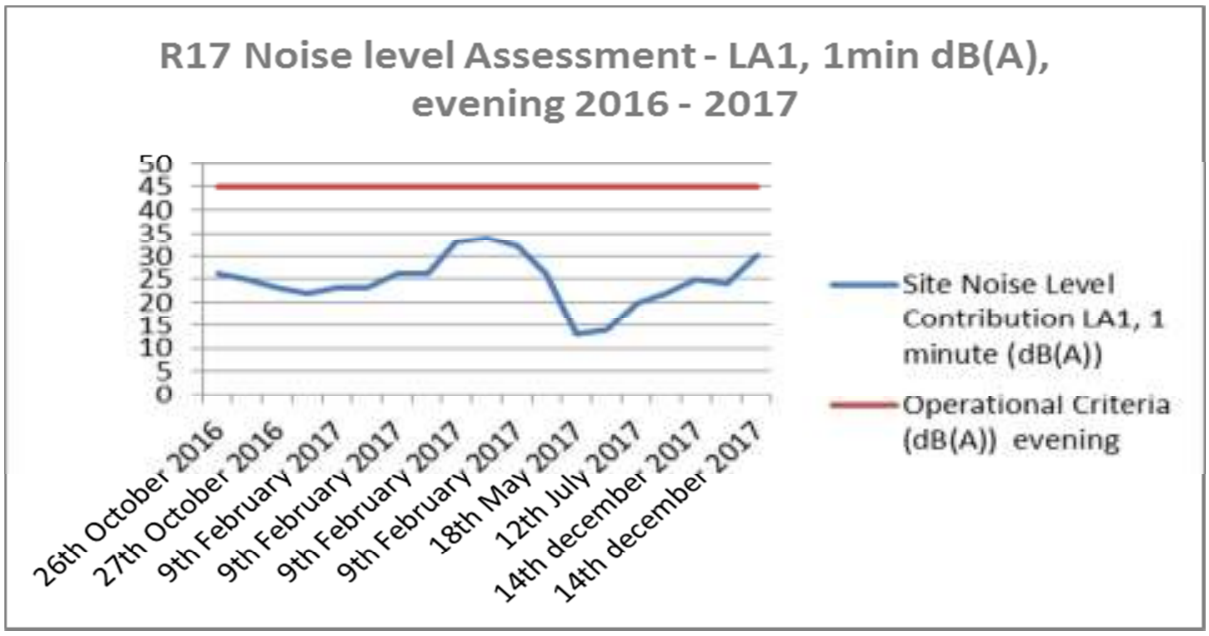


Figure 21: Noise Level Trends (LA1, 1minute) – 2017 R3

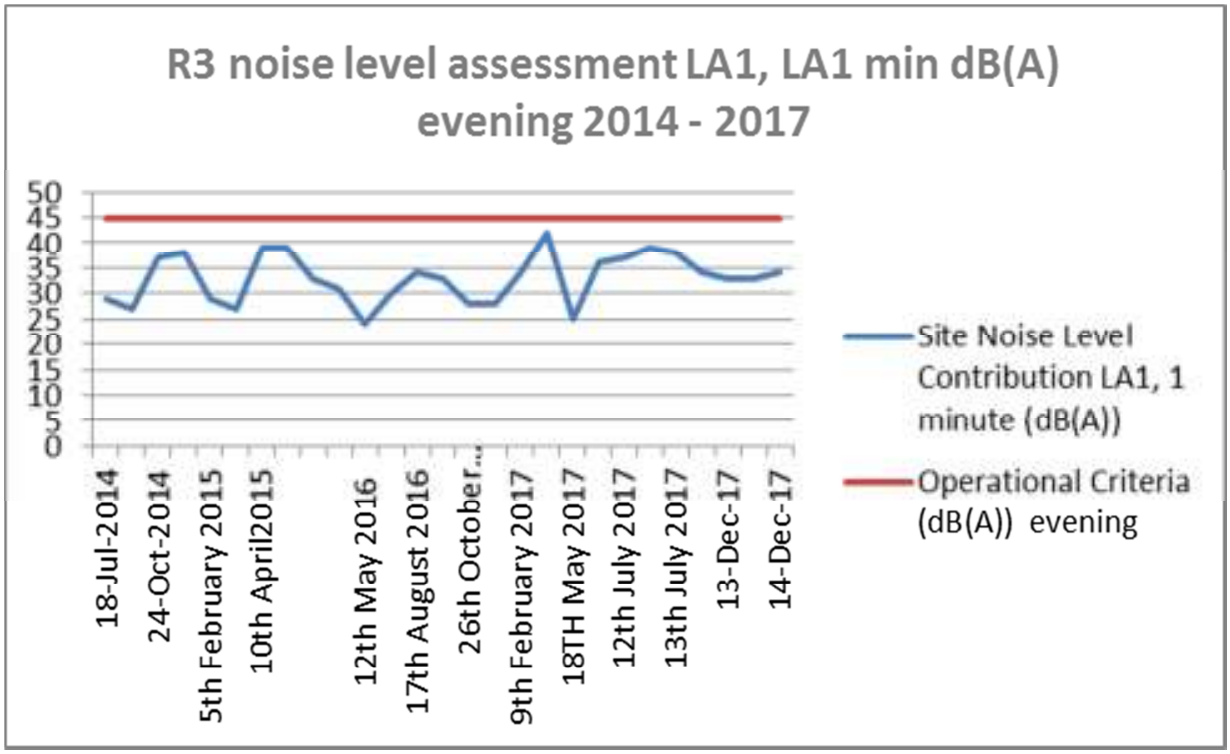


Figure 22: Noise Level Trends (LA1, 1minute) – 2017 R2

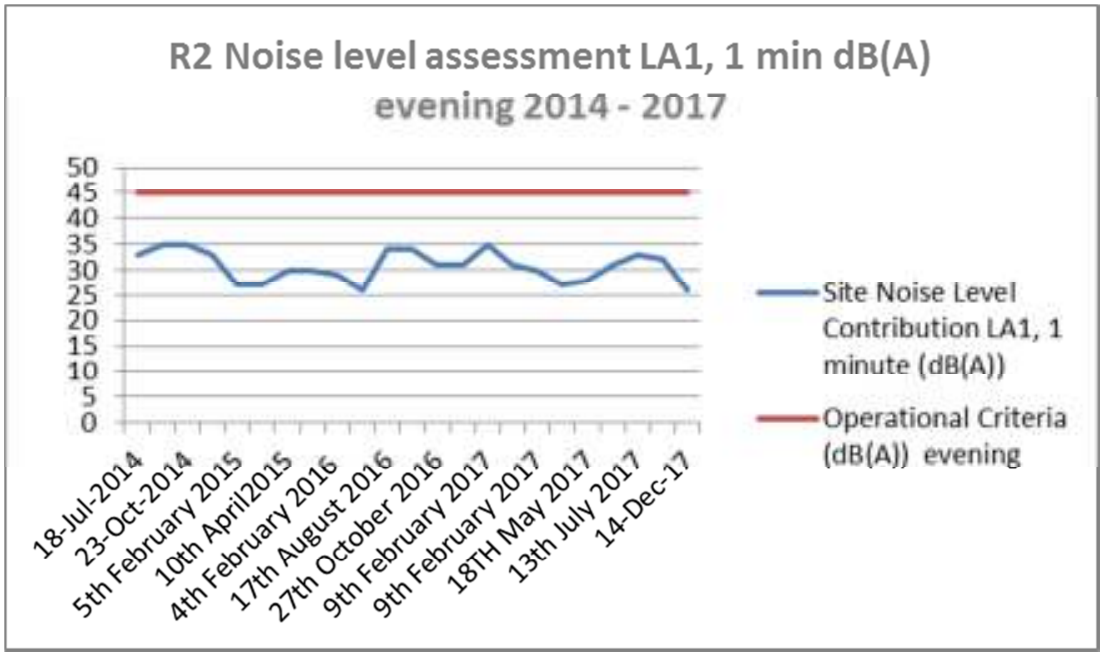


Figure 23: Noise Level Trends (LA1, 1minute) – 2017 R4

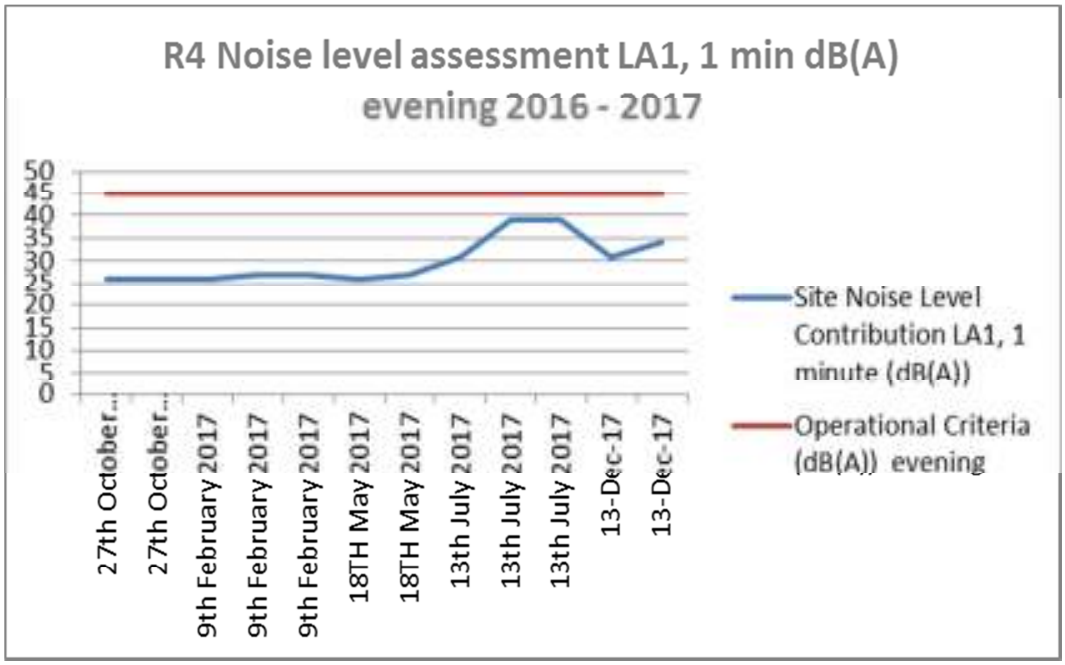
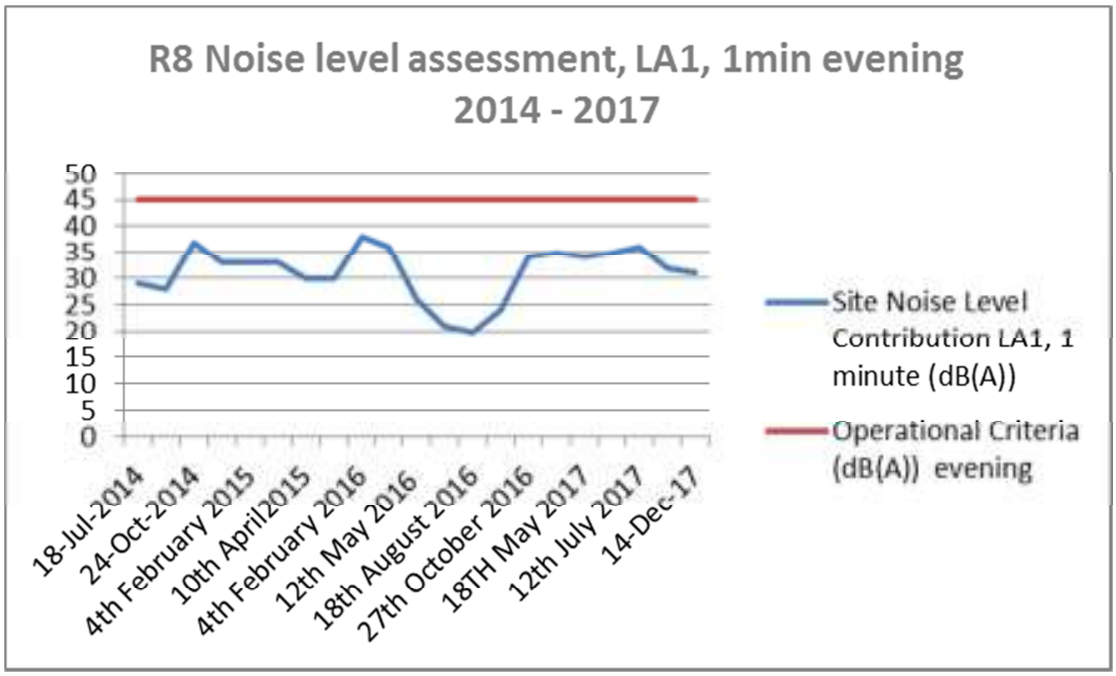


Figure 24: Noise Level Trends (LA1, 1minute) – 2017 R8



Low Frequency Noise

Low Frequency Noise was assessed as per the requirements of the Industrial Noise Policy. Assessment of Low frequency noise was undertaken every quarter as part of the regular monitoring at all receivers.

The Policy provides modification factors based on the tonal quality of the noise measured thereby assessing the presence of low frequency noise.

Tonal, low frequency, impulsive and intermittent noise characteristics were not present in the quarry noise emissions.

3.4.2 Noise Management Performance Review

The noise assessment conducted during the reporting period found that noise levels at all receiver locations for both LA1 (1 minute) and LAeq (15 minutes) were in compliance with respective Project Approval criteria. In most of the monitoring events the measured noise levels were considerably below Project Approval criteria. Furthermore, there have been no exceedances of LA1 (1 minute) or Laeq (15 minutes) since the Quarry was granted planning approval.

The exception however was at R3 during detailed monitoring in July, under inversion weather conditions, where levels of 38 and 44 were recorded at 7.17am and 7.44 am respectively.

3.4.3 Long Term Trend Analysis and Assessment

Long term trend analysis has been undertaken on monitoring data for residential receivers R2, R5, R6 and R16 as monitoring commenced prior to operations in 2014.

Analysis on residential Receivers R 4 and R17 has been undertaken since October 2016.

Extended hours of operation for in pit activities commenced in August 2016 however no noticeable variation has been identified in the noise monitoring.

Figures 15 to 24 provide a graphical representation of the noise monitoring results (estimated Quarry LAeq [15 minute and 1 min) contribution sourced from the quarterly monitoring reports) for the life of the project. It is clear that the monitoring results have remained generally consistent with neutral trend patterns since the commencement of operations at all locations.

Noise modelling for both the 2007 EA and the latest Modification 4 indicates that all receiver locations will experience noise levels below the criteria. Sleep disturbance and cumulative noise impact due to the operations are not considered likely.

The quarterly noise monitoring has found that the quarry achieved compliance with the approved operating noise criteria at all locations (with an exception at R3) and therefore the predicted models.

3.4.4 Noise summary and opportunities for improvement

The exceedances in July, even though compliant, are cause of concern for the residential receiver. Boral have therefore agreed to a Voluntary Undertaking with the DP&E to investigate ways to minimize the noise.

The Undertaking commitments to ….

1. Undertake noise monitoring / modelling to determine the source(s) of the noise,
2. Investigate real time monitoring and forecast periods of possible exceedances associated with the project's operations to allow for modifying operations as necessary,
3. Review the onsite weather station to ensure monitoring in accordance with the requirements specified in Appendix 7 of the approval,
4. Investigate any additional noise mitigation measures
5. Review and update the noise and blast management plan, as necessary and ensure up to date approval by the Secretary
6. Submit the findings, outlining any source(s) of the noise and any additional noise mitigation measures(s) including the implementation timeframes for the Secretary's consideration by the 31st January 2018,
7. Send a copy of this Undertaking, signed and dated by email to Georgia Dragicevic.

3.5 BLASTING

In accordance with the NBMP, monitoring is undertaken at four locations as presented in appendix 5. As part of every blast air-blast overpressure and ground vibration is monitored for compliance verification with the relevant assessment criteria in the Project Approval.

Conditions 12 and 13 (Schedule 3) of the Project Approval requires that air-blast overpressure and ground vibration should not exceed the criteria in presented Tables 13 and 14 respectively at any residence on privately-owned land.

Table 13: Air-blast Overpressure Impact Criteria

Air-blast overpressure (dB Lin peak)	Allowable Exceedance
115	5% of the total number of blasts over a period of 12 months
120	0%

Table 14: Ground Vibration Criteria

Peak Particle Velocity (mm/s)	Allowable Exceedance
5	5% of the total number of blasts over a period of 12 months
10	0%

3.5.1 Blast Monitoring Results

Blast monitoring result for over pressure and ground vibration during the reporting period are presented in Table 15. The maximum measurements for over pressure and ground vibration were 117.4 (20/7/17 – B5) and 2.15 mm/sec (2/2/17 – B5) respectively. The trends for over pressure and ground vibration were at all times below the Project Approval maximums and the 5% allowable exceedance per annum (refer to Figure 25 and Figure 26).

