Dixon Sand Pty Ltd

Old Northern Road and Haerses Road Quarries, Maroota

Annual Review 2018 – 2019

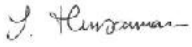
File Name: J16-001_AR_2018-19

Version 1.0

Prepared by: Project Environmental Services Pty Ltd

Project Environmental Services

Document Control

Name of Operation	Old Northern Road and Haerses Road Quarries, Maroota
Name of Operator	Dixon Sand Pty Ltd
Development Consent / Project Approval #	DA250-09-01 (Mod 5) – Old Northern Road Quarry DA165-7-2005 (Mod 2) – Haerses Road Quarry
Annual Review Start Date	1 July 2018
Annual Review End Date	30 June 2019
Name of Authorised reporting officer	Hunsamon Churcher
Title of Authorised reporting officer	Environmental Officer
Signature of Authorised reporting officer	
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Report name	Dixon Sand Pty Ltd - Old Northern Road and Haerses Road Quarries, Maroota Annual Review 2018 - 2019		
Cover Page Image	Native Vegetation Corridor, Old Northern Road Quarry (courtesy: PES, June 2019)		
Prepared by:	Hunsamon Churcher	Date:	29/09/2019

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Abbreviations

796/00/HE	Development Consent 796/00/HE for the Old Northern Road quarry,
Annual Review	This document (also formerly known as 'Annual Environmental Management Report')
DA250-09-01	Development Consent DA250-09-01 for the Old Northern Road quarry
DA165-7-2005	Development Consent DA165-7-2005 for the Haerses Road quarry
Dixon Sand	Dixon Sand Pty Ltd
DP&E	Department of Planning and Environment
DP&E (Resources Regulator)	Department of Planning and Environment – Resources Regulator
EIS	Environmental Impact Statement
EPA	NSW Environment Protection Authority
EP&A Act	NSW *Environment Planning and Assessment Act* 1979
EPL3916	Environment Protection Licence 3916 for the Old Northern Road quarry
EPL12513	Environment Protection Licence 12513 for the Haerses Road quarry
HRBOA	Biodiversity Offset Area, located at Haerses Road Quarry (for Old Northern Road DA250-09-01)
MTSGS	Maroota Tertiary Sands Groundwater Source
NVC	Native Vegetation Corridor, located at Old Northern Road Quarry
PIRMP	Pollution Incident Response Management Plan
PM10	Particulate matter <10um
SCBGS	Sydney Central Basin Groundwater Source
TEOM	Tapered Element Oscillating Microbalance
TSP	Total suspended particulates

1. Statement of Compliance

Table 1: Statement of Compliance

All Conditions of the relevant approval(s) were complied with?		
Old Northern Road Quarry	DA250-09-01	No
	EPL3916	Yes
Haerses Road Quarry	DA165-7-2005	Yes
	EPL12513	Yes

Table 2: Non-Compliances

Relevant Approval	Condition #	Condition description (summary)	Compliance Status	Section addressed in Annual Review
Old Northern Road Quarry				
DA 250-09-01	Cond. 7 of Sch.3 Table 3	24 hour average PM10 exceeded the 50ug/m3 criteria	Non-compliant	Table 12 in Section 5.1.4
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-compliances	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

2.1 Project Background

Dixon Sand Pty Ltd (Dixon Sand) operates two sand quarries on the Old Northern Road (Lots 29 and 196 DP 752025 and Lots 1 and 2 DP 547255) and on Haerses Road (Lot 170 DP 664766, Lot 170 DP 664767, Lots A and B DP 407341, Lots 176 and 177 DP 752039 and Lot 216 DP 752039) in Maroota, New South Wales. The quarry sites are located approximately 40 kilometres north of Parramatta. The locations of the quarries are shown in Figure 1.

Extraction commenced on Lots 29 and 196, DP752025 on the Old Northern Road in the early 1980s, with Dixon Sand undertaking extraction from 1992 to December 1998. The continued approval for extraction on Lots 29 and 196 was granted by the Land and Environment Court NSW on 7 July 2000 with subsequent multiple Modification applications being lodged. Current extraction operations occur on Lot 196, 1 and 2, with materials being processed at the central processing plant, stockpiled and sold to the market on Lot 196.

Extraction commenced at the Haerses Road quarry in 2006 with current extraction operations in Stage 1 and 2 cells. Sand is being transferred to the Old Northern Road quarry for processing and sales. Products are also currently being sold directly to the market from Haerses Road quarry. Modification to the development approval under Section 75W of the *Environmental Planning and Assessment Act* 1979 was granted on 22 January 2018 which permits the expansion of the extraction areas. Quarry operations will commence in the newly approved extraction areas when the pre-commencement requirements have been met.

Environmental Monitoring locations for the Old Northern Road and Haerses Road quarries are shown in Figures 2 and 3 respectively.

2.2 Scope of this document

The objective of this Annual Review is to report on the overall environmental performance and management of the operations and compliance with the consent conditions issued by the Secretary of NSW Department of Planning and Environment (DP&E). The reporting period is from 01 July 2018 to 30 June 2019, based on the date of the original quarry development consent 796/00/HE. Reporting for the rehabilitation assessment and ecological monitoring extends outside the specified period due to seasonal timing requirement for surveys.

