

Appendix 3
NOISE AUDIT FEBRUARY 2017
Atkins Acoustic

Grants Road Sand Pty Ltd.
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SOMERSBY NSW 2250

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Attention: Steve Jones

6 February 2017

Atkins Acoustics and Associates Pty Ltd.
Consulting Acoustical & Vibration Engineers

ENVIRONMENTAL NOISE AUDIT
GRANTS ROAD SAND QUARRY
SOMERSBY

1.0 INTRODUCTION

Atkins Acoustics was retained by Grants Road Sand Pty Ltd to conduct an environmental noise audit of the Grants Road Sand Quarry operations. The audit was conducted by Graham Atkins. Grahams qualifications and membership include BE, MAAS, MIEAust and CPEng. Graham is employed by Atkins Acoustics and Associates Pty Ltd a Member Firm of the AAAC.

The quarry currently operates under approval from DoPE dated 25 July 2014 (08_0099). Specific noise conditions (Schedule 3 - Conditions 5, 6, 7, 8 & 9) contained within the approval include a requirement for the preparation of a *NMP* (*Schedule 3 - Condition 9*) to the satisfaction of the Secretary.

The approval includes:

- extraction, processing and transportation of up to 250,000 tonnes per annum of various grades of washed sand, mortar sand, sandstone blocks and retaining wall rocks for a period of approximately thirty (30) years.
- total extraction of approximately nine point five (9.5) million tonnes (Mt) of extractable sand and sandstone.
- extension of quarry by approximately twenty (20) hectares.
- extraction to depth of thirty-five (35) metres, and
- extraction by dozer and excavator.

The quarry operates from 7.00am to 6.00pm Monday to Friday and 7.00am to 1.00pm Saturday. Due to the number of quarry staff, simultaneous plant operation is typically limited to three (3) items at any one time.

2.0 APPROVAL CONDITIONS (Noise)

Project construction and quarry operational noise conditions imposed by the DoPE (*Approval 08_0099*) dated 25 July 2014 – Schedule 3 are presented below:

NOISE

Hours of Operation

5. The Proponent shall only conduct construction activities and quarrying operations on the site:
- (a) between 7.00 am and 6.00 pm, Monday to Friday;
 - (b) between 7.00 am and 1.00 pm, Saturday; and
 - (c) at no time on Sunday or public holidays.

Note: The Proponent may carry out other activities e.g. maintenance, on the site provided that these activities are conducted in a manner that is inaudible at all privately-owned residences.

6. The following activities may be carried out on the site outside the hours specified in condition 5:
- (a) delivery or dispatch of materials as requested by Police or other authorities; and
 - (b) emergency work to avoid the loss of lives, property and/or to prevent environmental harm.

In such circumstances the Proponent shall notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.

Noise Impact Assessment Criteria

7. The Proponent shall ensure that the construction and operational noise generated by the project does not exceed the criteria in Table 1 at any residence on privately-owned land.

Table 1: Noise criteria

Receiver Location	$L_{Aeq(15min)}$ dB(A)
All privately-owned residences	40

Noise generated by the project is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the *NSW Industrial Noise Policy*. Appendix 2 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

However, the noise criteria in Table 1 do not apply if the Proponent has an agreement with the relevant landowner to exceed the noise criteria, and the Proponent has advised the Department in writing of the terms of the agreement.

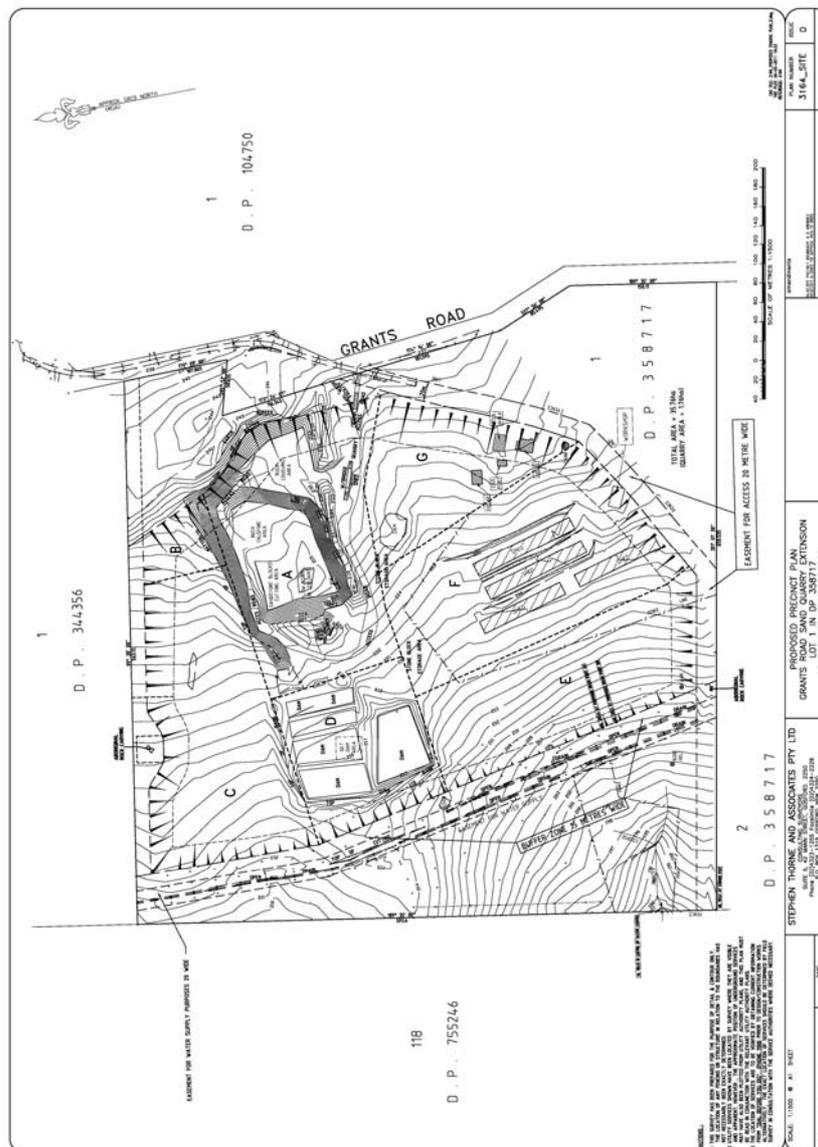
It is noted that no noise limits are provided in *Schedule 3 – Condition 7* for the National Park to the west of the quarry. Referenced to the EA Noise Assessment and the *NSW, INP* a target noise goal of $L_{Aeq, 15min}$ 50-55dB(A) is recommended for assessing noise at the National Park boundary.

3.0 DESCRIPTION OF QUARRING ACTIVITIES

The audit identified onsite extraction and processing of quarry products on Areas A and B (*Figure 1*). Operating plant and equipment identified during the audit included:

- McClosky (Tricon) Screen and loader in centre portion of Area B.
- Truck loading from stockpile area south-western portion Area A.
- Saw cutting central lower portion of Area A.

Figure 1. Quarry Precinct Layout



4.0 OVERVIEW

The noise audit was conducted between 8.00am and 12.15pm, Thursday 2 February 2017.

In accordance with the NMP noise measurements were conducted at three (3) reference locations nominated to represent residential receivers.

Location 1: 'Ibels' - 380 Somersby Falls Road

Location 2: 'McGregor' - 239 Grants Road

Location 3: 'Sammut' - 210 Grants Road

4.1 Measurement Instrumentation

The measurement instrumentation comprised a SVAN949 Sound and Vibration Analyzer. The meter was programmed to calculate and record 15 minute statistical levels. The reference calibration level of the meter was checked prior to and after the measurements with a Bruel & Kjaer Sound Level Calibrator Type 4230 and remained within ± 0.5 dB(A). The meter carried appropriate and current NATA calibration (*Attachment 2*).

Measurements were undertaken in accordance with procedures documented in Australian Standard AS1055-1997 'Acoustics - Description and Measurement of Environmental Noise' and the NSW Environmental Protection Authority, Industrial Noise Policy (*INP*).

4.2 Weather Conditions

Weather conditions reported for Mangrove Mountain (ID: 061375) during the audit were light winds from the south to south-south-east (1-3m/sec), air temperature 22-24°C, no rain and approximately 20% to 75% cloud cover.

4.3 Review of Noise Related Incidents

The Site Quarry Manager confirmed that no noise related incidents have been reported or recorded at the site during the period from 10 August 2016 and 2 February 2017.

5.0 MEASUREMENT RESULTS

5.1 Off-site Audit Results

Measurements and sources identified during the audit where appropriate were used to assess source noise contributions from the Grants Road Sand Quarry operations. A summary of the measurement results and calculated contributions is presented in *Table 1*.

Table 1: Audit Measurement Results
dBA re: 20×10^{-6} Pa

Measured Ambient Sound Pressure Levels dBA				Grants Road Sand Contribution $L_{Aeq, 15min}$	Comments
L_{Aeq}	L_{A10}	L_{A90}	L_{A1}		
Location 1: Ibels Residence – 380 Somersby Falls Road					
39.9	42.2	34.9	47.6	<35	Birds, distant road traffic, insects, GRS inaudible.
45.1	46.6	38.1	56.5	<35	Birds, distant road traffic, aircraft, insects, GRS inaudible.
Location 2: McGregor Residence – 239 Grants Road					
42.2	44.4	36.1	49.9	<35-6	Distant road traffic, insects, GRS onsite trucks and loaders audible at times.
41.7	44.8	36.7	49.3	<35-6	Distant road traffic, insects, GRS onsite trucks, loaders and McClosky (Tricon) screen audible at times.
Location 3: Sammut Residence – 210 Grants Road					
45.4	48.8	38.7	54.7	<36	Local domestic activities Distant road traffic, insects, GRS onsite trucks and loaders audible at times
42.5	46.7	35.8	51.8	<35	Local domestic activities Distant road traffic, insects, GRS onsite trucks and loaders audible at times
Location 4: National Park					
39.6	42.5	33.1	48.5	<40	GRS onsite trucks and loaders audible at times, birds, aircraft
42.4	53.5	37.9	48.5	<40	GRS onsite trucks and loaders audible at times, birds, aircraft

5.2 Site Audit Results

In addition to the offsite noise measurements *Table 2* presents a summary of sound power levels for the operating site plant and equipment.

Table 2: Quarry Plant and Equipment Sound Power Levels
dBA re: 10^{-12} Watts

Plant Description	Sound Power Level dB 10-12 Watts									
	dBA	31.5	63	125	250	500	1k	2k	4k	8k
Cat Loader 972G	102	109	113	104	104	98	96	93	85	77
Cat Loader 980G	104	113	118	109	104	101	100	96	92	91
McClosky (Tricon) Screen	108	107	105	105	105	103	101	100	96	88
Cat 365C - Saw Cutting	106	97	105	105	98	97	97	101	101	105

5.3 Compliance Status

The audit measurement results show that operational noise contributions from Grants Road Sand Quarry activities satisfied the (*Approval 08_0099*) dated 25 July 2014 project noise goal $L_{Aeq, 15min}$ 40dBA and the NMP recommended limit for the National Park $L_{Aeq, 15min}$ 50-55.

5.4 Noise Trends

A review of the measurement results (Table 1) and results reported for 2016 has shown that noise contributions from Grant Road Sand Quarry activities have remained steady.

5.5 Noise Mitigation Planning

Noise mitigation options planned for the next calendar year, include the continuation of the earth mounding/bunding on the north-eastern, northern and western site boundaries. Additionally and dependent on product demand, it is expected that the depths of the working platforms (Areas A and B) could increase by 3-4 metres.

6.0 CONCLUSION

Atkins Acoustics was retained by Grants Road Sand Pty Ltd to conduct an environmental noise audit for the Grants Road Sand Quarry.

The quarry currently operates under approval from DoPE dated 25 July 2014 (08_0099).

The site attended audit was conducted between 8.00am and 12.15pm, Thursday 2 February 2017.

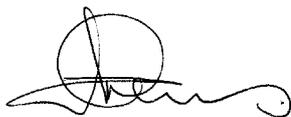
The measurement results show that operational noise contributions from Grants Road Sand Quarry satisfied the (*Approval 08_0099*) dated 25 July 2014 project noise goal $L_{Aeq, 15min}$ 40dBA and the NMP recommended limit for the National Park $L_{Aeq, 15min}$ 50-55.