Table 15: Blast Monitoring Results

Blast Date	Ground Vibration (mm/sec) Max Criteria: 10 5% Exceedance: 5				Over Pressure (db – Linear) Max Criteria: 120 5% Exceedance: 115				Compliance
	Monitoring Locations				Monitoring Locations				
	B2 (north west)	B1 (north east)	B4 Marulan sth rd)	B5 (Pace)	B2 (north west)	B1 (north east)	B4 Marulan sth rd)	B5 (Pace)	
5/01/2017	0	0	0	0	94.4	0	0	0	YES
9/01/2017	0	0	0.13	0.82	0	0	95.6	0	YES
12/01/2017	1.06	0	0.25	2.01	110.4	0	100.8	0	YES
23/01/2017	0.81	0	0.13	0.75	106	0	100.8	105.8	YES
2/02/2017	0.87	0	0.19	2.15	0	0	105.6	106.2	YES
9/2/2017	0.75	0	0.33	1.6	100.3	0	98.6	99.8	YES
16/02/2017	0.9	0	0.16	1.75	100.3	0	96.9	101.9	YES
23/02/2017	0.65	0	0.14	0.75	115.6	0	99.2	111.1	YES
9/03/2017	0.8	0	0.19	0.9	102.4	0	99.7	104.8	YES
16/03/2017	0.75	0	0.24	1.1	100.8	0	100.4	104.2	YES
23/03/2017	1.25	0	0.14	1.1	105.5	0	105	108.6	YES
6/04/2017	0	0	0.24	1.1	0	0	99.1	105.4	YES
13/04/2017	0	0	0.13	0.8	0	0	96.9	105.3	YES
20/04/2017	0	0	0	0	0	0	0	0	YES
4/05/2017	0	0	0.17	1.05	0	0	97.2	104.2	YES
11/05/2017	0	0	0.09	0.85	0	0	102.3	105.8	YES
18/05/2017	0.55	0	0.27	1	104.7	0	100	105.3	YES
26/5/2017	0.75	0	0	0.9	0	0	0	105.8	YES
6/06/2017	0.7	0	0.15	0.7	0	0	96.1	105.6	YES
9/06/2017	0.7	0	0.24	1.35	102.9	0	98.7	101.7	YES
15/06/2017	0	0	0	0	0	0	0	0	YES
23/06/2017	0.75	0	0.24	0.75	100.6	0	96.4	101.5	YES
29/06/2017	2	0	0.33	2.45	103.6	0	97.3	103.1	YES
6/07/2017	1.02	0	0.18	1.31	106.4	0	98.1	105.8	YES
20/07/2017	1.07	0	0.12	1.29	109.3	0	103.5	117.4	YES
27/07/2017	0.91	0	0	0.68	108.8	0	0	109	YES

4/08/2017	0.9	0	0.12	0.8	104.1	0	103	105.3	YES
11/08/2017	1.15	0	0.12	1	108.6	0	101.1	102.3	YES
17/08/2017	1.6	0	0.24	1.75	106.6	0	112.9	102.9	YES
31/08/2017	1.55	0	0.22	1.45	102.4	0	97	102.9	YES
11/09/2017	0	0	0.8	0	0	0	98.9	0	YES
21/09/2017	0.8	0	0.17	1.28	102.4	0	98.1	108	YES
29/09/2018	0.5	0	0	0.6	103.6	0	0	107.7	YES
13/10/2018	1.25	0	0.9	0.85	100.3	0	0	105.1	YES
24/10/2018	0.5	0	0	0.6	101	0	0	100.7	YES
2/11/2017	0.75	0	0.11	0.8	100.3	0	0	100.2	YES
13/11/2017	0.8	0	0	0.7	105.8	0	0	107.1	YES
16/11/2017	0.65	0	0.1	0.7	105.7	0	0	106.5	YES
4/12/2017	1.16	0	0	1.65		0	0		YES
8/12/2017	1.15	0	0	0.85	102	0	0	106.2	YES
14/12/2017	0	0	0	0	0	0	0		YES
21/12/2017	0.95	0	0.09	0.8	108.9	0	101.2	108.3	YES

Figure 25: Blasting Overpressure Trends

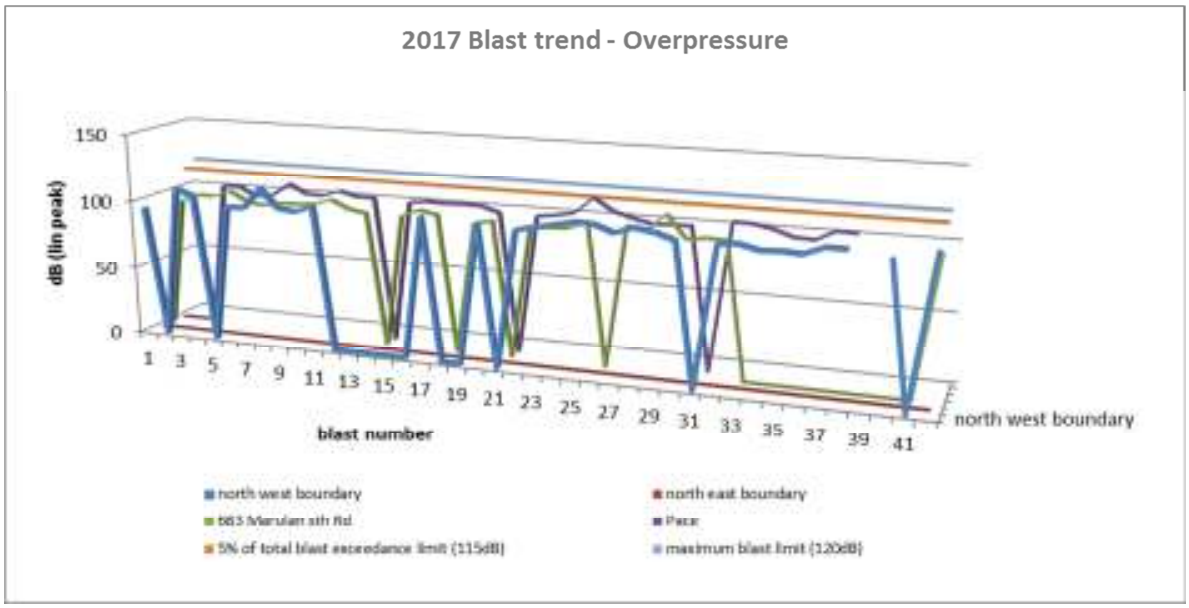
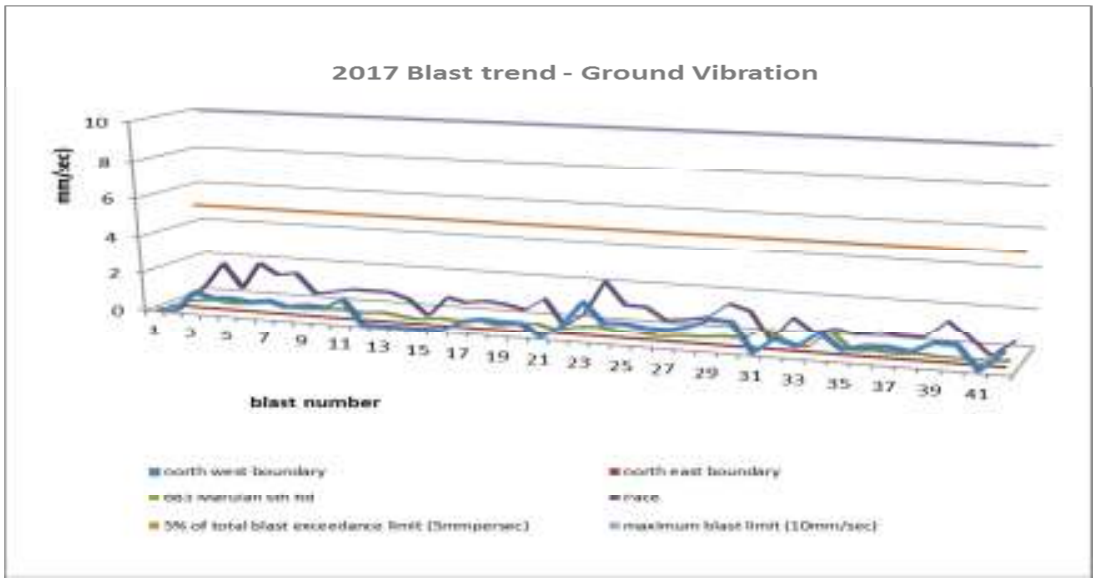


Figure 26: Blasting Ground Vibration Trends



3.5.2 Blast Management Performance Review

The Quarry conducted 43 blasts during the reporting period, all of which complied with Project Approval criteria. The majority or blast monitoring results were significantly below the respective Project Approval criteria for over pressure and ground vibration (refer to Figure 25 and Figure 26 respectively).

All blasts were performed in accordance with the following Environmental Performance Conditions under Schedule 3 of the Project Approval:

- Monday to Saturday with no blasts between 9.00 am and 5.00 pm on Sunday or public holidays (Condition 11);
- Monitored for overpressure and ground vibration levels (Conditions 12 and 13 respectively);
- Best practice considerations associated with safety and minimisation of fumes and dust (Condition 14); and
- Notifications to neighbours and public information (Condition 15).

3.5.3 Long Term Trend Analysis and Assessment

Figure 27 and Figure 28 provide a graphical representation of the blast monitoring results since the commencement of operations. It is clear that for both parameters that the results for this reporting period are consistent with previous years. Additionally, trend analysis depicts that over the operations, airblast overpressure and ground vibration has remained consistent.

Since the first AEMR reporting period in 2014, the Quarry has conducted 183 blasts.
All blasts were compliant with Airblast Overpressure and Ground Vibration blasting criteria as predicted in the EA and latest Modification 4.

Figure 27: Long Term Blast Trends – Overpressure

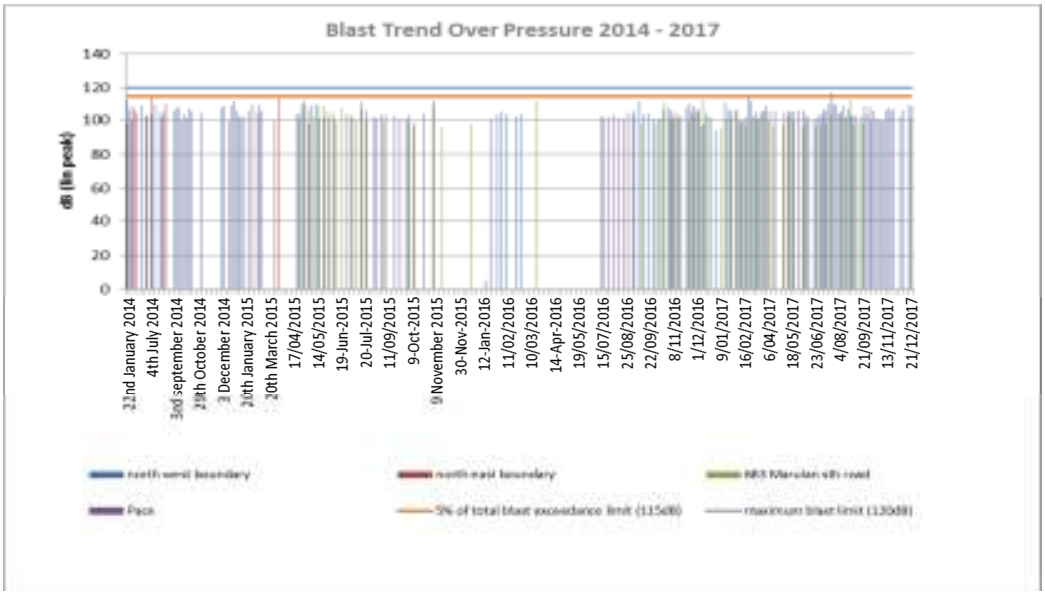
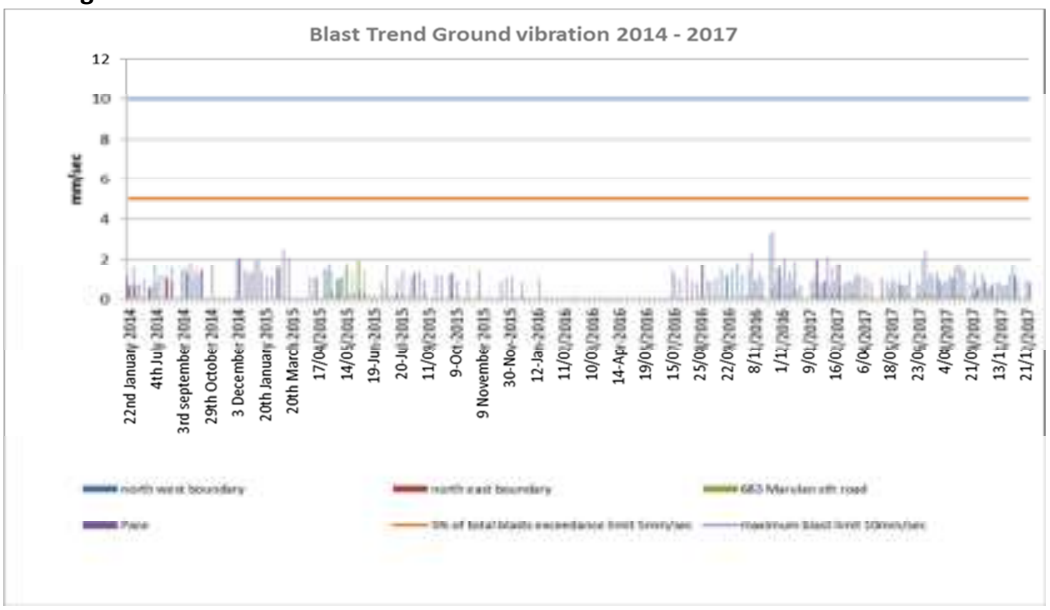


Figure 28: Long Term Blast Trends – Vibration



3.6 SURFACE WATER

3.6.1 Surface Water Management

Surface water management at the Quarry is conducted in accordance with a Water Management Plan (WMP) that was revised and approved during the reporting period. A key objective of the WMP is to be self-sufficient with no dependence on external sources.

In accordance with Condition 29 (Schedule 3) of the Project Approval, the WMP includes a surface water quality program that involves quarterly sampling from Tangarang Creek, Dam 1, upstream culvert, Marulan South Creek and overflow from any sediment ponds during extreme storm events. (refer to appendix 6 for sampling locations).

The Quarry's main Dam provides environmental flows into the ephemeral Tangarang Creek and as such downstream water quality is largely representative of the discharges with some minor natural variations from the wider catchment influences.

The suite of parameters analysed for each water quality sample is listed in Table 16.

Table 16: Summary of Creek Water Quality Parameters

Laboratory Analysis		
Total Dissolved Solids (mg/L)	Potassium (K+)	Bicarbonate (HCO_{3}^{-})
Total Suspended Solids (mg/L)	Magnesium (Mg2+)	Nitrate (NO_{3}^{-})
Turbidity – Laboratory (NTU)	Sodium (Na+)	Nitrite (NO_{2}^{-})
TPH C10-C36	Ammonia (NH4+)	Total Nitrogen
Benzo[a]pyrene	Chloride (Cl-)	Total Phosphorous
Naphthalene	Sulphate (SO42-)	Faecal coliforms (cfu/100mL)
Calcium (Ca2+)		

As part of the review of the Water Management Plan and its approval in July 2017 trigger levels were developed in line with ANZECC guideline recommendations.

Table 17 summarises the trigger values used to assess potential impacts on water quality in creeks in the vicinity of the Quarry. However, it should be noted that observations to date indicate that while the water quality in the Shoalhaven River mostly meets the ANZECC ecosystem protection levels, the upstream contributing creeks do not. Therefore, the trigger values in Table 17 are adopted as benchmark goals rather than a performance or compliance criteria.

Table 17: Water Quality Trigger Values

Indicator	ANZECC Default Trigger for Ecosystem Protection[1]	WaterNSW Benchmarks for Catchment Streams	Triggers
pH	6.5 – 7.5	6.5 – 8.0	6.5 – 8.5
EC (µS/cm)	30 – 350		<1200
Total nitrogen (mg/L)	0.25	<0.25	1.1
Total phosphorus (mg/L)	0.02	<0.02	0.09
Turbidity (NTU)	2 - 25	0 - 25	

[1] Default trigger values for physical and chemical stressors for South-east Australia for slightly disturbed ecosystems (upland river)

The trigger values are applied as follows for ongoing monitoring in Tangarang Creek (both upstream and downstream of any influence from the Quarry):

- If the upper bound for pH, EC, total suspended solids or turbidity is exceeded for a period of three consecutive months downstream of the quarry but is not exceeded upstream of the quarry, this would be the trigger to undertake further assessment of potential sources within the Quarry.
- If the additional assessment finds that the change in water quality may be induced by quarry operations, then further investigation would be required to identify the source of the water quality impact, and review and revise practices to minimise the impact.

This further assessment would include investigation of the potential pathways for water quality impacts within the Quarry area to identify whether the change in water quality is attributable to quarry activities, and the nature of activity that has caused the change.

Under DA Condition 24 (Schedule 3), the supply of 10% of daily inflows into the Quarry main dam must be provided as environmental flows to Tangarang Creek.

The release of water from the Quarry dam provides benefit to flow dependent aquatic life-cycle events such as spawning and migration, while also improving water quality and the general health of stream ecosystems. Without the supply of water from the Quarry, Tangarang Creek would only experience flows during significant rain events.

3.6.2 Surface Water Monitoring Results

Table 18 presents the quarterly surface water quality monitoring data collected from the Quarry Dam, and up (when flow is occurring) and downstream in Tangarang Creek. Due to the ephemeral nature of Tangarang Creek, the upstream monitoring point only experienced no flows during the reporting period.

Sampling at Marulan south Creek commenced in the last quarter of 2017.

Table 18: Surface Water Monitoring Results (2017)

Parameter	Dam				Tangarang Ck - Downstream				Tangarang Ck - Upstream			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
pH	8.5	8.8	8.2	8.8	8.1	8.2	8.1	8	No Flow	No Flow	No Flow	No Flow
Total Suspended solids (mg/l)	<5	6	11	5	<5	<5	5	5	No Flow	No Flow	No Flow	No Flow
Total Dissolved solids (mg/l)	418	343	486	464	454	430	455	394	No Flow	No Flow	No Flow	No Flow
Ammonia -N (mg/l)	0.96	0.05	0.31	1	0.01	<0.01	0.01	0.02	No Flow	No Flow	No Flow	No Flow
Nitrate-N (mg/l)	7.12	3.59	0.29	1.5	0.06	0.54	0.15	0.09	No Flow	No Flow	No Flow	No Flow
Nitrite-N (mg/l)	0.27	0.05	0.01	0.05	<0.01	<0.01	0.01	0.01	No Flow	No Flow	No Flow	No Flow
Sulphate (mg/l)	30	40	41	39	4	7	7	5	No Flow	No Flow	No Flow	No Flow
Chloride (mg/l)	97	101	126	134	101	99	113	102	No Flow	No Flow	No Flow	No Flow
Turbidity (NTU)	4.9	1.9	2.2	2.3	0.7	0.6	0.6	0.6	No Flow	No Flow	No Flow	No Flow
Calcium (mg/l)	44	32	44	35	50	46	54	36	No Flow	No Flow	No Flow	No Flow
Potassium (mg/l)	6	9	6	6	2	3	2	2	No Flow	No Flow	No Flow	No Flow
Magnesium (mg/l)	21	20	28	20	32	30	31	25	No Flow	No Flow	No Flow	No Flow
Sodium (mg/l)	56	61	86	68	65	62	66	63	No Flow	No Flow	No Flow	No Flow
Total phosphorus (mg/l)	0.02	<0.01	0.02	0.06	<0.01	0.02	0.01	0.01	No Flow	No Flow	No Flow	No Flow
total nitrogen	10	4.3	1.9	2.2	0.3	0.5	0.4	0.5	No Flow	No Flow	No Flow	No Flow
Hardness (CaCo3) (mg/l)	128	87	160	110	230	210	281	242	No Flow	No Flow	No Flow	No Flow
TKN (mg/l)	2.6	0.7	1.6	0.6	0.2	<0.1	0.2	0.4	No Flow	No Flow	No Flow	No Flow
Faecal Coliform (cfu/100ml)	50	8	6	32	12	1	41	28	No Flow	No Flow	No Flow	No Flow