Development consents DA250-09-01 (Modification 5) and DA165-07-05 (Modification 2) are applicable to this Annual Review.

The following consent conditions outline the requirement of the Annual Review:

Schedule 5 of Condition 12 of DA250-09-01 (Modification 5) and DA165-7-2005 (Modification 2) state:

By the end of March each year, or other timing as may be agreed by the Secretary, the Applicant must submit a review to the Department reviewing the environmental performance of the development to the satisfaction of the Secretary. This review must:

(a) describe the development (including any progressive rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;

(b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against the:

- *relevant statutory requirements, limits or performance measures/criteria;*

- *requirements of any plan or program required under this consent;*
- *monitoring results of previous years; and*
- *relevant predictions in the documents listed in condition 2(a) of Schedule 2;*

(c) evaluate and report on:

- *the effectiveness of the air quality and noise management systems; and*
- *compliance with the performance measures, criteria and operating conditions in this consent.*

(d) identify any non-compliance over the past calendar year, and describe what actions were (or are being) taken to ensure compliance;

(e) identify any trends in the monitoring data over the life of the development;

(f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies;

(g) escribe what measures will be implemented over the current calendar year to improve the performance of the development.

The Applicant must ensure that copies of the Annual Review are submitted to Council and are available to the Community Consultative Committee (see condition 8 of Schedule 5) and any interested person upon request.

Dixon Sand requested approval from the DP&E to combine the reporting for the Old Northern Road and Haerses Road quarry, and for the submission deadline to be adjusted to reflect the financial year reporting. Approval was granted by the DP&E on 9 February 2018 to submit a joint Annual Review by the end of September each year.

This Annual Review will report the environmental performance in accordance with DA250-09-01 Modification 5 and DA165-7-2005 Modification 1.

2.3 Old Northern Road Quarry Approvals

Development consent for the quarry on Lots 29 and 196 and extension into Lots 1 and 2 was issued by the Land and Environment Court on 7 July 2000 (796/00/HE) and 24 May 2004 (DA250-09-01), respectively. Consent No. 796/00/HE allowed for sand extraction, processing, and rehabilitation within Lots 29 and 196. This consent lapsed on the 22 of March 2010. Continued extraction on Lots 29 & 196 has been encompassed in DA250-09-01, which now forms a single integrated consent for all activities within Lots 1 & 2, and Lots 29 & 196. Extraction of Lot 29 has completed with the area currently being utilised for silt bonds and rehabilitation.

Continued use of the central processing plant on Lot 196, transport of product from the site, water management, and rehabilitation operations are approved under DA250-09-01, which lapses on 24 May 2022.

Five modifications to DA250-09-01 have been lodged and approved. Modification 5 is current and was approved on 14 November 2018. A summary of the development consents and modifications is provided in Table 3.

2.3 Haerses Road Quarry Approvals

Development consent was granted by the Minister for Planning on 14 February 2006 (DA165-7-2005) for the extraction of sand from Dixon Sand's property at Lot 170 DP 664767, Lots A and B DP 407341, and Lots 176 and 177 DP 752039 Haerses Road, Maroota, approximately two kilometres south of the existing Old Northern Road

operations. Sand extracted from the Haerses Road site has been trucked, processed and stockpiled at the existing processing plant on Lot 196 DP 752025 (Lot 196) on the Old Northern Road quarry. The development involves the blending and processing of variable quality sands from the Haerses Road site at the plant on Lot 196, and uses the existing processing plant and ancillary facilities such as the workshop, weighbridge and office, as well as the existing haul roads via the intersection with Old Northern Road. Direct sale of sandstone products to local and regional markets from Haerses Road site commenced in 2015.

The operation on the Haerses Road site will maintain a maximum extraction rate of 250,000 tonnes per annum for a period of 25 years, of which approximately 190,000 tonnes per annum will require processing. The Old Northern Road DA250-09-01 (Mod 4) permits an annual production rate of 495,000 tonnes from the processing plant located on Lot 196 from combined quarry products from Lots 29, 196, 1 and 2 and from Haerses Road. The annual output of product from Lots 1 and 2 at the processing plant is expected to be approximately 300,000 tonnes. The combined processing of sand extracted from the Haerses Road site and Old Northern Road Lots 1 and 2 (up to 490,000 tonnes per annum) will therefore be within the approved production rate of the existing processing plant on Lot 196 for approximately 25 years after commencement of extraction on the Haerses Road site (November 2006).

Consent was granted to modify the conditions of development consent DA250-09-01 by the then Minister for Planning on 14 February 2006, enabling the existing processing plant on Lot 196 to receive, stockpile and process material from the Haerses Road site, to increase the number of inbound laden truck movements to Lot 196 to 32 trucks per day, and to allow the disposal of tailings from the processing of sand from the Haerses Road site on Lots 29, 196, 1 and 2. A consent modification application (Section 96) was lodged with the Department of Planning to increase truck movements approved under DA250-09-01. This modification (DA 250-09-01 Mod 2) was approved during the 2008-2009 reporting period, in August 2008.

