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Boral Peppertree Quarry

Annual Review

January – December 2018

Document Control

Prepared by: Sharon Makin
Boral Peppertree Quarry

STATUS	DATE	DISTRIBUTION
DRAFT (Version No. 1)	22nd February 2019	Angus Shedden (Boral Peppertree Quarry Manager) Sharon Makin (Stakeholder and Environment Advisor)
Final (Version No. 1)	29th March 2019	Angus Shedden (Boral Peppertree Quarry Manager) Sharon Makin (Stakeholder and Environment Advisor)

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Boral Peppertree Quarry

Annual Review (Jan 2018 – Dec 2018)

Name of operation	Peppertree Quarry
Name of operator	Boral Resources (NSW) Pty Ltd
Development consent / project approval #	06_0074
Name of holder of development consent / project approval	Boral Resources (NSW) Pty Ltd
Mining lease #	Not applicable
Name of holder of mining lease	Not applicable
Water licence #	10WA102701 and 10WA116000
Name of holder of water licence	Boral Resources (NSW) Pty Ltd
MOP/RMP start date	Not applicable
MOP/RMP end date	Not applicable
Annual Review start date	1st January 2018
Annual Review end date	31st December 2018

I, Angus Shedden, certify that this audit report is a true and accurate record of the compliance status of Peppertree Quarry for the period 2018 Calendar Year and that I am authorised to make this statement on behalf of Boral Resources (NSW) Pty Ltd .

Note.

a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.

b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).

Name of authorised reporting officer : Angus Shedden

Title of authorised reporting officer : Peppertree Quarry Manager

Signature of authorised reporting officer

Date 29th March 2019

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Commonly Used Abbreviations and Acronyms

AR	Annual Review
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 STATEMENT OF COMPLIANCE

The Statement of Compliance for the 2018 Reporting Period is contained in Table 1.

Table 1: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
Approval MP 06_0074	No
EPL 13088	No

The Non compliances identified during the reporting period are detailed in Table 2. Each Noncompliance has been risked ranked as per the DPE Annual Review Guidelines Compliance Status key outlined in Table 3.

Table 2: Non Compliances

Relevant Approval	Condition #	Condition description	Compliance status	Comment	where addressed in the Annual review
MP 06_0074	Schedule 3, Condition 9	The Proponent must: (a) implement best practice noise management, including all reasonable and feasible noise mitigation measures to minimise the noise generated by the project;	non-compliant	It was identified that the NBMP does not adequately address item (a) in regards to Best Practice. The NBMP will be reviewed to include a section on Best practice and how activities are reviewed to ensure they align with current best practice.	Section 6.4 Table 16 Section 12 Table 28
MP 06_0074	Schedule 3, Condition 19	The Proponent must: (a) implement best management practice on site, including all reasonable and feasible measures to minimise the off-site odour, fume and dust emissions generated by the project;	non-compliant	It was identified that the AQMP does not adequately address item (a) in regards to Best Practice. The AQMP will be reviewed to include a section on Best practice and how activities are reviewed to ensure they align with current best practice.	Section 12 Table 28

MP 06_0074	Schedule 3, Condition 29	The Surface Water Monitoring Program must include: (a) detailed baseline data on surface water flows and quality in Tangarang Creek and Barbers Creek;	non-compliant	A review of the water monitoring requirements will be undertaken as part of the revision of the WMP. Water Flow monitoring is not possible within Barbers Creek due to accessibility.	Section 12 Table 28
MP 06_0074	Schedule 3, Condition 41	The Proponent must: (b) investigate ways to minimise waste generated by the project; (c) implement reasonable and feasible measures to minimise waste generated by the project; and	non-compliant	A waste management procedure will be developed to outline the current management of waste on the site and the programs in place for minimisation and recycling as well as tracking	Section 6.6 Section 12 Table 28
MP 06_0074	Schedule 3, Condition 46	Production data should be provided to DRE using the standard form for that purpose in accordance with the requirements of the condition.	non-compliant	A copy of the production data will be issued to the Department of Planning and Environment outside of the annual AR.	Section 12 Table 28
MP 06_0074	Schedule 3, Condition 42	The Proponent must ensure that all waste generated or stored on site is assessed, classified and managed in accordance with the EPA's Environmental Guidelines: Assessment Classification and Management of Liquid and Non-Liquid Wastes.	non-compliant	It was identified that even though waste has been classified education is required for correct disposal and recycling. On completion of a new stores area, a number of recycling bays will be established with the areas clearly identified for recycled materials.	Section 6.6 Section 12 Table 28

EPL 13088	M5.2	The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.	non-compliant	Contact line is available, but it is not clear on the website that this line that can be used for complaints. The website should be updated to clearly identify the telephone number through which complaints can be made.	Section 9

Table 3: Compliance Status Key

Risk Level	Colour Code	Description
High	non - compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	non - compliant	Non-compliance with: • potential for serious environmental consequences, but is unlikely to occur; or • potential for moderate environmental consequences, but is likely to occur
Low	non - compliant	Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur
Administrative non compliance	non - compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

2 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 February 2007 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 2016.

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 (AR) provides a summary of the Quarry's activities, environmental performance, statutory compliance and community relationships between the periods of 1st January 2018 to 31st December 2018 (the reporting period).

The AR 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 AR 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.

The AR has also been prepared in line with the DPE Annual Review Guideline October 2015.

Copies of the AR 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:

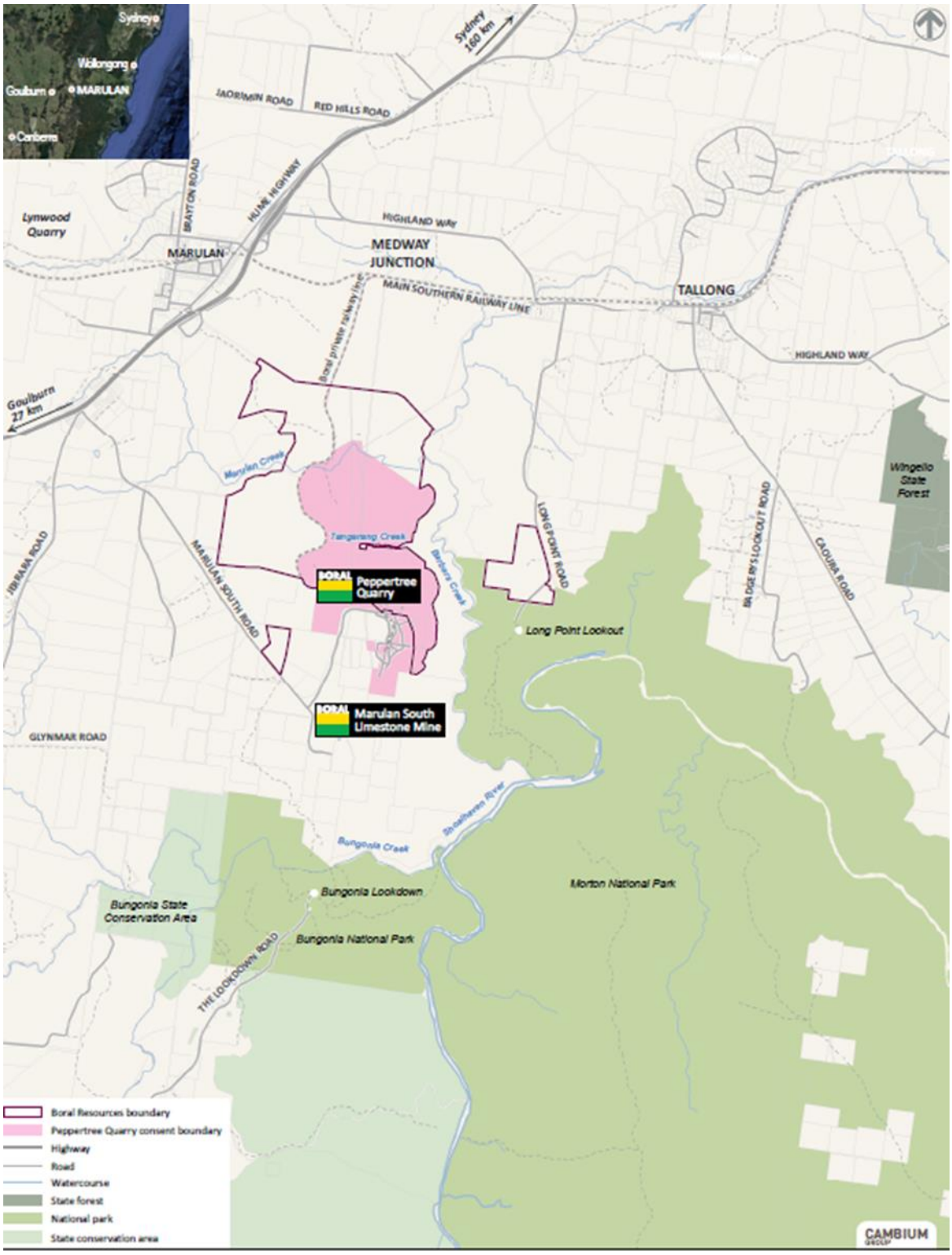
https://www.boral.com.au/locations/boral-marulan-south-operations / reporting -Peppertree Quarry

Key contacts associated with the management of the Quarry operations, environment, safety and stakeholder relationships are provided in Table 4.

Table 4: 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

Figure 1: Peppertree Quarry Location



3 APPROVALS

The Quarry operates under a number of regulatory approvals and licences which are summarised in Table 5 below.

Table 5: Approvals

Approval	Detail	Regulatory Authority
Project Approval 06_0074 Modification 4 (2016)	Quarry operating conditions updated for approval of an extension of in-pit operating hours and the establishment of a new overburden emplacement area (Southern Overburden Emplacement)	NSW Department of Planning and Environment
EPL No. 13088	The EPL is issued for the scheduled activity of: Crushing, Grinding, Separation and Extractive activities for tonnages greater than 2 million tonnes per annum. There have been no variations to the EPL during 2018.	NSW Environment Protection Authority
10WA102701	extraction of water from 110ML dam	NSW Office of Water
10WA116000	water bore licence allowing an annual extraction of up to 15 ML.	NSW Office of Water

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

https://www.boral.com.au/locations/boral-marulan-south-operations / General approval - Peppertree quarry

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

https://www.boral.com.au/our-commitment/environmental-reporting / Boral Quarries - NSW / Boral Peppertree Quarry

Boral is seeking to modify (Modification 5) Peppertree Quarry's operation to

- develop a new overburden area (South-west Overburden Emplacement – SWOE)
- extend the consent boundary to the south to encompass the SWOE
- construct a new haul road from the pit to the SWOE
- construct a new intersection at Marulan south road to link the new haul road with the SWOE
- amend the design of the Western Overburden Emplacement
- remove the Western Earth Bund (which has not been constructed) and
- Relocate a power line which runs through the proposed SWOE site.

An application was submitted to the Department of Planning and Environment late in 2018.

4 QUARRY OPERATIONS

4.1 OPERATIONS LAST 12 MONTHS

The pit has continued to develop in a south-eastern direction with a further overburden campaign undertaken during 2018, with the overburden being emplaced in 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 in 2018.

Drainage works were undertaken prior to the emplacements being established with most of the major sediment dams being completed on 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.

4.2 OPERATIONS NEXT 12 MONTHS

Over the next 12 months, the pit will continue to move in a south easterly direction. The Southern overburden emplacement will reach completion, with rehabilitation commenced.

In 2019, 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 2019 but move in a more southward direction.

The western overburden emplacement will reach completion, with rehabilitation commenced.

Final Determination of Modification (5) will be made by the Department of Planning and Environment. If approved pre construction works for the new emplacement will be commenced.

4.3 PRODUCTION, SALES AND TRANSPORT LAST 12 MONTHS

During the reporting period, the Quarry produced 2,252,925 tonnes of aggregate, which is in line with 2,269,559 tonnes on 2017 production (refer to Figure 2).

The DRE Production results Form for the Financial Year ending 2018 is contained in Appendix 1.

Project Approval Condition 7 (Schedule 2) requires all products to be transported from Peppertree by rail with a capped tonnage of 3.5 million tonnes per annum. For the 2018 calendar year 2,673,445 tonnes of product was transported by rail to Boral terminals at Maldon, Enfield and St Peters. This is both Peppertree product and approximately 420,000 tonnes of Limestone sand.

Road transportation may be allowed on request to Department of Planning and Environment. During the reporting period, Boral made 4 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.

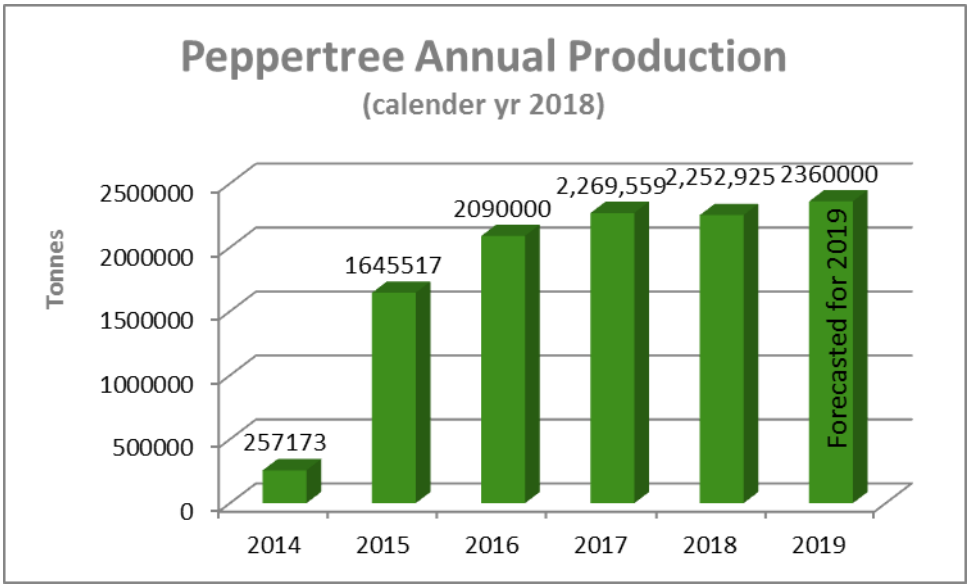
Table 6: Approval Requests for Road Transport

Date	Group	Material	Trucks	Complete
February 2018	Aglime	Overburden	6	not required
April 2018	Neighbours	scalps	100 over 12 months	50
April 2018	Soil conservation service - Woodward creek erosion works	rock	30	complete
June 2018	David Sali	scalps	10	complete
November 2017	Boral employee	crusher dust	20 trucks	completed in 2018

4.4 PRODUCTION, SALES AND TRANSPORT NEXT 12 MONTHS

Predictions for the next few years are that economic growth will continue in NSW and the anticipated production for 2019 is of a slight increase to 2.36 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



For 2019, 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.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Table 7 lists specific actions from the 2017 AR to have been undertaken during the 2018 reporting period.

Table 7: Actions Required from 2017 AR

Proposed Activities in 2018	Requested by	Status	Where Discussed
Review best options for a permanent solution for dust extraction at the crusher	Operator	Trials have been conducted with a mobile dust extraction unit Based on the results; a tender has been released for the installation of a baghouse related dust extraction system. Tenderer discussions have taken place, with the aim for construction and installation during 2019 and 2020	Section 12 Table 28
Undertake progressive Overburden stabilization and rehabilitation (as per Biodiversity and rehabilitation management plan 3 year plan)	Operator	Hydro mulching and planting has been undertaken on completed slopes of the eastern and southern overburden.	Section 8
Update Oil storage systems	Operator	A new oil storage system was installed in early 2018 including increasing the recycled oil tank from 5000L to 20 000L	Section 6.6
Establish site water balance	Operator	Site water balance in place. Use of water monitored regularly to understand limits during recent drought conditions	Section 7
Heritage & overburden campaign – construct additional sediment ponds at Southern Overburden emplacement	Operator	Sediment ponds constructed as per Modification 4. Heritage Works Salvage completed.	Section 6.9 and 7
undertake audit of the surface water management system at the Southern Overburden emplacement once system is installed	DP&E (Mod 4 approval condition)	System wasn't completed as of the end of 2018. Audit will be undertaken in 2019	Section 12 Table 28
Waste accountancy	Operator	Waste management contracts were reviewed during 2018 with some changes made to suppliers. A system is in place to receive advice on materials removed from site. Further work required to prepare a formal plan and program for minimization or recycling.	Section 6.6
undertake Voluntary Agreement actions	Dept of P&E	Voluntary Agreement actions have been implemented or are being progressed.	Section 6.4 Table 16

		Noise attenuation has been installed on identified primary equipment and a contract placed for the installation of a real time noise monitoring system.	
manage scar tree removal with AHMC	Operator	Inspections have been undertaken by 2 consultants specialized in scar tree identification and restoration, in consultation with the AHMC. Decision has been made to leave the trees in situ and fence.	Section 6.9
Artefact collation and review	Operator	this has not been progressed but is planned for 2019	Section 6.9
Implement Stakeholder Engagement plan for 2018 including assistance with Kite festival	Operator	Plan has been implemented with a number of activities undertaken during 2018	Section 9
Establish BioBank area	DP&E (Mod 4 approval condition)	A change to the establishment of a Biobank area was sort with a request to instead make the required payment to the Biodiversity Conservation Fund. This was approved and payment was made on the 25th October 2018.	Section 8
Pit expansion to the East	Operator	Pit continued expansion to the east with an overburden removal campaign commenced in August 2018	Section 4
undertake Independent audit	DP&E (Mod 4 approval condition)	Audit was undertaken 21st November 2018	Section 10
review of Ground water trigger levels	Operator	The Consultant Manidis Roberts RPS was requested to review groundwater results and associated trigger levels for a review of the Water Management Plan.	Section 7
Ongoing annual External review of weather data	Operator	Weatherzone dashboard in place for Peppertree operations and reviewed on a daily basis for forecasts	Section 6

A number of actions were identified in the update of the Management Plan following the approval of Modification 4. An update of the actions managed in 2018 is outlined in Tables 8 through to 12.

Table 8: 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	Artefacts have yet to be Returned to Country, but remain in storage. The aim is to return the artefacts by December 2020 after they have been collated.
PTQ-AHMP-32	An Aboriginal Heritage Report to be prepared	At end of salvage – May 2018	Collation work on the artefacts was not commenced during 2018. The report will be prepared once this work has been completed.
PTQ-AHMP-33	Submission of AHMIS card on completion of salvage works and associated review of current cards with OEH		Yet to be undertaken. Will be completed once collation works are done.

Table 9: 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 2018	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 2018	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	independent audit commissioned and conducted in November 2018

Table 10: 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 2018 and staff trained in	January 2018	weatherzone dashboard forecast in place, with forecasted possible noise at receivers. A contract for real time noise management system has been let for

	its use		installation and operation in 2019
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 2018 to determine future monitoring requirements	December 2018	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;	January 2018	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	independent audit commissioned and conducted in November 2018

Table 11: 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 2018	Review undertaken by Todoroski Air Sciences, identifying the need to relocate D1 to the boundary of the operations. Discussion required with the EPA and Dept of Planning and Environment.

Table 12: 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 2018	drafted and being implemented
PTQ-BRMP -02	establishment of benchmarks	November 2018	Cambium Group have prepared benchmark and monitoring plan.

			Completed
PTQ-BRMP -03	development monitoring program for all rehabilitation units	November 2018	Cambium Group have prepared benchmark and monitoring plan. Completed
PTQ-BRMP -04	management of serrated tussock	October 2018	as part of ongoing weed management plan
PTQ-BRMP -05	arrange fencing of bio bank area	October , November 2018	fencing not undertaken and no longer required due to the payment of funds to the Biodiversity Conservation Fund
PTQ-BRMP -06	arrange fencing of appropriate areas at southern overburden emplacement	October 2018	proposal obtained with fencing aimed for 2019
PTQ-BRMP -07	arrange fencing of appropriate areas at eastern overburden emplacement	December 2018	Rehabilitation areas were over planted with a view that fencing may not be required. However this has been revised and fencing is planned for 2019.

6 ENVIRONMENTAL PERFORMANCE

The Quarry has a comprehensive management and monitoring program that collects information and data for the assessment of environmental impacts, regulatory compliance and performance against continual improvement objectives. Management and 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.

Table 13 provides an overall summary of the environmental performance of the quarry across a number of parameters, with further details provided in the following sections.

Table 13: Summary of Environmental Performance

Aspect	performance during the reporting period	Trend / Key management implications	Implemented / proposed management actions
deposition gauges	complies with criteria at the neighboring residence	data over time is consistent with the EIS predictions, Modification 4 modeling and previous AR reporting	discuss with EPA and DPE relocation of the gauges or the continued extrapolation of data to the nearest residence
PM10 HVAS	complies with criteria at the neighboring residence	data over time is consistent with the EIS predictions, Modification 4 modeling and previous AR reporting	discuss with EPA and DPE relocation of the gauges or the continued extrapolation of data to the nearest residence
TSP HVAS	complies with criteria at the neighboring residence	data over time is consistent with the EIS predictions, Modification 4 modeling and previous AR reporting	discuss with EPA and DPE relocation of the gauges or the continued extrapolation of data to the nearest residence
Noise	complies with criteria at the sensitive receivers	data over time is consistent with the EIS predictions, Modification 4 modeling and previous AR reporting	real time noise monitoring to be implemented to allow for management of potential noise impacts review of best practice to be undertaken and included in the

			review of the NBMP
Blast - vibration	complies with criteria at the nominated receivers	data over time is consistent with the EIS predictions, Modification 4 modeling and previous AR reporting	continue to operate as per NBMP and Blast Management procedures
Blast – over pressure	complies with criteria at the nominated receivers	data over time is consistent with the EIS predictions, Modification 4 modeling and previous AR reporting	continue to operate as per NBMP and Blast Management procedures
Waste	review of waste management undertaken with new suppliers in place	waste minimization, recycling and tracking not actively progressed.	prepare waste management plan and establish improved tracking system
dangerous goods & Hazardous materials	complies with relevant requirements with systems in place		continue to maintain systems
bush fire management	complies with relevant requirements with systems in place		continue to maintain systems and review bush fire management plan
Heritage conservation	complies with AHMP requirements with unidentified finds and the completion of salvage works	continue to work with AMC representatives	undertake collation of the artefacts and plan to "return to Country"

6.1 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.

6.2 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 are within operational compliance.

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

6.3 Air Quality

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

6.3.1 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. All gauges are located on Boral owned land (refer Appendix 2).

The dust deposition gauges were sampled monthly (+/- 2 days) during the reporting with results comprising of the insoluble (mineralogical) matter and ash residue (organic).

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.

As all deposition gauges are located on Boral owned land, a review of the monitoring data and gauge location was conducted by Todoroski Air Sciences. Monitoring data was extrapolated to the neighboring residences (in line with Condition 17 Schedule 3) with no exceedances above the criteria. Refer Appendix 2 for results. It was also recommended that at least 2 of the gauges be relocated.

A discussion with the EPA and DPE will be undertaken as to the relocation or continued extrapolation of the data.

The monthly results and annual averages during the reporting period from the three dust deposition gauges (D1, D2 and D3) are in Appendix 2.

6.3.1.1 Deposited Dust – Performance Review (2018)

Site D2 and Site D3, for the majority of the 2018 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, associated with D3, 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.

Site D1 has been above the criteria on several occasions when measured at the gauge itself, however on occasions Ash levels have been comparatively low indicating a presence of organics in this gauge.

6.3.1.2 Long Term Trend Analysis and assessment (2014 – 2018)

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, 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.

6.3.1.3 Deposited Dust Summary and opportunities for improvements

As the dust gauges are situated on Boral owned land and not at the Boundary, monthly extrapolation of the data will continue to ensure compliance. A discussion will be had with the EPA and DP&E in 2019 as to either the relocation of the gauges or the continued modelling of the data to the nearest receiver.

6.3.2 PM10 and TSP

The two HVAS are on Boral owned land, paired together (refer appendix 2) 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 14 at any neighboring residence or privately owned land.

Table 14: 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

It has been identified that the HVAS are not located at the boundary of the Peppertree Quarry and therefore data obtained from these samplers needs to be extrapolated to determine compliance at the nearest receiver.

A report has been prepared by Todoroski Air Sciences on the location of the HVAS's and a review of the results extrapolated to the receivers. Details of the extrapolated data are included in Appendix 2.

6.3.2.1 TSP and PM10 – Performance Review (2018)

Graphical results for the annual average of TSP and PM_{10} for the 2018 reporting period are contained in Appendix 2. Both were within the Project Approval criteria of 90 µg/m^3 and 30 µg/m^3 respectively.