Parameter	Dam				Tangarang Ck - Downstream				Tangarang Ck - Upstream			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
TPH C10-C14 (µg/l)	<50	<50	<50	<50	<50	<50	<50	<50	No Flow	No Flow	No Flow	No Flow
TPH C15-C28 (µg/l)	110	<100	<100	110	<100	<100	<100	<100	No Flow	No Flow	No Flow	No Flow
TPH C29-C36 (µg/l)	<50	<50	<50	<50	<50	<50	<50	<50	No Flow	No Flow	No Flow	No Flow
sum TPH C10-C36 (µg/l)	110	<50	110	110	<50	<50	<50	<50	No Flow	No Flow	No Flow	No Flow
Naphthalene	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	No Flow
Acenaphthylene	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	No Flow
Acenaphthere	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	No Flow
Flourene	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	No Flow
Phenanthrene	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	No Flow
Anthracence	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	No Flow
Fluoranthene	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	No Flow
Pyrene	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	No Flow
Benzo(a)anthracene	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	No Flow
Chrysene	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	No Flow
Benzo(b+k)fluoranthene	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	No Flow
Benzo(a)pyrene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	No Flow	No Flow	No Flow	No Flow
Indeno(1,2,3-cd)pyrene	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	No Flow
Dibenzo(a,h)anthracene	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	No Flow
Benzo(g,h,i)perylene	<0.5	<0.5	< 0.5	< 0.5	<0.5	<0.5	<0.5	< 0.5	No Flow	No Flow	No Flow	No Flow

Parameter	Marulan South Creek			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
pH	NA	NA	NA	7.8
Total Suspended solids (mg/l)	NA	NA	NA	5
Total Dissolved solids (mg/l)	NA	NA	NA	411
Ammonia -N (mg/l)	NA	NA	NA	0.01
Nitrate-N (mg/l)	NA	NA	NA	0.02
Nitrite-N (mg/l)	NA	NA	NA	0.01
Sulphate (mg/l)	NA	NA	NA	3
Chloride (mg/l)	NA	NA	NA	129
Turbidity (NTU)	NA	NA	NA	1.9
Calcium (mg/l)	NA	NA	NA	27
Potassium (mg/l)	NA	NA	NA	4
Magnesium (mg/l)	NA	NA	NA	19
Sodium (mg/l)	NA	NA	NA	60
Total phosphorus (mg/l)	NA	NA	NA	0.01
total nitrogen	NA	NA	NA	0.6
Hardness (CaCo3) (mg/l)	NA	NA	NA	125
TKN (mg/l)	NA	NA	NA	0.6
Faecal Coliform (cfu/100ml)	NA	NA	NA	350

Parameter	Marulan South Creek			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
TPH C10-C14 (µg/l)	NA	NA	NA	<50
TPH C15-C28 (µg/l)	NA	NA	NA	<100
TPH C29-C36 (µg/l)	NA	NA	NA	<50
sum TPH C10-C36 (µg/l)	NA	NA	NA	<50
Naphthalene	NA	NA	NA	<1
Acenaphthylene	NA	NA	NA	<1
Acenaphthere	NA	NA	NA	<1
Flourene	NA	NA	NA	<1
Phenanthrene	NA	NA	NA	<1
Anthracence	NA	NA	NA	<1
Fluoranthene	NA	NA	NA	<1
Pyrene	NA	NA	NA	<1
Benzo(a)anthracene	NA	NA	NA	<1
Chrysene	NA	NA	NA	<1
Benzo(b+k)fluoranthene	NA	NA	NA	<1
Benzo(a)pyrene	NA	NA	NA	<0.5
Indeno(1,2,3-cd)pyrene	NA	NA	NA	<1
Dibenzo(a,h)anthracene	NA	NA	NA	<1
Benzo(g,h,i)perylene	NA	NA	NA	<0.5

3.6.3 Environmental Flows

Under Project Approval Condition 24 (Schedule 3), the supply of 10% of daily inflows into the Quarry main dam must be provided as environmental flows to Tangarang Creek. Table 19 presents the monthly averages of inflow and outflow volumes in comparison to the required 10% of environmental flow requirements. The environmental flows exceeded the 10% requirement in each of the months throughout the reporting period.

Table 19: Environmental Flow Data (2017)

Month (2017)	Inflow (Megalitres)	Outflow Requirement (10%)	Outflow (Megalitres)	Compliance
January	1.6	0.16	9.05	Yes
February	11.2	1.12	NA	Yes
March	30.4	3.4	NA	Yes
April	1	0.1	NA	Yes
May	11	1.1	19.64	Yes
June	5.8	0.5	39.48	Yes
July	0.9	0.09	1.95	Yes
August	2	0.2	2.42	Yes
September	0	0	2.49	Yes
October	0	0	1.35	Yes
November	5.4	0.54	1.72	Yes
December	5.21	0.52	1.14	Yes

NA: data not available due to back ponding of pond above the meter.

3.6.4 Surface Water Management Performance Review

The quarry surface water quality trends are generally consistent over the 2017 period, with historic trends.

The results for pH were substantially in the range of trigger levels (i.e. pH 6.5 to 8.5) (refer to Figure 29). The pH level in the Dam was generally higher than downstream in Tangarang Creek, at T1. The highest pH value of 8.8 reported from the Quarry Dam during the last quarter sampling event of the reporting period was marginally above the trigger upper limit of pH 8.5. pH variations may vary considerably in water systems and this result is unlikely to have had adversely impacted the health of the aquatic systems in Tangarang Creek. The higher than usual pH levels may be due to the lack of rain and inflow into the dam.

Figure 30 shows fluctuations in Total Dissolved Solids (TDS) during the reporting period. However, the results remained considerably below the ADWG guideline value of 500 mg/L. ANZECC (2000).

Turbidity levels (Figure 31) were consistent over the 4 sampling periods in 2017 being well below the ANZECC guideline for both the dam and T1.

Total Nitrogen and Phosphorous are indicators of nutrient levels in water systems and are shown in Figures 32 and 33 for the 2017 period.

Dam levels for Total Nitrogen decreased over the reporting period but still remained above the trigger level while T1 remained consistently low.

In comparison, total phosphorus levels increased in the last 2 sampling rounds at the Dam and may be as a result of the reduced flows into the dam and a significant duck population that now frequents the water source. Total Phosphorus remained low and below trigger levels at T1.

All results for hydrocarbon and Polycyclic Aromatic Hydrocarbons (PAHs) were at concentrations below the Laboratory levels of reporting (LORs).

In accordance with Project Approval Condition 24 (Schedule 3), environmental flows meeting the 10% average requirement from the Quarry Dam into Tangerang Creek were continuously provided throughout the reporting period (refer to Table 19).

With consideration to water quality trends in comparison to upstream results (when in flow), the Quarry Dam is providing consistent environmental flows to downstream sections of Tangarang Creek that are unlikely to be adversely impacting ecology of downstream systems or potential users in terms of stock watering or irrigation purposes.

Figure 29: pH Surface Waters Trends 2017

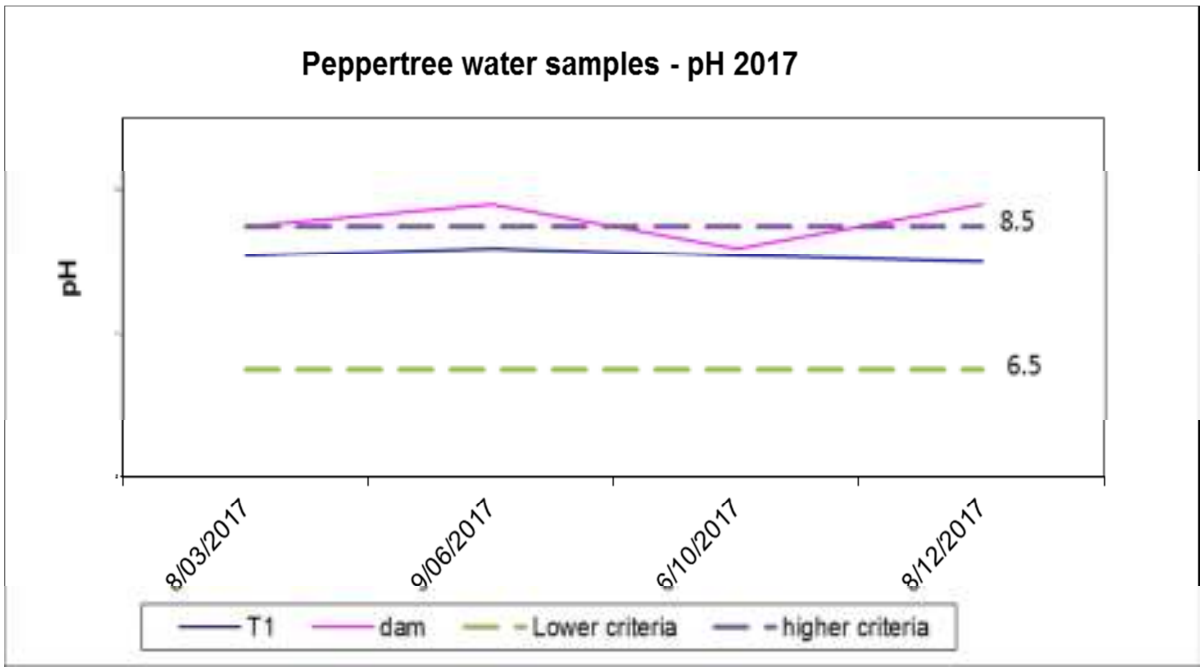


Figure 30: TDS surface water trends 2017

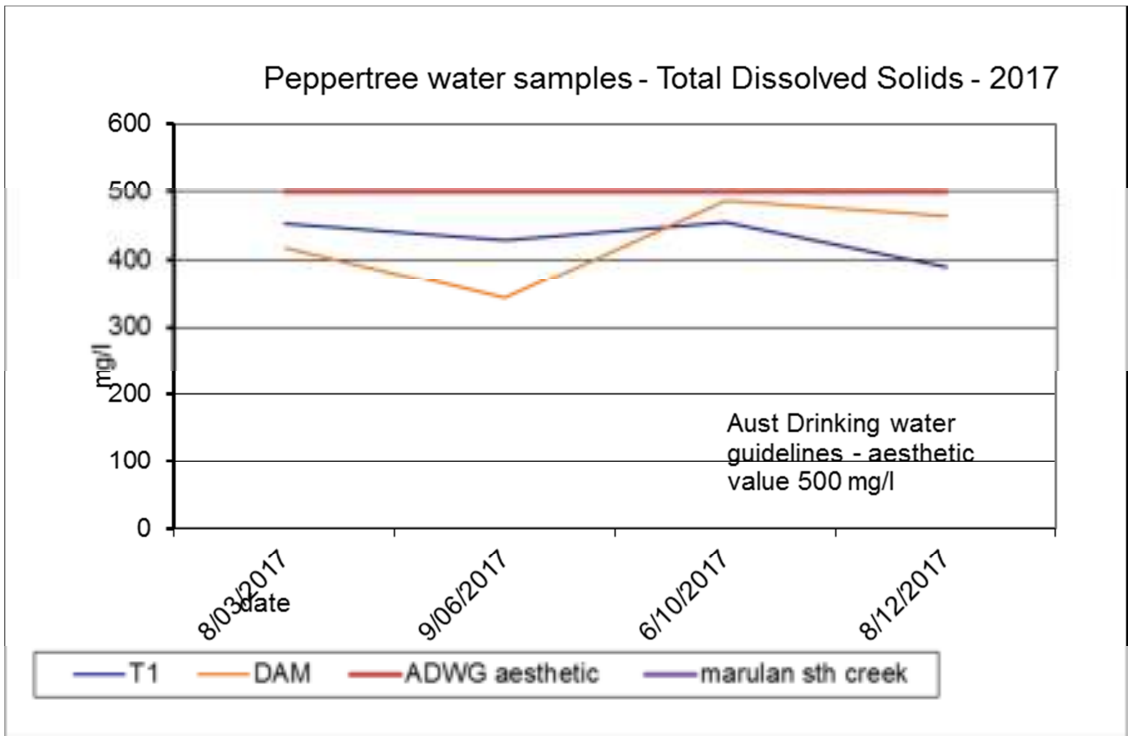


Figure 31: Turbidity surface water trends 2017

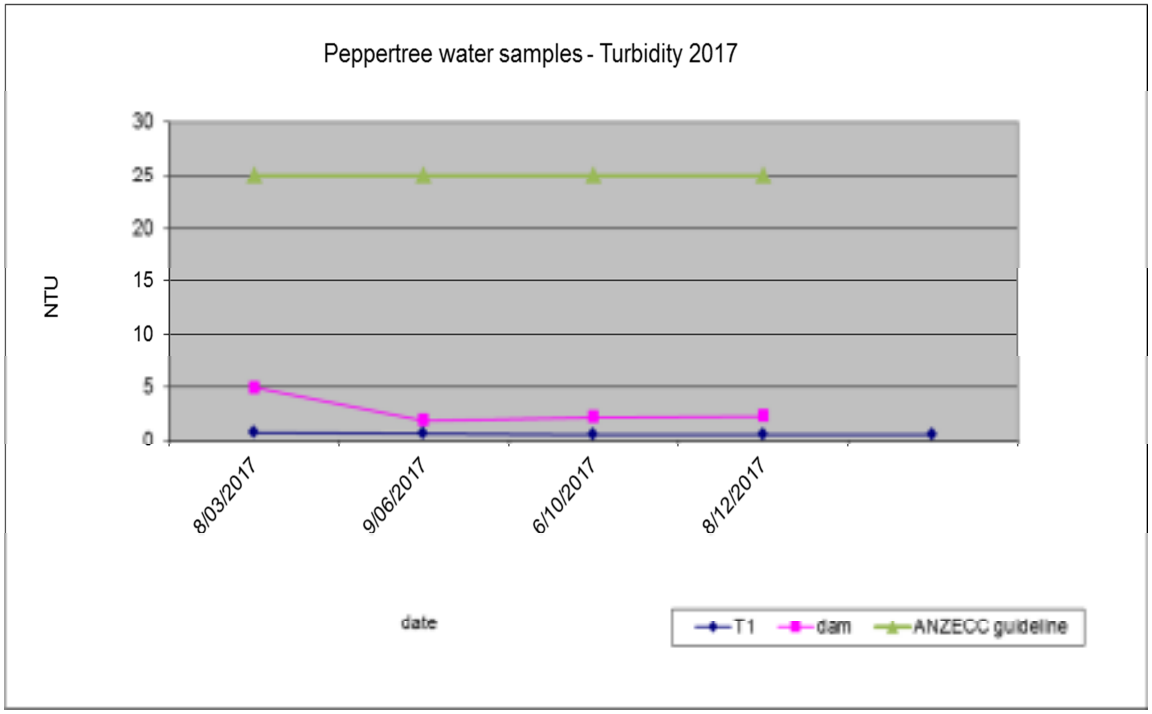


Figure 32: Nitrogen surface water trends 2017

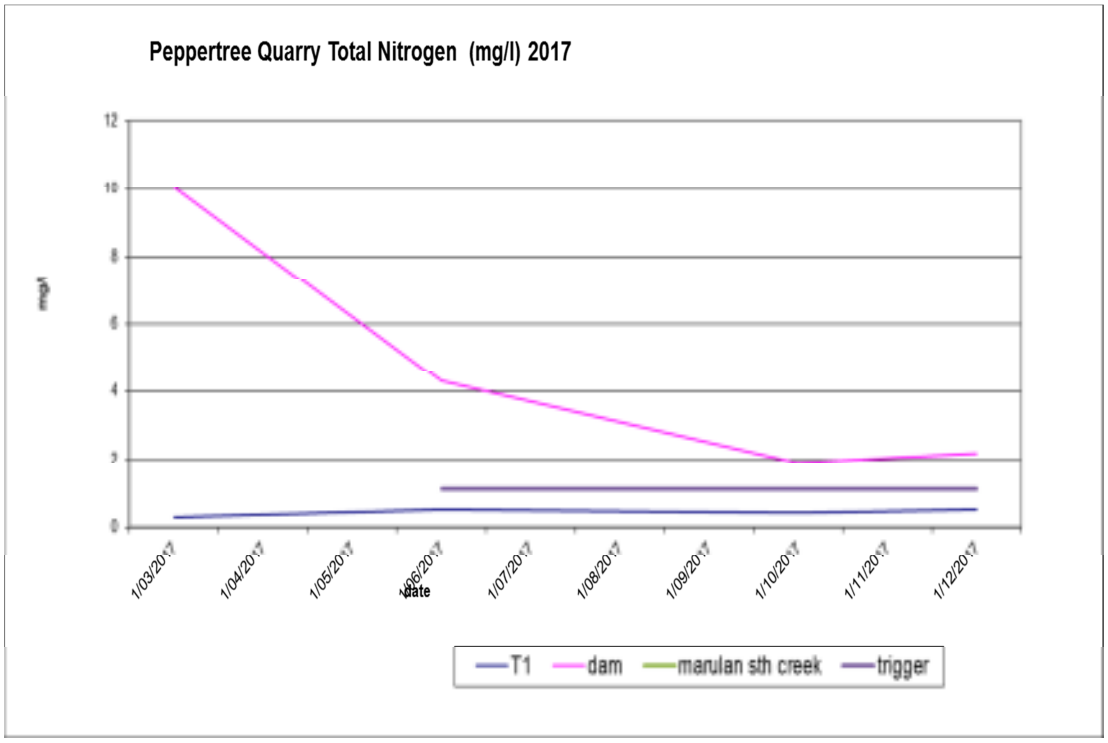
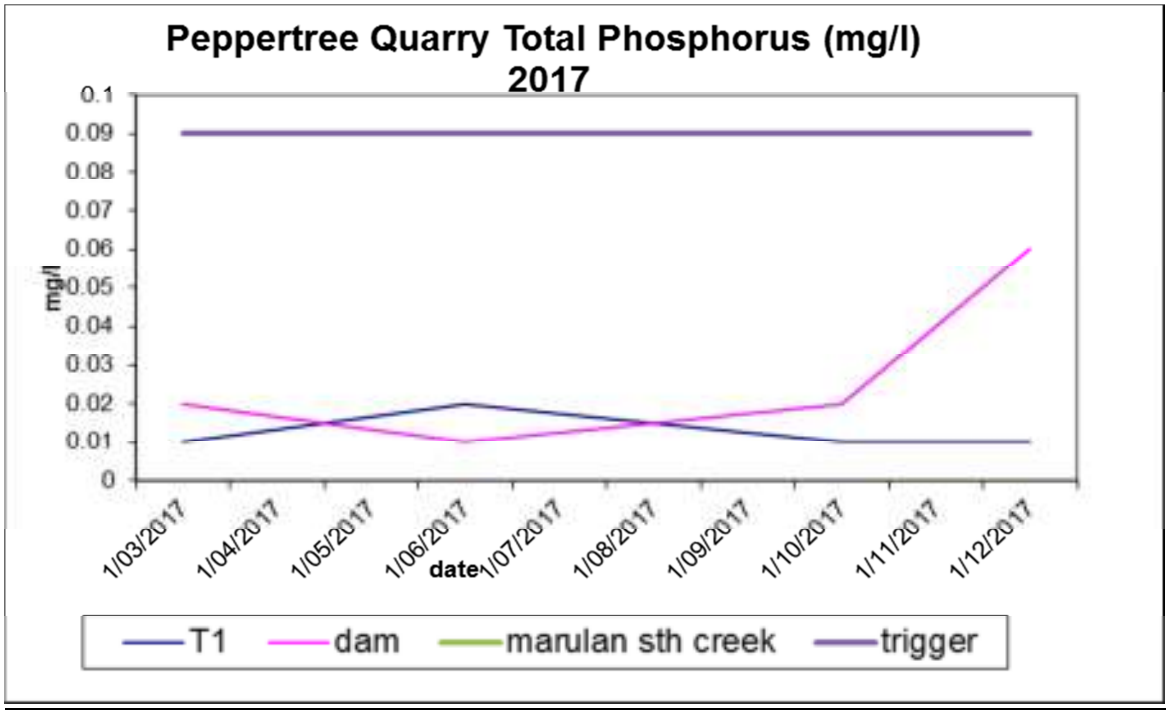


Figure 33: total phosphorus surface water trends 2017



3.6.5 Long Term Trend Analysis and Assessment

Long term trend analysis has been undertaken on pH, TDS, Turbidity, total Phosphorus and total nitrogen.
pH (Figure 34) is consistently between the range of 6.5 to 8.5, with some higher than usual levels occurring in the dam in rain or drought events. Levels at T1 downstream have remained within the trigger levels.