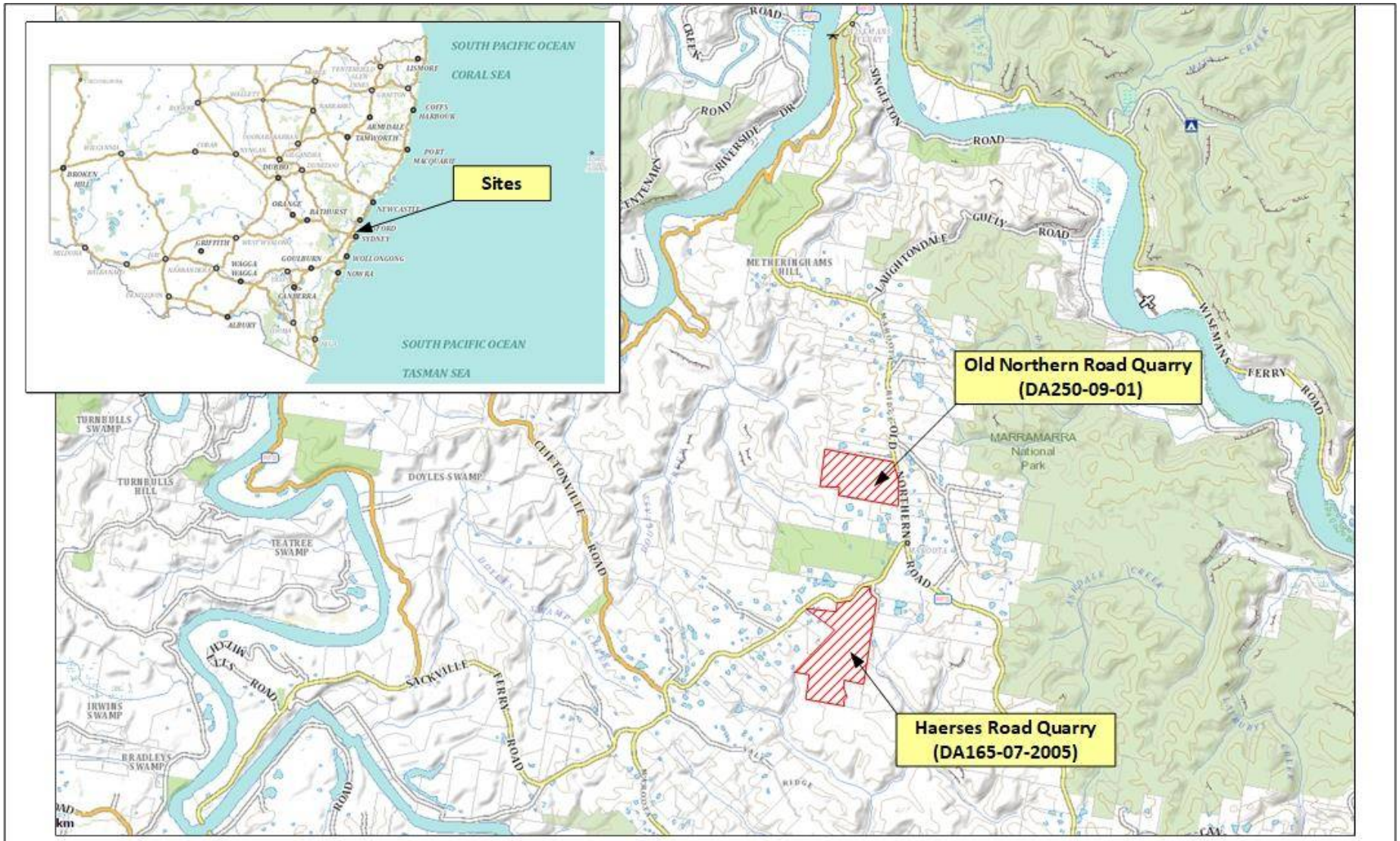
Dixon Sand lodged a modification application to modify DA165-7-2005 and expand the quarry extraction area, process products on site and to extend the life of the quarry. Approval for DA165-7-2005 Modification 1 was granted on 22 January 2018.

A modification under Section 4.55(1) of the *Environment Planning and Assessment Act* 1979 (EP&A Act) was subsequently lodged to correct an administrative error in Appendix 2 of the development consent. Approval for DA165-7-2005 Modification 2 was granted on 29 January 2019.