On 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 at the HVAS location.

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. When extrapolated to the boundary the results were below the criteria.

Problems were experienced with the consistent operation at the PM10 sampler at the end of 2017 with some improvement following maintenance of the machine. A new PM10 HVAS has been ordered with delivery planned for early 2019.

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

6.3.2.2 Long Term Trend Analysis and assessment – TSP and PM10

The TSP monitoring results have all been under the average annual criteria of 90ug/m3.

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, 2017 and again for 5 times during 2018. However when extrapolated all are below criteria.

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 with the predicted maximum 24 hour PM10 concentration at the residential receivers.

6.3.2.3 PM10, TSP Summary and opportunities for improvements

As the HVAS are situated on Boral owned land and not at the Boundary, monthly extrapolation of the data will continue to ensure compliance. A discussion will be had with the EPA and DP&E in 2019 as to either the relocation of the HVAS or the continued modelling of the data to the nearest receiver.

6.4 NOISE

The Noise and Blast Management Plan (NBMP) provides the framework and guidance for the Quarry activities to be conducted in a manner such 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 Appendix 3.

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

Usual quarterly monitoring in October was delayed till December as additional investigations into source noise were being conducted as part of the Voluntary Undertaking with the DPE.

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 3 shows the receiver locations required to be monitored.

Table 15 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 15: 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

Progress has continued on the implementation of agreed items on the Voluntary Undertaking with the DP&E to investigate ways to minimize the noise. Table 16 outlines the status of the commitments.

Table 16 Voluntary Undertaking Status

Commitment	Status
Undertake noise monitoring / modelling to determine the source(s) of the noise	Completed with a report issued to DPE May 2018
Investigate real time monitoring and forecast periods of possible exceedances associated with the project's operations to allow for modifying operations as necessary	Trial of real time monitoring system undertaken. Contract has been let to install a system in early 2019
Review the onsite weather station to ensure monitoring in accordance with the requirements specified in Appendix 7 of the approval,	Weather station has been reviewed by Todoroski Air Sciences and Wilkinson Murray. Monitoring by the Weather Station is in line with the requirements of Appendix 7 of the Approval.
.Investigate any additional noise mitigation measures	Additional noise mitigation measures were investigated and acoustic matting applied to the hopper and belting covers on the crusher.
Review and update the noise and blast management plan, as necessary and ensure up to date approval by the Secretary	The NBMP will be updated by the end of April 2019 in line with the Independent Audit review requirements
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,	completed on time
.Send a copy of this Undertaking, signed and dated by email to Georgia Dragicevic	completed on time

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.

6.4.1 Noise Management Performance Review

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) is provided in Appendix 3.

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.

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 is also provided in Appendix 3. 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.

Furthermore 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.

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

6.4.2 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.

Graphical representations of the noise monitoring results (estimated Quarry LAeq [15 minute and 1 min) contribution sourced from the quarterly monitoring reports) are contained in Appendix 3. The monitoring results have remained generally consistently below criteria since the commencement of operations at all locations.

Noise modelling for both the 2007 EA and the latest Modification 4 indicated 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 for the majority of the time and therefore is in line with the predicted models.

6.4.3 Noise summary and opportunities for improvement

Progress will continue with the implementation of a real time noise monitoring system to allow pit operations to be managed under temperature inversion conditions to reduce potential noise impacts on receivers.

A review of best practice for noise management in the quarry industry will be undertaken and an assessment made as to whether any additional works are required to be implemented.

The NBMP will be updated to capture the changes in noise management at the Quarry.

6.5 BLASTING

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

Monitoring of overpressure and ground vibrations at four nominated sensitive receptors is conducted during every blast (refer Appendix 4 for locations).

As part of every blast air, overpressure and ground vibration is monitored for compliance 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 17 and 18 respectively at any residence on privately-owned land.

Table 17: 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 18: 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%

6.5.1 Blast Management Performance Review

Blast monitoring results for over pressure and ground vibration during the reporting period are presented in Appendix 4. The maximum measurements for over pressure and ground vibration were 114.9 (22/3/18 – B5) and 4.1 mm/sec (16/2/18 – B2) respectively.

The Quarry conducted 44 blasts during the reporting period, all of which complied with Project Approval criteria.

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).

6.5.2 Long Term Trend Analysis and Assessment

Graphical representations of the blast monitoring results since the commencement of operations are presented in Appendix 4.

For both parameters, 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 AR reporting period in 2014, the Quarry has conducted 227 blasts.
All blasts were compliant with Airblast Overpressure and Ground Vibration blasting criteria as predicted in the EA and latest Modification 4.

6.6 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 19 outlines the identified waste streams and associated management.

Oily water waste and oil waste have been dealt with via an oil separator and oil collection tank which is emptied by a contractor for recycling. This system was reviewed and upgraded in 2018.

A waste management and minimization procedure will be prepared during 2019 to capture the processes in place at the quarry.

Table 19: 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
Aluminum 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
Oily water and waste oil	Vehicle maintenance	liquid waste	collected at workshop and recycled by contractor
Tyres	Vehicle maintenance	Solid general waste	recycled

6.7 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 refueling locomotives. The WorkCover Notification (NDG200221) is on behalf of an on-site contractor who operates and maintains the refueling facility. The Contractor's operation and management of the facility is audited on a regular basis for compliance.

6.8 Bush Fire Management

Schedule 3, condition 45 requires that the quarry to :

(a) ensure that the project is suitably equipped to respond to any fires on-site; and
(b) assist the rural fire service and emergency services as much as possible if there is a fire on-site.

Peppertree quarry has in place an extensive fire management system which is audited by independent experts on a quarterly basis.

Emergency response plans also contain details for bush fire management and responses.

6.9 HERITAGE CONSERVATION

The Aboriginal Heritage Management Plan (AHMP) updated in 2017 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.

The majority of Salvage works were completed in December 2017. The remainder of the identified area for salvage was undertaken over January, February and early March 2018.

In discussion with the AMC, the artefacts will be "returned to country" unless determined and agreed otherwise. This is planned for late 2020 after cataloguing and assessment of the artifacts are undertaken through 2019 and early 2020.

A scar tree /s were identified as part of a review of the site, prior to works commencing for the development of the southern overburden emplacement.

The process outlined in the AEMP for unidentified finds was enacted and the AMC representatives invited to site to view the trees. A request was made by the AMC that if the trees were required to be removed that they be relocated in their entirety.

Andrew Long from Andrew Long and Associates was commissioned to confirm that all 3 trees were scar tree.

Andrew Thorne was commissioned to provide advice on the relocation and preservation of the trees.

Both consultants visited site and met with the AMC representatives.

Following further discussion and advice, it was determined to leave the trees insitu.

7 WATER MANAGEMENT

Surface and groundwater is managed in accordance with a Water Management Plan (WMP), approved by the DP&E in July 2017.

Table 20 provides an overall summary of the environmental performance of the quarry in regards to water management, with further details provided in the following sections.

Table 20: Summary of Environmental Performance – Water Management

Aspect	performance during the reporting period	Trend / Key management implications	Implemented / proposed management actions
surface water quality	no results were over the trigger levels for 3 consecutive samples requiring detailed investigation	data over time is consistent with the EIS predictions, Modification 4 modeling and previous AR reporting	continue management and monitoring

Environmental flow	complies with criteria	data over time is consistent with the EIS predictions, Modification 4 modeling and previous AR reporting	continue management and monitoring
groundwater standing level	complies with criteria	data over time is consistent with the EIS predictions, Modification 4 modeling and previous AR reporting	continue management and monitoring
groundwater quality	Results are consistent with trends and show no marked variations in water quality nor any impacts associated from quarry operations	data over time has been consistent within each groundwater well.	review trigger levels and undertake assessment of groundwater quality on the environment

The Quarry experienced drought conditions during 2018 with limited water entering the Main Dam from either rainfall or runoff.

Drought response planning was put into place and included the assessment of …

- the use of the licensed groundwater well
- road delivery of potable water
- use of chemical additives for road dust suppression
- pumping of water from other local water supplies and
- rail delivery of potable water.

The groundwater well facilities such as the pump were repaired so this could be used if necessary. However, for a number of weeks, road delivery of water to internal dams was undertaken to ensure a supply for operations. This was ceased after rainfall in November 2018.

7.1 Surface Water

Surface water management at the Quarry is conducted in accordance with a Water Management Plan (WMP) that was revised and approved in 2017.

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 5 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 21.

Table 21: 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 22 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 22 are adopted as benchmark goals rather than a performance or compliance criteria.

Table 22: Water Quality Trigger Values

Indicator	ANZECC Default Trigger for Ecosystem Protection[1]	WaterNSW Benchmarks for Catchment Streams	Proposed 'Triggers'
pH	6.5 – 7.5	6.5 – 8.0	6.5 – 8.5
EC (µS/cm)	30 – 350		<1.200
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.

7.1.1 Surface Water Monitoring Results

The quarterly surface water quality monitoring data is presented in Appendix 5. Due to the ephemeral nature of Tangarang Creek, the upstream monitoring point only experienced one flow during the reporting period.

7.1.2 Surface Water Management Performance Review

The quarry surface water quality trends are generally consistent over the 2018 period with historic trends (refer Appendix 5)

The results for pH were substantially in the range of trigger levels (i.e. pH 6.5 to 8.5)

Fluctuations in Total Dissolved Solids (TDS) during the reporting period were generally in accordance with the ADWG guideline value of 500 mg/L. ANZECC (2000), with the exception of the Marulan South Creek samples. This Creek is not influenced by Quarry operations.

Turbidity levels were consistent over the 4 sampling periods in 2018 being well below the ANZECC guideline for both the dam and T1, with the exception of the Dam sample in November. This is likely due to rain fall.

Total Nitrogen and Phosphorous are indicators of nutrient levels in water systems and results are depicted in Appendix 5.

Dam levels for Total Nitrogen reflected rain events and fluctuated over the reporting period while Marulan South Creek was consistently above the Trigger level.

T1 remained consistently low and below the Trigger.

Total Phosphorus remained low and below trigger levels at T1, with Marulan South Creek and the dam levels following a similar pattern of being higher than usual before dropping below the trigger level and rising again in the last quarter.

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

No results were over trigger levels for 3 consecutive samples requiring a detailed investigation.

7.1.3 Long Term Trend Analysis and Assessment

Long term trend analysis has been undertaken on pH, TDS, Turbidity, total Phosphorus and total nitrogen with the results presented in Appendix 5.

pH is consistently between the range of 6.5 to 8.5, with some higher than usual levels occurring in the dam and Marulan south creek in rain or low flow events. Levels at T1 downstream have remained within the trigger levels.

Long term TDS levels at the dam and T1 sites have remained below the ADWG guidelines since rain events in 2013.

For the majority of time, Turbidity in both the dam and T1 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 fluctuate over time at all sampling sites. For most of the time, levels were below the trigger criteria for all sites. Levels did increase in the Dam and Marulan south creek at the end of 2018 which may be attributed to outside activities associated with local farming practices.

Total Nitrogen levels have fluctuated over time. T1 has been below trigger levels since 2014.

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.

7.1.4 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. The monthly averages of inflow and outflow

volumes in comparison to the required 10% of environmental flow requirement are presented in Table 23. The environmental flows exceeded the 10% requirement every month, with the exception of 2 (February and March 2018) throughout the reporting period. It is believed that the data collected at the outflow is incorrect due to the ponding of water downstream of the meter causing back flow. The area was cleared with improved flow readings for the following months.

Overall for 2018 the quarry complied with the 10% environmental flow requirement.

Table 23: Environmental Flow Data (2018)

Month (2018)	Inflow (Megalitres)	Outflow Requirement (10%)	Outflow (Megalitres)	Compliance
January	0	0	3	Yes
February	30.9	3.09	0.12*	No
March	24.2	2.42	0.12*	No
April	0.9	0.09	1.86	Yes
May	0.6	0.06	1.97	Yes
June	0	0	2.05	Yes
July	0	0	2.03	Yes
August	0	0	2.26	Yes
September	0	0	2.08	Yes
October	0	0	1.84	Yes
November	0	0	1.61	Yes
December	38.4	3.84	3.43	yes
Total	95	9.5	22.37	yes
*data may not be correct due to back ponding of pond above the meter, causing a lack of flow through the meter.				

7.1.5 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 quarterly monitoring at all sites.

7.2 GROUNDWATER

The Quarry WMP includes a groundwater monitoring program conducted quarterly of five shallow and seven deep piezometers ranging from between 15 m to 100 m in depth (refer to Appendix 5). 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 24 and Table 25.

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 24: 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 25: 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

The groundwater field sampling parameters, standing water levels and the Laboratory analytical results from the quarterly groundwater sampling completed during the reporting period are presented in Appendix 5.

7.2.1 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 thirteen sampling events had therefore been completed. Groundwater results and trends presented in Appendix 5 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.

pH trends have remained relatively stable in each piezometer for 2018. 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.

Field measured Electrical Conductivity (EC) during the reporting period ranged from 927 to 4977 uS/cm, indicative of fresh to brackish water quality. EC trends are relatively stable and consistent between each of the piezometers with several piezometers showing a decrease in the EC levels from July possibly due to weather conditions over the year.

Dissolved oxygen (DO) trends showed a high degree of variability in individual and between respective piezometers throughout the reporting period.

Standing water levels remained relatively 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.

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. On a limited number of occasions, Oil and grease was detected in bores outside of the pit area.

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 is minor, and is likely due to the poorly developed nature of the bores and the limited dataset utilised for development of the trigger levels.

7.2.2 Long term trend and assessment

pH trends have remained relatively stable in each piezometer 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.

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. Most significantly a drop in EC was identified in 6 of the bores in July 2018.

A rapid decrease in Dissolved Oxygen (DO) trends occurred from the development of the piezometers in 2015 through to 2016. Spikes in DO have occurred in several of the piezometers during 2017 and 2018 and are likely to have been influenced by recharge rain events.

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.

Key findings from the analytical results were:

- Concentrations of nutrients (total nitrogen and total phosphorous) exceeded the trigger values in most of the piezometers, 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.

7.2.3 Ground water summary and opportunities for improvement

A review of the data over the 13 sampling rounds has shown results above trigger values.

A review of these results show that they 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 2019, This will allow 14 rounds of data to be statistically assessed for the revision of the site specific triggers.

8 REHABILITATION

During the 2018 AR period, a total of 134.02 ha of Quarry land remains disturbed. This was an increase of 18.34 ha with the ongoing development of the southern and western overburden emplacements and the expansion of the pit footprint.

Table 26 presents the total estimated areas of disturbance and rehabilitation.

Table 26: Areas of Disturbance and rehabilitation

Area Reference	Total Disturbed Area (ha)	Total rehabilitated Area (ha)	Disturbed Area during 2018 (ha)	Rehabilitated Areas as of the end of 2018 (ha)
1: Infrastructure area – (Primary, STQ and TLO)	25	0 (Not applicable till end of life)	0	0
2: Quarry extraction area	46.5	0	6.22	0
3: eastern overburden emplacement	17.9	4.8	0	4.8
4: west pad	0.3	0	0	0
5: Overburden emplacement / Noise bund	12	12.1	0	0
6: Dam and creek rehabilitation area	10	10.3	0	0

7. heritage salvage	13.2	0	0	0
8. western overburden emplacement	4.6	0	0.3	0
9. southern overburden emplacement	11.52	2.8	5.62	2.8
Total area Disturbed / Rehabilitated as of the end of 2018	134.02	30	12.14	7.6

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.

Planting of the eastern overburden occurred in late 2018 along with the hydro mulching of 39 000m2 of overburden emplacement embankments.

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. An area for offset was identified however a change to the approval condition was requested to allow payment of funds to the Biodiversity Conservation Fund instead of the establishment of the BioBank.

This was approved and payment to the Fund was made on the 28th October 2018.

Cambium Group was commissioned at the end of 2017 to develop a Monitoring Program for the rehabilitation sites so that assessment towards completion can be made on an annual basis and rehabilitation plantings modified as necessary. Initial monitoring through a Rapid Visual Assessment was undertaken in March 2018. A further annual Rapid Visual Assessment was prepared in December 2018. Both Assessments were conducted by independent consultant Lachlan Crawford of LAMAC Management. The Monitoring Program also requires a more detailed Ecological Assessment every 2 years. This assessment was planned to be conducted in 2018 but was delayed due to consultant's availability and will be undertaken January 2019. Independent consultants, Emergent Ecology have been commissioned to undertake the assessment.

Schedule 3, Condition 35 and 36 requires the payment and review of a Rehabilitation Bond following The Independent Audit every 3 years. The Audit was undertaken in November 2018 and the Bond will be reviewed in early 2019.

9 COMMUNITY

9.1 ENVIRONMENTAL COMPLAINTS MANAGEMENT

The Quarry maintains an environmental complaint 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 27.

As part of an ongoing noise assessment program managed during the reporting period, fifteen 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 6.4. for more detail).

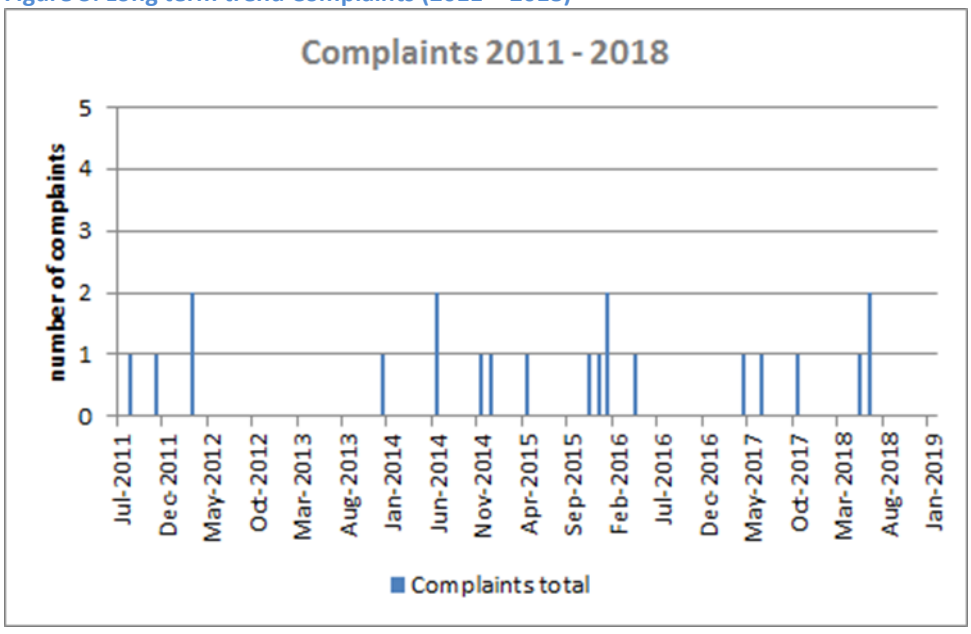
A real time noise monitoring system is to be implemented during 2019 to be able to manage noise impacts at this residence under temperature inversion conditions.

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 since the Quarry commenced production are presented in Figure 3 (2011- 2018).

Table 27: Complaints

Date - 2018	Nature of Concern	Outcome of investigation
31st May 2018	query as to whether we were blasting as the house just shook	No blasting had occurred at either Boral site, however other quarries in the area had blasted at this time
6th June 2018	query as to whether blasting was occurring as the house just shook	Blasting had occurred at around the time of the call. Blast was located higher in the pit than usual and associated with overburden rock. The wind was blowing in the direction of the residence. Air over pressure measured at the nearest monitor was 108.8 and vibration 1.15 both below criteria.
13th June 2018	train travelling through Bundanoon with white dust covering people at the station coming from the wagons under windy conditions	Train movements identified that a Marulan South train, and not Peppertree was travelling through Bundanoon at the time. It was noted that the train was treated with dust suppression products.

Figure 3: Long term trend Complaints (2011 – 2018)



9.2 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.

9.3 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 2018 calendar year - April and August. A meeting was convened for November 2018, however due to heavy rainfall on the day, and concerns for safety of our representatives having to drive in the wet conditions, the meeting was cancelled.

9.4 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.

9.5 COMMUNITY EVENTS

The Quarry staff is 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;
- Marulan Village Plan – Meeting and program support;
- Boral Youth Leadership program in partnership with Outward Bound; and
- CVA partnership with work at Marulan Public School,
- Marulan Railway Station 150th celebrations in partnership with the Marulan and District Historical Society
- Goulburn Mulwarre Council Community Bike ride as part of Bike week

9.6 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.

9.7 ACCESS TO INFORMATION

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

https://www.boral.com.au/locations/boral-marulan-south-operations

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

10 INDEPENDENT AUDIT

In accordance with Project Approval Condition 5 (Schedule 5) an Independent Audit was conducted in November 2018.

A copy of the final audit report and a response to any recommendations will be provided to the Department of Environment and Planning in early 2019.

The Next independent audit is planned for the end of 2021.

No formal audits were undertaken by government Agencies during 2018 however a number of site inspections were undertaken.

11 INCIDENTS & NON COMPLIANCES DURING THE REPORTING PERIOD

11.1 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 November 2018 and a copy can be accessed on the Boral website at: http://www.boral.com.au/Article/nsw_poela_environmental_reporting.asp

11.2 Summary of Regulatory Notifications

No notifications were provided to Department of Planning and Environment and EPA during the reporting period in regards to Peppertree Quarry operations.

12 Activities to be Completed in the Next Reporting Period

The activities proposed to be undertaken during the 2019 AR reporting period are presented in Table 28. The activities have been selected and prioritized 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 28: Proposed Activities in 2019 AR Period

Proposed Activities in 2019	Objectives
progress 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
review all management plans - NBMP, AQMP, BRMP, WMP, EMS	• Review in line approval condition in relation to Independent audit
review recommendations of the Rehabilitation Rapid Visual Assessments and Ecological Assessment and implement where practicable	• Move towards achieving biodiversity management plan goals of establishing vegetation corridors
Implement recommendations of the 2018 Independent audit	• Ensure compliance with Approval conditions
undertake audit of the surface water management system at the Southern Overburden emplacement once system is installed	• Surface water management
Discuss with DP&E and EPA relocation of dust monitoring devices or continued data extrapolation	• Show compliance in line with approval conditions
install and operate Real time noise monitoring alert system	• Minimisation of noise in the community • Voluntary undertaking commitment
Fence scar trees	• Preservation of Culture
Artefact collation and review	• Preservation of culture

Implement Stakeholder Engagement plan for 2019	• Ongoing community engagement
Pit expansion to the East	• Ongoing operations
review of Ground water trigger levels	• Management of groundwater
Document waste management procedures and formalize recycling strategies	• Identify opportunities for waste minimization practices

APPENDIX 1: ANNUAL RETURN FOR EXTRACTIVE MATERIALS – FINANCIAL YEAR 2018

Form S 4

Planning & Environment
Resources & Geoscience

RETURN FOR EXTRACTIVE MATERIALS YEAR ENDED 30 JUNE 2018

Quote RIMS ID in all correspondence

Quarry Id:	Rims ID: 400960	**Inquiries** please telephone: (02) 4063 6713
Operators Name:	BORAL RESOURCES (NSW) PTY LTD	
Address:	PO BOX 42 WENTWORTHVILLE NSW 2145	**Completed or Nil Returns** Email – mineral.royalty@planning.nsw.gov.au
Email:	ben.cummins@boral.com.au	Postal Address (see below)
Quarry Name: Quarry Address:	PEPPERTREE QUARRY MARULAN SOUTH RD	*Please amend name, postal address and location of mine or quarry if incorrect or incomplete*

2017-2018

The return should be completed and forwarded to the **MANAGER, ASSESSMENT COORDINATION, RESOURCE OPERATIONS, NSW DEPARTMENT OF PLANNING & ENVIRONMENT, PO BOX 344 HUNTER REGION MAIL CENTRE NSW 2310 on or before 30 November 2018.** 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 done during the year, a **NIL** return must be forwarded.