The long term trend for Total Dissolved Solids (Figure 35) is irregular however levels increase and decrease at the same events at both sampling locations.
All TDS levels at both sites have remained below the ADWG guidelines since rain events in 2013.

For the majority of time, Turbidity (Figure 36) in both the dam and creek samples has been below the ANZECC criteria. Turbidity has exceeded the criteria at both sites in times of large rain events when water from the above catchment enters the dam and downstream creek.
At these times, the dam is overflowing through the culverts with large flows.

Total Phosphorus levels (Figure 37) also fluctuate over time at both sampling sites. For the 2017 period, they were below the trigger criteria now in place. Two significant peaks have occurred in the past in late 2015 and early 2016 and are likely to have been short term and associated with rain events.

Total Nitrogen levels (Figure 38) align with those of Total Phosphorus and have fluctuated over time. One significant peak occurred early in 2017 as well as late 2016. It is likely these were related to rain events.

The initial EA and management plan predicted compliance with the appropriate ANZECC and ADWG criteria based on limited background sampling. With the exception, of periods of storm events, surface water analysis has been in line with the EA predictions and the criteria.

Figure 34: Long Term Water Quality - pH

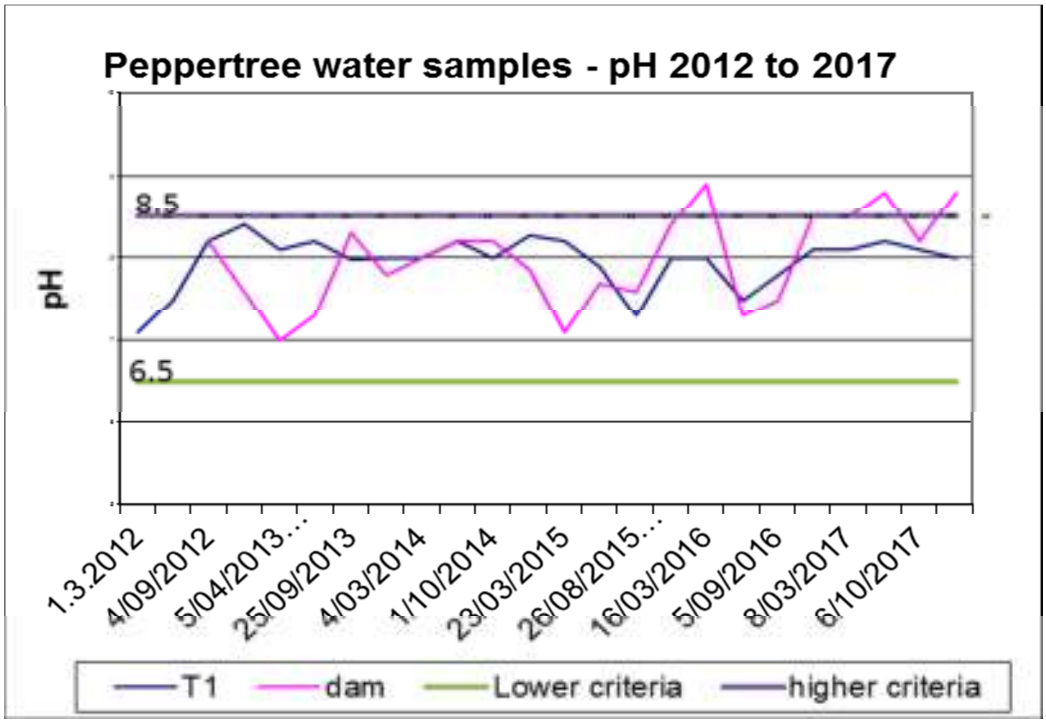


Figure 35: Long Term Water Quality – TDS

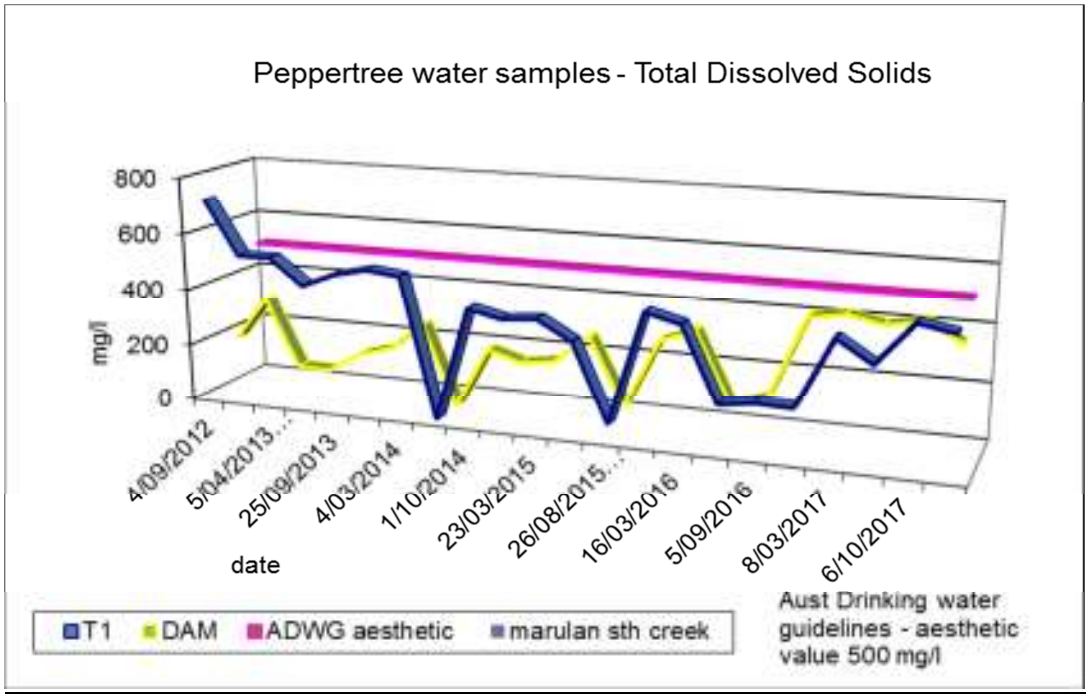


Figure 36: Long Term Water Quality – Turbidity

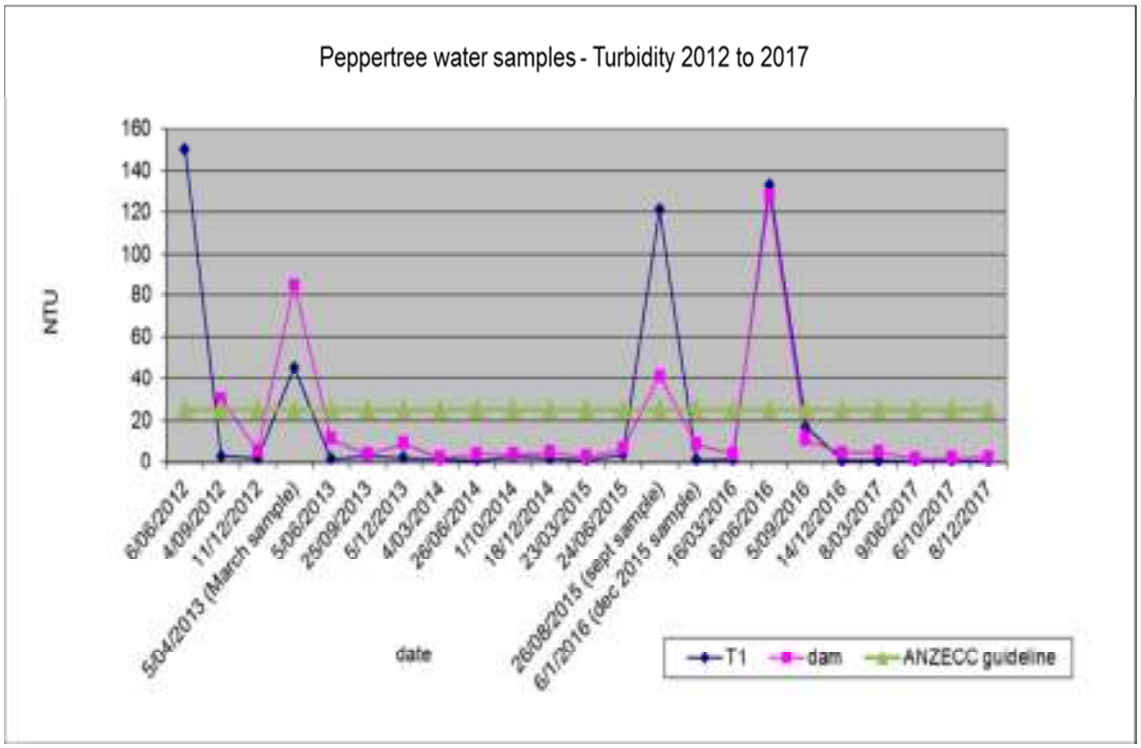


Figure 37: Long Term Water Quality – Total Phosphorus

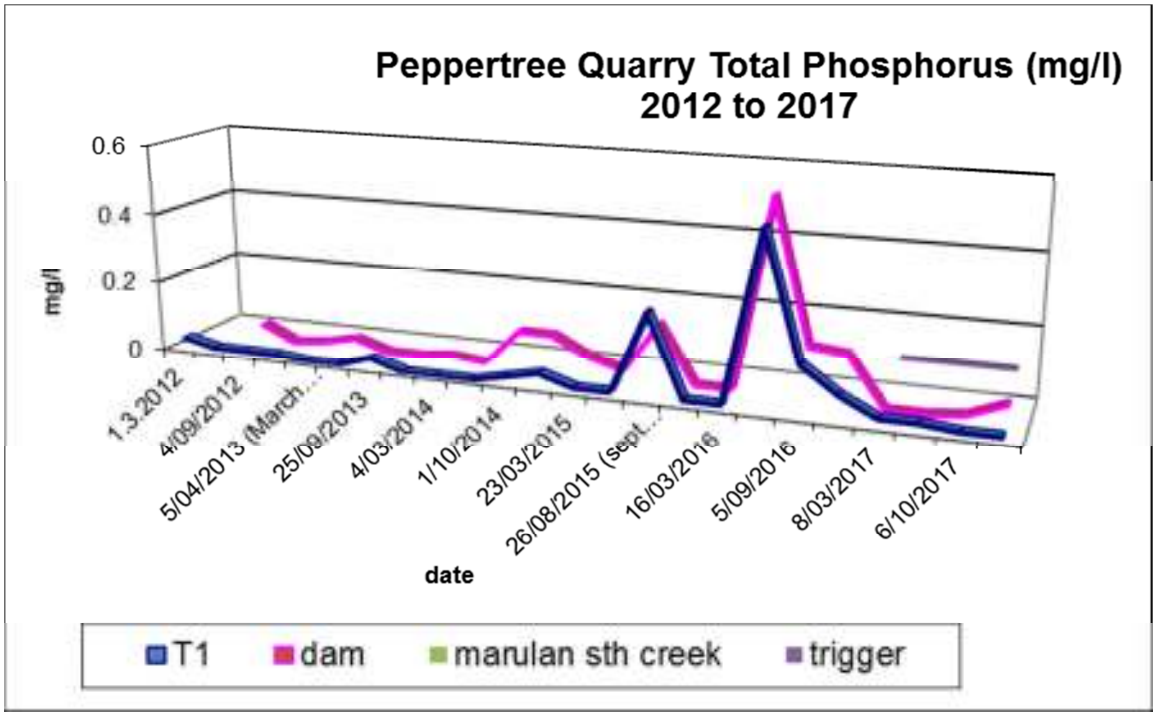
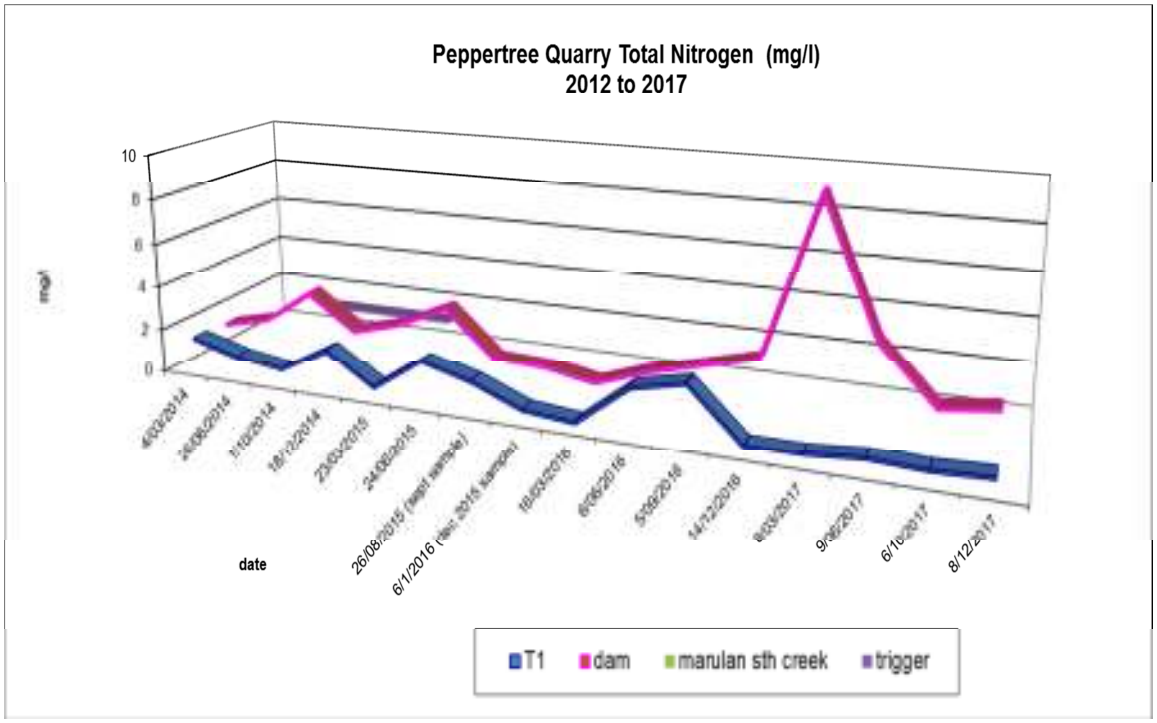


Figure 38: Long Term Water Quality – total Nitrogen



3.6.6 Surface water summary and opportunities for improvement

Results over the operation of the quarry, show little detrimental impact on the downstream environment in Tangarang creek.

Water management strategies need to remain in place with ongoing monitoring. Additional sampling at Marulan South creek will allow comparison against a benchmark creek not impacted by quarry operations

3.7 GROUNDWATER

The Quarry WMP includes a groundwater monitoring program conducted at least quarterly of five shallow and seven deep piezometers ranging from between 15 m to 100 m in depth (refer to Appendix 6). The groundwater monitoring is undertaken in general accordance with AS 5667.11 – 1998 Water Quality Sampling – Guidance on Sampling of Groundwaters.

The groundwater monitoring program is in the early stages of collecting data towards which longer term trends for establishing site specific trigger values (SSTV's). Indicative trigger values were included in the reviewed Water Management Plan and are shown in Table 20 and Table 21.

Assessment of groundwater results is undertaken following each monitoring round with any analytes with trigger levels exceedances being noted. In instances where trigger levels are exceeded in two consecutive rounds of monitoring further assessment is undertaken to determine whether the potential anomaly is the result of quarrying activities or due to natural variability.

Table 20: Field Parameter Trigger Values

Location	Parameter	5% UCL	95% UCL
PQ01D	pH	9.17	11.71
	EC	3646	4294
	DO	0.69	1.93
PQ03D	pH	12.55	12.85
	EC	4230	5562
	DO	0.94	2.56
PQ04S	pH	7.01	7.88
	EC	2528	4258
	DO	1.76	3.79
PQ04D	pH	6.38	8.41
	EC	1042	1174
	DO	3.01	5.92
PQ05D	pH	7.19	8.02
	EC	1658	1899
	DO	0.30	1.62
PQ06D	pH	12.27	12.59
	EC	3271	3678

	DO	0.64	1.49
PQ07D	pH	11.90	12.4
	EC	1841	3799
	DO	0.88	2.74
PQ08D	pH	7.10	7.59
	EC	2732	3606
	DO	0.86	5.59
PQ09S	pH	7.05	7.87
	EC	2016	3464
	DO	1.87	4.59
PQ09D	pH	7.24	8.24
	EC	1490	1729
	DO	1.02	6.93

Table 21: Laboratory analysis Trigger Values

Bore		TDS	Total Alkalinity	Sulfate	Chloride	Calcium	Magnesium	Sodium	Potassium	Fluoride	Nitrite + Nitrate	TKN	Total N	Total P
PQ01D	5% UCL	3137	449	82	1280	308	291	360	110	0.2	3.8	0.69	4.2	0.24
	95% UCL	2087	134	71	1024	107	33	324	11	0.1	0.14	0.32	0.53	0.01
PQ03D	5% UCL	1698	1179.75	15	213	206	1	201	391	0.4	0.05	1.5	1.5	0.19
	95% UCL	1148	742	6	182	92	1	197	250	0.3	0.01	1.0	1.1	0.01
PQ04S	5% UCL	2215	561	62	913	89	88	611	5	1.0	1.6	0.77	2.3	0.56
	95% UCL	1297	446	9	596	74	57	403	3	0.6	0.05	0.33	0.60	0.06
PQ04D	5% UCL	692	97	30	335	39	20	190	8	1.7	0.20	0.2	0.29	0.02
	95% UCL	563	82	29	314	36	18	167	3	1.5	0.03	0.1	0.11	0.01
PQ05D	5% UCL	1250	642	1	380	145	48	259	9	0.3	0.04	1.4	1.4	0.88
	95% UCL	1095	528	1	351	133	42	238	7	0.2	0.01	0.32	0.32	0.04
PQ06D	5% UCL	1553	539	224	209	68	1	260	244	0.6	0.03	1.7	1.7	0.10
	95% UCL	1068	481	183	191	32	1	253	225	0.5	0.01	1.2	1.2	0.02
PQ07D	5% UCL	1447	585	227	326	269	1	167	132	0.2	0.05	0.60	0.60	0.06
	95% UCL	852	213	137	303	116	1	144	93	0.1	0.01	0.43	0.43	0.01
PQ08D	5% UCL	2151	427	60	797	256	176	145	6	0.2	0.06	0.10	0.10	0.14
	95% UCL	2018	405	48	727	229	153	135	3	0.2	0.01	0.10	0.10	0.02
PQ09S	5% UCL	1947	509	21	725	192	195	155	7	0.3	3.9	0.77	4.2	0.85
	95% UCL	1673	469	8	668	169	178	151	6	0.2	1.2	0.25	2.0	0.02
PQ09D	5% UCL	1171	513	21	334	132	109	104	4	0.3	1.8	1.4	2.3	1.9
	95% UCL	954	490	11	312	114	96	98	3	0.2	0.01	0.12	0.12	0.04

3.7.1 Groundwater Monitoring Results

Tables 22 and 23 present the groundwater field sampling parameters and standing water levels respectively measured during the reporting period. Table 24 comprises of the laboratory analytical results from the quarterly groundwater sampling completed during the reporting period.