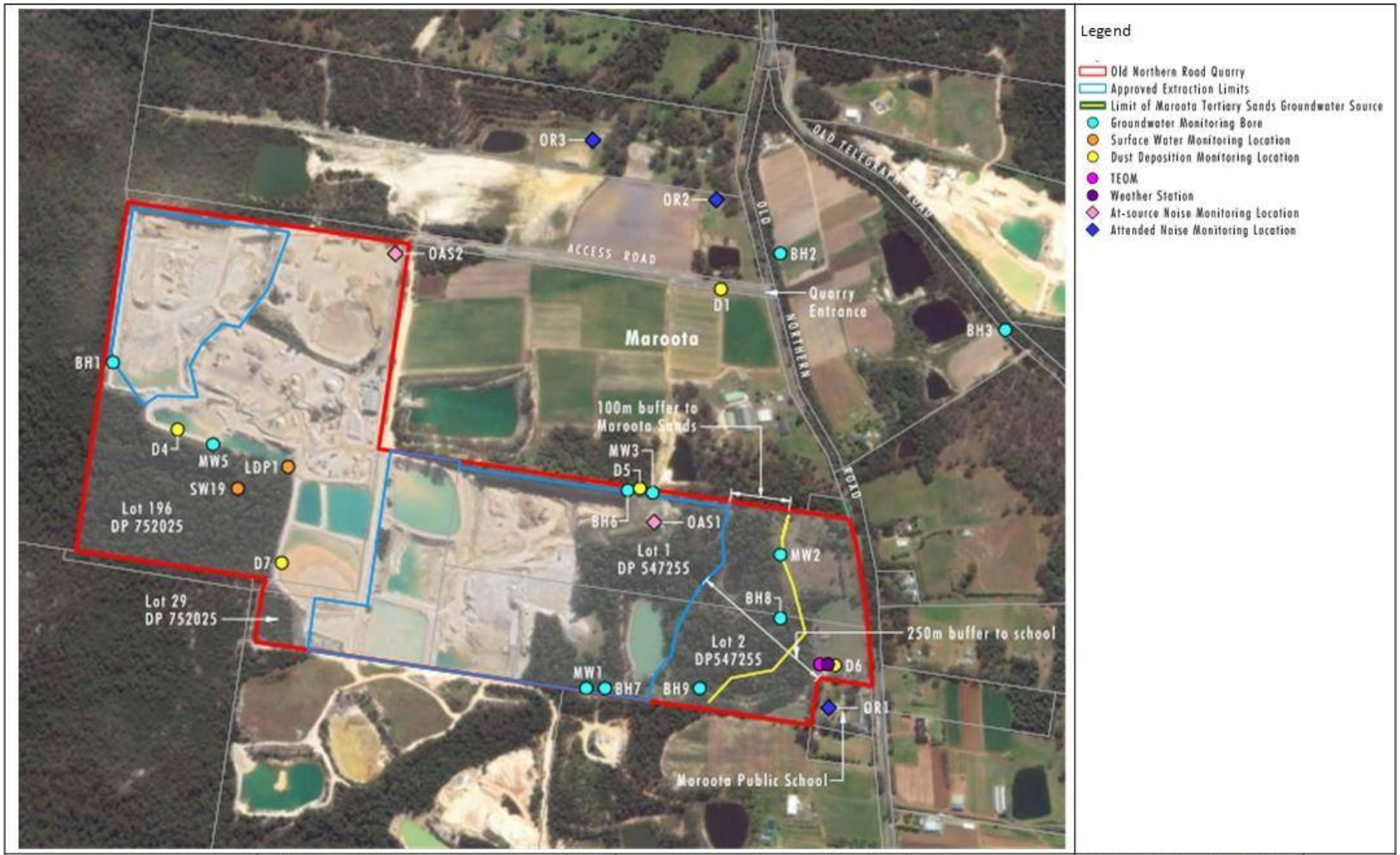
A summary of the development consents and modifications is provided in Table 3.

Table 3: Summary of Old Northern Road and Haerses Road Quarry Development Consents and Modifications