No noise related incidents were reported or recorded at the site during the period from 10 August 2016 and 2 February 2017.

A review of the measurement results with results reported for 2016 has shown that noise contributions from Grant Road Sand Quarry have remained steady.

Noise mitigation options planned for the next calendar year, include the continuation of the earth mounding/bunding on the site boundaries and dependent on product demand, the depths of working platforms in Areas A and B, could increase by 3-4 metres.

ATKINS ACOUSTICS & ASSOCIATES PTY LTD.



Graham Atkins

ATTACHMENT 1: ASSESSMENT MONITORING LOCATIONS



ATTACHMENT 2: SVAN Certificate of Calibration.

CERTIFICATE OF CALIBRATION

CERTIFICATE No.: **SLM 41167 & FILT 1049**

Equipment Description: Sound & Vibration Analyzer

Manufacturer: Svantek

Model No: Svan-949 **Serial No:** 9713

Microphone Type: SV-22 **Serial No:** 4011885

Filter Type: 1/3 Octave **Serial No:** 9713

Comments: All tests passed for type 1.
(See over for details)

Owner: Atkins Acoustics
Suite 17, 1 Jordan Street
Gladesville, NSW 2111

Ambient Pressure: 1001 hPa ± 1.5 hPa

Temperature: 23 °C $\pm 2^\circ$ C **Relative Humidity:** 38% $\pm 5\%$

Date of Calibration: 15/10/2015 **Issue Date:** 16/10/2015

Acu-Vib Test Procedure: AVP05 (SLM) & AVP06 (Filters)

CHECKED BY:  **AUTHORISED SIGNATURE:** 

Accredited for compliance with ISO/IEC 17025
The results of the tests, calibration and/or measurements included in this document are traceable to
Australian/national standards.



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AVCERT05 Rev. 1.1 11.06.13

Appendix 4
NOISE AUDIT DECEMBER 2017
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Attention: Steve Jones

20 December 2017

Atkins Acoustics and Associates Pty Ltd.
Consulting Acoustical & Vibration Engineers

ENVIRONMENTAL NOISE AUDIT
GRANTS ROAD SAND QUARRY
SOMERSBY

1.0 INTRODUCTION

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The quarry currently operates under approval from DoPE dated 25 July 2014 (08_0099). Specific noise conditions (Schedule 3 - Conditions 5, 6, 7, 8 & 9) contained within the approval include a requirement for the preparation of a *NMP* (*Schedule 3 - Condition 9*) to the satisfaction of the Secretary.

The approval includes:

- extraction, processing and transportation of up to 250,000 tonnes per annum of various grades of washed sand, mortar sand, sandstone blocks and retaining wall rocks for a period of approximately thirty (30) years.
- total extraction of approximately nine point five (9.5) million tonnes (Mt) of extractable sand and sandstone.
- extension of quarry by approximately twenty (20) hectares.
- extraction to depth of thirty-five (35) metres, and
- extraction by dozer and excavator.

The quarry operates from 7.00am to 6.00pm Monday to Friday and 7.00am to 1.00pm Saturday.

2.0 APPROVAL CONDITIONS (Noise)

Project construction and quarry operational noise conditions imposed by the DoPE (*Approval 08_0099*) dated 25 July 2014 – Schedule 3 are presented below:

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5. The Proponent shall only conduct construction activities and quarrying operations on the site:
- between 7.00 am and 6.00 pm, Monday to Friday;
 - between 7.00 am and 1.00 pm, Saturday; and
 - at no time on Sunday or public holidays.

Note: The Proponent may carry out other activities e.g. maintenance, on the site provided that these activities are conducted in a manner that is inaudible at all privately-owned residences.

6. The following activities may be carried out on the site outside the hours specified in condition 5:
- delivery or dispatch of materials as requested by Police or other authorities; and
 - emergency work to avoid the loss of lives, property and/or to prevent environmental harm.

In such circumstances the Proponent shall notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.

Noise Impact Assessment Criteria

7. The Proponent shall ensure that the construction and operational noise generated by the project does not exceed the criteria in Table 1 at any residence on privately-owned land.

Table 1: Noise criteria

Receiver Location	$L_{Aeq (15 min)}$ dB(A)
All privately-owned residences	40

Noise generated by the project is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the *NSW Industrial Noise Policy*. Appendix 2 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

However, the noise criteria in Table 1 do not apply if the Proponent has an agreement with the relevant landowner to exceed the noise criteria, and the Proponent has advised the Department in writing of the terms of the agreement.

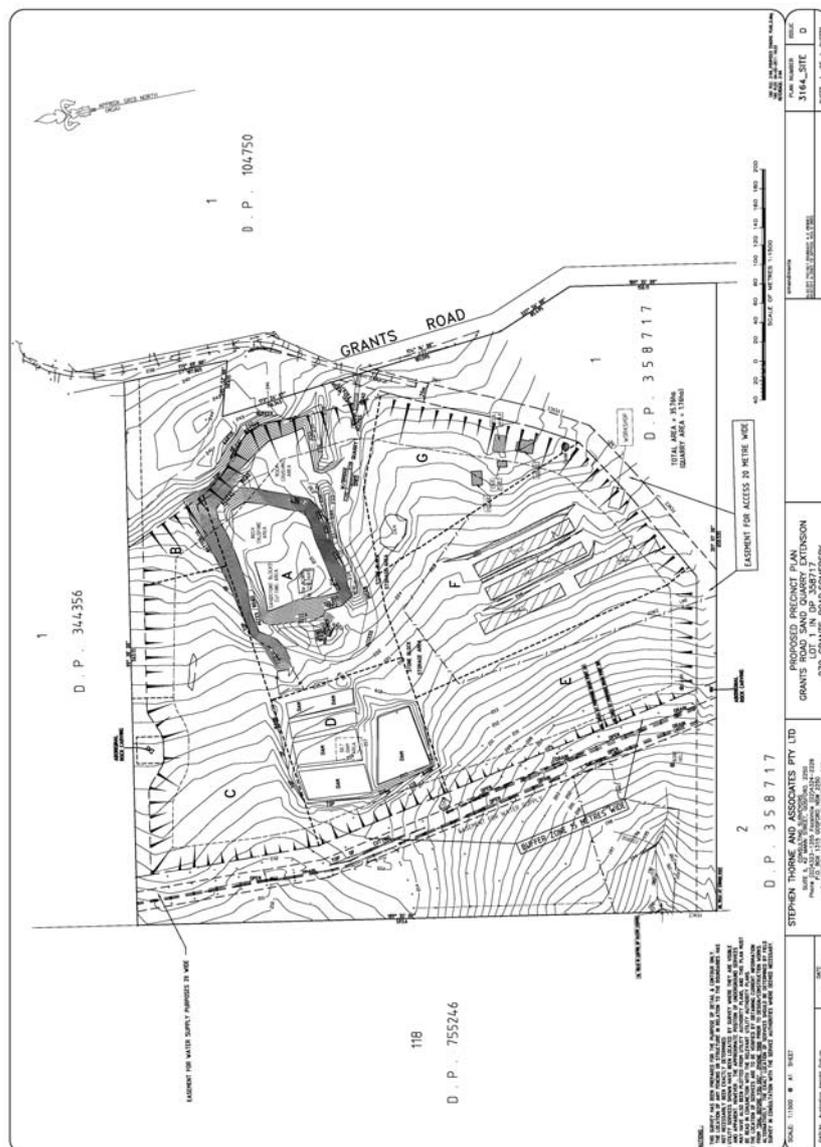
It is noted that no noise limits are provided in *Schedule 3 – Condition 7* for the National Park to the west of the quarry. Referenced to the EA Noise Assessment and the *NSW, INP* a target noise goal of $L_{Aeq, 15min}$ 50-55dB(A) is recommended for assessing noise at the National Park boundary.

3.0 DESCRIPTION OF SITE ACTIVITIES

The audit identified onsite extraction and processing of quarry products on Areas A and B (*Figure 1*). Operating plant and equipment identified during the audit included:

- McClosky (Tricon) Screen and loader in centre portion of Area B.
- Truck loading from stockpile area south-western portion Area A.
- Saw cutting central lower portion of Area A,
- Water pump and washing plant

Figure 1. Quarry Precinct Layout



4.0 OVERVIEW

The noise audit was undertaken between 7.00am and 12.10pm, Tuesday 19 December 2017.

In accordance with the NMP noise measurements were conducted at three (3) reference locations nominated to represent residential receivers.

Location 1: 'Ibels' - 380 Somersby Falls Road

Location 2: 'McGregor' - 239 Grants Road

Location 3: 'Sammut' - 210 Grants Road

4.1 Measurement Instrumentation

The measurement instrumentation comprised a Svan957 Sound and Vibration Analyzer. The meter was programmed to calculate and record 15 minute statistical levels. The reference calibration level of the meter was checked prior to and after the measurements with a Bruel & Kjaer Sound Level Calibrator Type 4230 and remained within ± 0.5 dB(A). The meter carried appropriate and current NATA calibration (*Attachment 2*).

Measurements were undertaken in accordance with procedures documented in Australian Standard AS1055-1997 'Acoustics - Description and Measurement of Environmental Noise' and the NSW Environmental Protection Authority, Industrial Noise Policy (*INP*) guidelines.

4.2 Weather Conditions

Weather observations and conditions reported for Mangrove Mountain (ID: 061375) during the audit were calm to light winds from the north to north-west (1-3m/sec), air temperature 23-31°C, relative humidity 50-97% and clear sky.

4.3 Review of Noise Related Incidents

The Site Quarry Manager confirmed that no noise related incidents were reported or recorded at the site during the period from 2 February 2017 to 18 December 2017.

5.0 MEASUREMENT RESULTS

5.1 Off-site Measurement Results

Attended measurements during the audit where appropriate were used to assess source noise contributions associated with Grants Road Sand Quarry operations. A summary of the measurement results and calculated contributions is presented in *Table 1*. Measurements at all reference assessment locations was dominated by cicada and insect noise

Table 1: Audit Measurement Results
dBA re: 20×10^{-6} Pa

Measured Ambient Sound Pressure Levels dBA				Estimated Grants Road Sand Contribution $L_{Aeq, 15min}$	Comments
L_{Aeq}	L_{A10}	L_{A90}	L_{A1}		
Location 1: Ibels Residence – 380 Somersby Falls Road					
54.9	55.8	54.0	56.9	<40	Cicadas, aircraft, birds, distant road traffic, insects, GRS inaudible.
55.2	55.9	54.2	57.6	<40	Cicadas, birds, distant road traffic, insects, GRS inaudible
Location 2: McGregor Residence – 239 Grants Road					
60.2	61.4	59.8	61.9	<40	Cicadas, distant road traffic, insects, GRS onsite trucks, loaders audible at times.
61.8	62.7	61.0	62.9	<40	Cicadas, distant road traffic, insects, GRS onsite trucks, loaders, excavators, water pump, wash plant and McClosky (Tricon) screen audible at times.
Location 3: Sammut Residence – 210 Grants Road					
67.1	67.8	64.4	68.8	<40	Cicadas, distant road traffic, insects, GRS onsite trucks, loaders and McClosky (Tricon) screen audible at times.
65.7	66.5	65.0	66.9	<40	Cicadas, distant road traffic, insects, GRS onsite trucks, loaders, excavators, water pump, wash plant and McClosky (Tricon) screen audible at times.
Location 4: National Park					
60.9	62.2	59.6	63.8	<50	Cicadas, GRS onsite trucks (L_{Amax} 58/9dBA), loaders, water pump, wash plant and McClosky (Tricon) screen audible at times.
60.7	61.0	59.2	62.7	<50	Cicadas, GRS onsite trucks, loaders (L_{Amax} 55/8dBA), water pump, wash plant and McClosky (Tricon) screen audible at times.

5.2 Site Audit Results

In addition to the offsite noise measurements *Table 2* presents a summary of sound power levels for the operating site plant and equipment.