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

Director, Title Assessments

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

Typical Geology _____

Nearest Town to Quarry Marulan

Local Council Name Goulburn Mulwaree Council

Deposited Plan and Lot Number/s of Quarry _____

Email Address of Operator _____

Name of Owner or Licensee BORAL RESOURCES (NSW) PTY LTD

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 no blank spaces have been left where figures should have been inserted.
- **SIGNATURE of PROPRIETOR or MANAGER** Ben Cummins **DATE** 19/11/18
- **CONTACT PERSON for this return** Ben Cummins
- **NAME** (Block letters) Ben Cummins **Telephone** 02 9033 5419

SALES Product 2018 (2018)

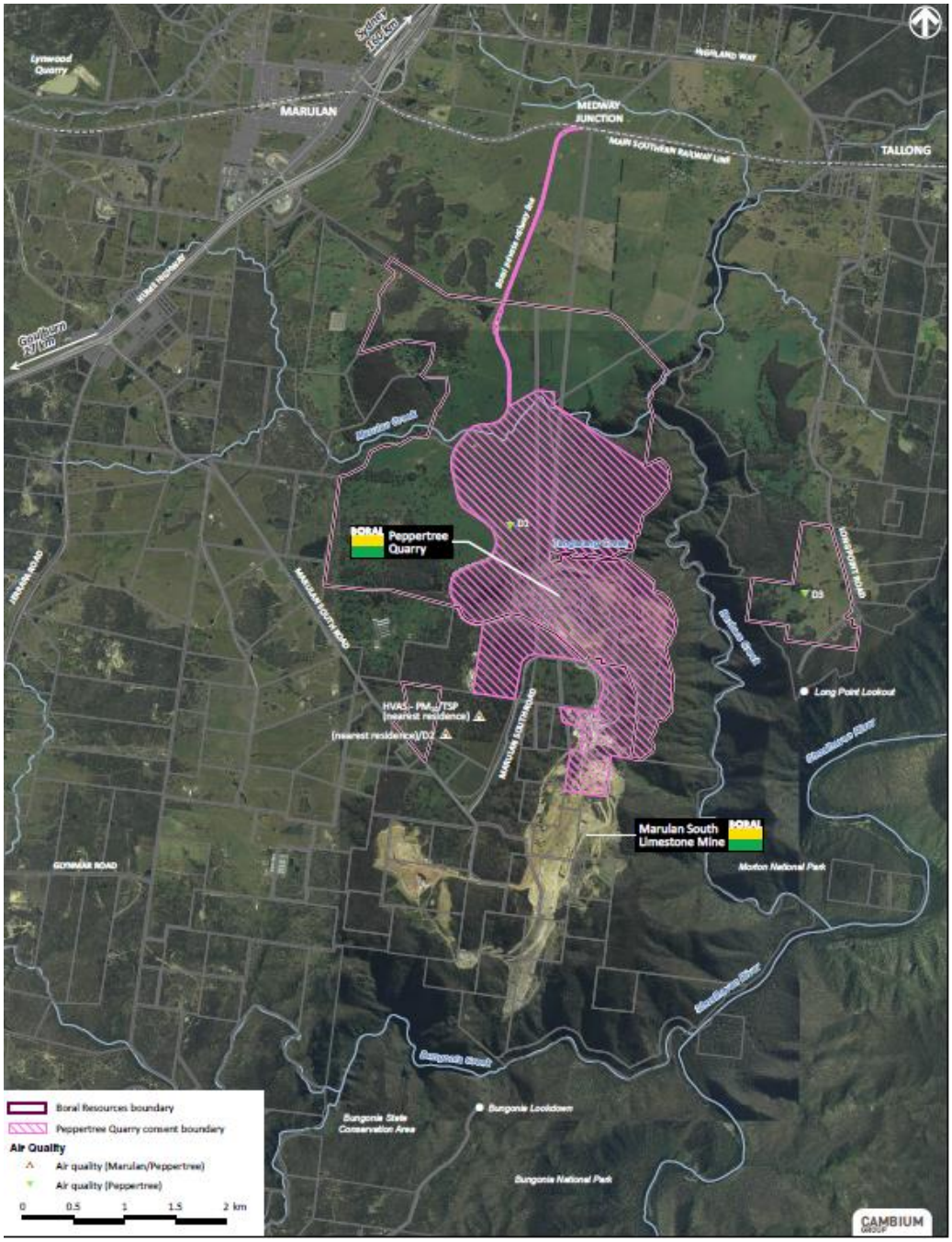
Production information may be published in aggregated form for statistical reporting. However, production data for individual operations is kept strictly confidential.

Product	Description	Quantity Tonnes
• Virgin Materials Crushed Coarse Aggregates		
Over 75mm		
Over 30mm to 75mm		
5mm to 30mm		1,250,148
Under 5mm		
Natural Sand		
Manufactured Sand		
Prepared Road Base & Sub Base		177,699
Other Unprocessed Materials		
• Recycled Materials Crushed Coarse Aggregates		
Over 75mm		
Over 30mm to 75mm		
5mm to 30mm		
Under 5mm		
Natural Sand		
Manufactured Sand		1,293,853
Prepared Road Base & Sub Base		
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 PRODUCTION	2,721,5700	
• Gross Value ($) of all Sales		
• Type of Material		
• Number of Full-Time Equivalent (FTE) Employees	Employees:	Contractors

Please Note: A return for clay based products can be obtained by contacting the inquiry number.

APPENDIX 2 AIR QUALITY MONITORING INFORMATION

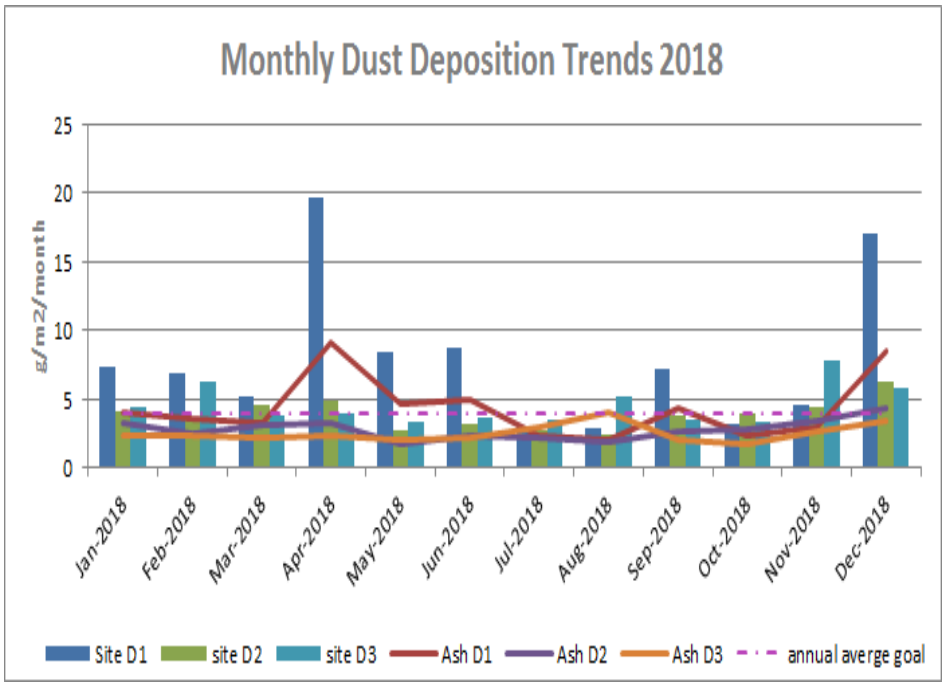
Air monitoring locations



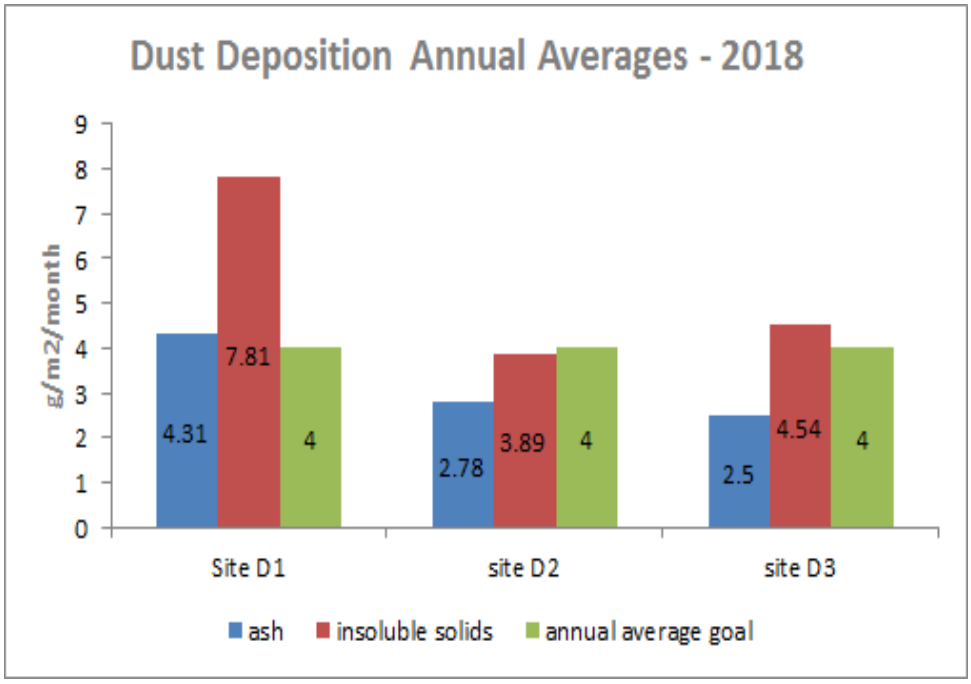
Dust Deposition Results

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	7.2	6.8	5.2	19.5	8.4	8.6	2.9	2.9	7.1	3.2	4.49	17.0	**7.81**
	Ash Content	4.0	3.5	3.2	9.0	4.5	4.9	2.3	2.0	4.3	2.3	2.8	8.4	**4.31**
D2	Insoluble Solids	4.0	3.52	4.5	4.8	2.7	3.2	2.7	2.4	3.8	3.9	4.4	6.2	**3.89**
	Ash Content	3.2	2.5	3.1	3.1	1.7	2.3	2.1	1.8	2.6	2.8	3.3	4.3	**2.78**
D3	Insoluble Solids	4.3	6.3	3.8	3.9	3.3	3.6	3.4	5.1	3.5	3.2	7.8	5.8	**4.52**
	Ash Content	2.3	2.3	2.1	2.2	1.9	2.2	2.9	4.0	1.9	1.7	2.5	3.4	**2.50**

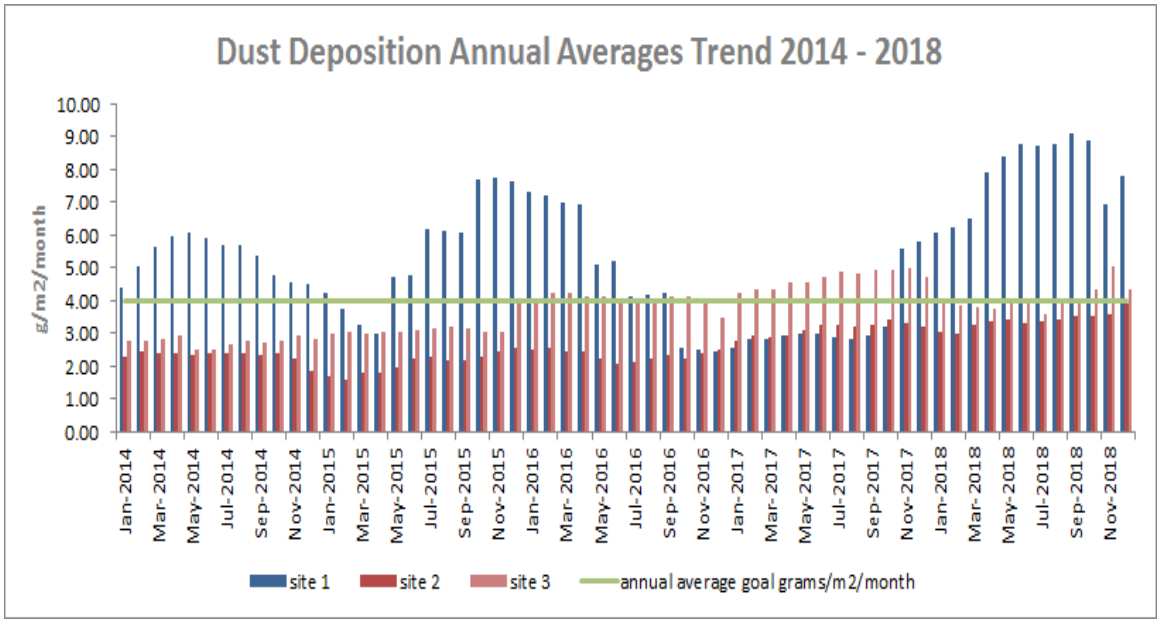
Monthly Dust Deposition Trends 2018



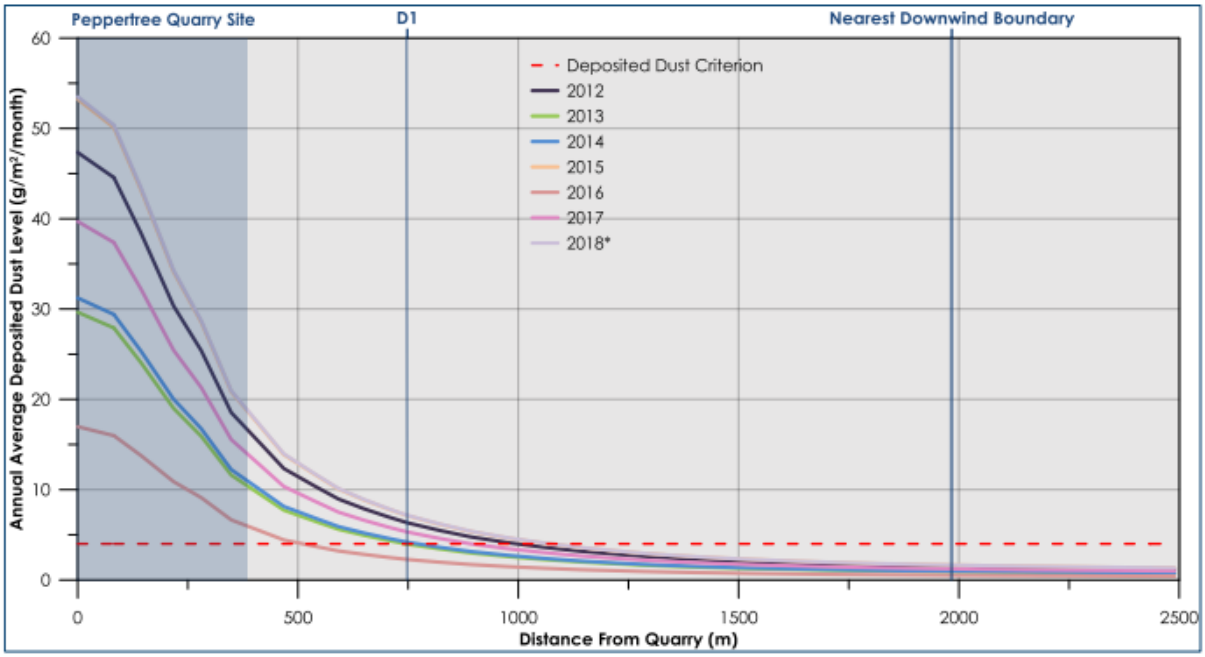
Dust Deposition Results – Annual Averages



Dust Deposition Results – Annual Averages trend 2014 - 2018

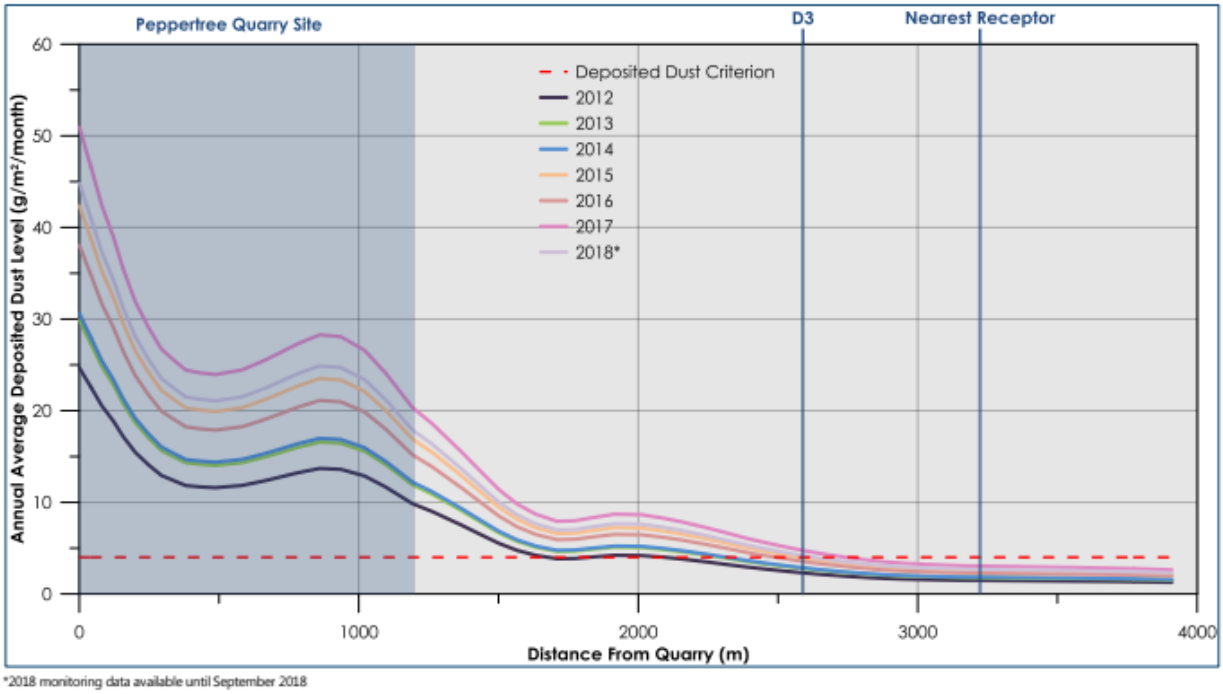


D1 – interpolated deposited dust levels - Todoroski Air Sciences review of Peppertree Quarry Deposited Dust Gauges – 2018 update



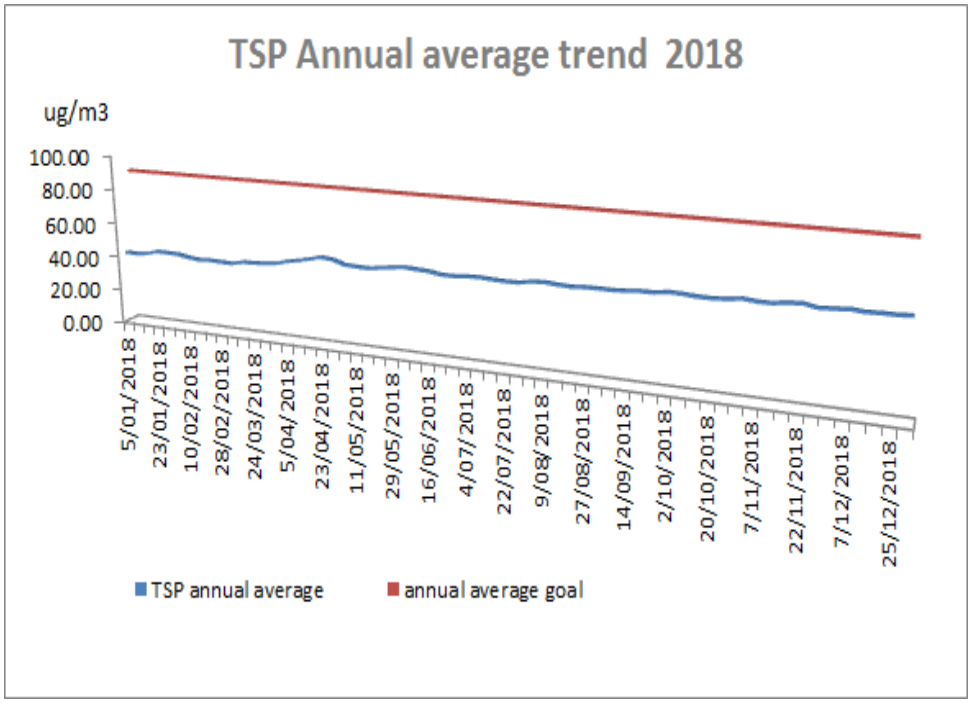
*2018 monitoring data available until September 2018

D3 - – interpolated deposited dust levels - Todoroski Air Sciences review of Peppertree Quarry Deposited Dust Gauges – 2018 update