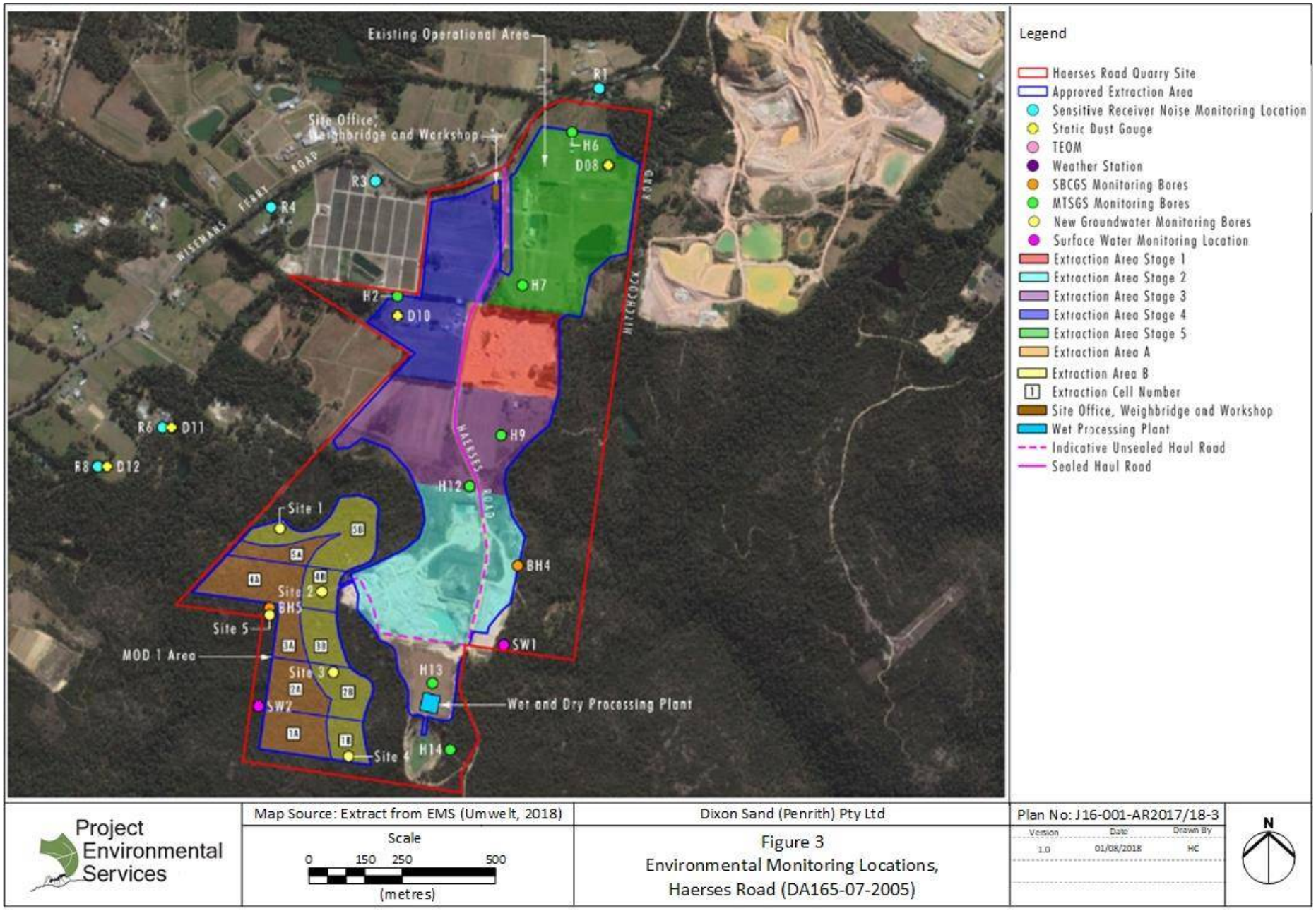
Development Consents	Status	Date of Determination	Comments
Old Northern Road Quarry			
796/00/HE	Approved and superseded by DA250-09-01	7 July 2000	Approval for sand extraction, processing and rehabilitation of Lots 29 and 196, Old Northern Road.
DA250-09-01	Approved and superseded by Modification 1	2 January 2003	Continual of sand extraction on Lot 29 and 196, and the extension of extraction operations into Lots 1 and 2.
DA250-09-01 Modification 1	Approved and superseded by Modification 2	14 February 2006	Haerses Road sand to be transported and processed at the main Processing Plant on Lot 196 at the Old Northern Road
DA250-09-01 Modification 2	Approved and superseded by Modification 3	20 August 2008	Increased truck movements from 120 to 180 per day
DA250-09-01 Modification 3	Approved and superseded by Modification 4	30 August 2012	• Amend DA250-09-01 to include extraction on Lots 29 and 196 • Permit the extraction of Lot 196 to a level not within 2 metres of the wet weather high groundwater table • Surrender of DA796/00/HE issued by the Land and Environment Court
DA250-09-01 Modification 4	Approved and superseded by Modification 5	6 July 2015	Application to include additional area on Lots 1 and 2 for extraction
DA250-09-01 Modification 5	Approved and current	17 November 2017	Application to extend the life of the quarry to 24 May 2042 and revision of the consent condition format
Haerses Road Quarry			
DA165-7-2005	Approved and superseded by Modification 1	14 February 2006	Approval for sand extraction, processing and rehabilitation for extraction stages 1 to 6 (inclusive)
DA165-7-2005 Modification 1	Approved and superseded by Modification 2	22 January 2018	Approval for the expansion of the quarry and additional sand extraction in Cells 1 to 5 (inclusive).
DA165-7-2005 Modification 2	Approved and current	29 January 2019	Correction applied to an administrative error in Appendix 2 of DA165-7-2005 Modification 1 consent conditions.



Project Environmental Services	Map Source: Sixmap (2016) Scale 0 120 200 400 (kilometres)	Dixon Sand (Penrith) Pty Ltd Figure 1 Locality Plan of the Old Northern Road and Haerses Road Quarries	Plan No: J16-001-AR2017/18-1 Version: 1.0 Date: 01/08/2019 Drawn By: HC



Project Environmental Services	Map Source: Extract from EMS (Umwelt, 2018) Scale 0 120 200 400 (metres)	Dixon Sand (Penrith) Pty Ltd Figure 2 Environmental Monitoring Locations, Old Northern Road (DA250-09-01)	Plan No: J16-001-AR2017/18-2 Version: 1.0 Date: 01/08/2018 Drawn By: HC N



Project Environmental Services

Map Source: Extract from EMS (Umwelt, 2018)

Scale

0 150 250 500

(metres)

Dixon Sand (Penrith) Pty Ltd

Figure 3
Environmental Monitoring Locations,
Haerses Road (DA165-07-2005)

Plan No: J16-001-AR2017/18-3

Version	Date	Drawn By
1.0	01/08/2018	HC

N

3. Operations Summary

3.1 Production and Vehicle Movements

All bulk sand truck movements from the Haerses Road site since commencement of extraction in November 2006 have delivered raw product to the Old Northern Road site for processing. Products have also been sold directly from Haerses Road quarry since 2015.