Table 2: Quarry Plant and Equipment Sound Power Levels
dBA re: 10⁻¹² Watts

Plant Description	Sound Power Level dB 10-12 Watts									
	dBA	31.5	63	125	250	500	1k	2k	4k	8k
Cat Loader 980G	105	92	119	103	100	99	101	95	90	89
Cat Excavator 336D	103	94	103	95	98	96	90	87	83	75
Cat Loader 980D	107	101	107	104	101	100	103	101	95	85
Water Pump	107	94	122	107	95	99	102	100	93	88
Wash Plant	107	103	106	105	98	97	96	98	90	85
McClosky (Tricon) Screen	110	98	102	95	101	101	102	97	93	83
Cat Excavator 365C - Saw Cutting	106	98	104	105	97	97	96	98	94	92

5.3 Compliance Status

The results summarised in *Table 1* show that noise from Grants Road Sand Quarry activities complied with the *Approval 08_0099* dated July 2014 noise goal $L_{Aeq, 15min}$ 40dBA and the NMP recommended goal for the National Park $L_{Aeq, 15min}$ 50-55.

5.4 Noise Trends

A review of the measurement results (Table 1) and previous reported levels has shown that noise contributions from Grant Road Sand Quarry have remained steady.

5.5 Noise Mitigation Planning

Noise mitigation options planned for the next calendar year, include the continuation of the earth mounding/bunding on the north-eastern, northern and western site boundaries. Additionally and dependent on product demand, it is expected that the depths of the working platforms (Areas A and B) could increase by 2-6 metres.

6.0 CONCLUSION

Atkins Acoustics was retained by Grants Road Sand Pty Ltd to conduct an environmental noise audit for the Somersby Quarry.

The quarry currently operates under approval from DoPE dated 25 July 2014 (Approval 08_0099).

The noise audit was conducted between 7.00am and 12.10pm, Tuesday 19 December 2017.

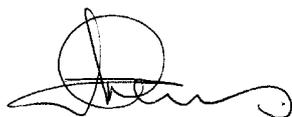
The findings of the survey show that noise from Grants Road Sand Quarry complied with the (*Approval 08_0099*) dated 25 July 2014 project noise goal $L_{Aeq, 15min}$ 40dBA and the NMP recommended goal for the National Park $L_{Aeq, 15min}$ 50-55.

No noise related incidents were reported or recorded at the site for the period between 2 February and 18 December 2017.

A review of the measurement results (Table 1) and previous reported levels has shown that noise contributions from Grant Road Sand Quarry have remained steady

Noise mitigation options planned for the next calendar year, include the continuation of the earth mounding/bunding on the site boundaries and dependent on product demand, the depths of working platforms in Areas A and B, could increase by 2-6 metres.

ATKINS ACOUSTICS & ASSOCIATES PTY LTD.



Graham Atkins

ATTACHMENT 1: ASSESSMENT MONITORING LOCATIONS



ATTACHMENT 2: Svan Certificate of Calibration.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: **SLM 21044 & FILT 3942**

Equipment Description: Sound & Vibration Analyser

Manufacturer: Svantek

Model No: Svan-957 **Serial No:** 21481

Microphone Type: 7052E **Serial No:** 46490

Filter Type: 1/1 Octave **Serial No:** 21481

Comments: All tests passed for class 1.
(See over for details)

Owner: Atkins Acoustics
Suite 17, 1 Jordan Street
Gladesville NSW 2111

Ambient Pressure: 1009 hPa \pm 1.5 hPa

Temperature: 24 °C \pm 2° C **Relative Humidity:** 40% \pm 5%

Date of Calibration: 13/07/2017 **Issue Date:** 17/07/2017

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: *[Signature]* **AUTHORISED SIGNATURE:** *[Signature]*
Jack Kille

Accredited for compliance with ISO/IEC 17025
The results of the tests, calibration and/or measurements included in this document are traceable to
Australian/national standards.



Accredited Lab. No. 9262
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Measurements



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AVCERT10 Rev. 1.2 03.02.15

Appendix 5
BASELINE AIR QUALITY MONITORING
Pacific Environmental Limited

Report

Baseline monitoring annual report – 2017 Grants Road Sand

Document control number: AQU-NW-002-0447733

Date: 27 March 2018

Pacific Environment
Limited 

 Technologies  Consulting  Monitoring

www.pacific-environment.com

Project name: Baseline monitoring annual report – 2017
Grants Road Sand

Document control number: AQU-NW-002-0447733

Prepared for: Grants Road Sand

Approved for release by: Jane Barnett

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Version	Date	Comment	Prepared by	Reviewed by
Draft 01	26.02.2018	First draft	Calum Phillips	Jane Barnett
Final	27.03.2018	Final	Calum Phillips	Jane Barnett



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Where site inspections, testing or fieldwork have taken place, the report is based on the information made available by the client or their nominees during the visit, visual observations and any subsequent discussions with regulatory authorities. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Pacific Environment is both complete and accurate. It is further assumed that normal activities were being undertaken at the site on the day of the site visit(s), unless explicitly stated otherwise.

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1 Introduction

Pacific Environment has been commissioned by Grants Road Sand to undertake baseline air quality and meteorological reporting for the Grants Road Sand Quarry, located in the NSW Central Coast at Somersby, NSW.

The results of the monitoring programs are provided on an annual basis. This report summarises the data collected during the January to December 2016 period.

2 Relevant monitoring guidelines and standards

2.1 Air quality monitoring guidelines

All monitoring for air quality is conducted in accordance with the NSW Environmental Protection Agency (EPA)¹ “*Approved methods for the sampling and analysis of air pollutants in NSW*” (NSW DEC 2005).

Specifically, the approved methods relevant to this monitoring plan are:

- AM-1 – Guide for the siting of sampling equipment.
- AM-2 – Guide for measurement of horizontal wind for air quality applications.
- AM-4 – Meteorological monitoring guidance for regulatory modelling applications.
- AM-18 – Particulate matter – PM₁₀ – high volume sampler with size-selective inlet.
- AM-19 – Particulates – deposited matter – gravimetric method.

2.1.1 General siting requirements

AM-1 refers to the Australian Standard (AS) 2922 – 1987, however this has been superseded by AS/NZS 3580.1.1:2007 *Methods for sampling and analysis of ambient air - Guide to siting air monitoring equipment*.

The siting of all instrumentation is undertaken in accordance with the requirements set out in both AS 2922 - 1987 and AS 3580.1.1: 2007. Where conflicts arise, preference will be given to the more recent standard.

2.1.2 Meteorological monitoring

AM-2 refers to the Australian Standard AS 2923 – 1987 “Ambient Air – Guide for Measurement of Horizontal Wind for Air Quality Applications”. AS 2923 applies to the determination of wind speed and direction for the purpose of air quality applications and sets out requirements for apparatus, calibration and maintenance, siting and installation and data recording and processing (including appropriate methods for wind averaging). A monitoring site for the meteorological station (met station) was chosen in accordance with AS 2923 –

¹ The NSW EPA exists as a legal entity operated within the Office of Environment and Heritage (OEH) which came into existence in April 2011. OEH was previously part of the Department of Environment, Climate Change and Water (DECCW). The DECCW was also recently known as the Department of Environment and Climate Change (DECC), and prior to that the Department of Environment and Conservation (DEC). The terms NSW EPA, OEH, DECCW, DECC and DEC are interchangeable in this report.

1987. The location is away from buildings or other obstructions that would otherwise impact on the prevailing wind flow.

A summary of the parameters measured is shown in Table 2-1.

Table 2-1: Weather Station Parameters

Parameter	Unit	Frequency	Averaging Period	Sampling Method
Rainfall	mm	Continuous	1 Hour	AM-4
Temperature @ 2 m	°C		10 Minute	AM-4
Temperature @ 10 m	°C			AM-2 and AM-4
Wind Speed @ 10 m	m/s			AM-2 and AM-4
Wind Direction @ 10 m	Degrees			AM-2 and AM-4
Sigma Theta	Degrees			AM-2 and AM-4
Relative Humidity	%			AM-4
Solar Radiation	W/m ²			AM-4

2.1.3 Particulate matter monitoring

AM-18 refers to the Australian Standard (AS) 3580.9.6:1990, however this has been superseded by AS/NZS 3580.9.6:2015 *Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM₁₀ high volume sampler with size selective inlet – Gravimetric method.*

PM₁₀ refers to all particles with equivalent aerodynamic diameters of less than 10 µm, that is, all particles that behave aerodynamically in the same way as spherical particles with a unit density.

The HVAS PM₁₀ data is collected at the Grants Road Quarry site (Figure 3-1) before analysis is completed by ALS Environmental. These results are provided to Pacific Environment for presentation in the air quality baseline report.

2.1.4 Dust deposition monitoring

AM-19 refers to the Australian Standard (AS) 3580.10.1-1991, however this has been superseded by AS/NZS 3580.10.1:2003 *Methods for sampling and analysis of ambient air – Method 10.1: Determination of particulate matter – Deposited matter – Gravimetric method.*

The deposition data is collected at the Grants Road Quarry site (Figure 3-1) and analysis is completed by ALS Environmental. These results are provided to Pacific Environment for presentation in the air quality baseline report.

2.2 Air quality criteria

The NSW EPA specifies air quality assessment criteria relevant for assessing impacts from air pollution (**NSW DEC, 2005**). These criteria are health-based (i.e. they are set at levels to reduce the risk of adverse health effects). The EPA criteria are consistent with the National Environment Protection Measures for Ambient Air Quality (referred to as the Ambient Air-NEPM) (**NEPC, 1998, NEPC, 2003**). In January 2017, the NSW EPA released their updated Approved Methods (**EPA, 2016**) to amend the annual average PM₁₀ criterion from 30 µg/m³ down to 25 µg/m³. The 2016 data in this report however, is referenced to the 30 µg/m³ criterion. Future reports will reference the 25 µg/m³ criterion and assess compliance accordingly.

Table 2-2 and Table 2-3 summarise the air quality criteria for concentrations of particulate matter and deposited dust levels that are relevant to this study. That is, the criteria stated form the basis for the standards to be achieved at the quarry.

Table 2-2: Air Quality Standards / Goals for Particulate Matter.

Pollutant	Averaging Period	Standard / Goal	Agency
Particulate matter with an equivalent aerodynamic diameter less than 10 µm (PM ₁₀)	24-hour maximum	50 µg/m ³	EPA impact assessment criteria; NEPM reporting goal (allows five exceedances per year for bushfires)
	Annual mean	30 µg/m ³	EPA impact assessment criteria

Notes: µg/m³ – micrograms per cubic metre, µm – micrometre.

Table 2-3: Air Quality Standards / Goals for Deposited Dust.

Pollutant	Averaging Period	Standard / Goal	Agency
Deposited dust (insoluble solids)	Annual mean	2 g/m ² /month (Incremental)	EPA impact assessment criteria
	Annual mean	4 g/m ² /month (Cumulative)	EPA impact assessment criteria

Notes: g/m²/month – grams per square metre per month.

NSW has not set any impact assessment criteria for crystalline silica but references the Victorian EPA ambient assessment criterion for mining and extractive industries of 3 µg/m³ (annual average as PM_{2.5}) (**VEPA, 2007**).

3 Monitoring locations

The Grants Road Sand Quarry baseline monitoring locations are shown in Figure 3-1. Featured are the automatic weather station (AWS), the High Volume Air Sampler (HVAS) and two dust deposition gauges (R1 and R4).