Figures 39, 40, 41 and 42 show trends for field measure parameters pH, electrical conductivity, dissolved oxygen and standing water levels respectively. PQ5 is identified as the sentinel water for the early identification fluctuation (refer to Figure 42).

Table 22: Groundwater Field Parameters

Bore ID	Field Parameters											
	pH				EC (µs/cm)				DO (ppm)			
	Jan	April	Jul	Oct	Jan	April	Jul	Oct	Jan	April	Jul	Oct
PQ01S	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
PQ01D	9.77	9.42	9.48	8.81	4120	3913	4310	2910	3.8	3.68	4.58	4.21
PQ03D	12.78	12.33	12.50	12.62	3406	3729	4081	2552	3.96	1.27	0.62	1.43
PQ04D	8.52	8.37	8.65	8.21	927	1164	1475	1193	3.6	5.01	6	5.15
PQ04S	7.83	8.19	8.25	8.07	3490	4086	4977	2528	3.06	2.29	4.23	4.4
PQ5D	7.53	7.89	8	7.7	1489	1668	1897	1563	5.15	3.89	0.78	1.25
PQ6D	12.6	12.23	12.17	12.49	3306	3893	4644	2556	3.5	4.76	0.78	2.04
PQ7D	12.08	12	12.05	11.83	1544	1598	1611	1616	1.67	1.47	1.4	1.69
PQ8D	7.91	7.98	8.01	7.56	3255	3735	3645	2648	.91	1.78	1.48	1.7
PQ8S	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
PQ9D	8.34	8.54	8.22	8.64	1341	1549	1653	1610	2.3	1.13	1.61	2.01
PQ9s	8.73	7.69	7.75	7.69	3051	3635	3848	2363	4.2	4	3.01	3.82

NS: Not Sampled

Table 23: Groundwater Standing Water Levels

Bore ID	Standing Water Levels (mbgl)			
	Jan 2017	April 2017	July 2017	October 2017
PQ01D	576.19	576.29	576.54	576.23
PQ01S	Dry	Dry	Dry	Dry
PQ03D	570.9	570.37	569.96	568.8
PQ04D	584.05	584.43	583.32	583.04
PQ04S	590.69	590.85	590.59	590.27
PQ5D	592.15	592.19	592.25	592.15
PQ6D	580.69	580.68	581.36	581.31
PQ7D	574.51	574.47	574.37	573.44
PQ8D	575.27	574.10	574.84	574.72
PQ8S	Dry	Dry	Dry	Dry
PQ9D	576.27	576.3	575.89	575.16
PQ9s	575.22	757.24	575.03	574.96

Table 24: Groundwater - Laboratory Analysis Results (2015 - 2017)

Site	Date	TDS	Susp. Solids	Turb.	Total Alk.	SO4	Cl	Ca	Mg	Na	K	F	Nitrate / Nitrite	TKN	Total N	Total P	O & G	PAH	TRH C6-C10 / BTEX	TRH C10-C40
PQ01D	19/01/2017	2570	294	52.7	104	70	1160	197	144	335	28	0.1	0.07	1.1	1.2	1.33	<5	ND	NO	<100
	27/04/2017	2230	10	5.3	36	92	972	210	6	313	30	<0.1	1.88	0.4	2.1	<0.01	<5	ND	NO	<100
	27/07/2017	2130	9	0.6	27	93	930	249	7	374	32	0.1	3.03	0.3	3.3	<0.01	<5	ND	NO	<100
	26/10/2017	2180	124	27.2	18	123	948	190	47	370	41	<0.1	3.64	0.4	4.0	0.01	<5	ND	NO	<100
PQ03D	19/01/2017	1110	123	91.3	506	13	224	64	<1	196	222	0.4	<0.01	1.2	1.2	0.01	<5	ND	NO	<100
	27/04/2017	1100	88	53.3	518	14	212	76	<1	188	180	0.3	<0.01	1.5	1.5	0.05	<5	ND	NO	<100
	27/07/2017	977	118	49.3	503	12	174	78	<1	176	171	0.5	0.02	1.1	1.1	<0.01	<5	ND	NO	<100
	26/10/2017	923	111	55.5	457	12	198	37	<1	175	148	0.4	<0.01	1.3	1.3	0.06	<5	ND	NO	<100
PQ04S	19/01/2017	1000	136	36.7	410	88	881	65	72	600	4	1.3	0.46	0.7	0.9	0.07	<5	ND	NO	<100
	27/04/2017	1060	61	21.5	398	89	865	58	63	444	3	0.9	0.21	1	1.2	0.07	<5	ND	NO	<100
	27/07/2017	1040	68	26.8	474	83	896	62	64	534	5	1.0	0.03	0.4	0.4	<0.01	<5	ND	NO	<100
	26/10/2017	1650	234	48	565	23	649	55	58	464	5	1.0	<0.01	0.5	0.5	0.13	6	ND	NO	<100
PQ04D	19/01/2017	296	18	7.4	102	31	356	38	19	194	10	1.6	0.26	0.2	0.4	0.02	<5	ND	NO	<100
	27/04/2017	260	<5	2.0	93	33	365	33	18	188	10	1.3	0.27	0.1	0.4	0.10	<5	ND	NO	<100
	27/07/2017	270	28	17.5	110	31	310	46	22	167	15	1.7	0.29	<0.1	0.5	0.08	<5	ND	NO	<100
	26/10/2017	207	9	5.9	122	33	345	33	20	181	14	1.5	0.37	0.2	0.6	0.01	<5	ND	NO	<100
PQ06D	19/01/2017	1150	521	420	618	1	991	140	46	262	24	0.5	<0.01	0.6	0.6	0.19	<5	ND	NO	<100
	27/04/2017	1110	1490	622	504	4	990	110	32	216	7	0.2	<0.01	0.4	0.4	0.12	<5	1.0	NO	<100
	27/07/2017	1120	68	98.9	460	7	920	125	35	232	8	0.3	0.02	0.6	0.6	0.08	<5	ND	NO	800
	26/10/2017	984	78	154	529	<1	960	108	33	210	6	0.4	<0.01	<0.1	<0.1	0.02	<5	ND	NO	<100
PQ09D	19/01/2017	1240	26	11.4	406	168	213	27	<1	262	204	0.6	<0.01	1.5	1.5	0.01	<5	ND	NO	<100
	27/04/2017	1260	46	24.2	467	178	210	50	<1	208	166	0.5	<0.01	1.9	1.9	0.04	<5	ND	NO	<100
	27/07/2017	1130	34	13.4	463	169	172	48	<1	253	199	0.6	<0.01	1.5	1.5	<0.01	<5	ND	NO	<100
	26/10/2017	1120	57	22	421	196	190	17	<1	238	153	0.6	<0.01	2.0	2.0	0.02	<5	ND	NO	<100
PQ07D	19/01/2017	937	33	13.7	86	124	331	106	<1	146	88	0.2	<0.01	0.4	0.4	<0.01	<5	ND	NO	<100
	27/04/2017	892	24	22.8	168	123	300	79	<1	138	76	0.1	<0.01	0.6	0.6	0.02	<5	ND	NO	<100
	27/07/2017	896	54	24.4	124	121	274	93	<1	164	86	0.2	0.02	1.6	1.6	2.10	<5	ND	NO	<100
	26/10/2017	994	1210	540	99	140	302	66	<1	159	81	0.2	<0.01	0.6	0.6	0.02	<5	ND	NO	<100
PQ08D	19/01/2017	2110	37	68.5	402	54	822	240	162	140	3	0.2	<0.01	<0.1	<0.1	<0.01	<5	ND	NO	<100
	27/04/2017	2260	23	52.4	371	55	823	217	141	113	2	0.2	<0.01	<0.1	<0.1	<0.01	<5	ND	NO	<100
	27/07/2017	2250	35	25.8	391	58	864	235	145	134	7	0.2	0.03	0.1	0.1	<0.01	<5	ND	NO	<100
	26/10/2017	2230	52	58	442	66	745	211	146	130	9	0.3	<0.01	<0.1	<0.1	0.02	<5	ND	NO	<100
PQ09S	19/01/2017	1830	603	426	472	23	712	180	172	153	8	0.3	6.96	0.9	5.8	0.51	<5	ND	NO	<100
	27/04/2017	1670	601	263	443	23	686	160	144	122	6	0.2	3.58	1.0	4.6	1.14	<5	ND	NO	<100
	27/07/2017	1860	160	54.8	476	23	690	166	148	136	7	0.3	7.37	0.3	7.7	<0.01	<5	ND	NO	<100
	26/10/2017	1730	76	14.6	456	24	595	148	144	131	7	0.3	6.47	1.0	7.5	<0.01	<5	ND	NO	<100
PQ09D	19/01/2017	1010	392	201	380	25	352	120	95	101	4	0.3	<0.01	<0.1	<0.1	0.07	<5	ND	NO	<100

Site	Date	TDS	Susp. Solids	Turb.	Total Alk.	SO4	Cl	Ca	Mg	Na	K	F	Nitrate / Nitrite	TKN	Total N	Total P	O & G	PAH	TRH C6-C10 / BTEX	TRH C10-C40
PQ01D	19/01/2017	2570	294	52.7	156	70	1180	197	144	335	28	0.1	0.07	1.1	1.2	1.33	<5	ND	ND	<100
	27/04/2017	2230	10	5.3	36	92	972	210	6	313	30	<0.1	1.68	0.4	2.1	<0.01	<5	ND	ND	<100
	27/07/2017	2130	9	0.6	27	93	830	249	7	374	32	0.1	3.03	0.3	3.3	<0.01	<5	ND	ND	<100
	26/10/2017	2190	124	27.2	18	123	948	190	47	370	41	<0.1	3.64	0.4	4.0	0.01	<5	ND	ND	<100
PQ03D	19/01/2017	1110	123	91.3	556	13	224	64	<1	196	222	0.4	<0.01	1.2	1.2	0.01	<5	ND	ND	<100
	27/04/2017	1100	88	53.3	518	14	212	76	<1	159	160	0.3	<0.01	1.5	1.5	0.05	<5	ND	ND	<100
	27/07/2017	977	118	49.3	503	12	174	78	<1	176	171	0.5	0.02	1.1	1.1	<0.01	<5	ND	ND	<100
	26/10/2017	923	111	55.5	457	12	198	37	<1	175	148	0.4	<0.01	1.3	1.3	0.06	<5	ND	ND	<100
PQ04S	19/01/2017	1930	136	36.7	410	86	881	65	72	602	4	1.3	0.45	0.7	0.9	0.07	<5	ND	ND	<100
	27/04/2017	1950	61	21.5	368	89	865	58	63	444	3	0.9	0.21	1	1.2	0.07	<5	ND	ND	<100
	27/07/2017	1940	48	35.6	474	43	698	62	64	534	5	1.0	0.03	0.4	0.4	<0.01	<5	ND	ND	<100
	26/10/2017	1650	234	48	565	23	649	55	56	464	5	1.0	<0.01	0.5	0.5	0.13	6	ND	ND	<100
PQ04D	19/01/2017	736	18	7.4	102	31	355	38	19	184	10	1.6	0.25	0.2	0.4	0.02	<5	ND	ND	<100
	27/04/2017	760	<5	2.0	93	33	365	33	18	148	10	1.3	0.27	0.1	0.4	0.16	<5	ND	ND	<100
	27/07/2017	770	28	17.5	110	31	310	40	22	187	15	1.7	0.29	<0.1	0.3	0.08	<5	ND	ND	<100
	26/10/2017	707	9	5.8	122	33	345	33	20	181	14	1.5	0.37	0.2	0.6	0.01	<5	ND	ND	<100
PQ05D	19/01/2017	1190	521	420	618	1	391	140	40	262	24	0.3	<0.01	0.6	0.6	0.19	<5	ND	ND	<100
	27/04/2017	1110	1490	622	504	4	390	110	32	218	7	0.2	<0.01	0.4	0.4	0.12	<5	1.0	ND	<100
	27/07/2017	1120	48	98.9	460	7	320	125	35	232	8	0.3	0.02	0.6	0.6	0.08	<5	ND	ND	400
	26/10/2017	984	78	154	529	<1	360	108	33	210	6	0.4	<0.01	<0.1	<0.1	0.02	<5	ND	ND	<100
PQ06D	19/01/2017	1240	26	11.4	406	168	213	27	<1	252	204	0.6	<0.01	1.5	1.5	0.01	<5	ND	ND	<100
	27/04/2017	1260	46	24.2	467	178	210	50	<1	208	166	0.5	<0.01	1.9	1.9	0.04	<5	ND	ND	<100
	27/07/2017	1130	34	13.4	463	169	172	48	<1	253	189	0.6	<0.01	1.5	1.5	<0.01	<5	ND	ND	<100
	26/10/2017	1120	57	22	421	198	190	17	<1	238	153	0.6	<0.01	2.0	2.0	0.02	<5	ND	ND	<100
PQ07D	19/01/2017	937	33	13.7	86	124	331	106	<1	166	88	0.2	<0.01	0.4	0.4	<0.01	<5	ND	ND	<100
	27/04/2017	892	24	22.8	150	123	333	79	<1	138	76	0.1	<0.01	0.6	0.6	0.02	<5	ND	ND	<100
	27/07/2017	898	54	24.4	124	121	274	93	<1	164	86	0.2	0.02	1.6	1.6	2.10	<5	ND	ND	<100
	26/10/2017	994	1210	540	99	140	302	66	<1	159	81	0.2	<0.01	0.6	0.6	0.02	<5	ND	ND	<100
PQ08D	19/01/2017	2110	37	68.5	402	54	822	240	162	143	3	0.2	<0.01	<0.1	<0.1	<0.01	<5	ND	ND	<100
	27/04/2017	2260	23	52.4	371	55	823	217	141	113	2	0.2	<0.01	<0.1	<0.1	<0.01	<5	ND	ND	<100
	27/07/2017	2250	35	25.0	391	38	664	235	145	134	7	0.2	0.03	0.1	0.1	<0.01	<5	ND	ND	<100
	26/10/2017	2230	52	58	442	66	745	211	146	130	3	0.3	<0.01	<0.1	<0.1	0.02	<5	ND	ND	<100
PQ09S	19/01/2017	1830	803	426	472	23	712	180	172	153	8	0.3	4.95	0.9	5.8	0.51	<5	ND	ND	<100
	27/04/2017	1870	601	253	443	23	685	160	144	122	6	0.2	3.58	1.0	4.6	1.14	<5	ND	ND	<100
	27/07/2017	1860	150	54.8	476	23	560	166	148	139	7	0.3	7.37	0.3	7.7	<0.01	<5	ND	ND	<100
	26/10/2017	1730	76	14.6	456	24	595	146	144	131	7	0.3	6.47	1.0	7.5	<0.01	<5	ND	ND	<100
PQ09D	19/01/2017	1010	382	201	360	25	352	120	95	101	4	0.3	<0.01	<0.1	<0.1	0.07	<5	ND	ND	<100

Site	Date	TDS	Susp. Solids	Turb.	Total Alk.	SO4	Cl	Ca	Mg	Na	K	F	Nitrate / Nitrite	TKN	Total N	Total P	O & G	PAH	TRH C6-C10 / BTEX	TRH C10-C40
	27/04/2017	868	686	285	425	21	354	118	86	82	3	0.2	<0.01	0.1	0.1	0.37	<5	ND	ND	<100
	27/07/2017	1070	117	52.2	432	24	294	118	98	105	4	0.3	0.02	<0.1	<0.1	0.01	<5	ND	ND	<100
	26/10/2017	1020	49	29.9	513	20	320	106	89	94	4	0.4	<0.01	0.1	0.1	0.03	<5	ND	ND	<100
Sump	19/01/2017	686	12	0.5	151	75	186	60	29	131	4	0.6	28.8	0.8	29.6	<0.01	<5	ND	ND	<100
	27/04/2017	944	184	59.5	127	99	280	80	40	103	5	0.3	27.6	2.4	30	0.11	<5	ND	ND	850
	27/07/2017	798	21	3.1	159	77	215	81	32	126	4	0.5	16.2	0.4	16.6	<0.01	<5	ND	ND	<100
	26/10/2017	1130	5	0.9	112	111	420	98	49	148	7	0.3	13.2	1.1	14.3	<0.01	<5	ND	ND	<100

NOTES:

1. Shaded Cells: Exceedances of ANZECC (2000) threshold values
2. NA: Not Analysed
3. ND: Non-Detect

Figure 39: Groundwater pH Trend (2017)

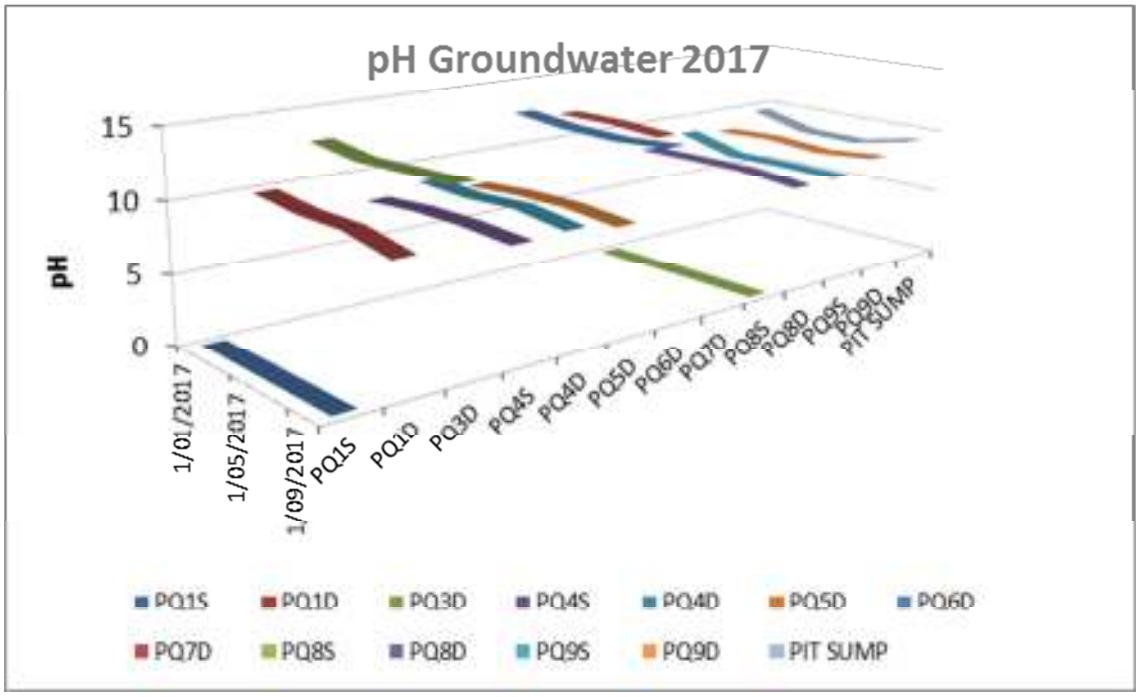


Figure 40: Groundwater Electrical Conductivity Trend (2017)