A total of **370,891** tonnes of sand products has been exported from the Old Northern Road site during the 2018-2019 reporting period. A total of **63,935.5** tonnes of product has been extracted from Haerses Road and transferred to Old Northern Road for processing in **1,801** truckloads during this reporting period. A total of **7,863.8** tonnes of products have been sold directly to local and regional markets from the Haerses Road quarry. These truck numbers and production volumes are compliant with all requirements and will continue to be accurately recorded upon the commencement of trucks delivering product directly offsite.

No truck movements were made prior to 6:00 am during the reporting period. The record of morning truck movement data and a sample of the daily truck record are contained in Appendix F.

Table 4 provides a summary of the annual production quantities and truck movements for Dixon Sand quarries during the reporting period.

Table 4: Production Data & Truck Movements at Old Northern Road and Haerses Road Quarries.

Month	Total combined Production ONR from Lots 1, 2, 29 and 196 and HR (t)	Total Production ot Haerses Rd Products (processed at ONR) (t)	Total Production Haerses of products sold directly to market from HR quarry (t)	Total Transfers from Haerses Rd to ONR (t)	Max Daily Truck Movements at ONR	Max Daily Transfer between HR and ONR inbound (laden)	Max No. Trucks 5:45 - 7:00am at ONR
Jul 2018	35,929	3,671.0	847.8	6,319.0	134	17	17
Aug 2018	36,398	3,851.4	558.0	6,567.5	124	13	16
Sep 2018	32,066	2,832.4	1078.0	5,112.0	128	12	14
Oct 2018	32,181	3,143.1	426.0	5,396.0	136	11	16
Nov 2018	35,048	3,692.0	846.0	6,532.0	122	15	15
Dec 2018	26,668	2,507.0	891.0	4,473.0	142	11	19
Jan 2019	23,636	2,069.3	372.0	3,656.5	106	10	18
Feb 2019	37,023	2,784.5	459.0	5,041.0	168	11	19
Mar 2019	29,179	3,027.5	532.0	5,360.5	130	13	16
Apr 2019	27,408	2,811.4	268.0	5,005.5	112	12	15
May 2019	31,550	3,490.4	910.0	6,248.0	114	13	14
Jun 2019	23,806	2,450.5	676.0	4,224.5	96	8	12
Totals / Maximum	**370,891**	**33,879.9**	**7,863.8**	**63,935.5**	**168**	**17**	**19**
Annual Limit	**495,000**	**-**	**60,000**	**190,000**			
				Daily Max Criteria	**180**	**28**	**40**

4. Actions Required from Previous Annual Review

The proposed recommendations contained in the previous 2017-2018 Annual Review have been actioned by Dixon Sand, as summarised in Table 5.

Table 5: Summary of Recommendations and Actions

Recommendation from the 2017 – 2018 Annual Review	Actions
Vegetation clearing and extraction	
• Old Northern Road – Vegetation clearing and extraction in the Stage 3 extraction cell on Lots 1 and 2 is planned. Pre-clearing surveys will be undertaken by a qualified ecologist and the two-stage clearing procedures will be implemented.	• Vegetation clearing in Stage 3 extraction cell on Lots 1 and 2 undertaken in accordance with the pre-clearing process outlined in the Biodiversity and Rehabilitation Management Plan.
• Extraction work will continue in Stage 2 east and west cells. Work associated with Modification 1 will commence	• Extraction in Stage 2 occurred in this reporting period. Pre-commencement requirements for Modification 1 have progressed.
Rehabilitation and bush regeneration	
• Old Northern Road – Rehabilitation will continue in the Native vegetation Corridor (NVC) on Lot 29 and Precincts 3 and 5 on Lot 196. Propagation of threatened species will continue. Weed management practices will continue on site.	• Continued rehabilitation undertaken in the NVC on Lot 29 and and Precincts 3 and 5 on Lot 196. On-going propoagation of threatened species and weed management undertaken.
• Haerses Road - Rehabilitation will commence in Stage 1 cell. Rehabilitation works will continue in the Offset Area 1, Offset Area 2 and the Biodiversity Offset Area (Old Northern Road DA250-09-01 Mod 4). Erosion and sediment controls will be maintained. A focus should also be placed on weed control, particularly *Lantana camara* which has a priority ranking under the *Biosecurity Act* 2016. Ecological monitoring associated with Modification 1 will commence.	• Continued rehabilitation of Stage 1 cell, Offset Area 1 and 2, and Biodiversity Offset Area (for Old Northern Road DA250-09-01 Mod 4) was undertaken. Erosion and sediment controls maintained. Continual weed management onsite. Due to Ecological monitoring associated with Modification 1 will commence in the next reporting period.
Groundwater quality sampling	
• Haerses Road - Additional groundwater sampling for buffer bores for Modification 1 commence in the next reporting period.	• Groundwater sampling for the buffer bores commenced in August 2018.