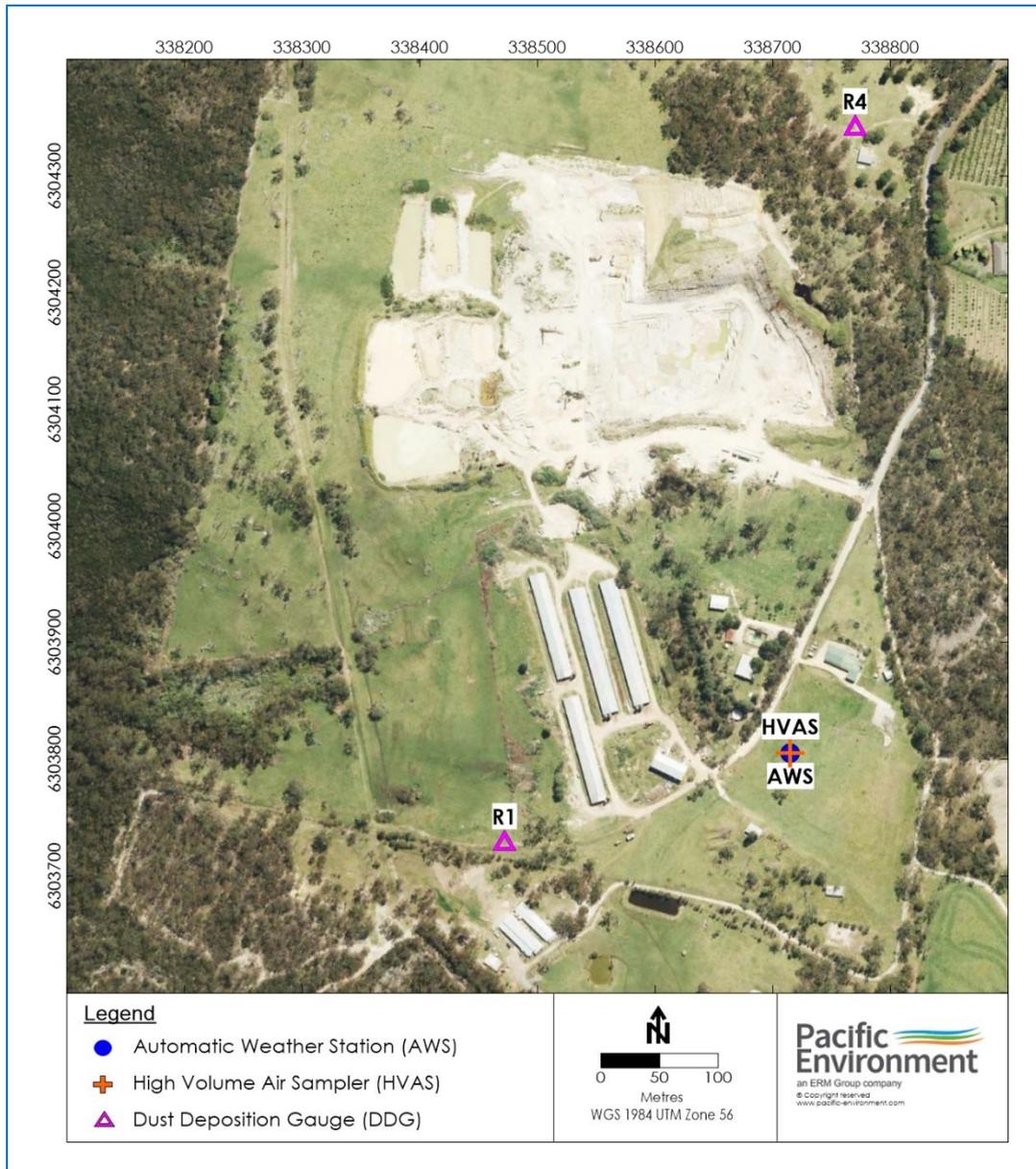


Figure 3-1: Monitoring Locations at Grants Rd. Quarry

4 Air quality monitoring results

4.1 Meteorological monitoring

Meteorological data collected during 2017 are summarised in Table 4-1 and Table 4-2.

The valid data recovery rate after all data validation processes is presented in Table 4-1. There were problems with birds damaging the wiring from the sensors to the logger which caused a loss of data.

There were also two incidents of lightning strikes which damaged some of the equipment beyond repair. It took time to send this equipment overseas for assessment, order replacement instruments, ship them and install them which is why there are significant data gaps in 2017.

Table 4-1: *Valid Data Recovery Rates - AWS*

Parameter	Valid Data Recovery Rate
Wind Speed	25%
Wind Direction	25%
Temperature – 2 m	78%
Temperature – 10 m	25%
Relative Humidity	25%
Pressure	25%
Solar Radiation	59%
Rainfall	78%

Table 4-2: Summary statistics

Parameter (units)	Statistical measure	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17
Wind Speed (m/s)	Mean	2.0	-	-	-	1.5	2.1	-	-	2.5	1.7	-	-
Temperature (°C) – 2m		23.9	22.3	19.8	16.0	13.9	5.5	-	-	16.9	17.7	17.7	22.1
Temperature (°C) – 10m		23.7	-	-	-	14.1	11.2	-	-	17.0	17.2	-	-
RH (%)		68.1	-	-	-	73.9	74.2	-	-	43.5	74.2	-	-
Barometric pressure (hPa)		983.5	-	-	-	993.4	996.7	-	-	986.5	989.4	-	-
Wind Speed (m/s)	Median	1.9	-	-	-	1.3	1.9	-	-	2.1	1.6	-	-
Temperature (°C) – 2m		22.4	21.2	19.5	15.4	13.7	11.1	-	-	16.7	17.0	17.6	20.9
Temperature (°C) – 10m		22.1	-	-	-	14.1	11.2	-	-	16.7	16.6	-	-
RH (%)		71.8	-	-	-	75.2	71.7	-	-	40.3	77.0	-	-
Barometric pressure (hPa)		984.0	-	-	-	993.7	996.6	-	-	987.5	990.7	-	-
Wind Speed (m/s)	Standard Deviation	1.1	-	-	-	0.8	1.0	-	-	1.5	0.9	-	-
Temperature (°C) – 2m		5.5	5.0	3.1	3.4	3.4	12.2	-	-	6.1	4.4	3.8	5.1
Temperature (°C) – 10m		5.3	-	-	-	2.9	2.1	-	-	5.8	3.7	-	-
RH (%)		19.0	-	-	-	14.4	13.9	-	-	19.8	15.6	-	-
Barometric pressure (hPa)		4.9	-	-	-	4.1	4.9	-	-	5.7	4.2	-	-
Rainfall (mm)	Monthly Total	28.4	121.6	385.4	53.6	12.4	76	-	-	1.2	57.8	13.2	40.2

4.1.1 Wind data

A wind rose for the annual period 2017 is presented in Figure 4-1. The wind rose indicates that winds from the west are dominant. The average wind speed for the period was 1.9 m/s and the percentage occurrence of calm wind conditions (less than or equal to 0.5 m/s) was 2.4 %.

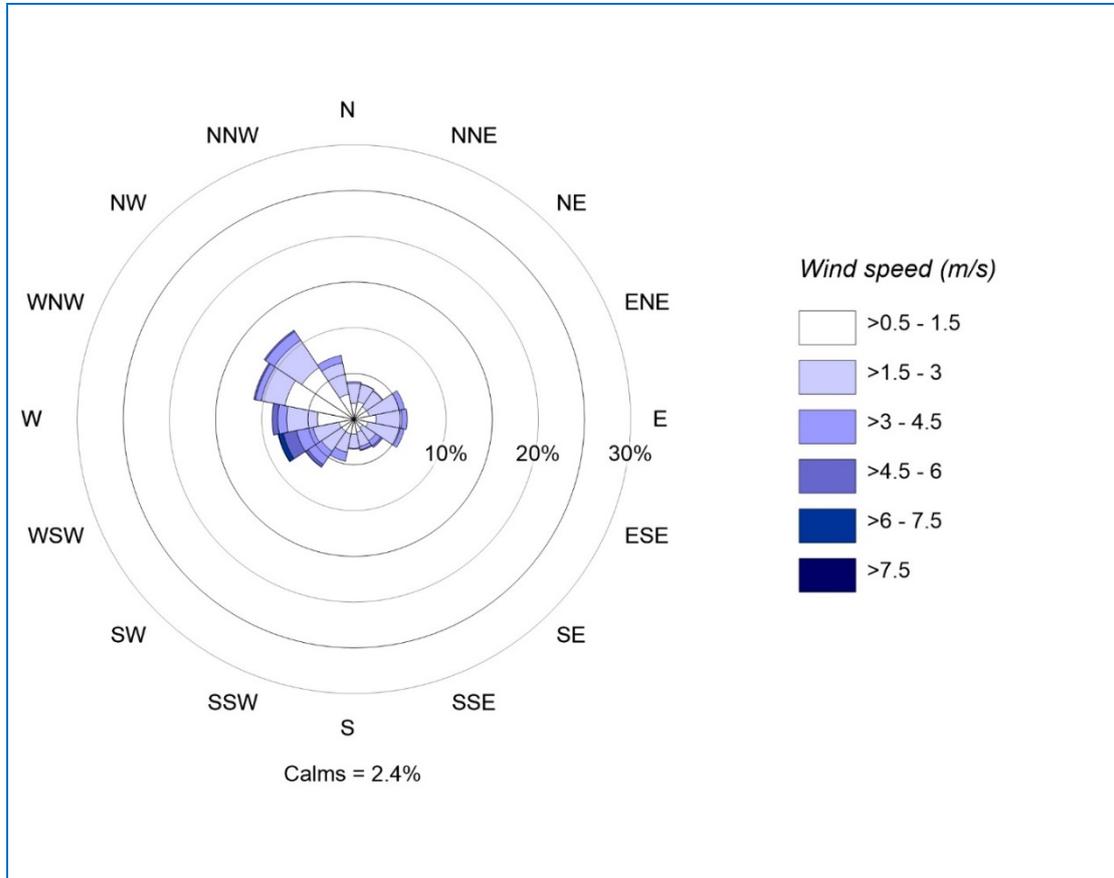


Figure 4-1: Grants Road Sand Wind Rose, 2017

4.1.2 Temperature

A plot of the hourly average temperature, recorded at 2 m and 10 m, is shown in Figure 4-2. June was the coldest recorded month on average and January was the hottest month on average. The maximum daily average of 31°C was recorded on 05 February 2017. The monthly average temperature is shown in Table 4-3.

Table 4-3: *Monthly Average Temperature, 2017*

Month	Monthly Average Temperature at 2m (°C)	Monthly Average Temperature at 10m (°C)
January	23.9	23.7
February	22.3	-
March	19.8	-
April	16.0	-
May	13.9	14.1
June	5.5	11.2
July	-	-
August	-	-
September	16.9	17.0
October	17.7	17.2
November	17.7	-
December	22.1	-

4.1.3 Rainfall

A plot of the daily average rainfall is shown in Figure 4-3 and the monthly average rainfall is shown in Figure 4-4. March recorded the highest monthly rainfall of 385 mm.