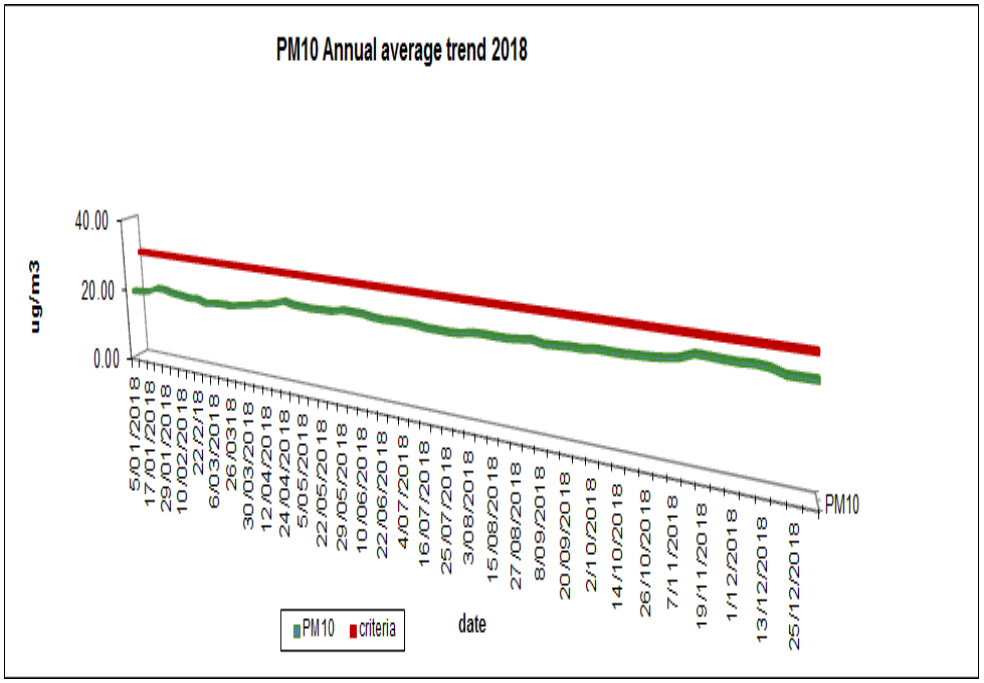


*2018 monitoring data available until September 2018

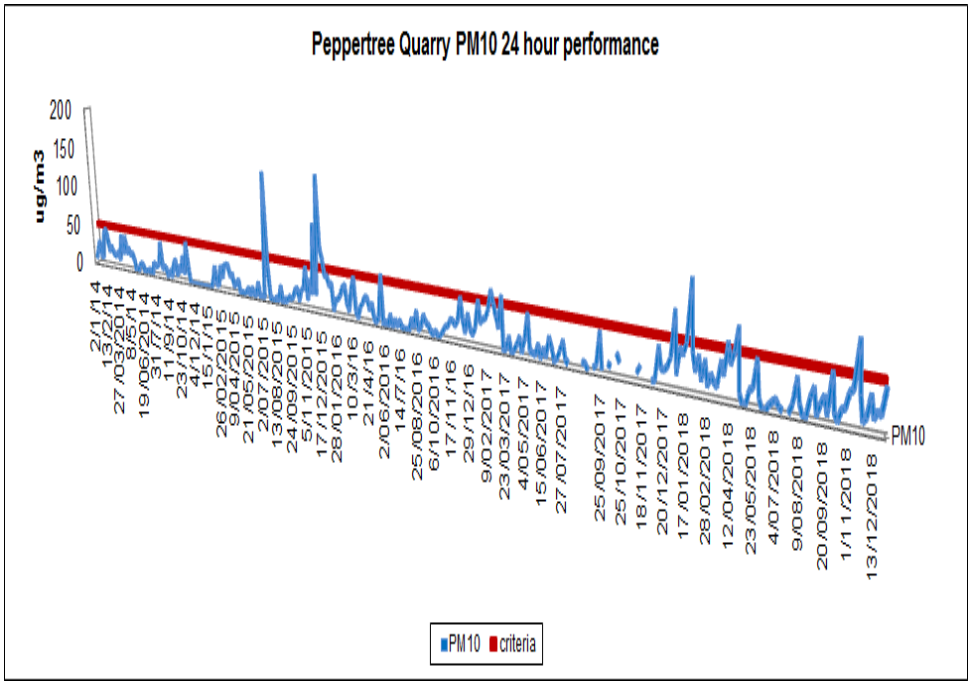
TSP - Annual Average results – 2018



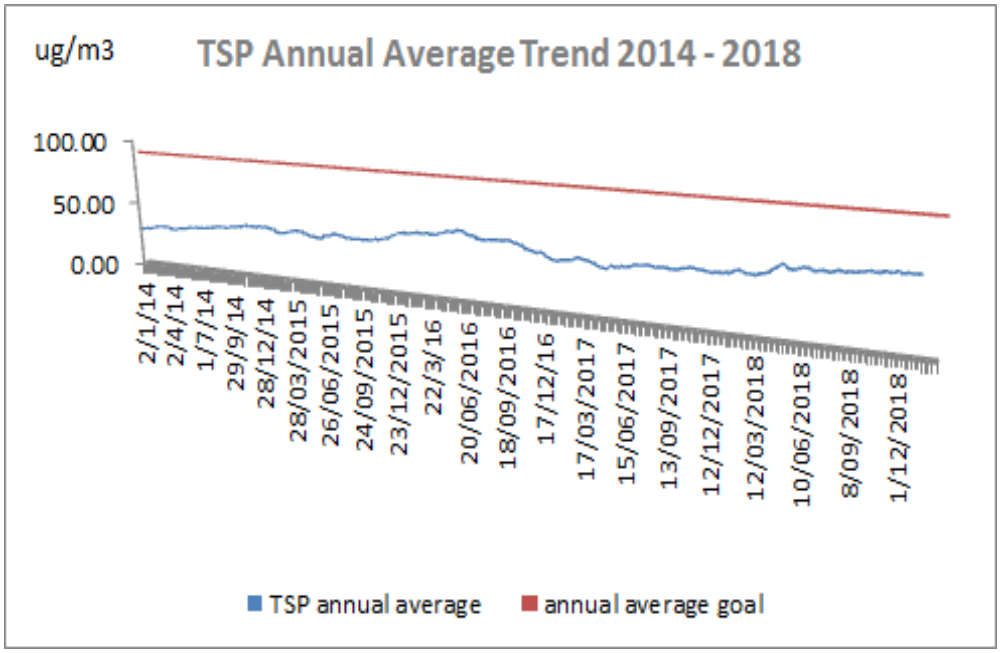
PM_{10} annual average results 2018



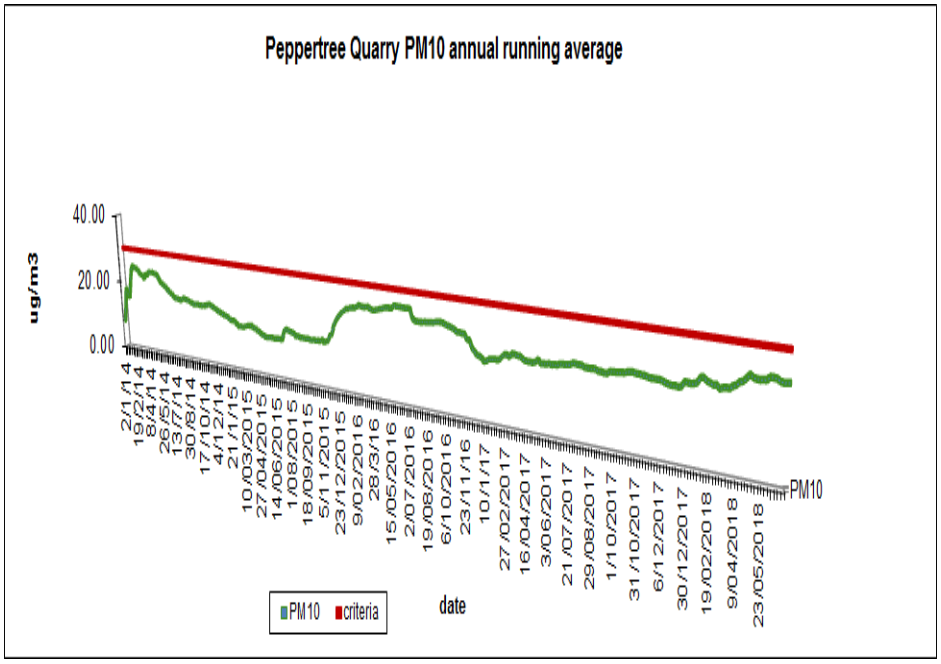
PM10 24 hour performance results – 2014 - 2018



Long Term TSP Trend – 2014 to 2018



Long Term PM10 Trend – 2014 to 2018

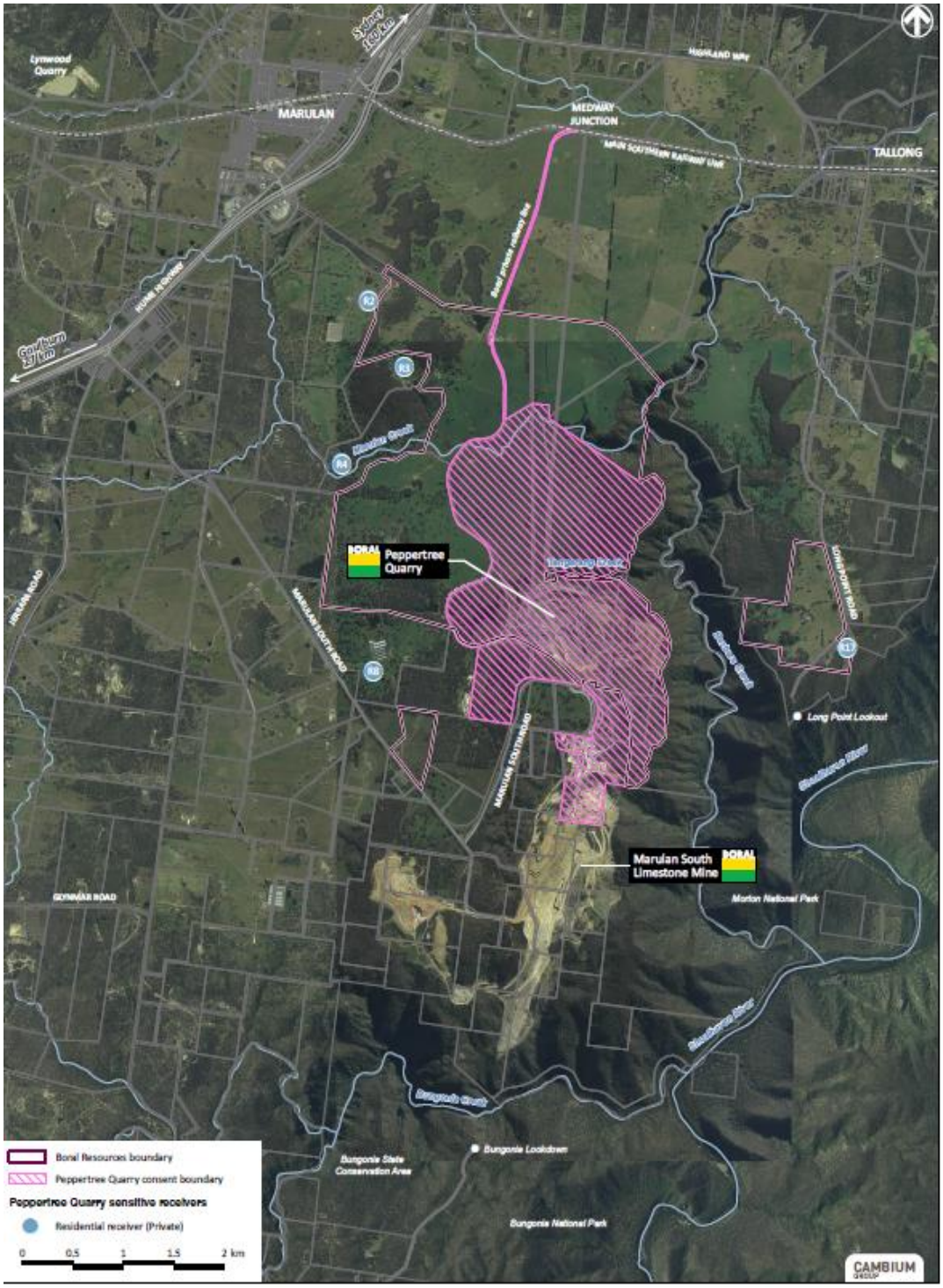


Estimated Dust Levels at receptor locations – Todoroski Air Sciences Peppertree HVAS Review 2017 & 2018

Date	Measured 24-hour average PM_{10} level (µg/m³)	Maximum possible extrapolated level at most impacted receptor location (µg/m³)	Percentage time HVAS downwind (Peppertree + Marulan) (%)	Estimated maximum Peppertree + Marulan contribution at receptor location (µg/m³)
16/1/2017	51.24	26.7	46	12.3
15/02/2017	64.66	33.7	67	22.6
21/02/2017	52.19	27.2	75	20.4
11/03/2017	61.15	31.8	67	21.3
28/12/2017	80.86	42.1	42	17.7
17/01/2018	51.02	26.6	92	24.5
23/01/2018	114.45	**59.6**	38	22.6
9/04/2018	59.28	30.9	29	9.0
17/04/2018	50.83	26.5	71	18.8
24/04/2018	76.31	39.7	58	23.0
2/10/2018	50.98	26.5	29	7.7
13/11/2018	86.01	44.8	33	14.8

APPENDIX 3 NOISE MONITORING

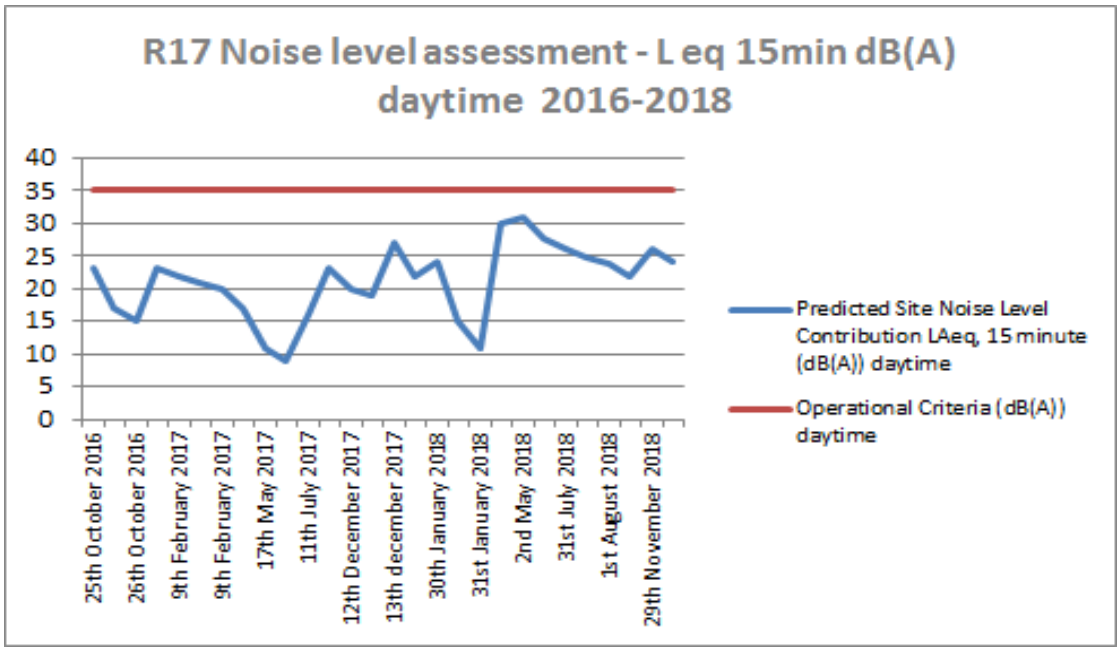
Residential receiver locations

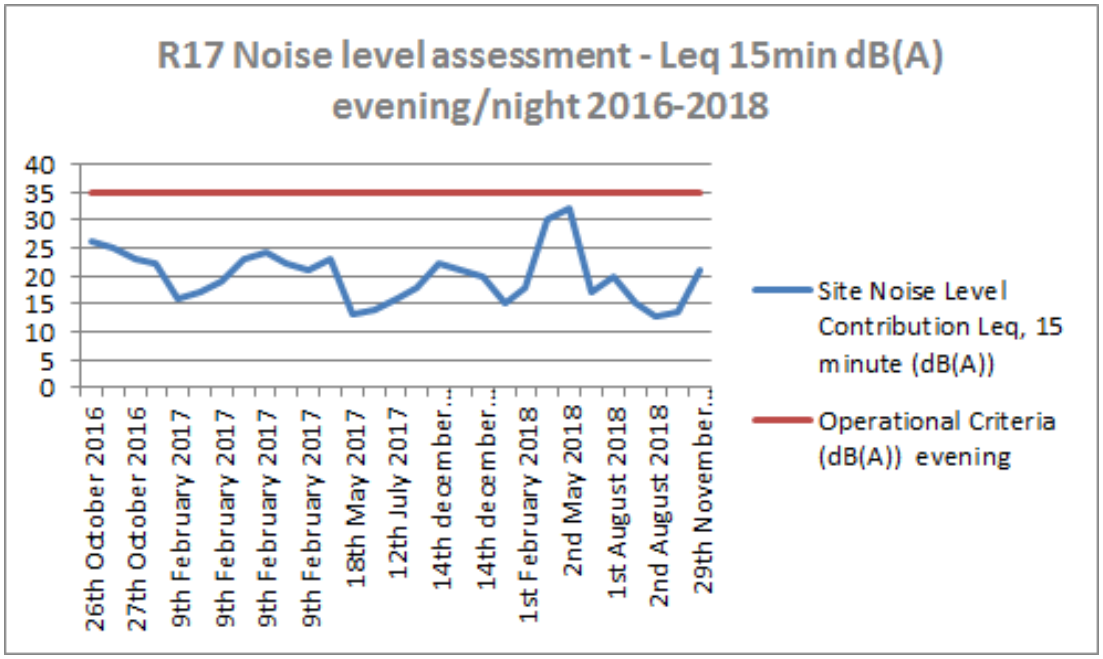


Noise Assessment Results (LAeq (15min))

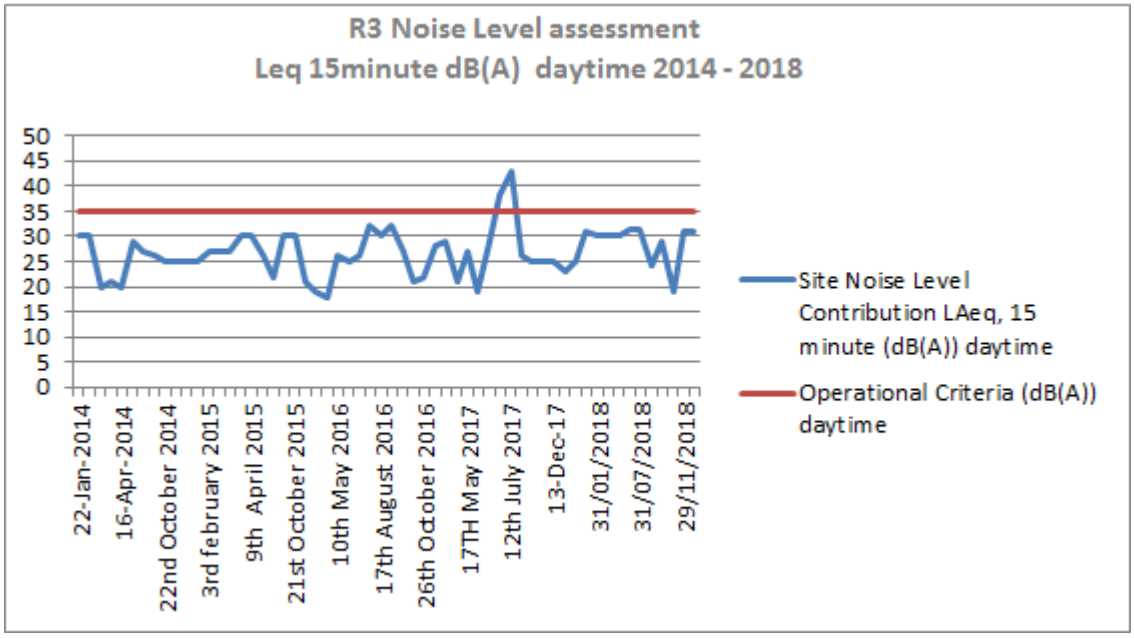
Residential Receiver	Assessment Dates (2017)	Noise Level Assessment (LAeq (15min))		
		Compliance Criteria	Measured Noise Levels dB(A)	Compliance with Criteria
Receiver R3	January	Day: 35 Evening/Night: 35	23/25/31/30 24/24	Yes Yes
	May	Day: 35 Evening/Night: 35	30/30 30/30	Yes Yes
	July/August	Day: 35 Evening/Night: 35	31/32/24/29 33/31/30/27/34/35	Yes Yes
	November	Day: 35 Evening/Night: 35	19/31/31 30	Yes Yes
Receiver R2	January	Day: 35 Evening/Night: 35	26/26/16/18 19/20	Yes Yes
	May	Day: 35 Evening/Night: 35	30/31 32/33	Yes Yes
	July/August	Day: 35 Evening/Night: 35	32/30/26/27 26/25	Yes Yes
	November	Day: 35 Evening/Night: 35	32/27/26 32	Yes Yes
Receiver R8	January	Day: 41 Evening/Night: 35	24/22/25/35 30/30	Yes Yes
	May	Day: 41 Evening/Night: 35	31/33 30/30	Yes Yes
	July/August	Day: 41 Evening/Night: 35	31/31/29/29 33/34/15/31/29/32/32	Yes Yes
	November	Day: 41 Evening/Night: 35	35/33/29 25	Yes Yes
Receiver 4	January	Day: 35 Evening/Night: 35	19/22/28/29 27/28	Yes Yes
	May	Day: 35 Evening/Night: 35	31/30 30/30	Yes Yes
	July/August	Day: 35 Evening/Night: 35	32/30/28/27 31/27/33/33	Yes Yes
	November	Day: 35 Evening/Night: 35	33/31/33 33	Yes Yes
Receiver 17	January	Day: 35 Evening/Night: 35	22/24/15/11 15/18	Yes Yes
	May	Day: 35 Evening/Night: 35	30/31 30/32	Yes Yes
	July/August	Day: 35 Evening/Night: 35	28/26/25/24 17/20/15/13/13	Yes Yes
	November	Day: 35 Evening/Night: 35	22/26/24 21	Yes Yes

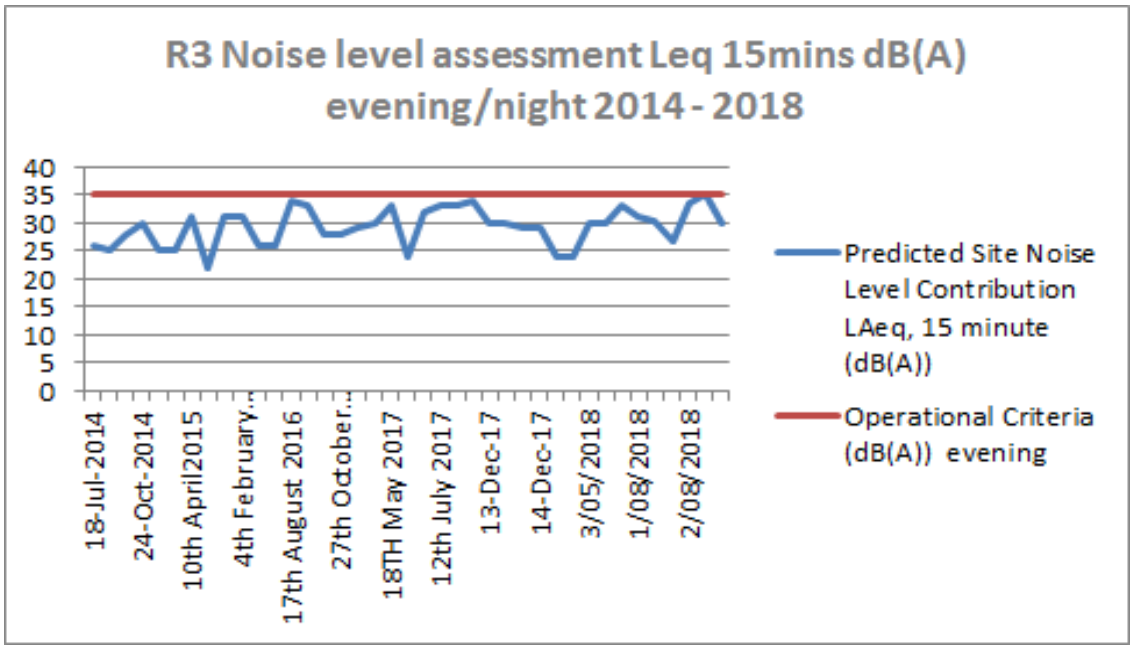
R 17 Off-Site Noise Level Trends (LAeq 15) 2016 – 2018



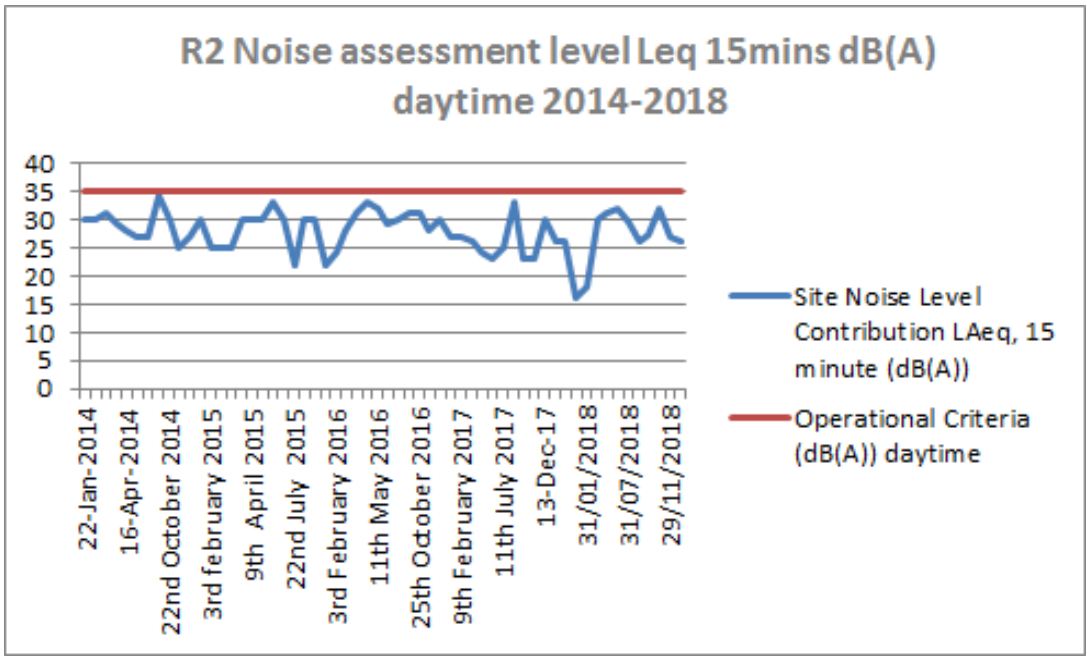


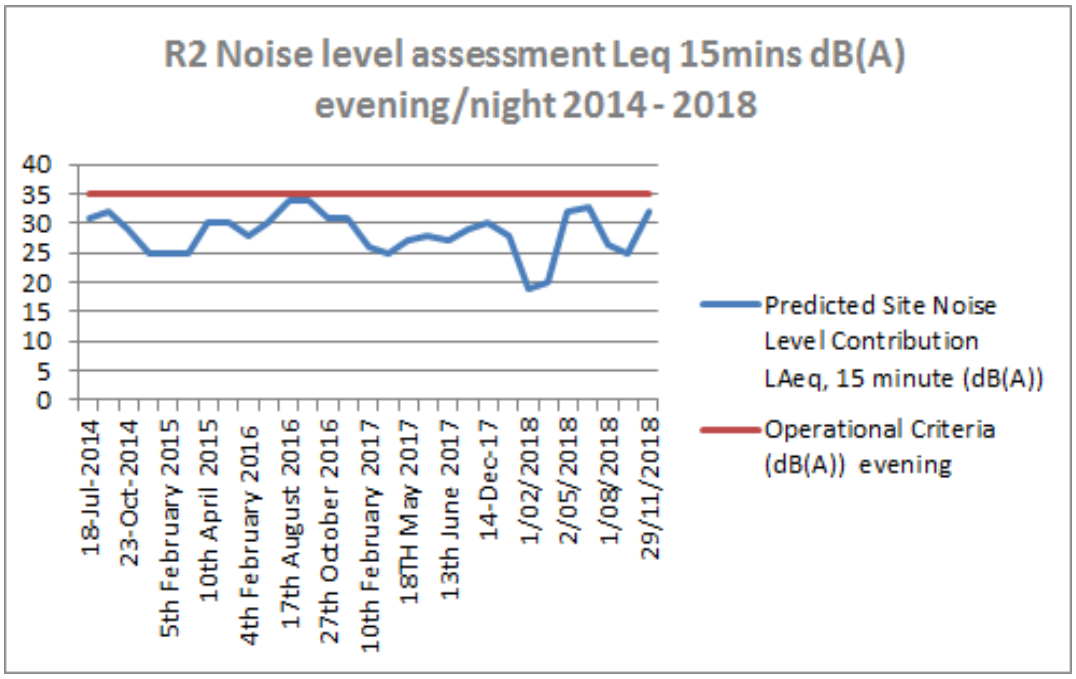
R 3 Off-Site Noise Level Trends (LAeq 15) 2014 – 2018