5. Environmental Performance

5.1 Air Quality

5.1.1 Dust Sources and Mitigation Measures

The objectives, criteria limits, procedures, response, reporting and responsibilities of air quality management are contained in:

- Air Quality Management Plan (Umwelt, April 2018) for the Old Northern Road quarry and
- Air Quality Management Plan (Dixon Sand, May 2019) for the Haerses Road quarry.

The following potential sources of dust generated from Dixon Sand quarry and mitigation measures have been identified in Table 6.

Table 6: Potential sources of dust and mitigation measures.

Potential Dust Sources	Mitigation Measures
• topsoil stripping; • ripping with a bulldozer; • extraction with an excavator and truck; • crushers and screens at the processing plant; • wind erosion from stockpiles; • loading sand products into trucks; • vehicle movement and haulage on site; • product transportation along unsealed haul roads; and • occasional haul road grading.	• minimising the area of disturbance by only clearing areas immediately prior to extraction; • progressive rehabilitation; • maintaining dust suppression equipment to all processing plant; • maintaining a manual sprinkler system including fine sprays on the conveyors of the dry processing plant, overhead sprinklers and a conical jet stockpile sprinkler; • stabilising topsoil stockpiles by planting with a cover crop of non-invasive cereal or legumes; • using a water cart to suppress dust on unsealed roads, during dry conditions on days of operation; • sealing Haerses Road; • limiting vehicle speed to 20 km/hr on internal unsealed access tracks; • ensuring all loads leaving the site are covered; and • regularly maintaining mobile and fixed equipment to minimise exhaust emissions.

5.1.2 Compliance Limits

Condition 8 of Schedule 3, DA250-09-01 and Condition 10 of Schedule 3, DA165-7-2005 require Dixon Sand to operate a continuous air quality monitoring system to minimise the impacts at sensitive receivers such as the Maroota Public School. The following air quality criteria are to be complied with:

- dust deposition - 4g/m²/month (annual average) or 2g/m²/month increase;
- total suspended particulate matter (TSP) – 90µg/ m³ (annual mean); and
- particulate matter <10µm (PM10):
    - 50 µg/m³ (average for 24 hour period)
    - 30 µg/m³ (annual mean).

The NSW Environment Protection Authority (EPA) also requires the automatic alarm system of the Tapered Element Oscillating Microbalance (TEOM) continuous dust monitoring device to be set at a PM10 trigger value which triggers specific dust mitigation measures:

- 42 µg/m³ (average for rolling 24 hour period for wind directions between 270° and 315°) for the Old Northern Road quarry, and
- 42 µg/m³ (average for rolling 24 hour period for wind directions between 180° and 240°) for the Haerses Road quarry.

Table 7 lists the relevant PM10 and Total suspended particulates (TSP) criteria as required by the Development Consents and Environment Protection Licences.

Table 7: PM10 and TSP Criteria.

Source	Condition	Criteria / Trigger Value	Comments
Old Northern Road			
DA250-09-01	Sch. 3, Cond. 7	30 µg/m^3	Annual PM_{10} average – long term impact assessment
		50 µg/m^3	24 hour PM_{10} average – short term impact assessment
EPL3916	O3.3	37 µg/m^3	Trigger value for PM_{10} automatic alarm
EPL3916	M2.4	42 µg/m^3 with prevailing wind direction from 270º-315º	Criteria for enacting management plan strategies to notify the EPA, reduce dust emissions immediately and cease operations in Lots 1 and 2.
DA250-09-01	Sch. 3, Cond. 7	90 µg/m^3	Annual average criteria for TSP
Haerses Road			
EPL12513	M2.3	42 µg/m^3 with prevailing wind direction from 180º-240º	Criteria for enacting management plan strategies to notify the EPA, reduce dust emissions immediately and cease operations
DA165-7-2005	Sch. 3, Cond. 9	30 µg/m^3	Annual average – long term impact assessment
EPL12513	O3.6		
DA165-7-2005	Sch. 3, Cond. 9	50 µg/m^3	24 hour average – short term impact assessment
EPL12513	O3.6		
EPL12513	O3.3	42 µg/m^3	Trigger value for PM_{10} automatic alarm and management plan strategies
DA165-7-2005	Sch. 3, Cond. 9	90 µg/m^3	Annual average criteria for TSP
EPL12513	O3.6		

5.1.3 Results

Climatic Data

Monthly climatic measurements were recorded by the weather station located adjacent to the Maroota Public School, in accordance with:

- Condition M4.1 of the EPL 3916,
- Condition M4.1 of the EPL 12513, and

These results are shown in Table 8.

Table 8: Monthly Total Rainfall and Daily Temperature Averages.