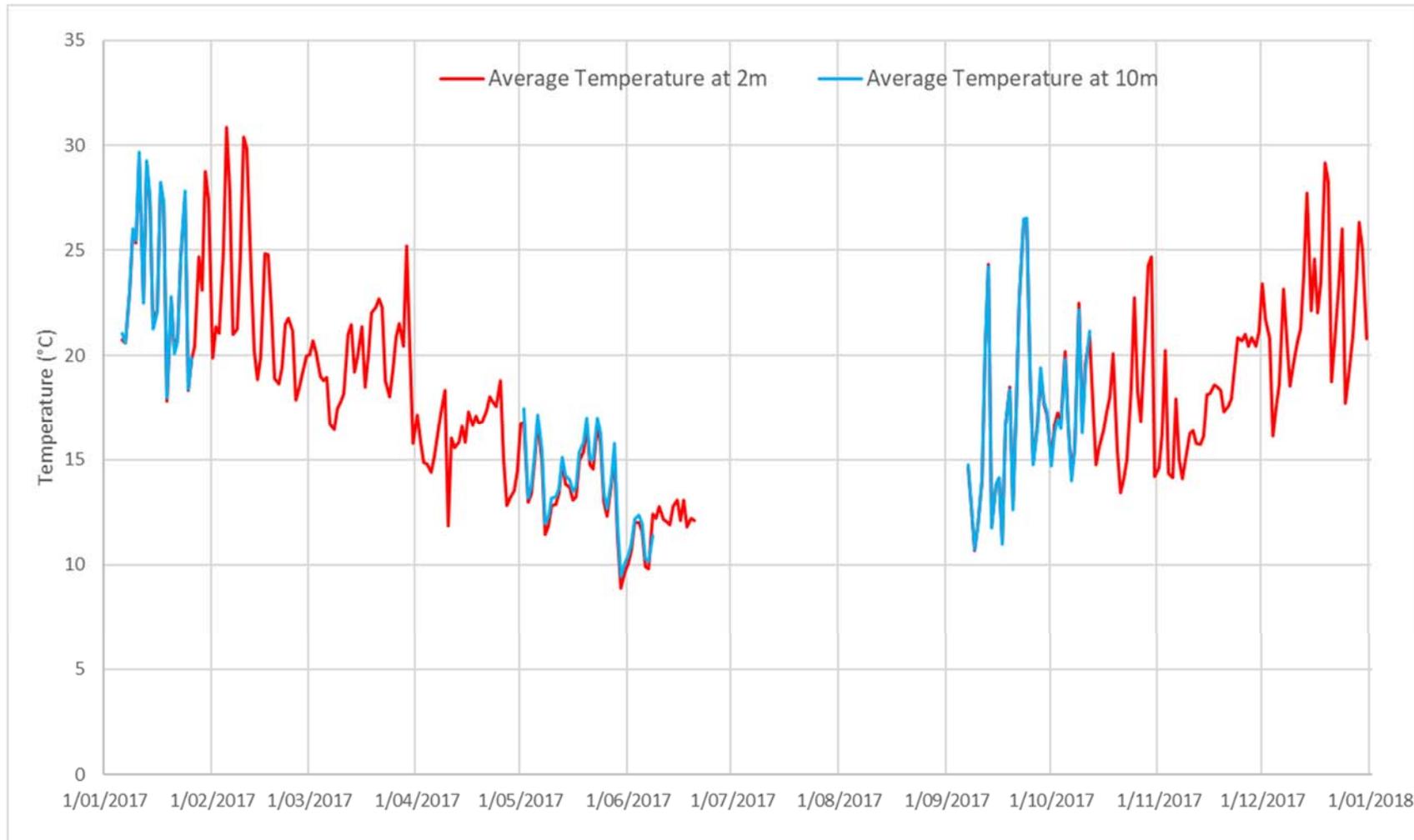


Figure 4-2: Temperature Daily Temperature 2017

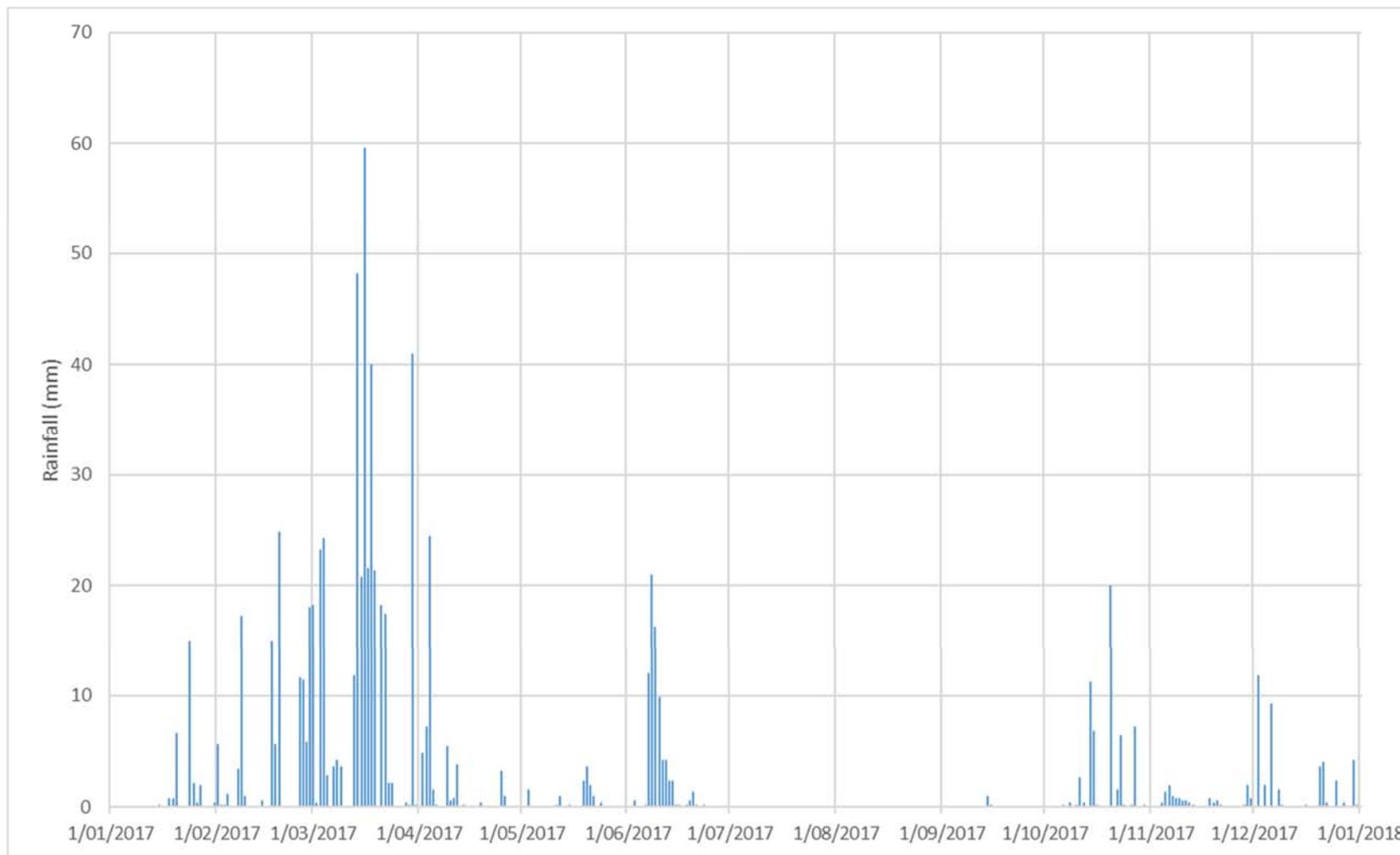


Figure 4-3: Daily Rainfall, 2017

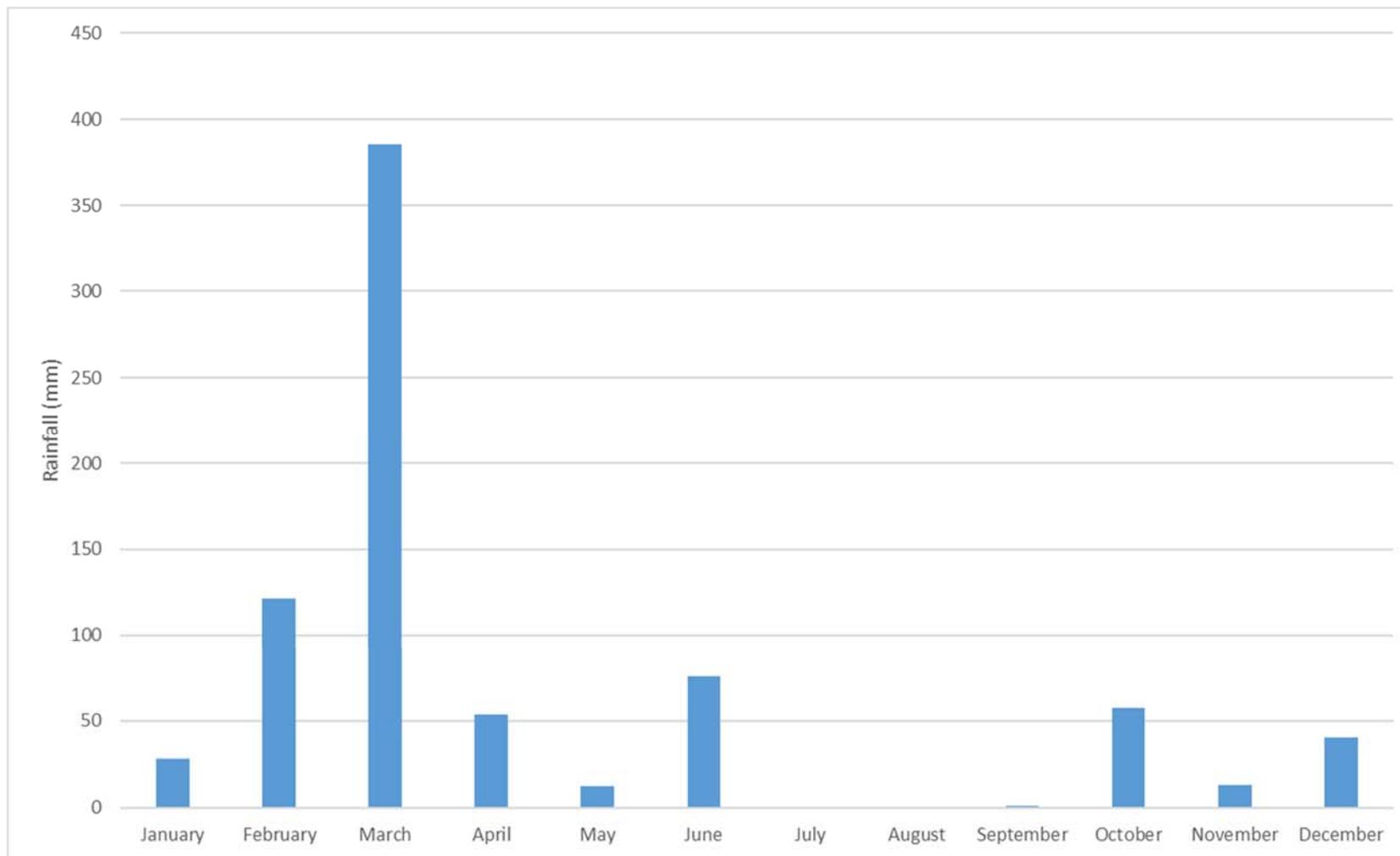


Figure 4-4: Monthly Rainfall Total, 2017.

4.2 Particulate matter (PM₁₀)

4.2.1 Measured results

The results for the available PM₁₀ data are presented in Figure 4-5. Of a possible 60 samples (over approximately 12 months), thirty eight samples are reported, resulting in a data recovery rate of approximately 71%. The average PM₁₀ concentration over the recorded 1-year period was 6.8 µg/m³, which is well below the annual EPA impact assessment criterion of 25 µg/m³. All reported results are well within the EPA maximum 24-hour average criterion of 50 µg/m³ for PM₁₀, with a maximum 24-hour average of 21.2 µg/m³ recorded on 17 February 2017.

The dust sample collected by the HVAS monitor includes both dust generated by site activities (incremental dust impact) and dust from all other local sources (background dust levels). However as stated previously, even with the background levels accounted for, the PM₁₀ levels are considerably below their respective 24-hour and annual criterion.

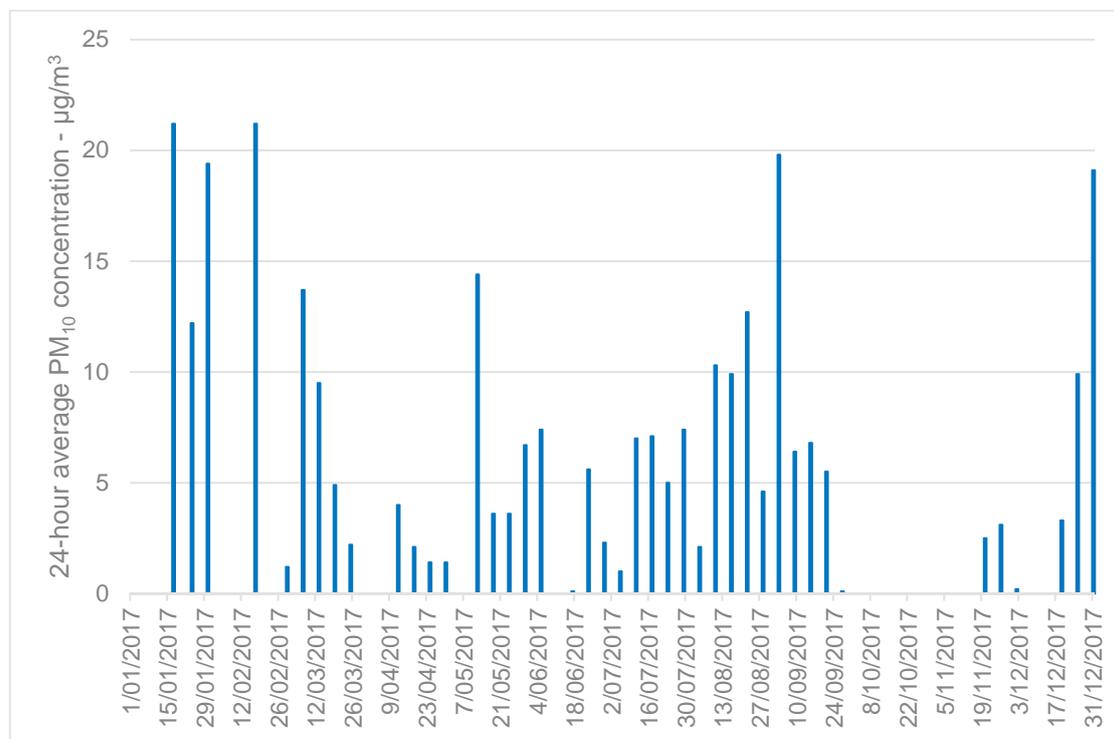


Figure 4-5: HVAS Monitoring Results for PM₁₀, 2017

4.2.2 Comparison to environmental assessment predictions

The Air Quality Assessment (AQA) for the Grants Road Sand Quarry Extension was completed by PAEHolmes in 2013, *Air Quality Impact Assessment – Extension of Grants Road Quarry (PAEHolmes, 2013)*. The cumulative results predicted in the assessment indicate that the 24-hour PM₁₀ ground level concentrations at the current location of the HVAS would be in the order of 70 µg/m³. The highest measured cumulative 24-hour PM₁₀ concentration was 21.2 µg/m³ in 2017) a value considerably lower than the conservative predictions made in the air quality assessment.