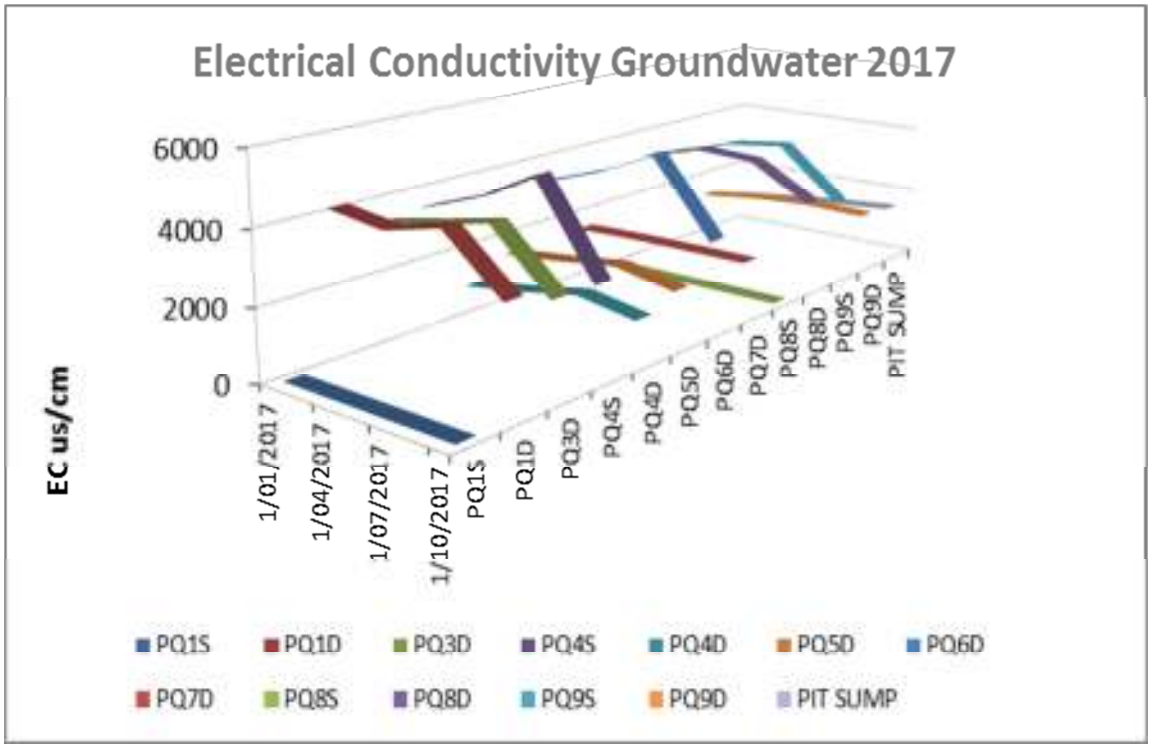


Figure 41: Groundwater Dissolved Oxygen Trend (2017)

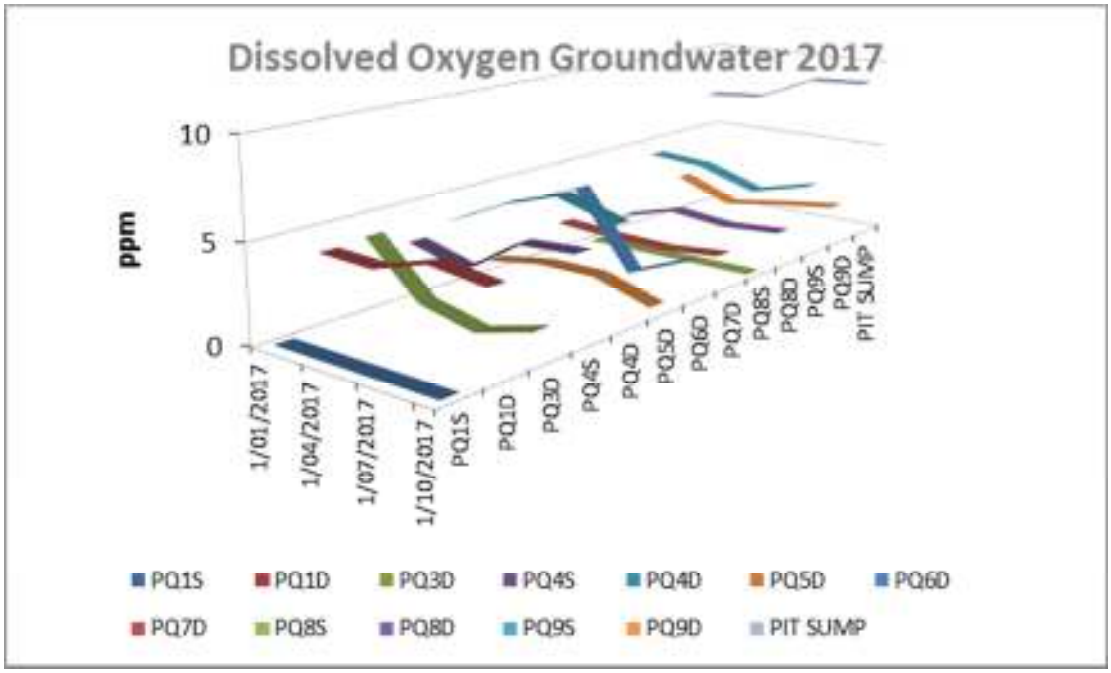
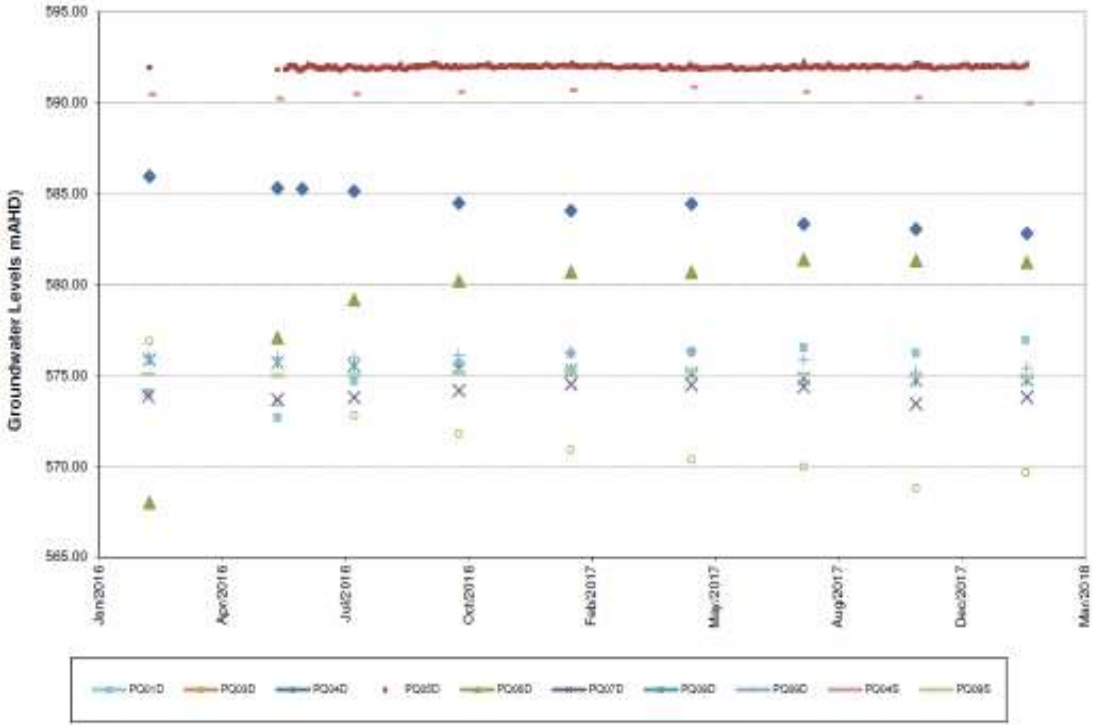


Figure 42: Standing Water Level - Sentinel Well (PQD5)



3.7.2 Groundwater Management Performance Review

It should be noted that the groundwater monitoring first commenced in October 2015 and to the end of the reporting period nine sampling events had therefore been completed. Groundwater results and trends presented in Section 3.7.1 above and discussed below are in the early stages of a long-term monitoring program which will generate a greater data set from which more detailed and accurate interpretation of any potential or actual impacts on groundwater may be occurring through quarry activities.

Figure 39 shows that pH trends have remained relatively stable in each piezometer for 2017. The pH levels vary considerably between the respective piezometers with a range of 6.9 (neutral) to 12.78 (alkaline). These levels occur in both in pit groundwater bores as well as those outside of any influence from quarry activities.

Table 22 presents a summary of field measured Electrical Conductivity (EC) during the reporting period which ranged from 927 to 4977 uS/cm, indicative of fresh to brackish water quality. Figure 40 shows the early EC trends are relatively stable and consistent between each of the piezometers. Laboratory analysed TDS was commensurate with the field EC values. Several piezometers showed an increase in the EC levels in July with this rapidly decreasing in October, likely due to dry weather conditions over the year.

Figure 41 shows dissolved oxygen (DO) trends showed a high degree of variability in individual and between respective piezometers throughout the reporting period. For example, the DO in PQ4D was measured at 3.6 ppm in January and increased to 6 ppm in July (refer to Table 22).

Figure 42 shows that standing water levels remained stable in each of the piezometers, with some fluctuation due to infrequent rainfall events. PQ5 is identified as the sentinel water bore and shows no fluctuation of water level (refer to Figure 40).

Key findings from the analytical results were:

- Concentrations of nutrients (total nitrogen and total phosphorous) exceeded the trigger values in most of the piezometers throughout the reporting period, and as such it is believed that these levels are representative of background levels
- Organic analyses (oil & grease, polycyclic aromatic hydrocarbons, volatile and semi-volatile total recoverable hydrocarbons and benzene, toluene, ethyl benzene, xylenes and naphthalene) were not detected at the majority of the piezometers aside from:
    - Oil and Grease at PQ04S (6 mg/L). The detection was near the laboratories limit of reporting of 5 mg/L.
    - Total PAH in PQ05D (1 µg/L). The results were on the laboratories limit for reporting of 1.0 µg/L.
    - Total Recoverable Hydrocarbons in PQ05D (400 µg/L).

For all the other analytes, all piezometers across the site showed levels above the trigger values at times. This is likely due to a result of the limited dataset utilised for the initial statistical assessment, for the development of the trigger values.

The majority of these trigger exceedances results are minor, and are likely due to the poorly developed nature of the bores and the limited dataset utilised for development of the trigger levels.

3.7.3 Long term trend and assessment

Figure 43 shows that pH trends have remained relatively stable in each piezometer for since the commencement of the monitoring program in 2015. The pH levels have varied considerably between the respective piezometers with a range of neutral to alkaline. These levels occur in both in pit groundwater bores as well as those outside of any influence from quarry activities.

Figure 44 shows the early EC trends are relatively stable and consistent between each of the piezometers. Variations appear to occur consistently across most of the bores and are most likely in response to recharge rain events.

Figure 45 shows a rapid decrease in Dissolved Oxygen (DO) trends from the development of the piezometers in 2015 through to 2016. Spikes in DO have occurred in several of the piezometers and are likely to have been influenced by recharge rain events.

Figure 42 shows that standing water levels remained stable in each of the piezometers, with some fluctuation due to infrequent rainfall events. PQ5 is identified as the sentinel water bore and shows no fluctuation of water level (refer to Figure 40).

Key findings from the analytical results were:

- Concentrations of nutrients (total nitrogen and total phosphorous) exceeded the trigger values in most of the piezometers throughout the sampling period, and as such it is believed that these levels are representative of background levels
- Organic analyses (oil & grease, polycyclic aromatic hydrocarbons, volatile and semi-volatile total recoverable hydrocarbons and benzene, toluene, ethyl benzene, xylenes and naphthalene) have been detected at times in some of the piezometers. These have been one off occurrences and on investigation have not been associated with quarry operations. It is more likely to be associated with development of the piezometers or laboratory level of detections.

For all the other analytes, all piezometers across the site showed levels above the trigger values at times. This is likely due to a result of the limited dataset utilised for the initial statistical assessment, for the development of the trigger values.

A review of the exceedances show that the results are consistent with previous trends and do not indicate marked variations in water quality.

Figure 43: Groundwater pH Trend (2015 - 2017)

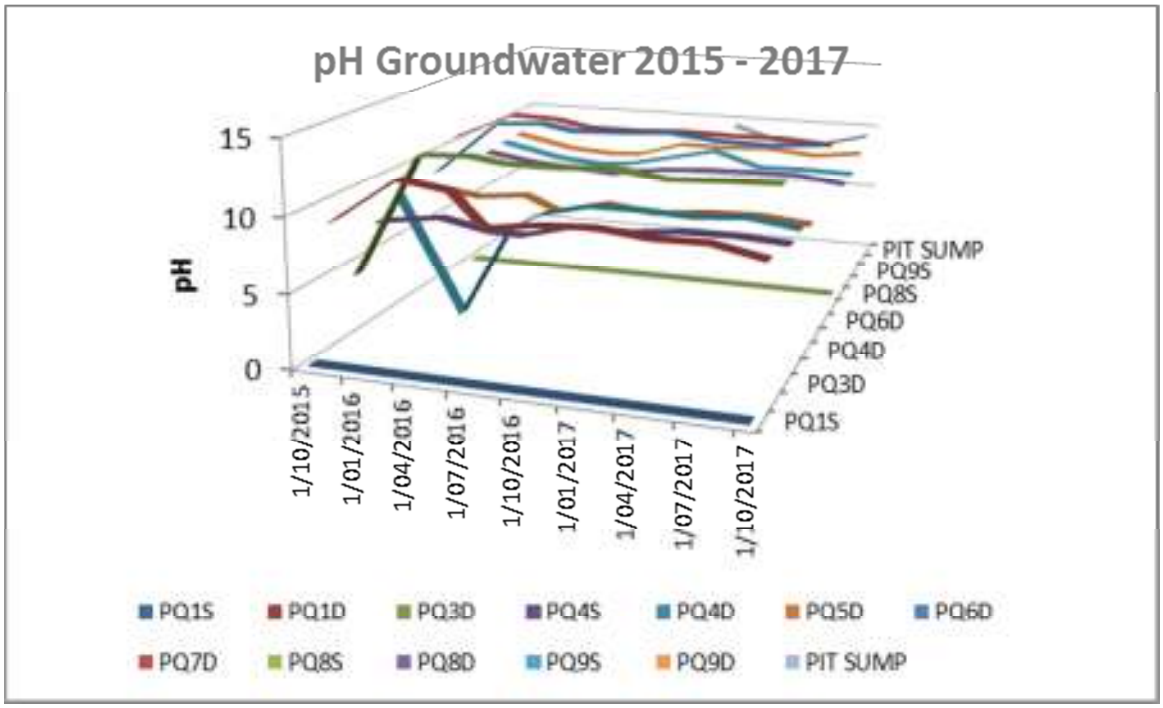


Figure 44: Groundwater Electrical Conductivity Trend (2015 - 2017)

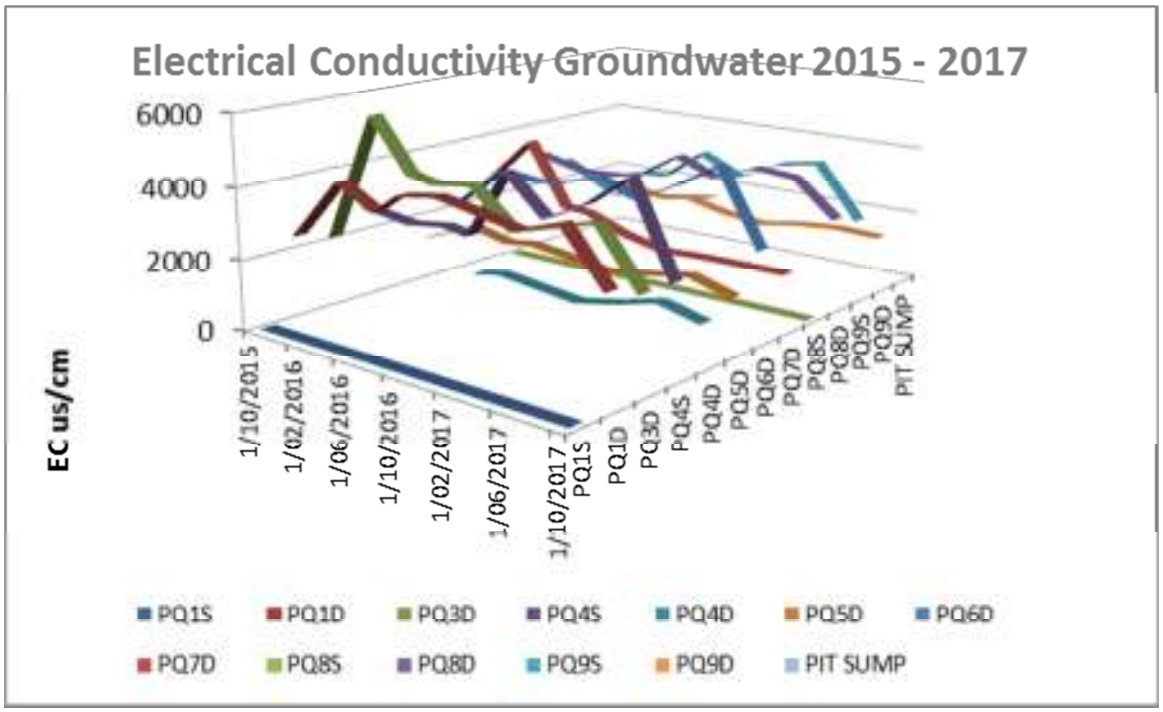
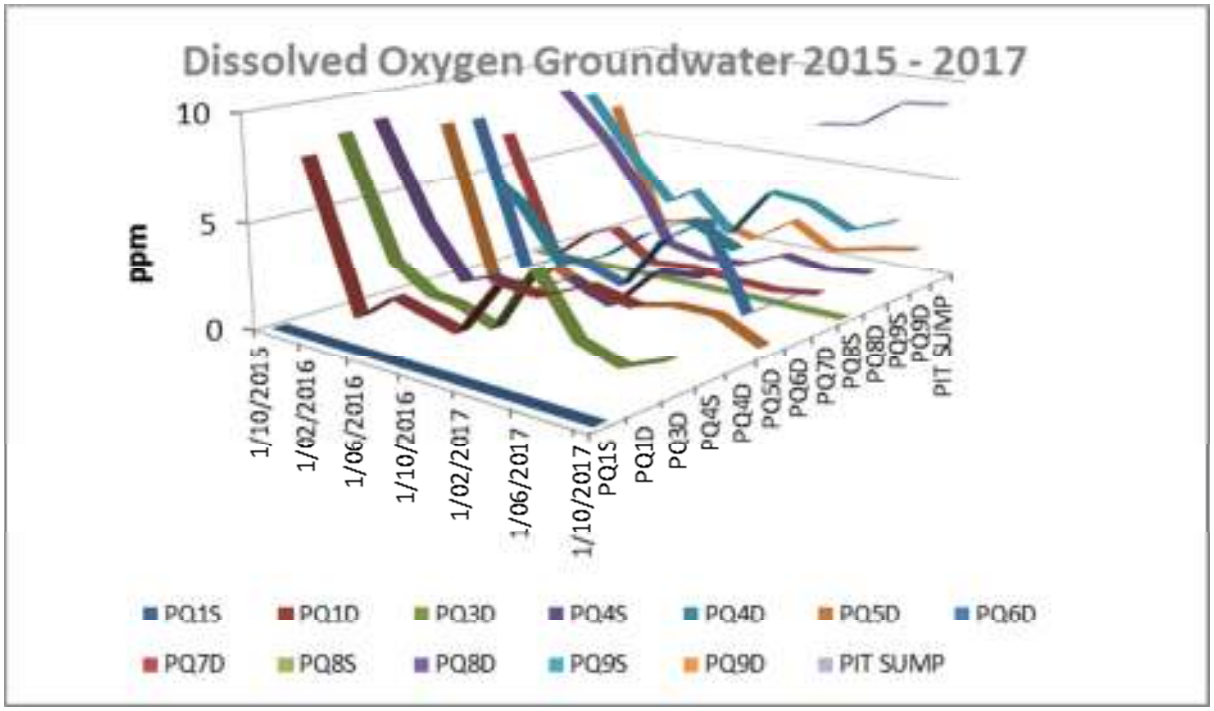


Figure 45: Groundwater Dissolved Oxygen Trend (2015 - 2017)



3.7.4 Ground water summary and opportunities for improvement

A review of the data over the 9 sampling rounds has shown exceedances of the trigger values.