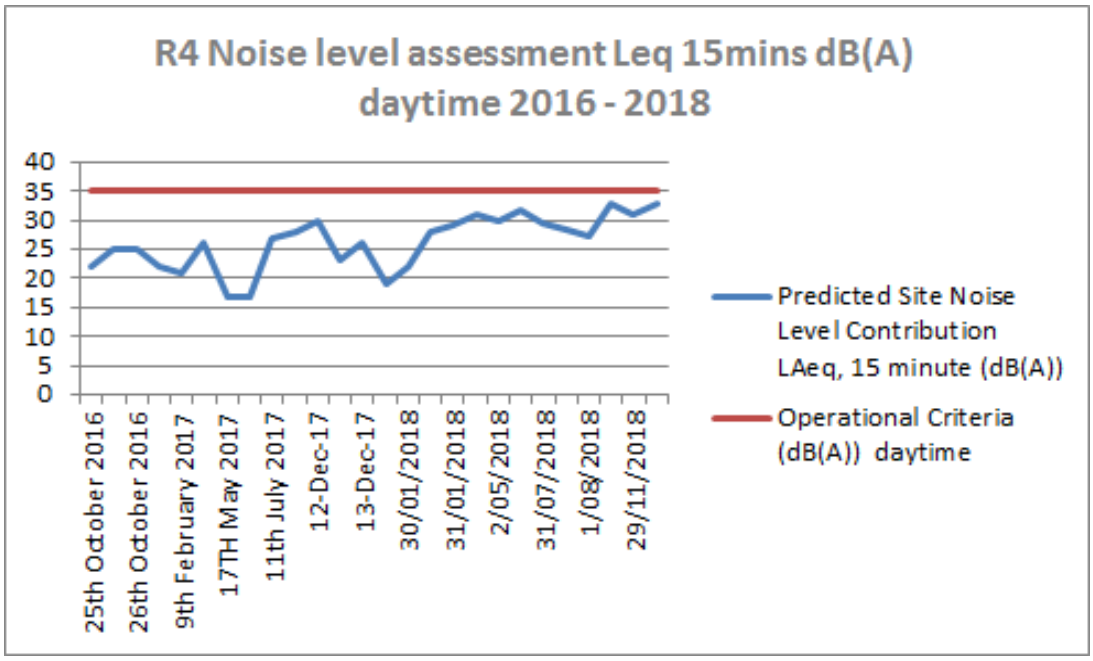


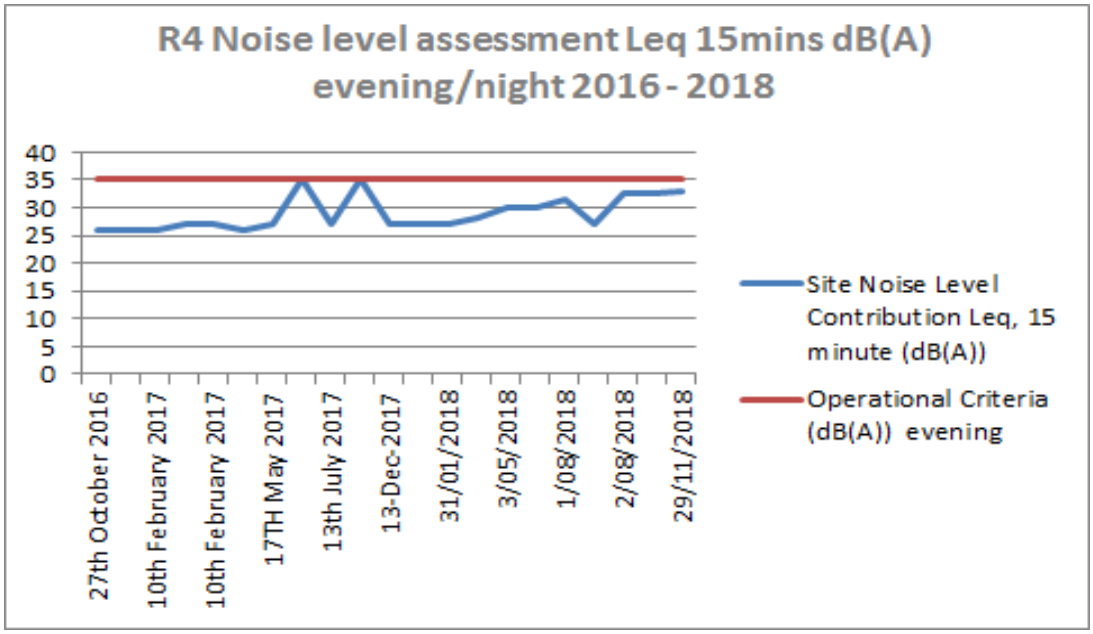
R2 Off-Site Noise Level Trends (LAeq 15) 2014 – 2018



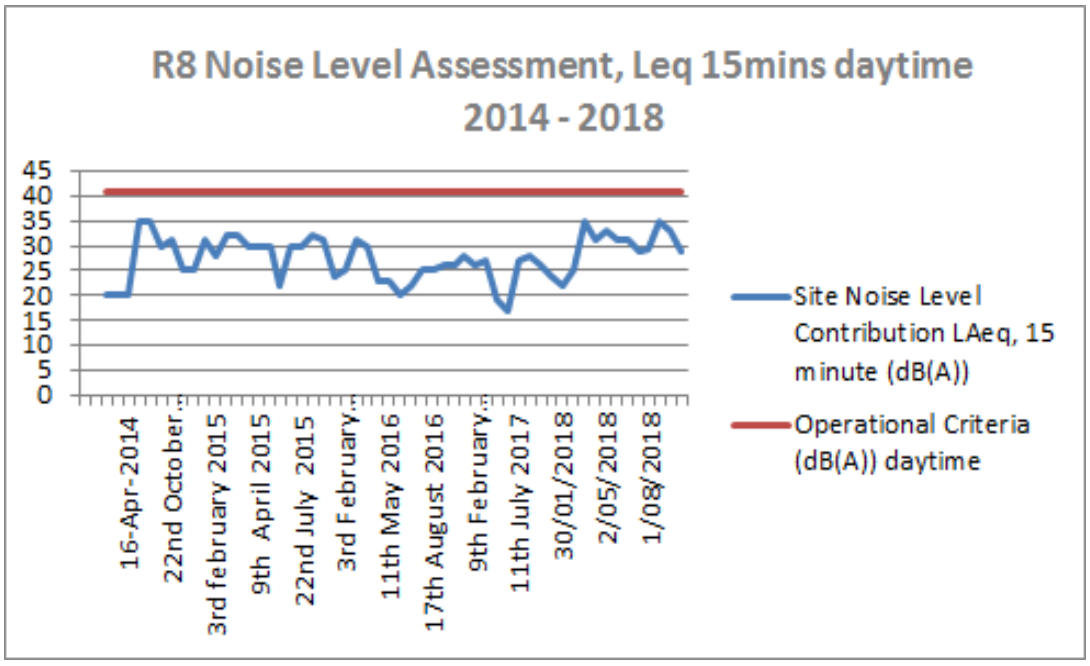


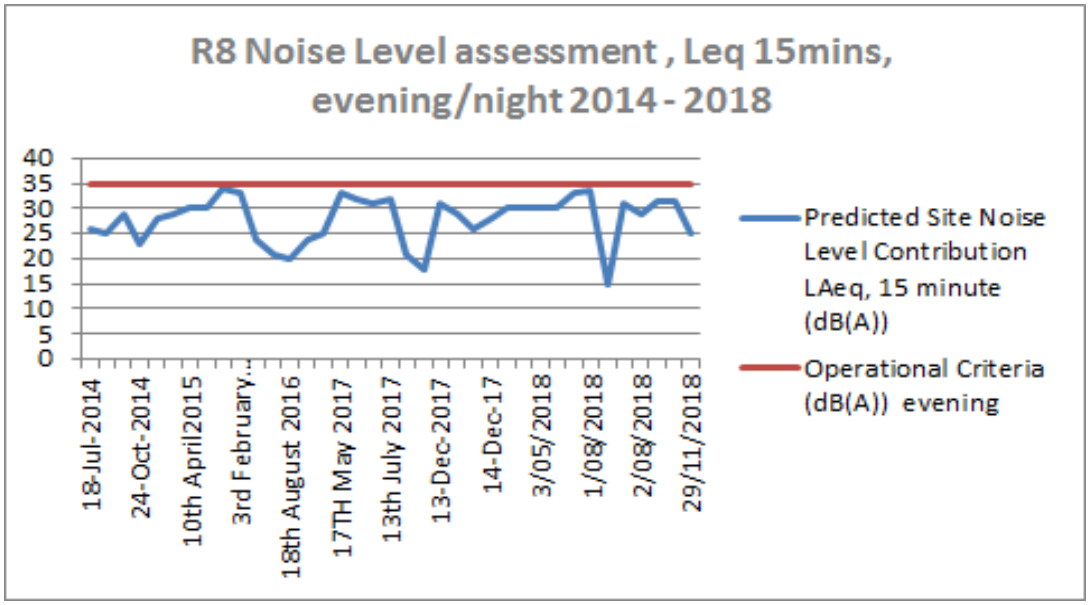
R 4 Off-Site Noise Level Trends (LAeq 15) 2016 – 2018





R8 Off-Site Noise Level Trends (LAeq 15) 2014 – 2018

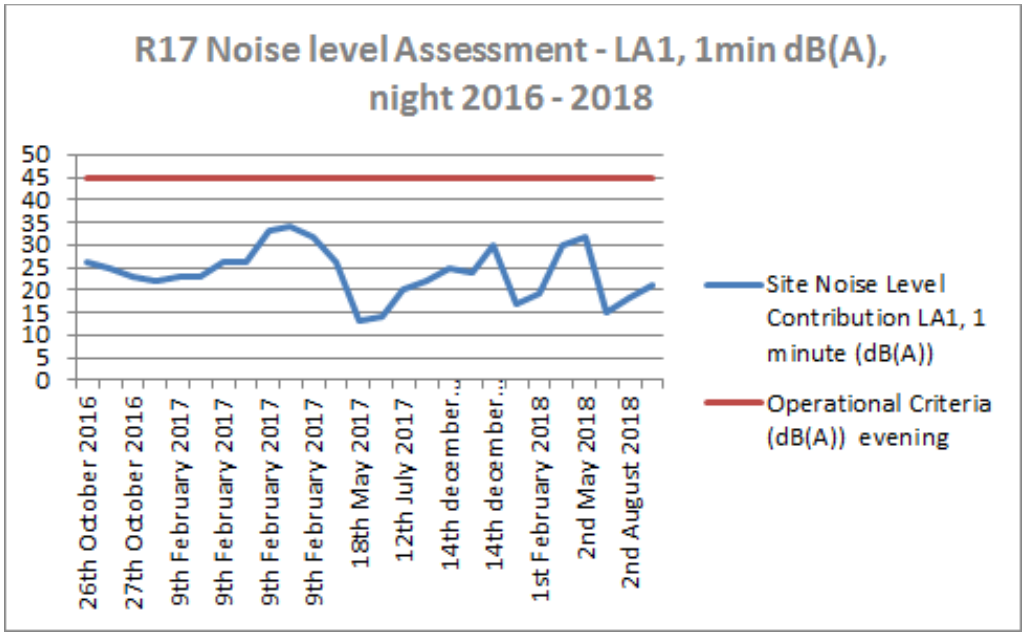




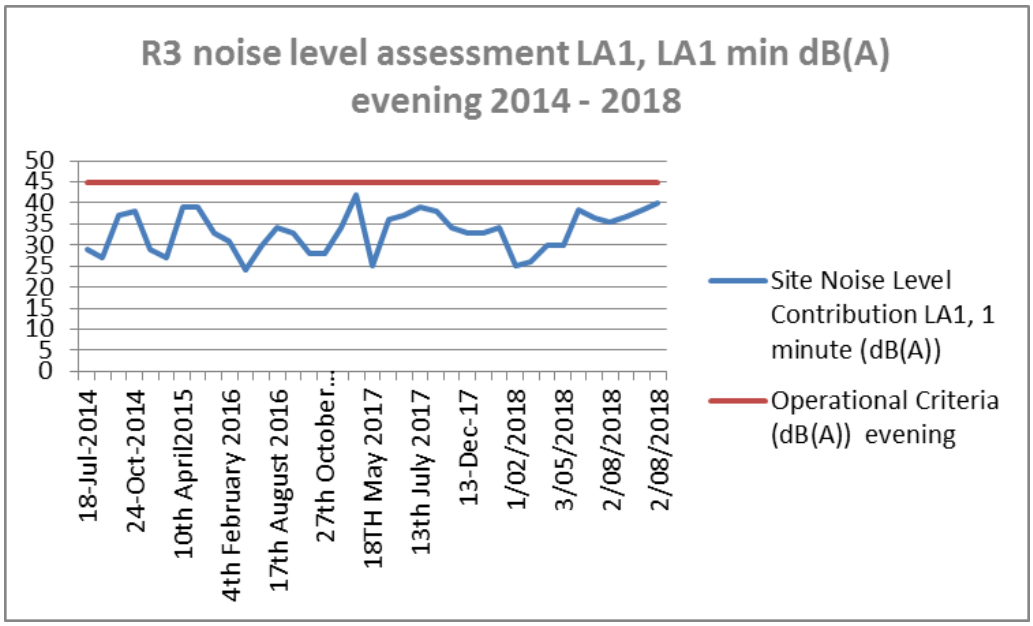
Noise Assessment Results (LA1 (1min))

Residential Receiver	Assessment Dates (2018)	Noise Level Assessment (LA1 (1min))		
		Compliance Criteria	Measured Noise Levels dB(A)	Compliance with Criteria
Receiver R3	January	45	25/26/	Yes
	May	45	30/30	Yes
	July/August	45	38/36/35/37/40	Yes
	November	45	30/32	Yes
Receiver R2	January	45	19/20	Yes
	May	45	32/33	Yes
	July/August	45	18/24	Yes
	November	45	no monitoring	Yes
Receiver R8	January	45	33/33	Yes
	May	45	30/30	Yes
	July/August	45	38/39/15/31/29/32/32	Yes
	November	45	28/33	Yes
Receiver R4	January	45	28/29	Yes
	May	45	30/30	Yes
	July/August	45	41/37/38/38	Yes
	November	45	no monitoring	Yes
Receiver R17	January	45	17/19	Yes
	May	45	30/32	Yes
	July/August	45	15/18	Yes
	November	45	21	Yes

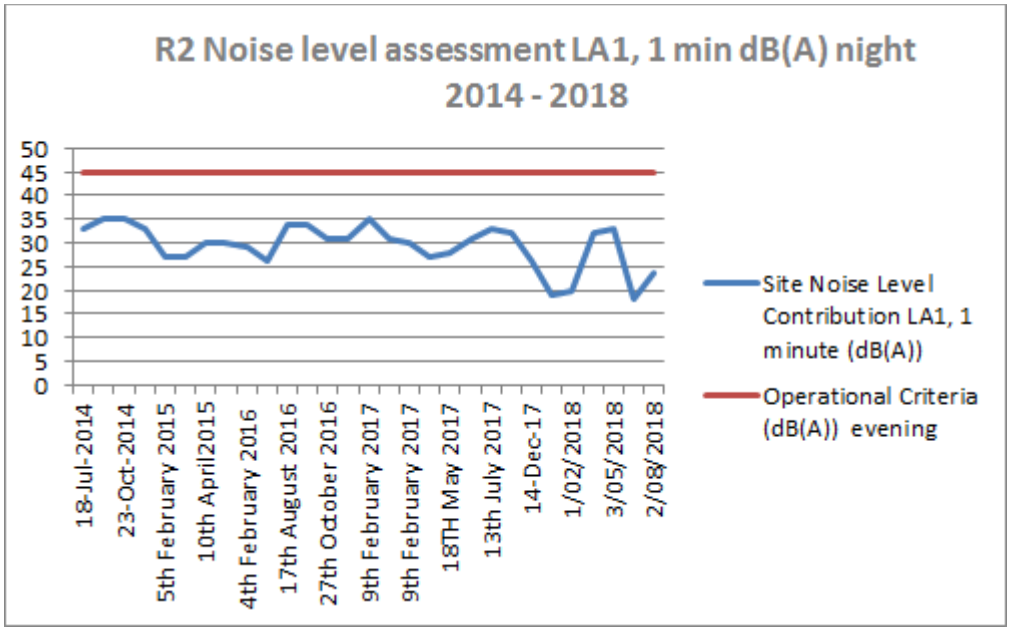
R 17 Noise Level Trends (LA1, 1minute) 2016 – 2018



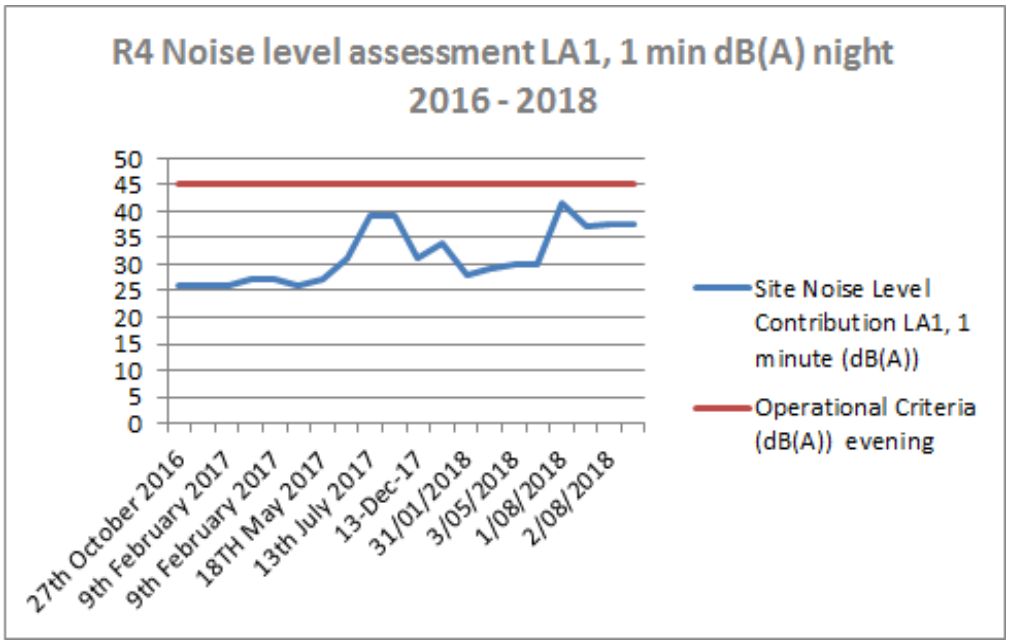
R3 Noise Level Trends (LA1, 1minute) 2014 – 2018 R3



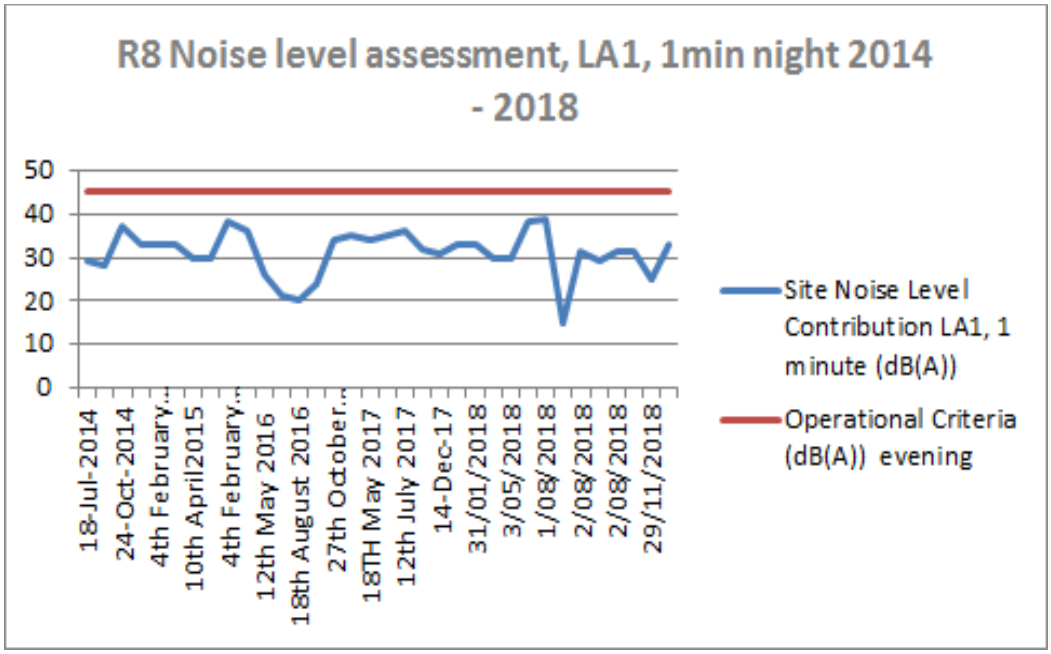
R2 Noise Level Trends (LA1, 1minute) 2014 – 2018