The predicted annual average PM₁₀ concentration in the AQA was approximately 30 µg/m³ at the HVAS location, however an annual average concentration of 6.8 µg/m³ was measured in 2017. This is consistent with the 24-hour results, where the actual concentration has been established to constitute 50% or less than the predicted concentration at the same location.

Given the results of the data during the monitoring period, currently no action is required to control environmental performance. Rather it is recommended that current mitigation processes are sustained.

4.3 Dust deposition

4.3.1 Measured results

Dust deposition is measured at two locations, R1 and R4, as shown in Figure 3-1. The results for the available dust deposition data are presented in Figure 4-5. Of a possible 12 samples, 12 samples are reported. The average dust deposition level over the recorded period was 0.6 g/m²/month at R1 and 0.9 g/m²/month at R4, which are well below the EPA cumulative annual average criterion of 4 µg/m³. The maximum level of 4 g/m²/month was recorded in February at R4 but all other recorded levels were below 2 g/m²/month.

The dust sample collected by the deposition gauges includes both dust generated by site activities (incremental dust impact) and dust from all other local sources (background dust levels). Even with the background levels accounted for, the deposition levels are considerably below both the incremental and cumulative annual criteria.

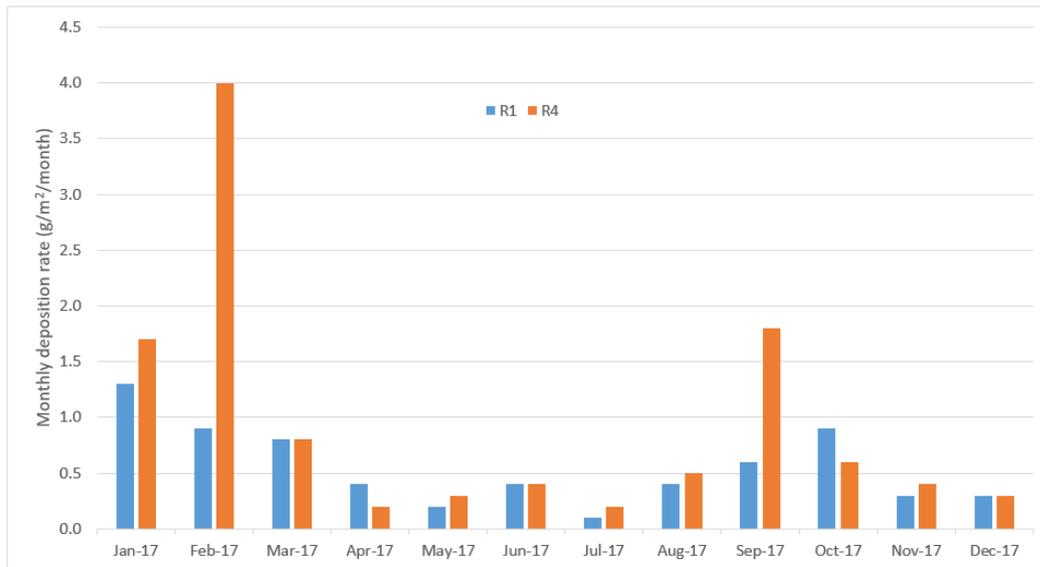


Figure 4-6: Dust deposition monitoring results for 2017

4.3.2 Comparison to environmental assessment predictions

The Air Quality Assessment (AQA) for the Grants Road Sand Quarry Extension was completed by PAEHolmes in 2013, *Air Quality Impact Assessment – Extension of Grants Road Quarry (PAEHolmes, 2013)*. The cumulative results predicted in the assessment indicate that the annual dust deposition level at the locations of the deposition gauges would be in the order of 1.7 g/m²/month at R1 and 1.9 g/m²/month at R4.

Given the results of the data during the monitoring period, currently no action is required to control environmental performance. Rather it is recommended that current mitigation processes are sustained.

4.4 Respirable crystalline silica

There have been no on-site measurements yet of respirable crystalline silica, but this will be carried out during a period of maximum throughput. In lieu of direct measurements, Section 4.4.1 provides some discussion around some inferences made using the measured PM₁₀ data.

4.4.1 Comparison to environmental assessment predictions

A crystalline silica content of 17% of PM₁₀ was used for the air quality assessment in 2013 (PAEHolmes, 2013). The measured annual average PM₁₀ concentration of 6.8 µg/m³ would therefore contain approximately 1.2 µg/m³ of crystalline silica. However, it is noted that only the respirable fraction of PM₁₀ is relevant for assessing respirable crystalline silica, that is, PM₄ or lower. If it is conservatively assumed that 50% of PM₁₀ is PM_{2.5}, then the inferred annual average respirable crystalline silica concentration might be approximately 0.6 µg/m³, significantly below the annual criterion of 3 µg/m³. These low levels would need to be confirmed through monitoring.

5 References

Australian Standard / New Zealand Standard (2015). Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM₁₀ high volume sampler with size-selective inlet - Gravimetric method. AS 3580.9.6:2015.

Australian Standard / New Zealand Standard (2007). Methods for sampling and analysis of ambient air - Guide to siting air monitoring equipment. AS 3580.1.1:2007

NEPC (1998, 2003). "National Environment Protection (Ambient Air Quality) Measure"

NSW DEC (2005). "Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales". New South Wales EPA 59-61 Goulburn Street, Sydney, NSW August 2005.

NSW EPA (2016). "Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales". NSW Environment Protection Authority. December 2016.

PAEHolmes (2013). "Air Quality Impact Assessment – Extension of Grants Road Quarry".

VEPA (2007). "Protocol for Environmental Management: Mining and Extractive Industries", Prepared by the Victorian EPA, December 2007.

Appendix 6
GROUNDWATER DEPENDENT ECOSYSTEM
Conacher Consulting



THIRD ANNUAL MONITORING REPORT

FOR

GROUNDWATER DEPENDANT ECOSYSTEM
2017 MONITORING PROGRAM

GRANTS ROAD SAND QUARRY EXTENSION

MARCH 2018
REF: 8016

PREFACE

This report has been prepared by *Conacher Consulting* to address the 2017 annual reporting requirements for Groundwater Dependant Ecosystems for the approved extension to the Grants Road Sand Quarry at Somersby.

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SECTION 1

INTRODUCTION & METHODS

1.1 DOCUMENT INTENT

This report has been prepared by *Conacher Consulting* for the Grants Road Sand Quarry Extension Project to provide details on the results of Groundwater Dependant Ecosystem (GDE) monitoring during the 2017 monitoring period.

1.2 MONITORING METHODOLOGY

Three monitoring quadrats were surveyed at each of the locations shown in Figure 1.1. Groundwater dependant ecosystem condition was monitored through sampling of both qualitative and quantitative variables. The following variables were measured:

i. **Native Plant Composition**

The dominant native flora species and projected foliage cover for each vegetation stratum (upper, mid and lower) were recorded for each plot. The dominant native flora species in each vegetation stratum were recorded.

ii. **Exotic Plant Composition**

The dominant exotic flora species and total cover of exotic flora species for each vegetation stratum (upper, mid and lower) was recorded for each plot.

iii. **GDE Extent and Distribution**

Mapping of each GDE was undertaken from a recent aerial photograph from 8 August 2017 (Nearmap 2017).

iv. **Vegetation Photo Point Monitoring**

Photographs were taken for each monitoring quadrat from each cardinal point from the centre point of each monitoring plot.

v. **Surface Erosion and Sedimentation Monitoring**

A visual inspection of each of three identified GDE patches to the west of the site was undertaken.

vi. **Comparison with Groundwater Monitoring Data**

The Larry Cook Consulting P/L (2018) results for the groundwater monitoring levels for the current monitoring period were reviewed.



SECTION 2

MONITORING RESULTS

2.1 QUANTITATIVE FLORISTIC MONITORING RESULTS

The following vegetation types mapped within one kilometre of the site by Bell (2009), have been identified in the Water Sharing Plan for the Kulnura Mangrove Mountain Groundwater Source (Dept. of Infrastructure, Planning and Natural Resources 2006) as high priority groundwater dependant ecosystems:

- Hawkesbury Coastal Banksia Woodland
- Sandstone Hanging Swamp

Previous site investigations have identified that areas mapped by Bell (2013) as Hawkesbury Coastal Banksia Woodland are located on shallow well drained sandstone soils and mostly do not contain obligate GDE flora species. However a coral fern understorey variant to this community occurs where upslope man-made drainage diversions have altered natural run-off patterns and resulted in increased soil moisture. These moister areas of Hawkesbury Coastal Banksia Woodland are considered to be potentially partially groundwater dependant and two monitoring quadrats have been located in these areas (Monitoring Points 1 & 2).

One patch of Sandstone Hanging Swamp was also located offsite downslope of the quarry operations. A monitoring quadrat was located within this patch (Monitoring Point 3). Monitoring quadrat locations are shown in Figure 1.1.

The patch size for each area of GDE vegetation is mapped in Figure 1.1.

Patch Description	2016 Patch Size
Hawkesbury Coastal Banksia Woodland (Coral Fern Understorey) – Patch 1	0.22 ha
Hawkesbury Coastal Banksia Woodland (Coral Fern Understorey) – Patch 2	0.04 ha
Sandstone Hanging Swamp – Patch 4	0.24 ha

The results for the 2017 floristic monitoring surveys for groundwater dependant ecosystems are provided in Table 2.2.