A review of the exceedances show that the results are consistent with previous trends and do not indicate marked variations in water quality nor any impacts associated from the quarry operations.

The groundwater monitoring program is in the early stages of collecting data towards which longer term trends for establishing site specific trigger values (SSTV's). Indicative trigger values have been developed and will be reviewed following the sampling round in January 2018, This will allow 10 rounds of data to be statistically assessed for the revision of the site specific triggers.

4 COMPLIANCE

4.1 INCIDENT MANAGEMENT AND RESPONSE

In accordance with NSW EPA requirements, a Pollution Incident Response Management Plan (PIRMP) has been developed and implemented which details the:

- Risks and hazards associated with quarry operations, equipment and materials;
- Controls in place to reduce the risk in the occurrence of potential incidents;
- Inventory of pollutants and respective volumes stored on-site;
- Safety and incident response equipment;
- Communication strategy for the immediate notification of an incident to relevant government agencies and neighbours;
- Actions to be taken during or immediately after an incident; and
- Training and responsibilities of response staff.

The PIRMP was last reviewed and revised in October 2017 and a copy can be accessed on the Boral website at:

http://www.boral.com.au/Article/nsw_poela_environmental_reporting.asp

4.2 SUMMARY OF REGULATORY NOTIFICATIONS

The following sections are a summary of notifications provided to Department of Planning and Environment and EPA during the reporting period.

4.2.1 Noise exceedance

In July 2017, the DP&E and EPA were notified by phone and follow up email of a noise level criteria exceedance at a residential receiver, identified during targeted monitoring. This was notified in line with Schedule 5, Condition 8 of the Conditions of consent. Further investigation revealed that the exceedance had occurred under temperature inversion conditions, as per Appendix 7 of the Approval and are therefore complaint.

Boral have committed to a Voluntary Undertaking to further investigate the source of the noise and minimisation and management opportunities (refer section 3.4.4)

4.2.2 Show Cause Notice

On 7th October 2017, the Department of Planning and Environment had issued Boral with a Show Cause Notice for the following matters:

- AEMRs for the reporting periods 2013, 2014 and 2015 were not submitted with regulatory specified timelines; and
- An Independent Audit report had not been submitted within one month of its completion.

A letter response to the Show Cause Notice was provided on 24th October 2017 from the Quarry Manager, which detailed the circumstances and corrective actions being undertaken to address the above matters and to ensure future regulatory timelines for submission of necessary documents are

complied with. All AEMRs and audit reports were issued. In response the DP&E, issued an Official Caution.

4.2.3 Audits

4.2.3.1 Independent Audit

In accordance with Project Approval Condition 5 (Schedule 5) an Independent Audit was conducted at the end of 2015.

The Independent Audit found that the Quarry was in substantial compliance with the 60 applicable Project Approval conditions. The only non-compliance was in relation to a historic uncontrolled discharge event that occurred in the previous reporting period (2015).

However, the Audit Report included a number of recommendations towards further improvement opportunities (mainly administrative in nature) were subject to an internal review. A response to the Audit recommendations was provided by the Quarry Manager to the Department of Planning and Environment on the26th October 2016. The majority of the recommendations had been addressed by the end of the reporting period with the remainder to be actioned during the early months of the 2017 AEMR reporting period (refer to Table 25).

The Next independent audit is planned for August 2018.

Table 25: Independent Audit recommendation - Status

No.	Consent condition/ issue	Recommendation	Response	Due date	Status
PQ 1/15	Sched 2, C 12 Operations of Plant and Equipment	When management plans or monitoring programs are due for renewal/review, ensure formal approval from DP&E is received.	Revised Management plans are due to be issued to the Department of planning by the 30 November 2016. Follow up will be made with the Department to ensure approval is received.	Initial follow up will be made by 20th December as to any recommendations and by 30th January 2017 for approval .	All plans, except Biodiversity management plan and water management plan issued in November 2016 and approved by the DP&E. Water Management plan issued and approved October 2017. Biodiversity plan approved April 2017. complete
PQ 3/15	Sched 3, C 23 Surface and Groundwater	Review design of dam to determine if additional retention basin is required.	Additional sediment control structures to be installed and maintenance system to be established	30 December 2016	installed
PQ 3/15	Sched 3, C 26 Surface and Groundwater	A copy of the WMP should be submitted to NOW, EPA and Sydney Catchment Authority for review and comment.	The drafted Revised WMP will be submitted to NOW, EPA and Sydney Catchment Authority for review and comment.	Submission to authorities by October 13 2016 with follow up meetings where possible	plan submitted to all authorities and comments included in the plan. complete
PQ 4/15	Sched 3, 28 Surface and Groundwater	The ESCP should be revised to address the requirements of the Blue Book.	Revised management plans are being drafted and the ESCP will be revised to address the requirements of the Blue Book	30 November 2016	revised as part of the Water Management Plan. complete

No.	Consent condition/ issue	Recommendation	Response	Due date	Status
PQ 5/15	Sched 3, 29 Surface and Groundwater	When the SWMP is due for revision, baseline data on surface water flows and quality in Tangarang Creek and Barkers Creek will need to be included.	Revised management plans are being drafted and the SWMP will be revised to include baseline data on surface water flows and quality in Tangarang Creek and Barkers Creek	30 November 2016	revised as part of the Water Management Plan. complete
PQ 6/15	Sched 3, C 32 Aboriginal Heritage	Ensure Peppertree Quarry website is updated and easily accessible	The website review has now been included in the Boral electronic work tracking system (EAM) to trigger alerts when the review is due.	10 November 2016	ongoing
PQ 7/15	Sched 3, C 34	When the LRMP is due for revision, it will need to provide greater clarity on the short, medium and long term rehabilitation measures. The monitoring performance of these measures will need to be defined as well as the completion criteria.	A new biodiversity and rehabilitation management plan is being prepared and will include these measures.	28 February 2017	Biodiversity management plan issued and approved April 2017. complete
PQ 8/15	Sched 3, C 37 Visual Impact	Implement recommendations of Compliance Lighting Audit including: "• adjust lighting fixers on the side of buildings to ensure the main beam angle is kept below 70 degrees as recommended in AS 4282; • review the type of permanent night lighting used. HPS lamps emit a softer orange light than the	A Change Management risk assessment has been conducted on the implementation of the recommendations of the lighting audit. It has identified potential safety issues with the changes to lighting as areas of coverage may be reduced and a delay in lighting coming on in emergency situations. Management practices are still being reviewed as to what is achievable.	Complete review February 2017	review and risk assessment undertaken. At the current time, no changes to be implemented.

No.	Consent condition/ issue	Recommendation	Response	Due date	Status
		intense white light of the metal halide. • reduce height of fixed lighting structures on buildings as much as possible to reduce light spill and skyglow; • consider formalising a protocol for use of lighting at the Quarry that is considered appropriate for safety and occurs routinely; • investigate options to turn off lighting sources in areas of low use; and • if complaints are received in relation to the Quarry these recommendations should be revisited."	Individual concerns expressed by any residences will be addressed		
PQ 9/15	Sched 3, C 41 Waste Management	It is recommended Boral implement and monitor waste minimisation strategies to determine further areas of improvement. The monthly invoices provided by Remondis could be used to track the amount of waste produced by Boral. The identified areas of improvement should be discussed in the Annual Review. It is also suggested that more	A Waste management plan is being prepared to identify and detail waste management practices onsite including the capture of data.	January 2017	systems in place to capture and manage data

No.	Consent condition/ issue	Recommendation	Response	Due date	Status
		detail be included in the waste management review in the Annual Review including assessment of waste management and minimisation actions undertaken by Boral.			
PQ 10/15	Sched 3, C 43 Emergency and Hazards Management	Ensure all oil/lubricant products are stored appropriately with self-contained bunding.	A review of oil storage bunding has been conducted and plans developed for improvements	Implementation of plans by December 2016	Order has been placed for new system to be installed in 2018 following review in 2017
PQ 11/15	Sched 5, C 1 Environmental Management Strategy	Update document to acknowledge EPL and all applicable requirements including the protocol for reporting exceedances. When EMS is due for renewal/review, ensure formal approval from Director-General is received.	A Revised Environmental Management Strategy is being drafted and will be revised to address the EPL and all applicable requirements including the protocol for reporting exceedances	30 November 2016	EMS, issued in November 2016 and approved by the DP&E. complete
PQ 12/15	Sched 5, C 3 Incident Reporting	It is recommended that Boral ensures the deadline of reporting an exceedance/incident to the Department and relevant agencies is met.	Boral management are made aware of exceedances/incidents. Follow up will be made to ensure reporting to the Department and relevant agencies is met.	ongoing	ongoing
PQ 13/15	Sched 5, C 4 Annual Reviews	It is recommended that Boral complete and submit all outstanding Annual Reviews. As per the requirements of the	All AEMRs have been submitted. The preparation and submission of the AEMR has now been included in the Boral electronic work tracking	10 November 2016	complete

No.	Consent condition/ issue	Recommendation	Response	Due date	Status
		condition, all future Annual Reviews will need to be completed by March of the following year. It is suggested Boral create a schedule with an internal deadline at least one month prior to the deadline to the Director-General to ensure all future Annual Review deadlines are met.	system (EAM) to trigger alerts when the AEMR requires preparation and is due.		
PQ 14/15	Sched 5, C 7 Revision of Strategies, Plans and Programs	It is recommended Boral completes the reviews and any necessary revisions of the incident reports completed in 2015 and maintain this documentation in the future.	Revised Management plans are due to be issued to the Department of planning by the 30 November 2016. Finding and recommendations from 2015 incidents will be included.	30 November 2016	All plans, except Biodiversity management plan and water management plan issued in November 2016 and approved by the DP&E. Water Management plan issued and approved October 2017. Biodiversity plan approved April 2017. complete
PQ 15/15	Sched 5, C 10 Community Consultative Committee	Boral could make documents available on the website more regularly and ensure the documents on the website are up to date with the latest version.	The website review has now been included in the Boral electronic work tracking system (EAM) to trigger alerts when the review is due.	10 November 2016	ongoing

4.2.3.2 Department of Planning and Environment Audit

In December 2016, the Quarry was the subject of a compliance audit undertaken by DP&E. The Audit found the Quarry was compliant with 133 applicable Project Approval conditions. There were 8 non-compliances identified. Seven of the non-compliance were against administrative conditions and the other was a low-risk concern with particulate dust concentrations which on two occasions marginally exceeded the short-term 24-hour average criteria of 50 µg/m^3 during the2016 reporting period.

An action plan (refer Table 26) was developed in response to the non-compliances and issued to DP&E with some items to be undertaken in 2017.

Table 26: DP&E Audit 2016 Action Plan Status

ID #	Schedule condition	Audit finding	Audit Recommendation	Corrective action	Status
	Schedule 3, condition 17	One minor non compliance of deposited dust recorded from Pit 1. Under discussion with the EPL regarding sampling location.	2015 AEMR and EPL monitoring data indicate compliance with criteria at these locations. One non compliance recorded, but due to nature of material found it is unlikely to have originated from the site, but may be attributed to cropping activities on nearby farms and/or material from Limestone Quarry.	Peppertree quarry will continue to monitor and report exceedances of monitoring criteria. Investigations will be undertaken to determine the possible source and to ensure Peppertree environmental controls are in place and operational	Ongoing
	Schedule 3, condition 41 (a) Schedule 3, condition 41 (b) Schedule 3, condition 41 (b)	2015 IEA states: "Partially Compliant" "(a) There is no evidence that Boral is monitoring the amount of waste generation. (b) Boral has a service agreement with Remands and has installed bins for the separation of waste in the office and workshop. Initial actions of investigating ways to minimise waste generation have been undertaken by Boral. (c) Boral recycles waste oil, scrap steel, conveyor belts and timber. Bins for these materials are situated around the site (d) A Waste Management Plan is proposed for 2016 (AEMR 2015) The Proponent must: (b) investigate ways to minimise waste	Audit sighted dockets for waste oil removal, tip receipts for other waste, service agreement, waste management spreadsheet showing what and where waste goes. It is recommended that Boral establish a clear procedure for monitoring waste generation. As per above As per above	Waste management review to be undertaken and procedures to be put in place for management, including data collection and analysis. As per above As per above	systems in place to track and manage data

ID #	Schedule condition	Audit finding	Audit Recommendation	Corrective action	Status
		generated by the project; to the satisfaction of the Secretary. The Proponent must: (c) implement reasonable and feasible measures to minimise waste generated by the project; to the satisfaction of the Secretary.			
	Schedule 5, condition 10 (a), 10(b), 10(c), 10(d), 10(e), 10 (f)	All reporting is currently up to date. Work orders in EAM to ensure reporting will be kept up to date in the future.	On 7 October 2016 the Dept. sent a Show Cause notice to Boral Peppertree in relation to the non-submission of the 2013 and 2014 AEMRs and the late submission of the 2015 AMER. All of the required documents were submitted following this Show Cause. The Dept. has received Boral's response on this matter, and will determine its response following finalisation of the current group of Boral audits.	Issue all AEMRs on time	2016 AEMR issued on time – 29th March 2017

5.0 ACTIVITIES PROPOSED IN NEXT AEMR PERIOD

The activities proposed to be undertaken during the 2018 AEMR reporting period are presented in Table 27. The activities have been selected and prioritised based on:

- Internal and Independent Audit findings and recommendations;
- Operational requirements; and
- Continual improvement objectives in accordance with Boral's Environmental Policy and integrated HSEQ management System.

Table 27 : Proposed Activities in 2018 AEMR Period

Proposed Activities in 2018	Objectives
Review best options for a permanent solution for dust extraction at the crusher	• Mitigation of dust
Undertake progressive Overburden stabilization and rehabilitation (as per Biodiversity and rehabilitation management plan 3 year plan)	• Minimise erosion and sediment runoff • Move towards achieving biodiversity management plan goals of establishing vegetation corridors
Update Oil storage systems	• Minimise risk of land contamination
Establish site water balance	• Understand water usage to better ensure water availability in times of drought
Heritage & overburden campaign – construct additional sediment ponds at Southern Overburden emplacement	• Management of overburden and construction of noise bunds
undertake audit of the surface water management system at the Southern Overburden emplacement once system is installed	• Surface water management
Ongoing annual External review of weather data	• Ensure reliability of the weather station data
Waste accountancy	• Identify opportunities for waste minimization practices
undertake Voluntary Agreement actions	• Minimisation of noise in the community
manage scar tree removal with AHMC	• Preservation of Culture
Artefact collation and review	• Preservation of culture
Implement Stakeholder Engagement plan for 2017 including assistance with Kite festival	• Ongoing community engagement
Establish Bio Bank area	• Management of vegetation and habitat to create corridors
Pit expansion to the East	• Ongoing operations
undertake Independent audit	• Compliance with conditions of consent
review of Ground water trigger levels	• Management of groundwater

6.0 CONCLUSION

Peppertree Quarry has continued to focus on ensuring the environment and our neighbors are not adversely impacted by quarry operations.

Throughout this reporting period extraction and processing of quarry materials has remained consistent with the previous year, with only a small increase in production tonnes.

The construction of the Southern and western overburden emplacements was commenced, with an overburden removal contract commencing in August 2017.

Rehabilitation works on site was limited due to weather conditions but a benchmark monitoring program was established in line with the new Biodiversity and Rehabilitation management plan.

Heritage works continued in the latter part of the year in future pit expansion areas with artefacts salvaged and stored for collation and cataloguing in 2018.

Noise was a focus for the second part of 2017, as the noise assessment program was continued with Boral undertaking a Voluntary Agreement with DP&E.

The 2017 reporting period also contained a strong focus on maintaining regulatory compliance. Environment monitoring continued and showed minimal impact on the environment and community from quarry operations.

However a number of opportunities for improvement were identified and will be addressed in the 2018 AEMR reporting period.