R4 Noise Level Trends (LA1, 1minute) – 2018

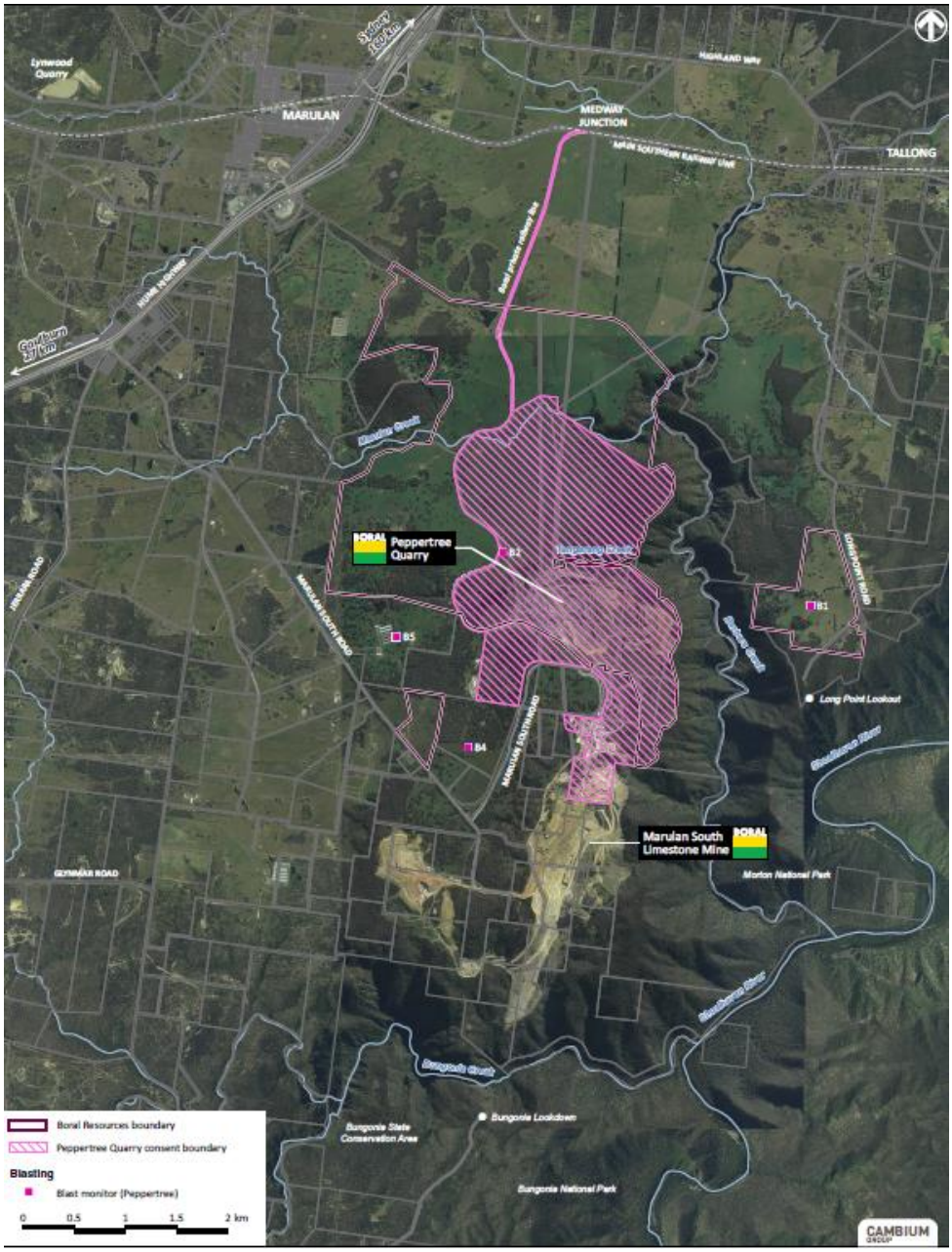


R8 Noise Level Trends (LA1, 1minute) – 2018



APPENDIX 4 BLAST MONITORING INFORMATION

Blast monitoring locations

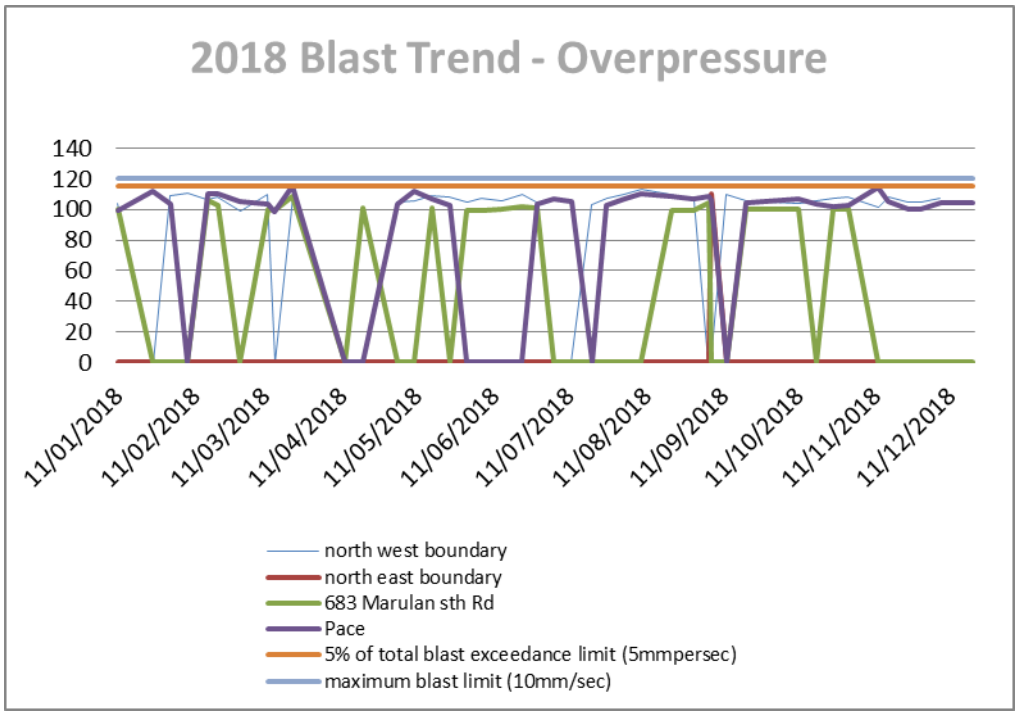


Blast Monitoring Results

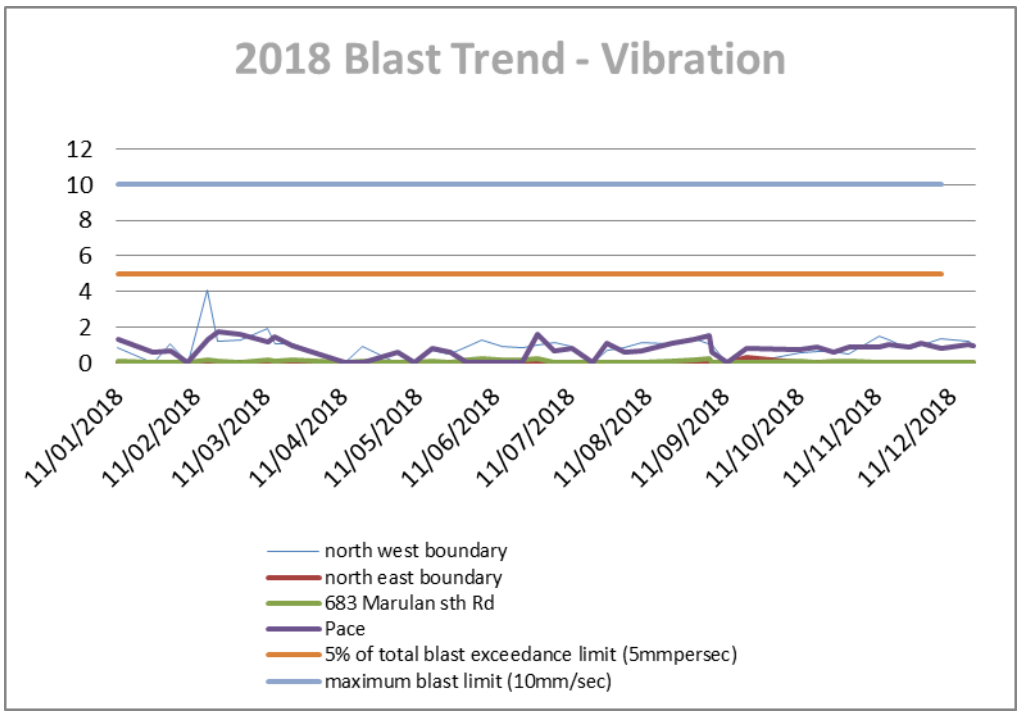
Blast Date	Ground Vibration (mm/sec) Max Criteria: 10 5% Exceedance: 5				Over Pressure (db – Linear) Max Criteria: 120 5% Exceedance: 115				Compliance
	Monitoring Locations				Monitoring Locations				
	B2 (north west)	B1 (north east)	B4 Marulan sth rd)	B5 (Pace)	B2 (north west)	B1 (north east)	B4 Marulan sth rd)	B5 (Pace)	
11/01/2018	98.4	0	100	99.5	0.85	0	0.13	1.35	YES
25/01/2018	0	0	0	111.9	0	0	0	0.6	YES
1/02/2018	103.8	0	0	103.5	1.1	0	0	0.65	YES
8/02/2018	0	0	0	0	0	0	0	0	YES
16/02/2018	109.1	0	106.4	110.5	4.1	0	0.17	1.3	YES
20/2/2018	110.5	0	102.4	109.9	1.2	0	0.1	1.75	YES
1/03/2018	106.4	0	0	105	1.3	0	0	1.6	YES
12/03/2018	108.4	0	100.3	103.2	1.9	0	0.17	1.2	YES
15/03/2018	99.3	0	99.2	98.5	1.1	0	0.1	1.45	YES
22/03/2018	110	0	108.2	114.9	1.05	0	0.14	0.98	YES
12/04/2018	0	0	0	0	0	0	0	0	YES
19/04/2018	108.9	0	100.8	0	0.93	0	0.12	0	YES
3/05/2018	0	0	0	103.6	0	0	0	0.63	YES
10/05/2018	0	0	0	112.1	0	0	0	0.04	YES
24/05/2018	104.9	0	0	102.5	0.49	0	0	0.63	YES
17/05/2018	105.9	0	100.9	106.7	0.73	0	0.11	0.83	YES
31/05/2018	108.1	0	99.6	0	0.9	0	0.14	0	YES
6/6/2018	108.8	0	99.7	0	1.32	0	0.21	0	YES
14/06/2018	104.4	0	100.5	0	0.91	0	0.14	0	YES
22/06/2018	107.3	0	101.7	0	0.88	0	0.15	0	YES
28/06/2018	105.4	0	100.9	103.2	0.98	0	0.21	1.64	YES
5/07/2018	110.1	0	0	106.9	1.14	0	0	0.65	YES
12/07/2018	104.9	0	0	105	0.94	0	0	0.82	YES

20/07/2018	0	0	0	0	0	0	0	0	YES
26/07/2018	0	0	0	102.5	0.73	0	0	1.13	YES
2/08/2018	103	0	0	107.3	0.88	0	0	0.59	YES
9/08/2018	107.3	0	0	110.3	1.17	0	0	0.7	YES
21/08/2018	109.9	0	99.2	108.2	1.07	0	0.11	1.14	YES
30/08/2018	113	0	99.4	106.5	1.34	0	0.2	1.31	YES
5/09/2018	109.8	0	104.2	108.9	1.04	0	0.23	1.56	YES
6/09/2018	105.6	0	0	105.9	1.05	0	0	0.6	YES
12/09/2018	0	0	0	0	0	0	0	0	YES
20/09/2018	0	110.3	100.5	104.4	0	0.3	0	0.8	YES
11/10/2018	109.8	0	100.1	106.9	0.57	0	0.13	0.73	YES
18/10/2018	105.4	0	0	103.2	0.65	0	0	0.9	YES
25/10/2018	103.8	0	100.3	101.8	0.62	0	0.11	0.57	YES
31/10/2018	105.8	0	100.4	102.8	0.52	0	0.11	0.91	YES
12/11/2018	107.3	0	0	114.4	1.52	0	0	0.89	YES
16/11/2018	108	0	0	105.5	1.3	0	0	1	YES
24/11/2018	101.1	0	0	100.1	0.81	0	0	0.9	YES
29/11/2018	108	0	0	100.1	1.02	0	0	1.12	YES
7/12/2018	104.7	0	0	104.2	1.39	0	0	0.84	YES
18/12/2018	104.7	0	0	104.8	1.23	0	0	1.01	YES
20/12/2018	107.3	0	0	104.2	0.89	0	0	0.96	YES

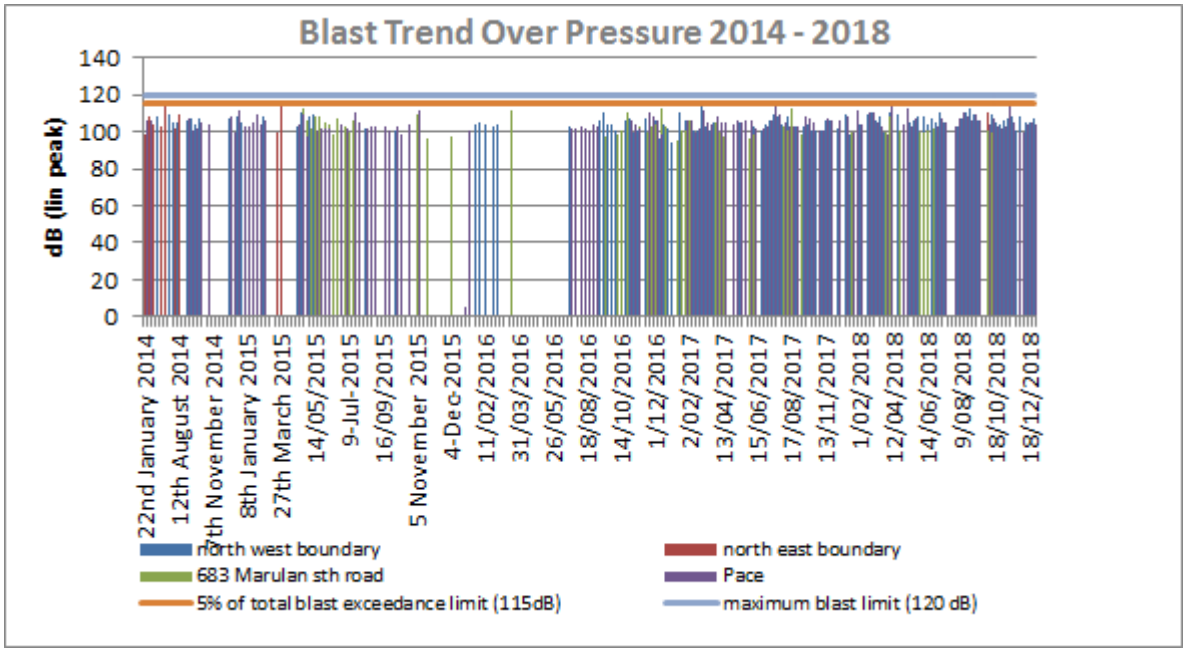
Blasting Overpressure Performance for 2018



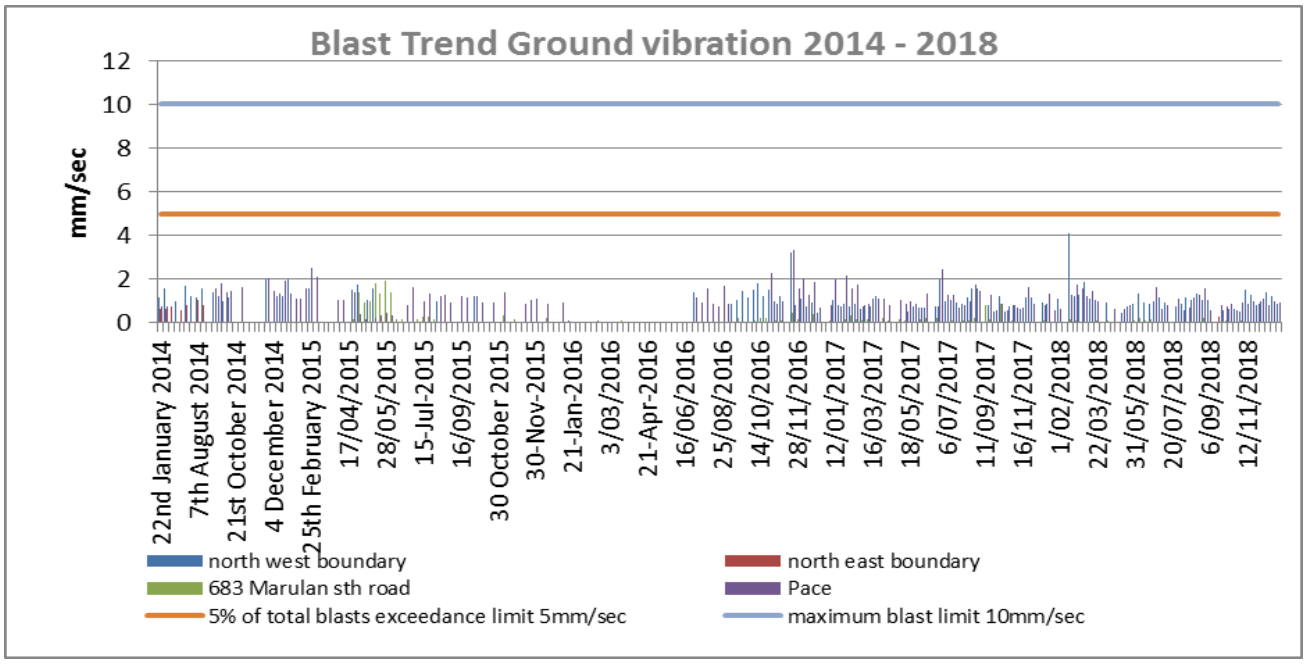
Blasting Ground Vibration Performance for 2018



Long Term Blast Trends – Overpressure

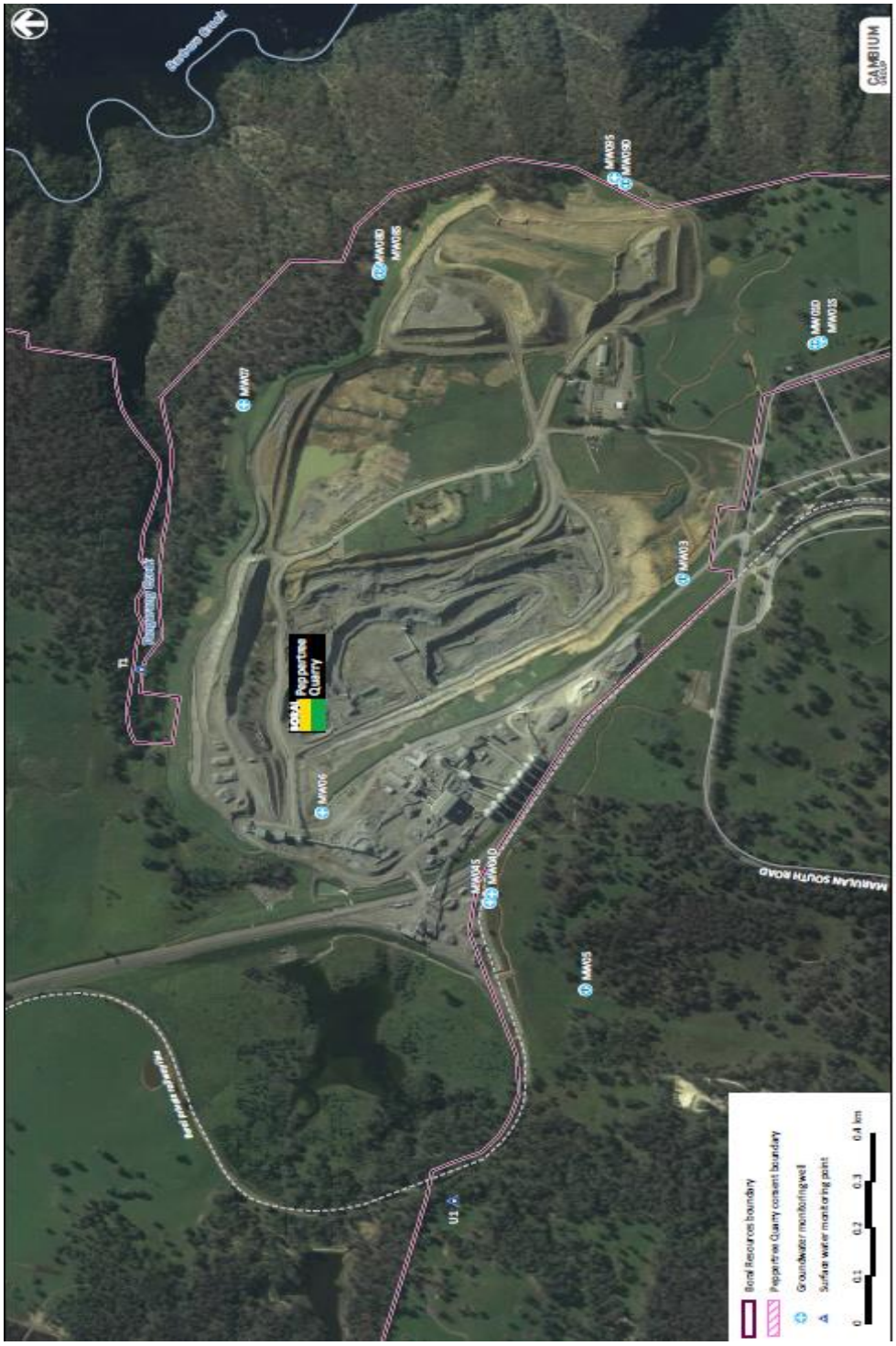


Long Term Blast Trends – Vibration



APPENDIX 5 SURFACE AND GROUNDWATER MONITORING INFORMATION

Surface and groundwater monitoring locations

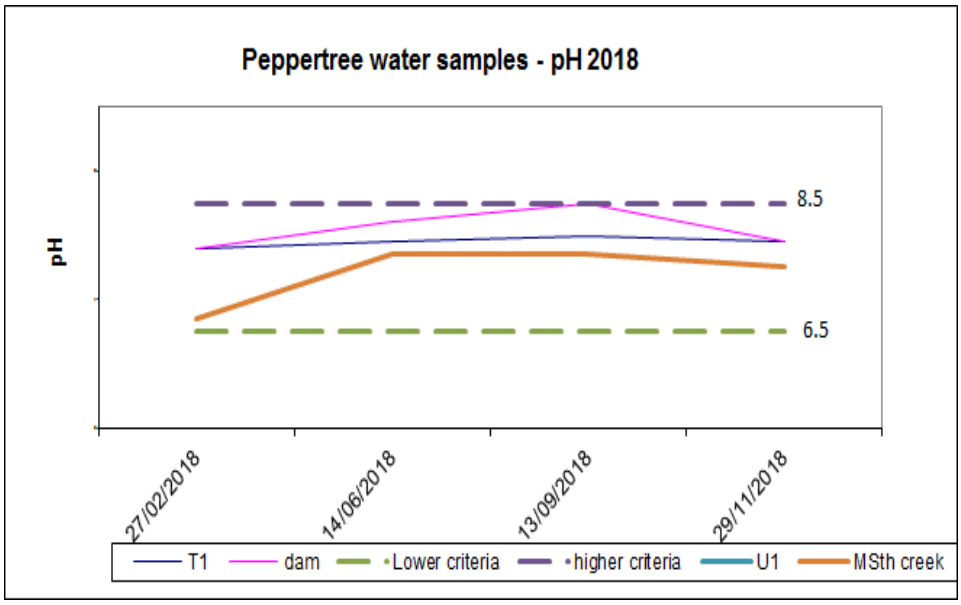


Surface Water Monitoring Results (2018)

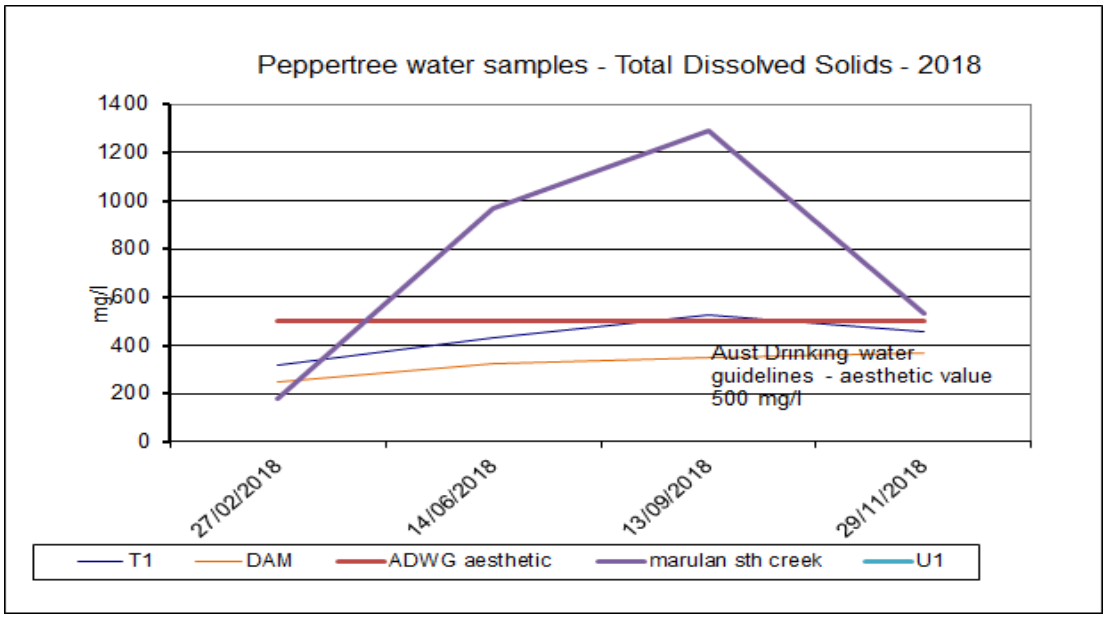
Parameter	Dam				Tangarang Ck - Downstream				Tangarang Ck - Upstream				Marulan South Ck			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
pH	7.8	8.2	8.5	7.9	7.8	7.9	8	7.9	7.7	No Flow	No Flow	No Flow	6.7	7.7	7.7	7.5
Total Suspended solids (mg/l)	8	<5	8	60	<5	<5	<5	<5	12	No Flow	No Flow	No Flow	<5	24	27	12
Total Dissolved solids (mg/l)	246	326	352	366	320	434	525	455	260	No Flow	No Flow	No Flow	180	971	1290	530
Ammonia -N (mg/l)	0.15	0.1	0.12	0.28	0.03	<0.01	<0.01	0.02	0.12	No Flow	No Flow	No Flow	0.02	<0.01	0.02	0.03
Nitrate-N (mg/l)	0.33	0.14	<0.01	0.45	0.11	0.3	0.16	0.07	0.32	No Flow	No Flow	No Flow	0.2	<0.01	<0.01	0.36
Nitrite-N (mg/l)	0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.02	No Flow	No Flow	No Flow	<0.01	<0.01	<0.01	0.02
Sulphate (mg/l)	20	32	31	28	7	14	8	8	22	No Flow	No Flow	No Flow	14	1	<1	26
Chloride (mg/l)	72	74	106	102	65	136	132	137	77	No Flow	No Flow	No Flow	39	342	510	241
Turbidity (NTU)	21.2	1.1	4.1	114	6.1	0.7	1.2	1	16.4	No Flow	No Flow	No Flow	14.8	6.8	14.7	14
Calcium (mg/l)	20	37	40	32	36	56	54	56	21	No Flow	No Flow	No Flow	11	83	86	39
Potassium (mg/l)	6	6	6	6	2	2	2	2	5	No Flow	No Flow	No Flow	5	9	12	8
Magnesium (mg/l)	10	15	18	17	18	36	32	34	11	No Flow	No Flow	No Flow	6	58	79	30
Sodium (mg/l)	40	48	53	45	43	71	67	71	41	No Flow	No Flow	No Flow	19	133	167	99
Total phosphorus (mg/l)	0.17	0.16	<0.01	0.08	<0.01	0.03	<0.01	0.01	0.19	No Flow	No Flow	No Flow	0.13	0.17	0.05	0.21
total nitrogen	1.9	1	1	1.6	0.6	0.5	0.3	0.4	1.8	No Flow	No Flow	No Flow	1.7	1.1	1.6	1.7
Hardness (CaCo3) (mg/l)	78	136	135	96	189	270	231	258	80	No Flow	No Flow	No Flow	40	374	365	104
TKN (mg/l)	1.6	0.9	1	1.1	0.5	0.2	0.1	0.3	1.5	No Flow	No Flow	No Flow	1.5	1.1	1.6	1.3
Faecal Coliform	100000	21	5	1000	280	1	4	410	2500	No	No	No	260	1400	24	2900