**TABLE 2.2
GROUNDWATER DEPENDANT ECOSYSTEM
FLORISTIC MONITORING RESULTS**

	Monitoring Point 1	Monitoring Point 2	Monitoring Point 3
Vegetation Type	Hawkesbury Banksia Scrub Woodland with Coral Fern Understorey (Somersby Plateau Fernland Woodland)	Hawkesbury Banksia Scrub Woodland with Coral Fern Understorey (Somersby Plateau Fernland Woodland)	Sandstone Hanging Swamp
Native Vegetation Structure			
Canopy Layer Species	<i>Eucalyptus piperita</i> <i>Eucalyptus haemastoma</i> <i>Eucalyptus scias</i>	<i>Eucalyptus piperita</i> <i>Eucalyptus haemastoma</i> <i>Allocasuarina littoralis</i>	<i>Eucalyptus piperita</i>
Canopy Layer Structure	Height: 8m PFC: 20%	Height: 15m PFC: 5%	Height: 25m PFC: 10%
Shrub Layer Species	<i>Acacia suaveolens</i> <i>Acacia parramattensis</i> <i>Callistemon citrinus</i> <i>Viminaria juncea</i> <i>Acacia oxycedrus</i> <i>Grevillea speciosa</i> (Several burnt dead <i>Banksia ericifolia</i> observed)	<i>Banksia ericifolia</i>	<i>Callicoma serratifolia</i> <i>Cyathea australis</i> <i>Gahnia sp.</i> <i>Doryanthes excelsa</i>
Shrub Layer Structure	Height: 2m PFC: 5-25%	Height: 8m PFC: 20%	Height: 7m PFC: 5%
Groundcover Layer Species	<i>Gleichenia microphylla</i> <i>Entolasia marginata</i> <i>Gonocarpus tetragynus</i> <i>Chorizandra sphaerocephala</i>	<i>Gleichenia dicarpa</i> <i>Pteridium esculentum</i> <i>Entolasia marginata</i> <i>Isolepis nodosa</i> <i>Bauera rubioides</i> <i>Actinotus minor</i> <i>Eurychorda complanata</i> <i>Juncus usitatus</i> <i>Dampiera stricta</i> <i>Xyris bracteata</i>	<i>Gleichenia dicarpa</i> <i>Hypolepis mullerii</i> <i>Oplismenus imbecillus</i> <i>Pteridium esculentum</i>
Groundcover Layer Structure	Height: 0.5m PFC: 80%	Height: 2.5m PFC: 60%	Height: 0.5m PFC: 5-90%

**TABLE 2.2
GROUNDWATER DEPENDANT ECOSYSTEM
FLORISTIC MONITORING RESULTS**

	Monitoring Point 1	Monitoring Point 2	Monitoring Point 3
Exotic Vegetation Structure			
Canopy Layer Species	Nil	Nil	Nil
Canopy Layer Structure	Nil	Nil	Nil
Shrub Layer Species	Nil	Nil	<i>Solanum mauritianum</i>
Shrub Layer Structure	Nil	Nil	Nil
Groundcover Layer Species	Nil	Nil	<i>Ageratina adenophora</i> <i>Lonicera japonica</i>
Groundcover Layer Structure	Nil	Nil	To 0.5 metres high, with 80% PFC
Disturbance Notes	Controlled burn by NPWS 2 years ago has killed <i>Banksia ericifolia</i> canopy. Groundcover layer is regenerating.	Controlled burn by NPWS 2 years ago has killed <i>Banksia ericifolia</i> canopy. Groundcover layer is regenerating.	High levels of weed invasion present in groundcover layer (not recent weed invasion).

2.2 QUALITATIVE MONITORING RESULTS

i. GDE Surface Erosion and Sedimentation Results

No surface erosion attributable to the quarry operations was observed within any of the GDE areas shown in Figure 1.1 during the monitoring surveys.

ii. Assessment of Groundwater Monitoring Data

The Water Monitoring Report prepared by Larry Cook and Associates (2018) has identified no potential impacts from approved quarrying activities on the aquifer system underlying the site for the 2017 monitoring period.

iii. GDE Photo Point Results

The results of the photo point surveys are provided in Table 2.3.

**TABLE 2.3
GROUNDWATER DEPENDANT ECOSYSTEM COMPARITIVE QUADRAT MONITORING PHOTOGRAPHS**

	Northern Aspect	Eastern Aspect	Southern Aspect	Western Aspect
MQ1 2016				
MQ1 2017				
MQ2 2016				

**TABLE 2.3
GROUNDWATER DEPENDANT ECOSYSTEM COMPARITIVE QUADRAT MONITORING PHOTOGRAPHS**

	Northern Aspect	Eastern Aspect	Southern Aspect	Western Aspect
MQ2 2017				
MQ3 2016				
MQ3 2017				

SECTION 3

COMPLIANCE WITH PERFORMANCE MEASURES

3.1 EROSION

The performance target for erosion is that negligible erosion of the surface within the GDEs occurs as a result of adverse impact attributable to the quarry operations authorised under the project approval. The trigger level for management intervention is observable erosion of the surface within the GDEs, directly attributable to the quarry operations authorised under the project approval.

No surface erosion within GDE areas attributable to the quarry operations was observed and no management intervention is required.

3.2 SEDIMENTATION

The performance target for sedimentation is that negligible sedimentation within the GDEs occurs as a result of adverse impact attributable to the quarry operations authorised under the project approval.

The trigger level for management intervention is observable sedimentation within the GDEs, directly attributable to the quarry operations authorised under the project approval.

No sedimentation within GDE areas attributable to the quarry operations was observed and no management intervention is required.

3.3 GROUND WATER DEPENDANT ECOSYSTEM EXTENT

The performance target for GDE size is for only minor changes in the sizes of the GDEs as a result of adverse impact attributable to the quarry operations authorised under the project approval.

The trigger level for management intervention is adverse change in size of the GDEs of greater than 20% mappable extent, directly attributable to the quarry operations authorised under the project approval.

The GDE areas were burnt prior to site inspections undertaken in 2015 and are currently regenerating. The extent of the GDEs determined from the current air photo has identified no change in general extent.

3.4 GROUND WATER DEPENDANT ECOSYSTEM SPECIES COMPOSITION & DISTRIBUTION

The performance target for species composition and distribution is for no significant change to the composition or distribution of species within the GDEs as a result of adverse impact attributable to the quarry operations authorised under the project approval.

The trigger level for management intervention is adverse change in composition or distribution of the dominant species, directly attributable to the quarry operations authorised under the project approval.

The GDE areas were burnt prior to site inspections undertaken in 2015 and are currently regenerating. Incidental observations have identified that the northern-most patches of GDE vegetation are still regenerating with flora species more characteristic of dry environments typical of the adjoining vegetation communities. Further changes between monitoring events are expected as these areas continue to regenerate, these changes should not be related to the quarry operations at the subject site.

The GDE species composition and distribution is to be surveyed during the 2018 monitoring period to further inform determination of any adverse changes attributable to the quarry operations.

3.5 MITIGATION AND RESPONSE MEASURES

Monitoring has identified that all performance targets have been met for GDEs and requirement for mitigation or response measures has not been triggered in relation to 2017 site operations.

SECTION 4

CONCLUSIONS & RECOMMENDATIONS

4.1 CONCLUSIONS

The quarry operations for the 2017 monitoring period have not exceeded the compliance and performance measures for Groundwater Dependant Ecosystems.

4.2 RECOMMENDATIONS

The implementation of mitigation and response measures in relation to the 2017 quarry operations is considered not necessary.

5. REFERENCES

- Bell (2007) *Review of Flora and Fauna Information for Grants Road Sands*, Gosford LGA.
- Bell, S.A.J. 2009. *The natural vegetation of the Gosford Local Government Area, Central Coast, New South Wales: Revised and Updated*. Report to Gosford City Council. Eastcoast Flora Survey.
- Bell, S.A.J. (2013) *Review of vegetation mapping, Gosford LGA: addressing vegetation loss since 2004*. Unpublished Report to Gosford City Council. November 2013. Eastcoast Flora Survey.
- Larry Cook Consulting P/L (2018) Water Monitoring Period 1.1.17-21.12.18 Grants Road Sand Quarry. Unpublished Report prepared for Grants Road Sand.
- NSW Scientific Committee 2012, Coastal Upland Swamp in the Sydney Basin Bioregion – endangered ecological community listing, NSW Scientific Committee Final Determination. Available Online: <http://www.environment.nsw.gov.au/determinations/coastaluplandswampfd.htm>
- Water Sharing Plan for the Kulnura Mangrove Mountain Groundwater Sources 2003. New South Wales Government.

Appendix 7
BIODIVERSITY SOMERSBY MINTBUSH
Conacher Consulting



THIRD ANNUAL MONITORING REPORT

FOR

**SOMERSBY MINTBUSH
2017 MONITORING PROGRAM**

GRANTS ROAD SAND QUARRY EXTENSION

**MARCH 2018
REF: 8016**

PREFACE

This report has been prepared by *Conacher Consulting* to address the 2017 annual monitoring and reporting requirements for Somersby Mintbush for the approved extension to the Grants Road Sand Quarry at Somersby.

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SECTION 1

INTRODUCTION

1.1 DOCUMENT INTENT

This report has been prepared by *Conacher Consulting* to address the monitoring requirements of Condition 22 “Somersby Mintbush Monitoring and Management Program” of the Schedule 3 Environmental Performance Conditions specified within the Project Approval issued under Section 75J of the Environmental Planning and Assessment Act (1979) for the Grants Road Sand Quarry Extension project.

1.2 PROJECT SITE DETAILS

The project site is located within Lot 1 DP 358717, 270 Grants Road Somersby.

1.3 PREVIOUS MONITORING RESULTS

2015 Monitoring Surveys

A baseline assessment of the *Prostanthera junonis* locations previously identified adjacent to the site and described as Population 7 Reservoir Road Brisbane Water National Park was undertaken on 23 October 2015 and 7 November 2015.

No specimens of *P. junonis* were observed during the baseline surveys as the locations where this species was previously identified had been subject to a controlled burn undertaken by NPWS.

Previous contact with the National Parks and Wildlife Service confirmed that a hazard reduction burn was undertaken on 8-11 October with very high to extreme fuel loads which burnt very well over the three days emitting large smoke plumes. NPWS identified that the fire was limited to within 100m of the subject site, however field surveys identified that the burn was directly adjacent to the site and in some places burnt vegetation within the offset area on the site. Review of the Somersby Mintbush Recovery Plan has identified that the time of the previous fire in this location was 1994.

The previous location of *P. junonis* identified along the Great North Walk track showed noticeable signs of erosion caused by inadequate track maintenance and poor design.

2016 Monitoring Surveys

Regrowth of *P. junonis* was observed at subpopulations 3 and 4. Two flowering plants were detected at sub-population 3 where none were detected in recent years, several juvenile non-flowering plants were also recorded.

No flowering plants and several juvenile non-flowering plants were observed at the location of sub-population 4.

The low numbers of flowering plants detected and evidence of regrowth plants was considered to be a result of the NPWS hazard reduction burn undertaken during October 2015.

SECTION 2

2017 MONITORING RESULTS

2.1 SOMERSBY MINTBUSH 2017 COUNT RESULTS

Counts of flowering *P. junonis* plants were undertaken on 13 November 2017 and 27 November 2017 and at each of the Somersby Mintbush subpopulation locations adjacent to the quarry allotment identified by NSW NPWS (2000).

Plant clumps were identified and counted as any flowering *P. junonis* plants in a patch with a separation distance of $\leq 30\text{cm}$ from the nearest *P. junonis* plant.

The results of the counts are provided in Table 2.1 and the locations of the sub-populations are shown in Figure 2.1.

Sub-Population Number	2015 Count Results	2016 Count Results	2017 Count Results
1	0	0	0
2	0	0	0
3	0	2 flowering plants (several non-flowering juvenile regrowth plants observed)	3 clumps containing 18 flowering plants
4	0	No flowering plants several non-flowering juvenile plants observed	12 clumps containing 34 flowering plants

2.2 QUALITATIVE MONITORING RESULTS

The following performance indicators have been developed with regard to *P. junonis*.

- *Prevention of any erosion of the surface of areas containing Somersby Mintbush as a result of actions associated with the approved extraction operations*
- *Prevention of sedimentation within areas containing Somersby Mintbush as a result of actions associated with the approved extraction operations*
- *Prevention of reduction in the area of the sites containing Somersby Mintbush as a result of actions associated with the approved extraction operations.*

No visible signs of disturbance to *P. junonis* or its habitats as a result of quarry activities were observed. Photographs of the habitats at subpopulations 3 and 4 during the 2017 monitoring period are provided in Figures 2.2 to 2.4. Erosion of the track through subpopulation 4 was observed in previous years. No noticeable NPWS maintenance of this track within the Brisbane Water National Park has occurred since the commencement of monitoring.