APPENDIX 1: ANNUAL RETURN FOR EXTRACTIVE MATERIALS – FINANCIAL YEAR 2017

Form S 1

Planning & Environment
Resources & Geoscience

RETURN FOR EXTRACTIVE MATERIALS: YEAR ENDED 30 JUNE 2017

Quote RIMS ID in all correspondence

Quarry Id: Rims ID: 400960

Operators Name: BORAL RESOURCES (NSW) PTY LTD PO
Address: BOX 42
WENTWORTHVILLE
NSW 2145

Email: ben.cummins@boral.com.au

Quarry Name: PEPPERTREE QUARRY
Quarry Location: MARULAN SOUTH RD

Inquiries please telephone:
(02) 4931 6435
Completed or Nil Returns
Fax - (02) 4931 6776
Email –

Please amend name, postal address and location of mine or quarry if incorrect or incomplete

The return should be completed and forwarded to the **STATISTICAL OFFICER, ROYALTY & ADVISORY SERVICES, NSW PLANNING & ENVIRONMENT, PO BOX 344 REGIONHUNTER MAIL CENTRE NSW on 2310 or before 31 October, 2017**

If completion of the return is unavoidably delayed, an application for extension of time should be requested **before** the due date. If no work was during done the year, a **NIL** return must be forwarded.

The return should relate to the **above quarrying establishment** covering and the should operation of the quarrying and treatment (such as crushing, screening, washing etc.) carried out at or near the quarry. A return even if required the operations solely of a developmental nature and whether area being worked is held under a mining title or otherwise.

Zane West, Royalties and Advisory Services Manager

Please complete the following information to assist in identifying the location of the Quarry

Typical Geology _____
Marulan
Nearest Town to Quarry _____
Goulburn Mulwaree Council
Local Council Name _____
Deposited Plan and Lot Number/s of Quarry _____
Email Address of Operator _____
Boral Resources (NSW) Pty Ltd
Name of Owner or Licensee _____
PO Box 42, Wentworthville NSW 2145
Postal Address of Licensee _____
Licence/Lease Number/s (if any)
From Mineral Resources NSW (Industry & Investment NSW) _____
From Department of Lands or other Department _____
If any output was obtained from land NOT held under licence from the above Departments, state the Name/s and Address/es of the Owners of the land _____

- To the best of my knowledge, the particulars which have been entered in this return are correct and spaces in which blank have been entered where figures should have been inserted.

Ben Cummins	13/11/2017
SIGNATURE of OWNER or MANAGER	DATE

Ben Cummins

- **PERSON to be contacted if queries arise regarding this return** _____

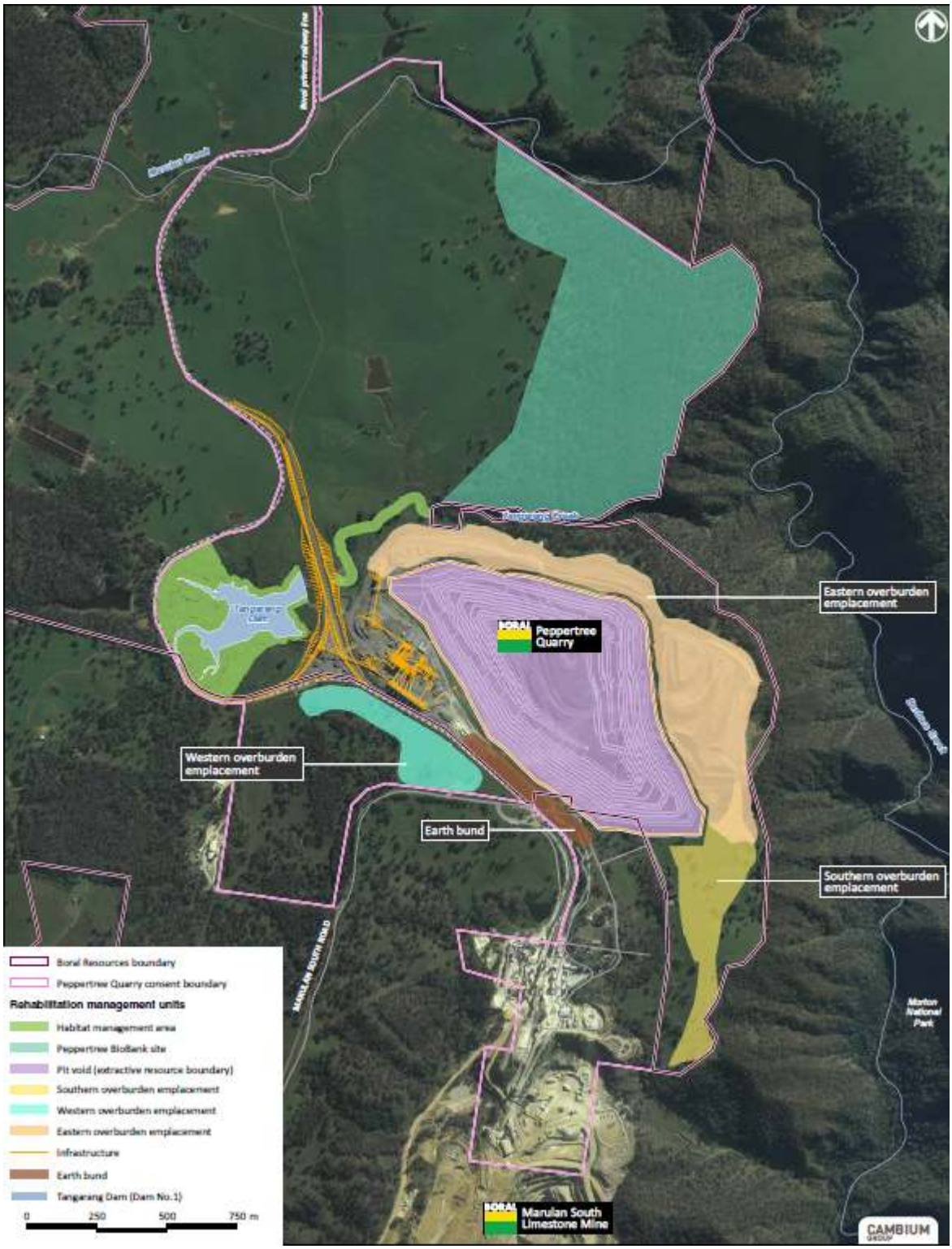
Ben Cummins		02 9033 5419
NAME (Block letters)		Telephone

SALES During 2016-2017

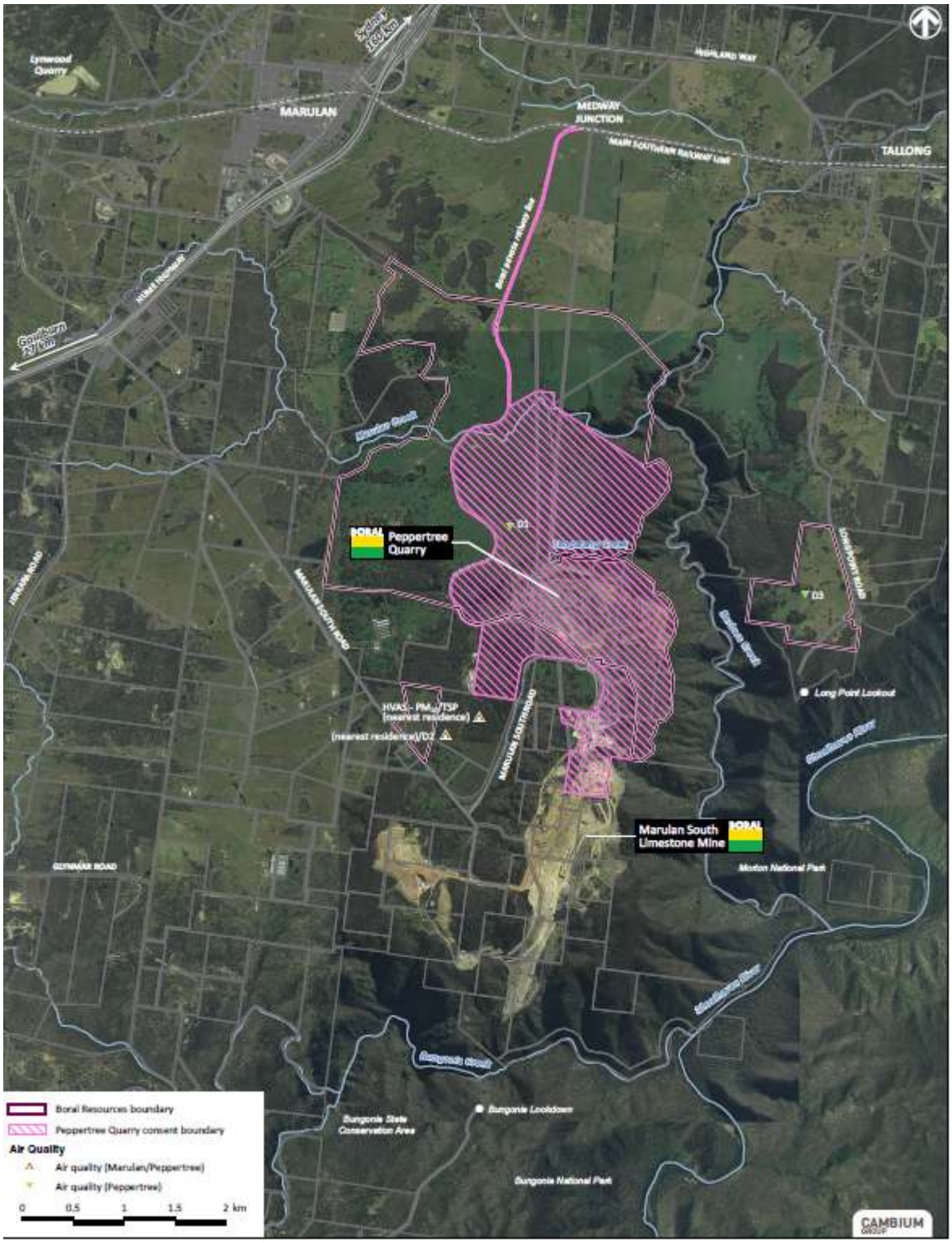
Production Information may be published in aggregated form for statistical reporting. However, product-on-data for individual operations is kept strictly confidential.

	Product	Description	Quantity Tonnes
	Virgin Materials		
•	Crushed Coarse Aggregates		
	Over 75mm		
	Over 30mm to 75mm		
	5mm to 30mm		1,225,830
	Under 5mm		
	Natural Sand		
	Manufactured Sand		1,137,092
	Prepared Road Base & Sub		132,422
	Other Unprocessed Materials		
	Recycled Materials		
•	Crushed Coarse Aggregates		
	Over 75mm		
	Over 30mm to 75mm		
	5mm to 30mm		
	Under 5mm		
	Natural Sand		
	Manufactured Sand		
	Prepared Road Base & Sub		
	Other Unprocessed Materials		
•	River Gravel		
	Over 30mm		
	5mm to 30mm		
	Under 5mm		
•	Construction Sand	Excluding Industrial	
•	Industrial Sand		
	Foundry, Moulding		
	Glass		
	Other (Specify)		
•	Dimension Stone	Building, Ornamental, Monumental	
	Quarried in Blocks		
	Quarried in Slabs		
•	Decorative Aggregate	Including Terrazzo	
•	Loam	Soil for Topdressing,Garden soil, Horticultural purposes)	
•	TOTAL SITE PRODUCTIO		2,495,345
•	Gross Value ($) of all		
•	Type of Material		
		[redacted]	
•	Number of Full-Tim Equivalent (FTE) Employees	Employees:	Contractor

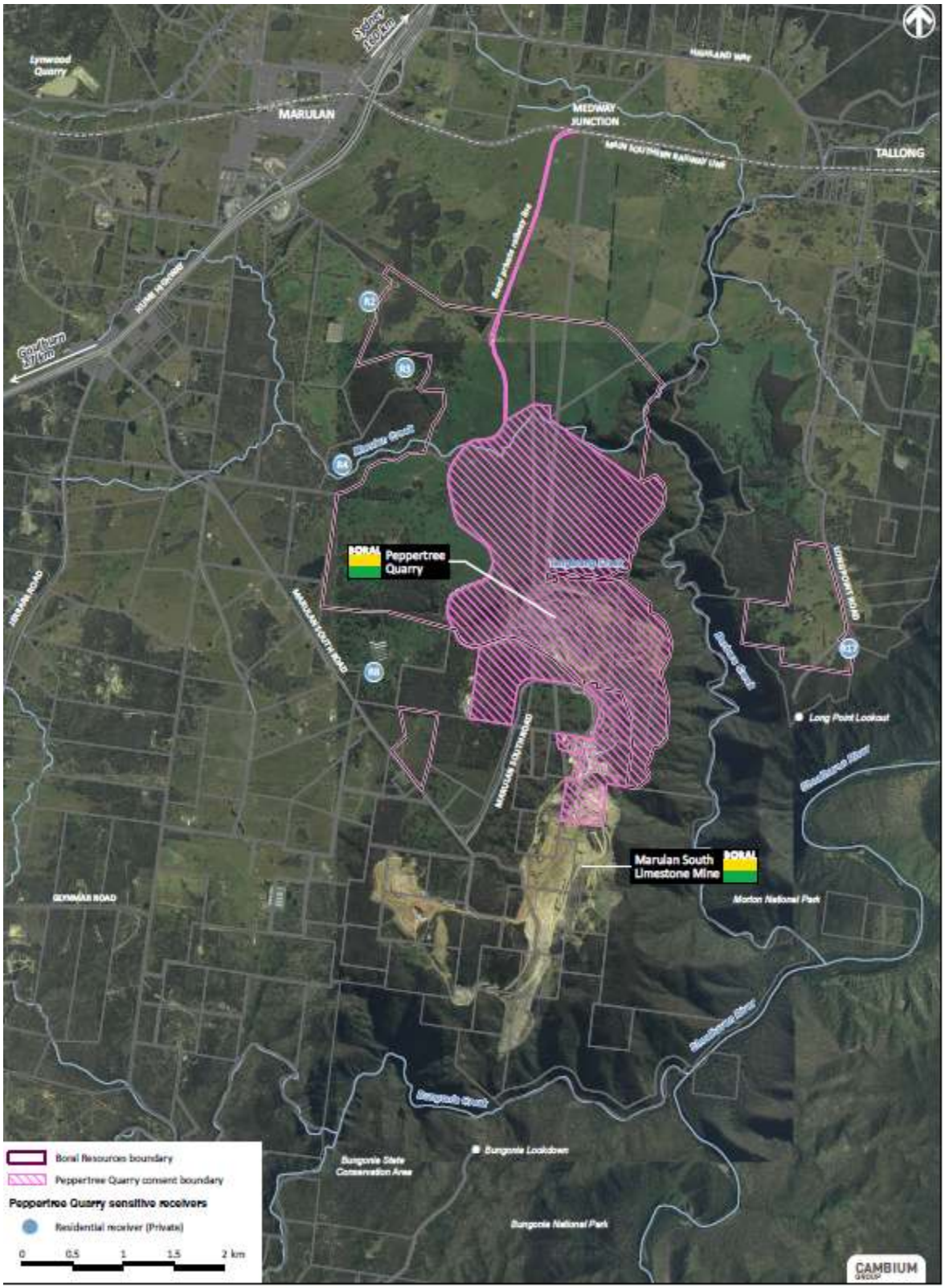
APPENDIX 2 REHABILITATION MANAGEMENT UNITS



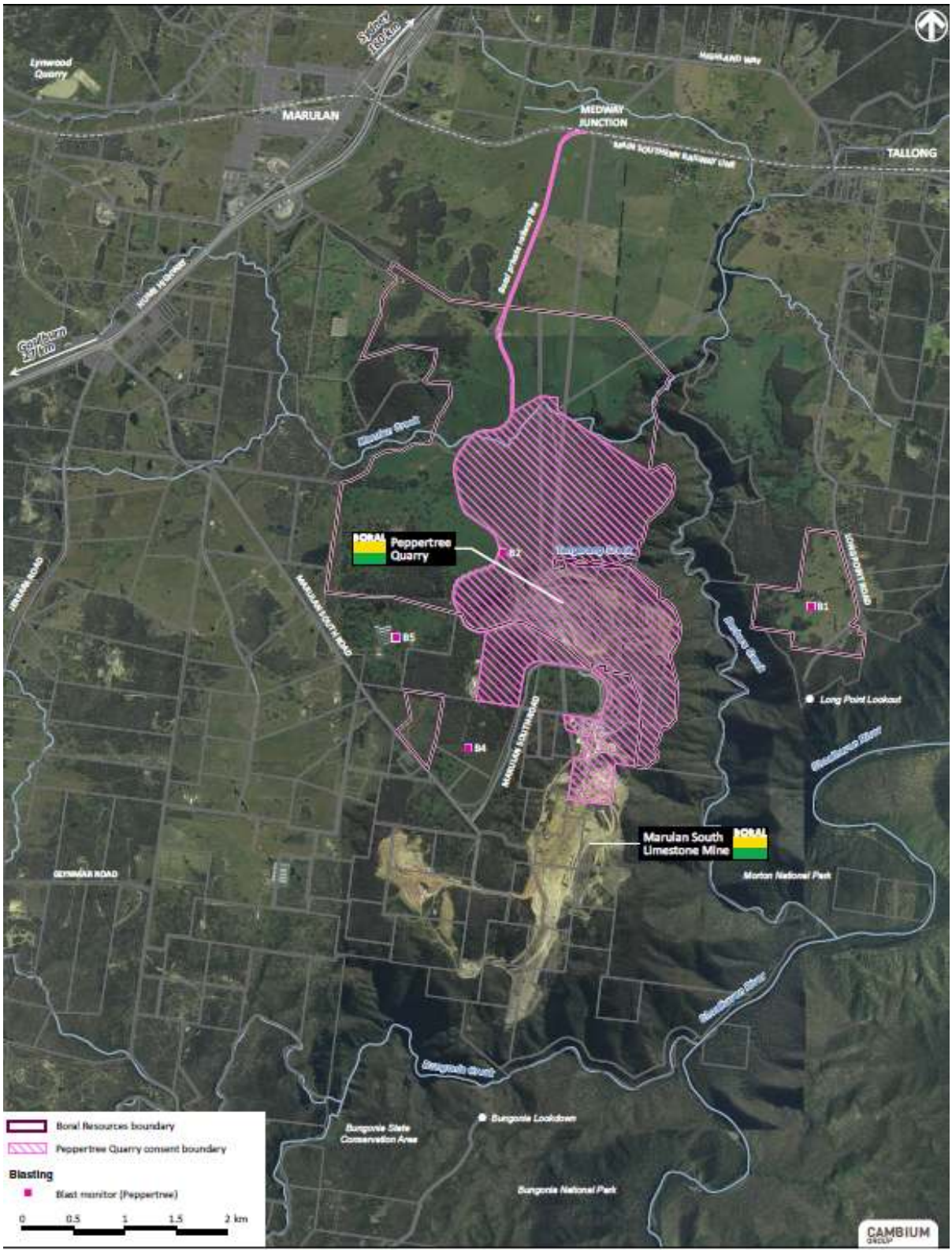
APPENDIX 3 AIR QUALITY MONITORING LOCATIONS



APPENDIX 4 NOISE MONITORING RESIDENTIAL RECEIVER LOCATIONS



APPENDIX 5 BLAST MONITOR LOCATIONS



APPENDIX 6 SURFACE AND GROUNDWATER MONITORING LOCATIONS