(cfu/100ml)										Flow	Flow	Flow				
TPH C10-C14 (µg/l)	<50	<50	<50	<50	<50	<50	<50	<50	<50	No Flow	No Flow	No Flow	<50	<50	<50	<50
TPH C15-C28 (µg/l)	110	110	110	110	<100	<100	<100	<100	<100	No Flow	No Flow	No Flow	<100	<100	<100	<100
TPH C29-C36 (µg/l)	<50	<50	<50	<50	<50	<50	<50	<50	<50	No Flow	No Flow	No Flow	<50	<50	<50	<50
sum TPH C10-C36 (µg/l)	110	110	110	110	<50	<50	<50	<50	<50	No Flow	No Flow	No Flow	<50	<50	<50	<50
Naphthalene	<1	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	<1	<1	<1	<1
Acenaphthylene	<1	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	<1	<1	<1	<1
Acenaphthere	<1	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	<1	<1	<1	<1
Flourene	<1	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	<1	<1	<1	<1
Phenanthrene	<1	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	<1	<1	<1	<1
Anthracence	<1	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	<1	<1	<1	<1
Fluoranthene	<1	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	<1	<1	<1	<1
Pyrene	<1	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	<1	<1	<1	<1
Benzo(a)anthracene	<1	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	<1	<1	<1	<1
Chrysene	<1	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	<1	<1	<1	<1
Benzo(b+k)fluoranthene	<1	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	<1	<1	<1	<1
Benzo(a)pyrene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	No Flow	No Flow	No Flow	<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-cd)pyrene	<1	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	<1	<1	<1	<1
Dibenzo(a,h)anthracene	<1	<1	<1	<1	<1	<1	<1	<1	<1	No Flow	No Flow	No Flow	<1	<1	<1	<1
Benzo(g,h,i)perylene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	No Flow	No Flow	No Flow	<0.5	<0.5	<0.5	<0.5

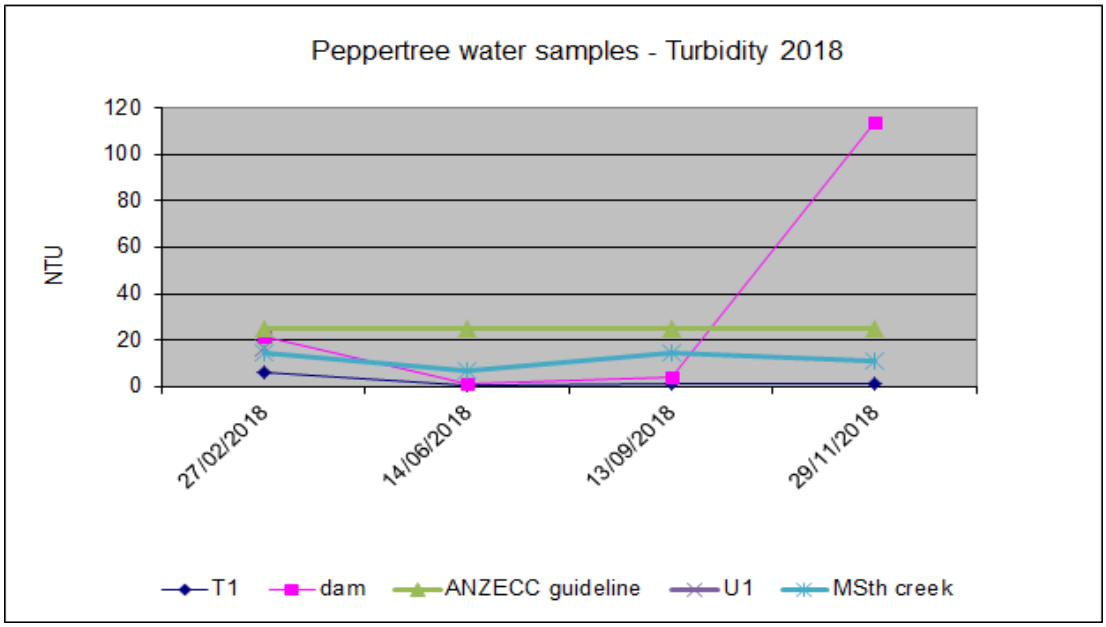
pH Surface Waters Trends 2018



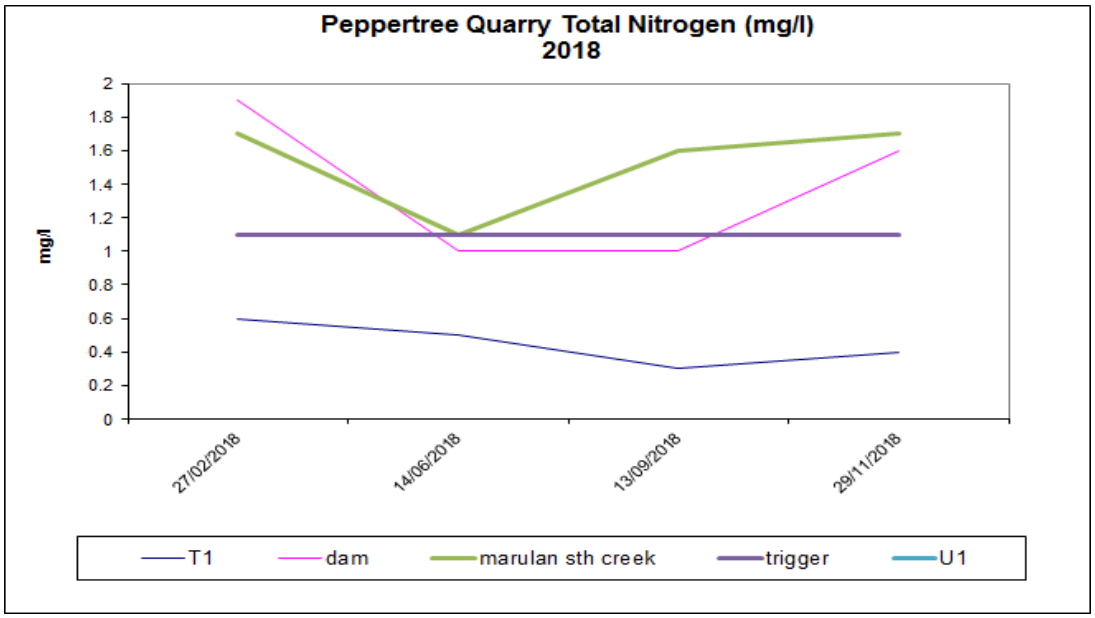
TDS surface water trends 2018



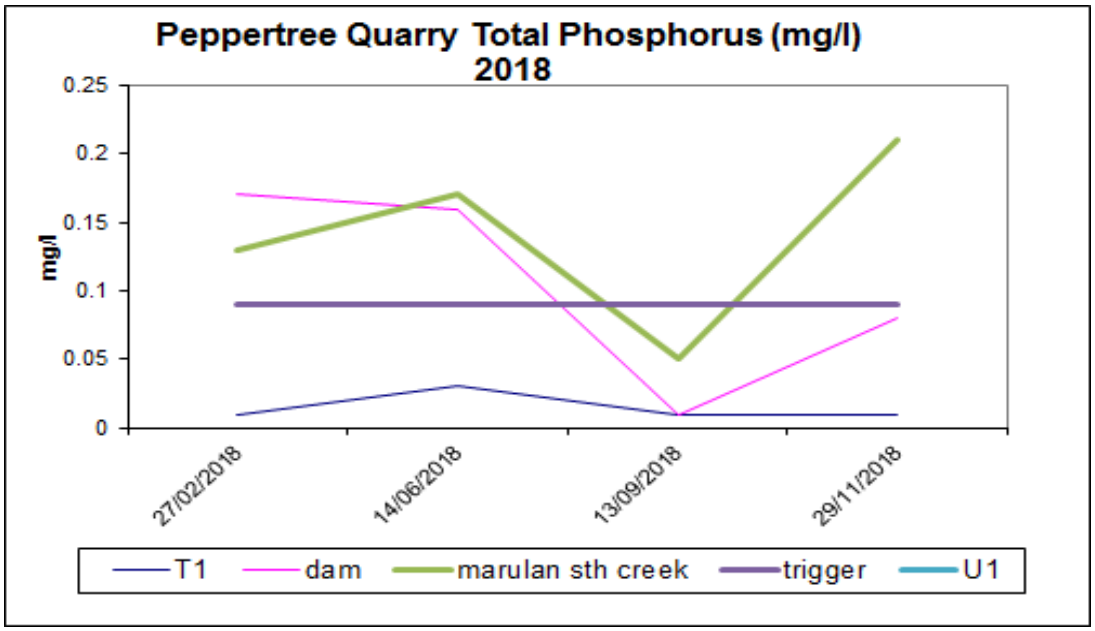
Turbidity surface water trends 2018



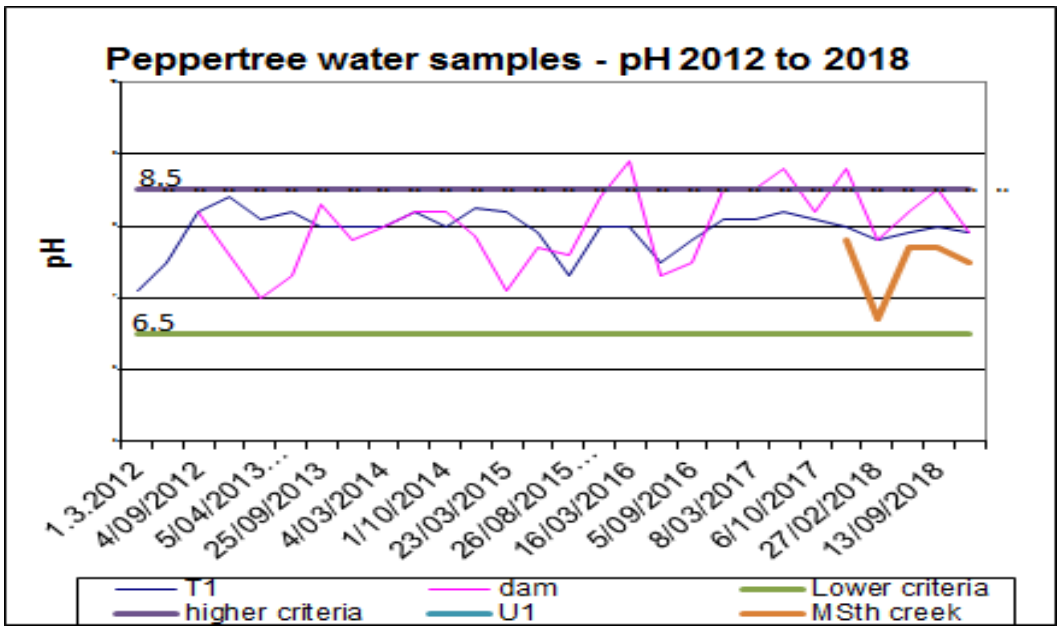
Nitrogen surface water trends 2018



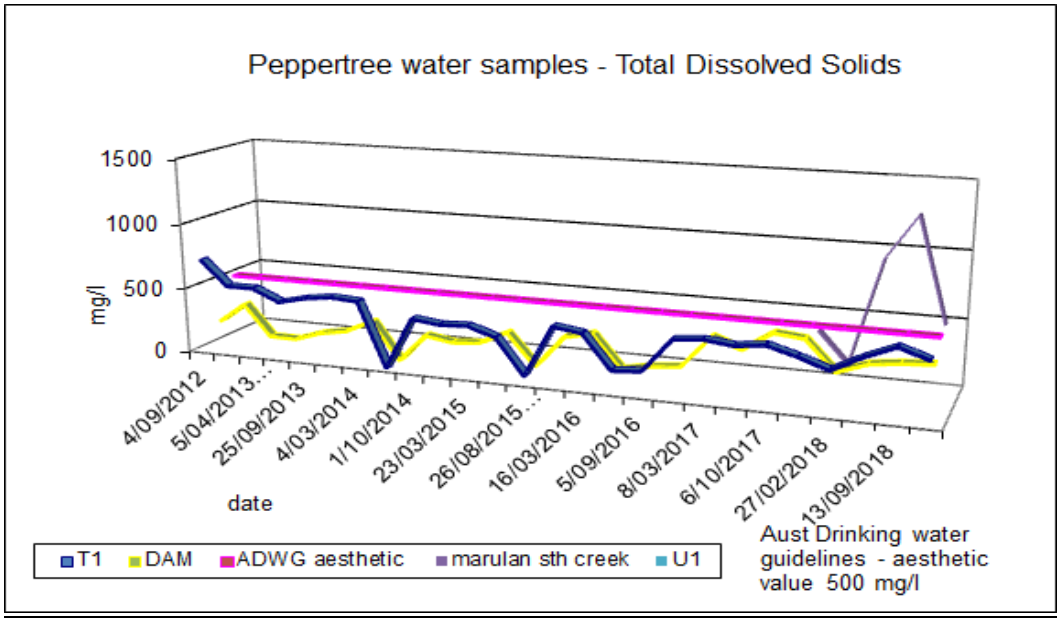
total phosphorus surface water trends 2018



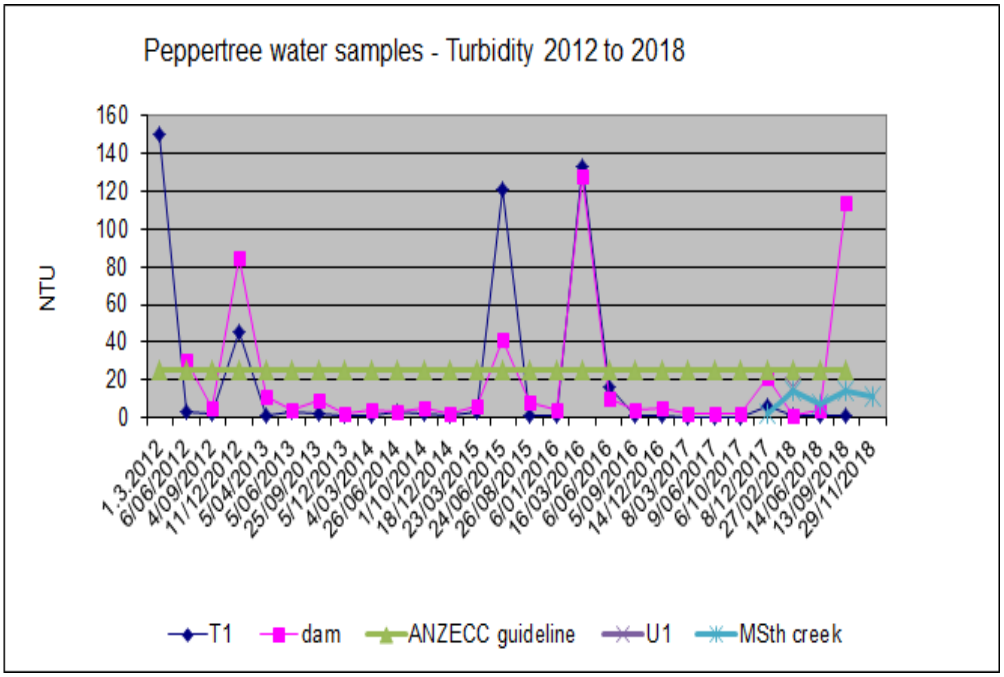
Long Term Water Quality - pH



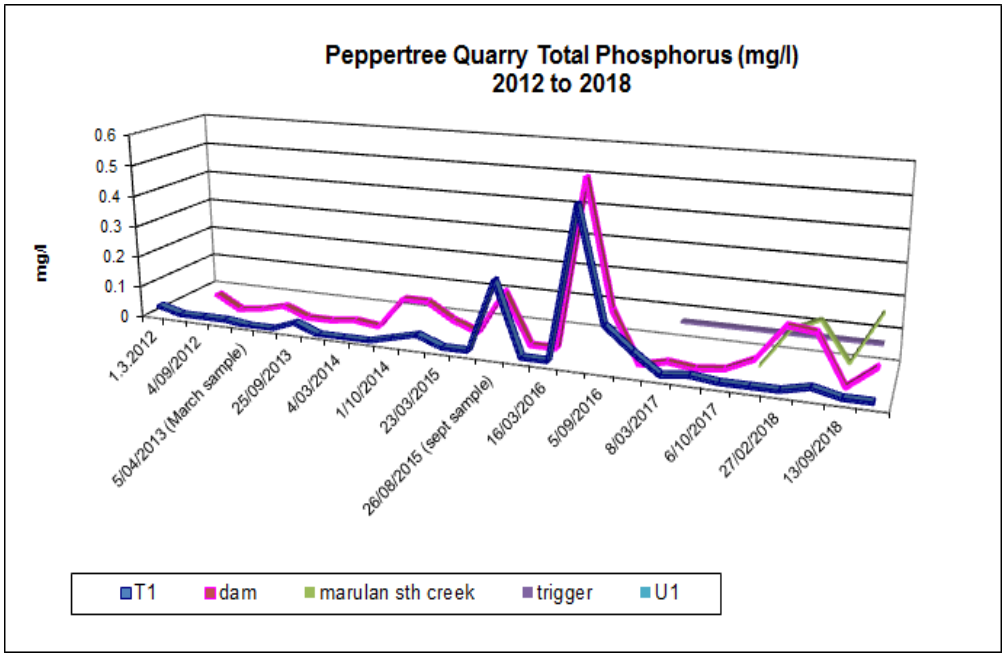
Long Term Water Quality – TDS



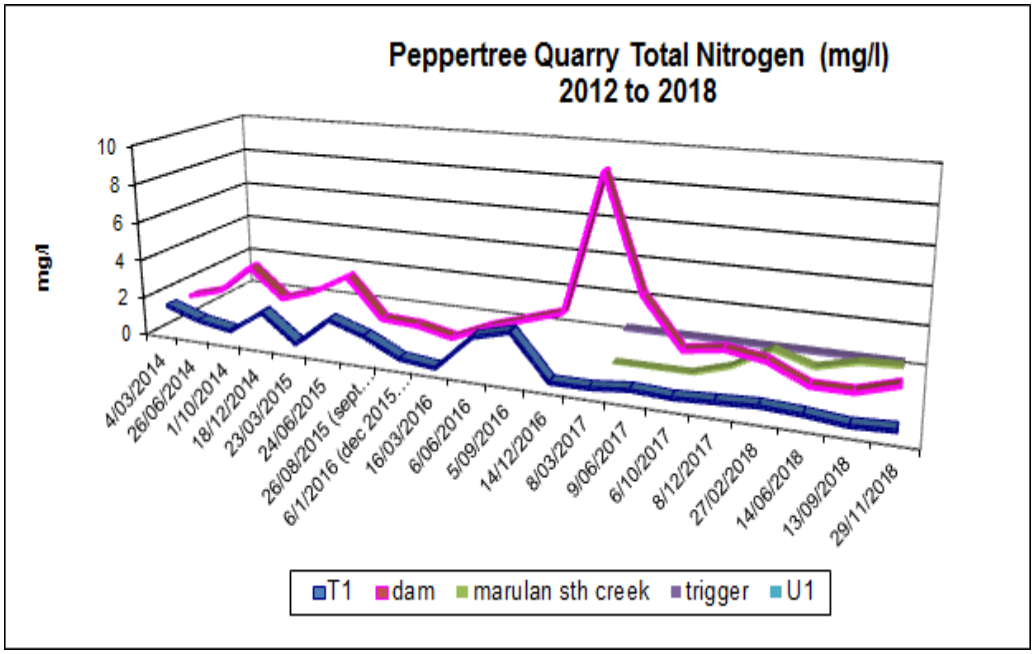
Long Term Water Quality – Turbidity



Long Term Water Quality – Total Phosphorus



Long Term Water Quality – total Nitrogen



Groundwater Field Parameters

Bore ID	Field Parameters											
	pH				EC (µs/cm)				DO (ppm)			
	Jan	May	Aug	Nov	Jan	May	Aug	Nov	Jan	May	Aug	Nov
PQ01S	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
PQ01D	8.08	7.94	8.55	8.11	3160	3605	3342	1241	4.6	7.12	4.94	3.66
PQ03D	12.64	12.27	11.89	11.32	2650	557.5	908	2020	1.1	6.7	1.99	2.27
PQ04D	8.01	10.1	9.67	.5	1451	1392	1417	501	3.89	5.29	3.36	3.77
PQ04S	7.89	8.82	8.59	8.48	2630	2022	2833	2020	2.93	5.97	2.3	2.17
PQ5D	7.97	8.29	7.89	7.94	1786	1808	1699	1659	0.44	1.96	1.79	1.09
PQ6D	12.51	12.23	11.85	11.47	2850	3042	2989	2114	1.37	1.51	1.36	1.37
PQ7D	12.04	12.4	11.43	11.86	1711	1513	1521	1339	1.3	1.31	1.82	2.65
PQ8D	6.99	7.77	7.83	7.24	2670	2963	1873	1108	1.75	2.62	2.61	2.35
PQ8S	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
PQ9D	8.45	7.23	7.52	7.2	1748	1859	1496	1485	2.16	2.03	2.41	3.56
PQ9s	7.00	7.16	7.53	7.26	2490	2764	2749	1870	3.5	3.87	4.47	5.15

NS: Not Sampled

Groundwater Standing Water Levels

Bore ID	Standing Water Levels (mbgl)			
	Jan 2018	May 2018	August 2018	November 2018
PQ01D	576.94	577.69	577.45	577.71
PQ01S	Dry	Dry	Dry	Dry
PQ03D	569.66	569.73	569.95	570.19
PQ04D	582.81	582.81	582.85	582.5
PQ04S	589.98	590.08	589.85	589.45
PQ5D	592.14	591.93	591.71	591.52
PQ6D	581.22	581.23	581.22	581.23
PQ7D	573.79	573.57	573.35	572.64
PQ8D	574.74	574.76	574.57	574.44
PQ8S	Dry	Dry	Dry	Dry
PQ9D	575.4	575.58	575.55	575.52
PQ9s	574.87	574.86	574.8	574.79