Figure 2.2 Photo Point 1 Sub-population 3 habitat in November 2017



Figure 2.3 Photo Point 2 Sub-population 4 habitat in November 2017

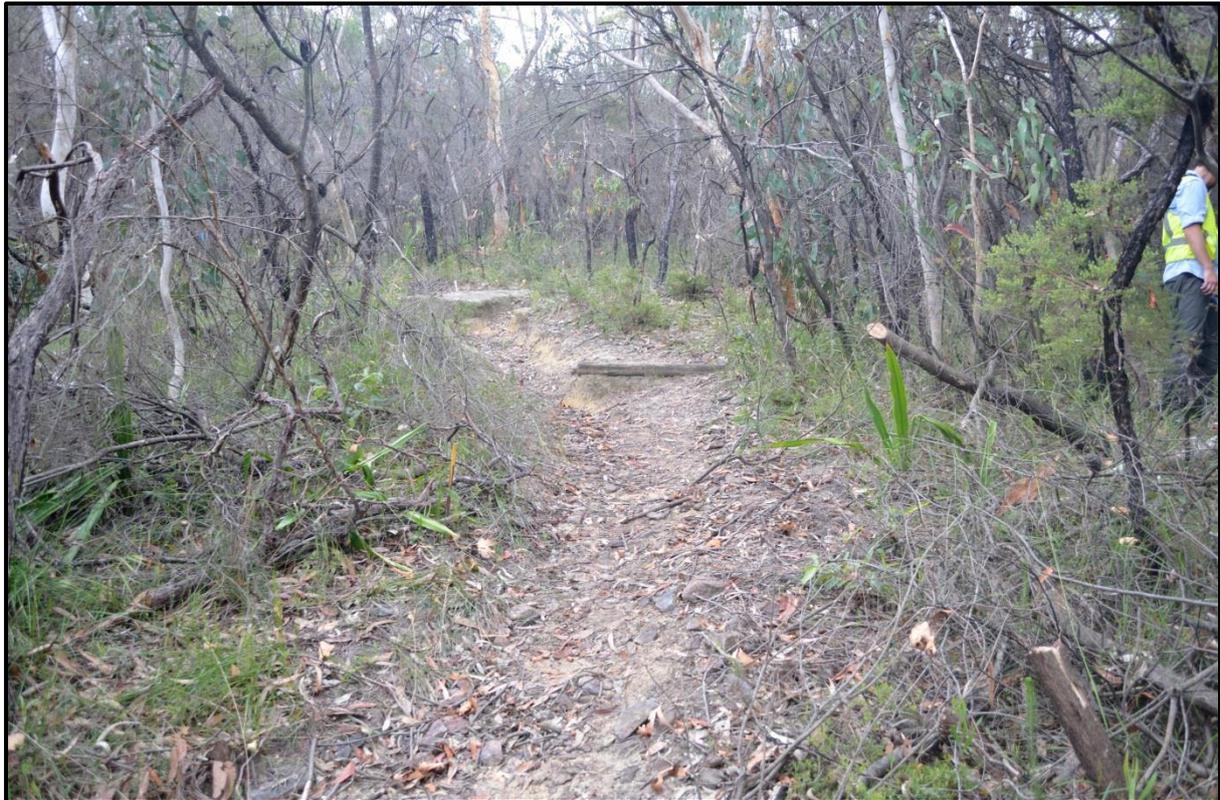


Figure 2.4. Photo of erosion of track through Sub-population 4 in November 2017

2.3 DETAILS OF NON-COMPLIANCE MATTERS

No non-compliance matters were observed with regard to Somersby Mintbush.

2.4 MONITORING TRENDS

Regrowth of *P. junonis* was observed at subpopulations 3 and 4. Flowering plants were detected at sub-population 4 which were not detected in recent years. The increasing numbers of flowering plants detected and evidence of several regrowth non-flowering plants is considered to be a result of regeneration following the NPWS hazard reduction burn undertaken during October 2015.

2.5 PROJECT IMPACT DISCREPANCIES

No discrepancies between the predicted and actual impacts of the project were observed with regard to Somersby Mintbush.

It is considered that the populations present are still regenerating following the 2015 hazard reduction burning operations of the NPWS. This impact should not be attributed the extraction operations within the site.

2.6 MEASURES TO IMPROVE PROJECT PERFORMANCE

No necessary measures to improve project performance were identified for the current monitoring period.

SECTION 3

CONCLUDING COMMENTS

3.1 CONCLUDING COMMENTS

The following concluding comments are provided:

- i. Further counts of the previously identified locations of *P. junonis* should be undertaken during the 2018 monitoring period.
- ii. Suitable erosion and sedimentation controls should continue to be maintained for the site.
- iii. The plants and associated habitats present are continuing to regenerate following the 2015 hazard reduction burning operations of the NPWS.

4. REFERENCES

Conacher Consulting (2016) Somersby Mintbush 2015 Monitoring Report, Grants Road Sand Quarry Extension Lot 1 DP 358717 270 Grants Road Somersby.

Conacher Consulting (2017) Somersby Mintbush 2016 Monitoring Report, Grants Road Sand Quarry Extension Lot 1 DP 358717 270 Grants Road Somersby.

NSW National Parks and Wildlife Service (2000) Somersby Mintbush *Prostanthera junonis* Recovery Plan. NSW NPWS. Hurstville NSW.

Appendix 8
LANDSCAPE & REHABILITATION MONITORING
Conacher Consulting



**2017 MONITORING REPORT
FOR
LANDSCAPE AND REHABILITATION
MANAGEMENT PLAN &
BIODIVERSITY OFFSET MANAGEMENT PLAN**

GRANTS ROAD SAND QUARRY

**MARCH 2018
REF: 0816/3**

1 INTRODUCTION

This Report has been prepared by Conacher Consulting to outline the implementation and monitoring requirements of Project Approval Condition No. 27 (Landscape and Rehabilitation Management Plan) for the Grants Road Quarry Extension (Application No. 08-0099)

The Landscape and Rehabilitation Management Plan (LRMP) for the Grants Road Sand Quarry (Conacher Consulting November 2015) was approved by the Department of Planning and Environment in December 2015. The LRMP separated the management and rehabilitation of the site into the following three distinct components:

- Biodiversity Offset Area Management Plan
- Buffer Area Landscape Management Plan
- Quarry Rehabilitation Plan.

Reporting on actions undertaken and monitoring of actions for each of the above Plans are provided in in the following sections of this Report.

The implementation of some of the actions required in the offset area have been delayed during the 2017/2018 reporting period due to a proposal to modify the location and size of the offset area. This proposed modification includes the incorporation of mature growth eucalypt forest located on land to the south that has recently been purchased by the owners of the quarry. Recent advice from the Department of Planning and Environment is that the application to amend and extend the offset area is in its final stages.

2 BIODIVERSITY OFFSET AREA MANAGEMENT PLAN

The Biodiversity Offset Area Management Plan is required to be implemented in conjunction with the extension of the quarry area into the Stage 2 areas. Notwithstanding this requirement, several actions have been implemented over the reporting period. This will provide some baseline data for evaluating future management actions within the Biodiversity Offset Area.

The works implemented or underway in relation to the Biodiversity Offset Area are noted in Table 1. Continued monitoring of these actions will be undertaken in the 2018 reporting period.

		ACTIONS	COMMENTS
SITE RESOURCE MAPPING	A1	Complete micro habitat/site features mapping	Microhabitat / site features mapping completed and field checked
	A2	Identify and analyse soil erosion/sediment problems	Inspections completed – No issues arising
	A3	Identify surface drainage features	Completed in association with A1 above
	A4	Identify habitat enhancement needs	Commenced, ongoing

**TABLE 1 (cont.)
ACTIONS IMPLEMENTED IN THE BIODIVERSITY OFFSET AREA**

		ACTIONS	COMMENTS
VEGETATION AND WEED MANAGEMENT	B1	Collect soil samples for nutrient testing	Placed on hold pending results of amendment to offset areas
	B2	Map main weed occurrences	Weed Plan completed
	B3	Develop weed management strategy	Weed Management Strategy commenced – to be finalised after offset amendment completed
	B4	Prepare revegetation strategy	Not commenced. Awaiting outcome of offset area amendment.
	B5	Collect suitable seeds for revegetation	Awaiting outcome of offset area amendment.
	B6	Implement revegetation strategy	Awaiting outcome of offset area amendment.
FENCING	C1	Identify deer exclusion fencing requirements	Underway
	C2	Construct deer exclusion fencing	Awaiting outcome of offset area amendment.
	C3	Maintain deer exclusion fencing	Not commenced
HABITAT ENHANCEMENT	D1	Implement habitat enhancement	Underway, awaiting outcome of offset area amendment.
	D2	Install 36 nest boxes, record locations	36 Nest boxes installed. Tree locations to be recorded
	D3	Salvage environmental/habitat resources	Clearing not commenced as yet
	D4	Undertake pre-clearance surveys	Not required as yet
REPORTING/MONITORING	E1	Re-assess risks to implementation of action	Not required as yet
	E2	Implement adaptive response strategies	Not required as yet
	E3	Implement monitoring and reporting strategy to cover:	
		– Nestboxes	Nest boxes monitored in 2017. 2 boxes fallen and some in need of repairs.
		– Weed control	Weed control underway in north-east offset area.
		– Vegetation growth/condition	Not required as yet

TABLE 1 (cont.) ACTIONS IMPLEMENTED IN THE BIODIVERSITY OFFSET AREA			
ACTIONS			COMMENTS
		- Revegetation areas	Not required as yet
		- Habitat enhancement measures	Habitat enhancement of drainage line in north-west area underway.
		- Fencing condition	Fencing condition assessment completed.
		- Ongoing actions	- Weed management underway - Habitat enhancement underway
		- Remedial actions	Not required as yet

3 BUFFER AREA LANDSCAPE MANAGEMENT PLAN

The timing of management actions within the Buffer Area are directly linked to the implementation of works/actions within the Biodiversity Offset Areas. The actions to be implemented in the Buffer Area are listed in Table 2.

TABLE 2 ACTIONS IMPLEMENTED IN THE BUFFER AREA			
ACTIONS			COMMENTS
BUFFER AREA DELINEATION – Identify on-ground and/on plan	A1	15m to 20m designated buffer area	Completed
	A2	Pipeline easement	Completed
	A3	Aboriginal Heritage sites	Completed
	A4	Trees to be retained	Trees retained
	A5	Location of noise abatement mounds	Not constructed
	A6	Drainage areas/culverts access easements	Underway
FENCING/ ACCESS	B1	Identify existing fence/condition	Completed
	B2	Identify fence access/gate requirements for pipeline easement, aboriginal heritage sites, vehicle access	Completed
VEGETATION	C1	Identify remnant vegetation	Completed
	C2	Locate and mark hollow bearing trees	Completed
	C3	Assess weed infestations requiring control	Completed
	C4	Identify bushfire hazard	Completed

TABLE 2 (cont.) ACTIONS IMPLEMENTED IN THE BUFFER AREA			
ACTIONS			COMMENTS
		management needs by machinery slashing or stock grazing	
	C5	Summarise vegetation management in aboriginal heritage sites	Not commenced yet
	C6	Identify vegetation management for noise abatement mounds	Locations identified but not constructed yet.
DRAINAGE AND LAND MANAGEMENT	D1	Identify through drainage from quarry area and pipeline easement	Completed
	D2	Inspect for soil erosion or sediment accumulations	Completed
	D3	Maintain area free of rubbish accumulations	No rubbish accumulated

4 QUARRY AREA REHABILITATION

Resource extraction continued within the existing quarry pit in 2016. Rehabilitation of the Precinct A area is to be undertaken on a progressive basis after the extraction level for the resource is reached in this Stage, as identified in the approved Quarry Rehabilitation Plan.

5 CALCULATIONS FOR REHABILITATION BOND

The Conservation and Rehabilitation Bond Calculation Report (Conacher Consulting December 2016 Ref: 4143/6) was prepared to address Condition No. 28 of Schedule 3 of the approval. This Report calculated that the Conservation and Rehabilitation Bond be set at \$306,000.00. This figure has been accepted by the Department of Planning and Environment. The financial arrangements for the rehabilitation bond have been finalised.

6 MONITORING AND COMPLIANCE

Details of Non-compliance Matters

No non-compliance matters have been observed

Monitoring Trends

No monitoring trends have been observed

Project Impact Discrepancies

No discrepancies between the predicted and actual impacts of the project were observed with regard to Landscape and Rehabilitation matters.

Measures to Improve Project Performance

Discussions have identified that quarterly meetings and inspections between the operators and project consultants to be undertaken during the 2018 reporting period.

7 RECOMMENDATIONS

No changes to the Landscape and Rehabilitation Management Plan are considered necessary at this stage. The Biodiversity Offset Management Plan will require amendments to accommodate changes resulting from the proposed modifications to the offset areas.