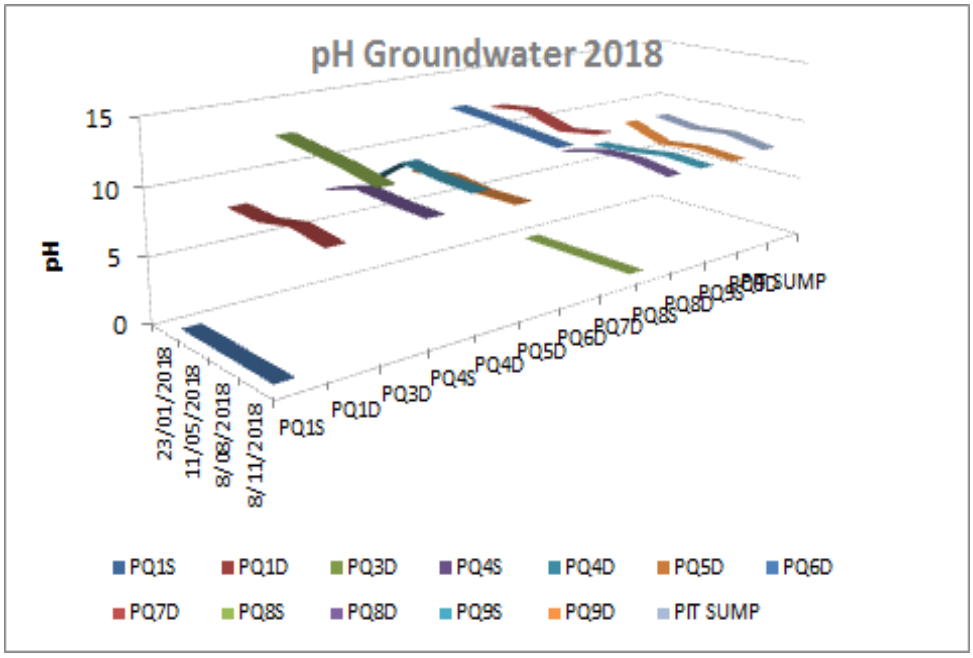
Groundwater - Laboratory Analysis Results (2015 - 2017)

NOTES:

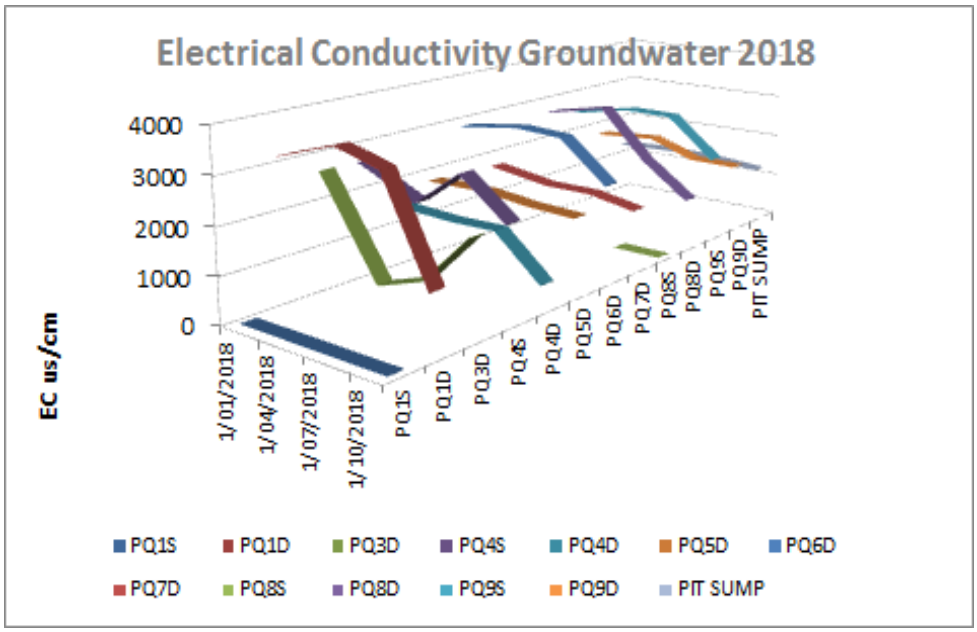
1. Shaded Cells: Exceedances of ANZECC (2000) threshold values
2. NA: Not Analysed
3. ND: Non-Detect

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	1.10	1.20	1.33	<5	ND	ND	<100
	27/04/2017	2230	10	5.3	36	92	972	210	6	313	30	<0.1	1.68	0.40	2.10	<0.01	<5	ND	ND	<100
	27/07/2017	2130	9	0.6	27	93	830	249	7	374	32	0.1	3.03	0.30	3.30	<0.01	<5	ND	ND	<100
	26/10/2017	2190	124	27.2	18	123	948	190	47	370	41	<0.1	3.64	0.40	4.00	0.01	<5	ND	ND	<100
	23/01/2018	2100	117	85.5	28	108	1060	228	44	370	38	<0.1	3.51	1.20	4.70	0.1	74	ND	ND	<100
	11/05/2018	1840	103	44.6	25	125	1070	216	32	330	22	<0.1	3.59	3.10	6.70	0.06	8	1.6	ND	1230
	8/08/2018	1970	48	42.4	10	104	854	214	52	334	27	<0.1	3.45	0.80	4.20	0.01	<5	ND	ND	280
	8/11/2018	2690	53	46.1	16	90	1010	236	45	344	52	<0.1	2.94	0.50	3.40	0.03	<5	ND	ND	ND
PQ03D	19/01/2017	1110	123	91.3	556	13	224	64	<1	196	222	0.4	<0.01	1.20	1.20	0.01	<5	ND	ND	<100
	27/04/2017	1100	88	53.3	518	14	212	76	<1	159	160	0.3	<0.01	1.50	1.50	0.05	<5	ND	ND	<100
	27/07/2017	977	118	49.3	503	12	174	78	<1	176	171	0.5	0.02	1.10	1.10	<0.01	<5	ND	ND	<100
	26/10/2017	923	111	55.5	457	12	198	37	<1	175	148	0.4	<0.01	1.30	1.30	0.06	<5	ND	ND	<100
	23/01/2018	975	81	49	303	12	215	76	<1	178	141	0.4	<0.01	1.30	1.30	0.03	<5	ND	ND	<100
	11/05/2018	910	26	9.2	400	18	226	80	<1	162	111	0.4	<0.01	1.50	1.50	0.06	<5	ND	ND	<100
	8/08/2018	956	32	32.7	482	18	197	87	<1	168	110	0.4	0.03	1.20	1.20	0.03	<5	ND	ND	<100
	8/11/2018	785	443	536	401	20	216	88	<1	172	106	0.4	0.02	1.90	1.90	0.19	<5	ND	ND	<100
PQ04S	19/01/2017	1930	136	36.7	410	86	881	65	72	602	4	1.3	0.45	0.70	0.90	0.07	<5	ND	ND	<100
	27/04/2017	1950	61	21.5	368	89	865	58	63	444	3	0.9	0.21	1.00	1.20	0.07	<5	ND	ND	<100
	27/07/2017	1940	48	35.6	474	43	698	62	64	534	5	1	0.03	0.40	0.40	<0.01	<5	ND	ND	<100
	26/10/2017	1650	234	48	565	23	649	55	56	464	5	1	<0.01	0.50	0.50	0.13	6	ND	ND	<100
	24/01/2018	1400	110	28.6	504	50	654	69	62	437	4	0.9	0.08	0.50	0.60	0.1	11	ND	ND	<100
	11/05/2018	1390	78	5.2	580	39	641	71	57	417	4	0.9	0.11	1.20	1.30	0.1	<5	ND	ND	<100
	8/08/2018	1550	10	3	590	29	501	70	55	405	3	0.9	0.02	0.20	0.20	0.02	<5	ND	ND	<100
	8/11/2018	1650	48	13.7	486	44	570	74	59	409	3	0.9	0.02	0.30	0.30	0.03	<5	ND	ND	<100
PQ04D	19/01/2017	736	18	7.4	102	31	355	38	19	184	10	1.6	0.25	0.20	0.40	0.02	<5	ND	ND	<100
	27/04/2017	760	<5	2	93	33	365	33	18	148	10	1.3	0.27	0.10	0.40	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	0.30	0.08	<5	ND	ND	<100
	26/10/2017	707	9	5.8	122	33	345	33	20	181	14	1.5	0.37	0.20	0.60	0.01	<5	ND	ND	<100
	24/01/2018	712	36	22.2	117	30	386	44	25	186	14	1.5	0.38	0.20	0.60	<0.01	<5	ND	ND	<100
	11/05/2018	688	38	2.9	117	35	394	39	21	181	10	1.6	0.37	0.20	0.60	0.02	<5	ND	ND	<100
	8/08/2018	818	23	16.2	129	34	325	41	24	184	10	1.5	0.37	0.20	0.60	0.02	<5	ND	ND	110
	8/11/2018	761	26	9.4	120	32	369	41	25	188	11	1.6	0.36	0.20	0.60	0.01	<5	ND	ND	<100
PQ05D	19/01/2017	1190	521	420	618	1	391	140	40	262	24	0.3	<0.01	0.60	0.60	0.19	<5	ND	ND	<100
	27/04/2017	1110	1490	622	504	4	390	110	32	218	7	0.2	<0.01	0.40	0.40	0.12	<5	1	ND	<100
	27/07/2017	1120	48	98.9	460	7	320	125	35	232	8	0.3	0.02	0.60	0.60	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
	24/01/2018	992	1310	640	381	35	398	134	51	149	30	0.2	0.03	0.40	0.40	0.04	<5	ND	ND	<100
	11/05/2018	1150	3640	1780	478	6	410	137	36	184	5	0.3	0.01	0.60	0.60	0.16	22	ND	ND	<100
	8/08/2018	1080	42	148	490	16	334	140	43	172	15	0.2	<0.01	<0.1	<0.1	0.02	<5	ND	ND	<100
	8/11/2018	1200	183	138	383	5	376	139	42	174	13	0.3	0.04	0.50	0.50	0.18	<5	ND	ND	<100
PQ06D	19/01/2017	1240	26	11.4	406	168	213	27	<1	252	204	0.6	<0.01	1.50	1.50	0.01	<5	ND	ND	<100
	27/04/2017	1260	46	24.2	467	178	210	50	<1	208	166	0.5	<0.01	1.90	1.90	0.04	<5	ND	ND	<100
	27/07/2017	1130	34	13.4	463	169	172	48	<1	253	189	0.6	<0.01	1.50	1.50	<0.01	<5	ND	ND	<100
	26/10/2017	1120	57	22	421	198	190	17	<1	238	153	0.6	<0.01	2.00	2.00	0.02	<5	ND	ND	<100
	24/01/2018	1110	64	33.4	351	174	211	23	<1	261	169	0.5	0.03	1.70	1.70	0.03	<5	ND	ND	<100
	11/05/2018	1040	28	4.2	422	181	218	49	<1	235	147	0.5	<0.01	1.90	1.90	0.02	<5	ND	ND	<100
	8/08/2018	1190	157	90.6	469	163	185	23	<1	244	162	0.5	0.03	1.70	1.70	0.02	<5	ND	ND	<100
	8/11/2018	1420	112	42.4	366	176	194	4	<1	256	164	0.5	<0.01	2.10	2.10	0.06	<5	ND	ND	<100
PQ07D	19/01/2017	937	33	13.7	86	124	331	106	<1	166	88	0.2	<0.01	0.40	0.40	<0.01	<5	ND	ND	<100
	27/04/2017	892	24	22.8	150	123	333	79	<1	138	76	0.1	<0.01	0.60	0.60	0.02	<5	ND	ND	<100
	27/07/2017	898	54	24.4	124	121	274	93	<1	164	86	0.2	0.02	1.60	1.60	2.1	<5	ND	ND	<100
	26/10/2017	994	1210	540	99	140	302	66	<1	159	81	0.2	<0.01	0.60	0.60	0.02	<5	ND	ND	<100
	24/01/2018	916	2720	1670	86	116	326	85	<1	164	81	0.2	0.02	0.50	0.50	0.04	<5	ND	ND	<100
	11/05/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/08/2018	824	52	21.8	119	111	288	77	<1	157	72	0.2	0.02	0.50	0.50	0.06	<5	ND	ND	<100
	8/11/2018	652	58	12.6	66	77	319	36	27	135	55	0.1	<0.01	0.40	0.40	<0.01	<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	391	38	664	235	145	134	7	0.2	0.03	0.10	0.10	<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
	24/01/2018	2070	39	60.4	389	61	828	239	147	133	3	0.2	0.05	<0.1	<0.1	<0.01	<5	ND	ND	<100
	11/05/2018	1600	20	38.4	405	61	835	242	137	124	3	0.2	<0.01	<0.1	<0.1	0.01	<5	ND	ND	<100
	8/08/2018	1890	17	46.7	427	48	673	226	140	128	4	0.2	0.02	<0.1	<0.1	<0.1	<5	ND	ND	<100
	8/11/2018	2550	35	61.1	318	43	754	238	139	125	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	0.90	5.80	0.51	<5	ND	ND	<100
	27/04/2017	1870	601	253	443	23	685	160	144	122	6	0.2	3.58	1.00	4.60	1.14	<5	ND	ND	<100
	27/07/2017	1860	150	54.8	476	23	560	166	148	139	7	0.3	7.37	0.30	7.70	<0.01	<5	ND	ND	<100
	26/10/2017	1730	76	14.6	456	24	595	146	144	131	7	0.3	6.47	1.00	7.50	<0.01	<5	ND	ND	<100
	24/01/2018	1780	480	297	477	22	650	168	149	140	7	0.3	5.23	0.80	6.00	2.23	<5	ND	ND	<100
	11/05/2018	1280	200	88.4	490	26	653	154	134	125	5	0.3	6.4	0.50	6.90	0.08	<5	ND	ND	<100
	8/08/2018	1550	1047	61.4	515	24	531	154	138	130	6	0.3	6.82	0.40	7.20	0.04	<5	ND	ND	<100
	8/11/2018	2040	121	68.1	422	23	597	149	145	136	6	0.3	6.57	1.90	8.50	0.09	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
	27/04/2017	868	686	285	425	21	354	118	86	82	3	0.2	<0.01	0.10	0.10	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	0.10	0.10	0.03	<5	ND	ND	<100
	24/01/2018	1060	66	42.6	496	9	349	122	93	100	5	0.2	0.03	0.10	0.10	<0.01	<5	ND	ND	<100
	11/05/2018	906	59	11	482	30	367	113	91	93	3	0.2	<0.01	<0.1	<0.1	0.06	<5	ND	ND	<100
	8/08/2018	970	23	18.3	535	12	301	117	92	97	7	0.2	0.1	0.20	0.30	0.01	<5	ND	ND	<100
	8/11/2018	1180	28	18	425	10	326	108	94	98	6	0.3	<0.01	0.30	0.30	0.04	<5	ND	ND	<100
Sump	19/01/2017	686	12	0.5	151	75	186	60	29	131	4	0.6	28.8	0.80	29.60	<0.01	<5	ND	ND	<100
	27/04/2017	944	184	59.5	127	99	280	80	40	103	5	0.3	27.6	2.40	30.00	0.11	<5	ND	ND	850
	27/07/2017	798	21	3.1	159	77	215	81	32	126	4	0.5	16.2	0.40	16.60	<0.01	<5	ND	ND	<100
	26/10/2017	1130	5	0.9	112	111	420	98	49	148	7	0.3	13.2	1.10	14.30	<0.01	<5	ND	ND	<100
	24/01/2018	558	<5	1	59	115	292	63	38	125	7	4	13.1	0.20	13.30	<0.01	<5	ND	ND	<100
	11/05/2018	713	7	1.4	124	103	322	76	34	112	4	0.4	13	0.90	13.90	<0.01	<5	ND	ND	<100
	8/08/2018	661	8	4.7	159	67	239	68	36	95	4	0.3	2.38	0.60	3.00	<0.01	<5	ND	ND	<100
	8/11/2018	471	15	27.4	75	47	115	31	20	63	2	0.4	3.87	0.80	4.70	0.02	<5	ND	ND	<100

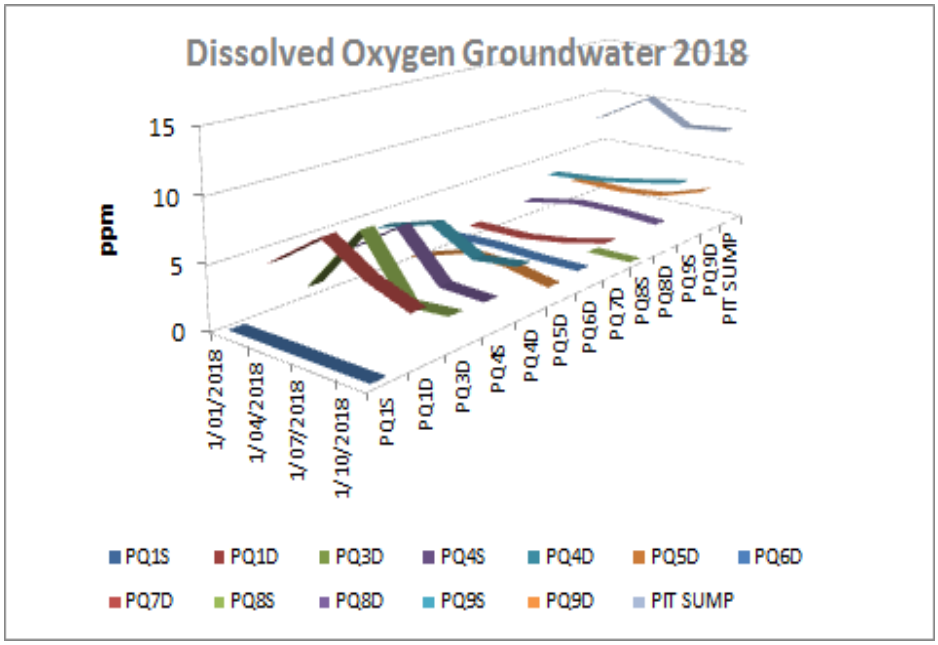
Groundwater pH Trend (2018)



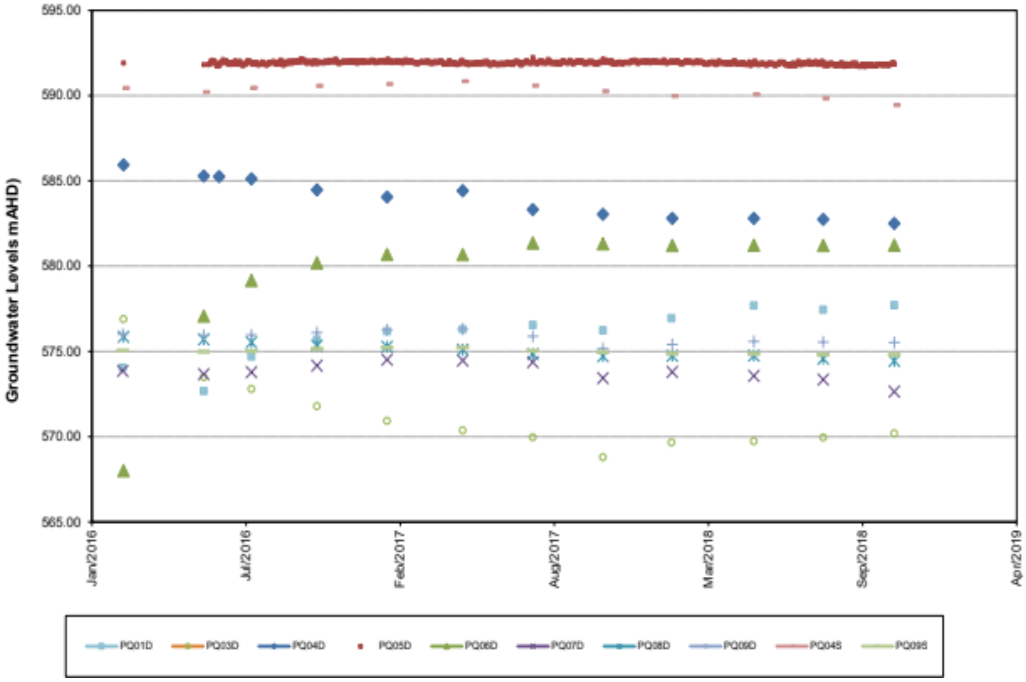
Groundwater Electrical Conductivity Trend (2018)



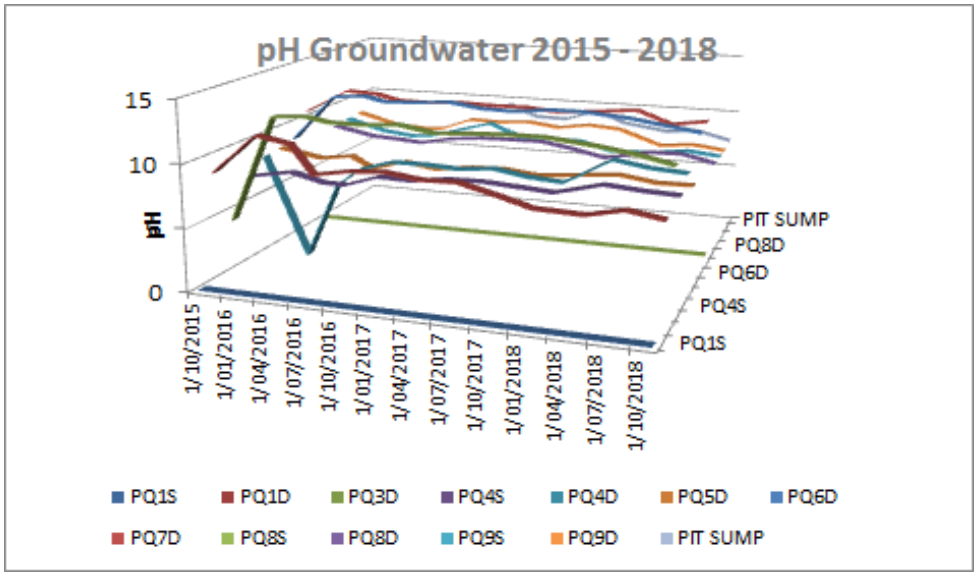
Groundwater Dissolved Oxygen Trend (2018)



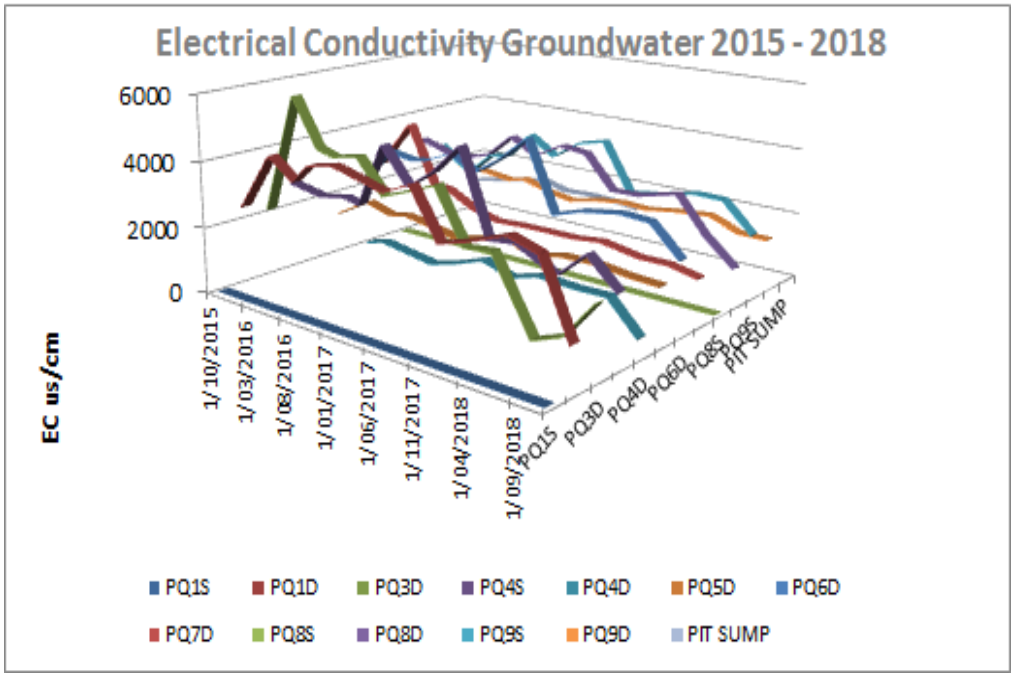
Standing Water Level - Sentinel Well (PQD5)



Groundwater pH Trend (2015 - 2018)



Groundwater Electrical Conductivity Trend (2015 - 2018)



Groundwater Dissolved Oxygen Trend (2015 - 2018)