Month	Jul 2018	Aug 2018	Sep 2018	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019
Ave Temp (°C)	12.4	12.4	14.4	16.6	19.2	22.3	24.7	21.8	20.7	18.1	16.0	12.1
Total Rainfall (mm)	1.4	4.2	9.0	36.0	21.8	13.0	16.0	6.0	36.2	4.4	3.6	13.6

Data presented in Table 8 shows that the highest monthly rainfall of 36.2mm was recorded in March 2019 and the lowest monthly rainfall of 1.4mm was recorded in July 2018. The total rainfall recorded during this reporting period is 165.2mm, representing a lower annual rainfall than the previous five monitoring periods which were 372.8 (2017-2018), 924mm (2016-2017), 1026.4mm (2015-2016) and 942mm (2014-2015) and 251.4mm (2013-2014).

From the recorded data of monthly temperature, January 2019 experienced the highest average temperature of 24.7°C while June 2018 experienced the lowest average temperature of 12.1°C. Fluctuations of temperatures recorded are generally influenced largely by the El-Nino and La-Nina climate cycle.

Dust Deposition

Five dust deposition gauges are located on the Old Northern Road quarry and four gauges are located at the Haerses Road quarry. Table 9 lists the locations of these dust gauges.

Table 9: Site location of dust deposition gauges

Dust Gauge I.D.	Location Reference	Quarry Site
D01A	Quarry Access Road, near the Old Northern Road	Old Northern Road
D04	Rehabilitation Area	Old Northern Road
D05	Bundwall, Lot 1	Old Northern Road
D06	Maroota Public School	Old Northern Road
D07	Mulloc Heap	Old Northern Road
D08&D09	Hitchcock Road, Olive Grove	Haerses Road
D10	Haerses Road (EPL#12513, Point 3)	Haerses Road
D11	Haerses Road Receiver R6	Haerses Road
D12	Haerses Road Receiver R8 (located on the boundary of R7 and R8)	Haerses Road

Dust deposition results are collected and analysed monthly by a NATA accredited laboratory. Table 10 presents the monthly dust deposition results between July 2018 and June 2019. Table 11 contains the calculated annual averages for the dust deposition gauges. The monitoring cycle yielded 13 months of monitoring results during this reporting period. Dust gauges D11 and D12 commenced operation in this reporting period, yielding a 9 months of monitoring results.

The monthly laboratory results for dust deposition for this reporting period is presented in Appendix A.

Table 10: Dust Deposition Results: July 2018 – June 2019.

Dust Gauge Location	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jun-19
	(g/m2/month)												
D01A Front Gate	0.8	1.7^	1.2*^^	4.6^^	5.8^	1.5	2.1^^	1.5	1.8	19.6#	0.7	1.2	1.7
D04 Rehab	0.4	0.7	0.8^^	0.8	Broken+	1.2	17.0#	1.9	1.6	2.0	0.3	0.7	0.6
D05 Bundwall	0.8	1.4	1.8^^	0.9	1.4	1.7	1.9^^	0.9	1.4	2.2	0.5	1.4^^	1.9
D06 School	0.5	0.5	1.3^^	1.0	0.7	1.2	1.7^^	0.8	1.5	1.5	0.4	0.6	0.5
D07 Mulloc Heap	0.2	0.4	0.8	0.8	0.5	1.2	2.3	1.2	0.9	1.4	0.3	0.8	0.6
D08 Hitchcock Rd Grove	0.8	0.4	0.4^^	3.2	2.4	2.8	2.5	2.7^^	1.2	1.8	3.0	0.5	1.2^^
D10 Haerses Rd (Pt 3, EPL12513)	0.5#	1.8	1.0^^	2.4	1.0	1.6##	2.3	0.8	4.4#	7.9^^	5.4	1.5^^	4.6#
D11					1.1	0.8	1.8#	0.9	2.3^^	1.8	1.3	0.7#	0.4
D12					1.5	1.3	1.0	1.4	1.0	1.8	0.5	0.5	0.5

Note: * : Sand present in sample
: Vegetation / algae present in sample
: Bird dropping present in sample
^ : Dust/sediment present in sample
^^ : Insects / spider web present in sample
+: Dust gauge broken

Table 11: Calculated Annual Averages of Dust Deposition: June 2018 – June 2019.

Dust Gauge Location	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	May-19	Jun-19
	(g/m2/month)												
D01A Front Gate	0.8	1.3^	1.2*^^	2.1^^	2.8^	2.6	2.5^^	2.4	2.3	4.1#	3.8	3.5	3.4
D04 Rehab	0.4	0.6	0.6^^	0.7	0.7+	0.8	3.5#	3.3	3.1	2.9	2.7	2.5	2.3
D05 Bundwall	0.8	1.1	1.3^^	1.2	1.3	1.3	1.4^^	1.4	1.4	1.4	1.4	1.4^^	1.4
D06 School	0.5	0.5	0.8^^	0.8	0.8	0.9	1.0^^	1.0	1.0	1.1	1.0	1.0	0.9
D07 Mulloc Heap	0.2	0.3	0.5^^	0.6	0.5	0.7	0.9	0.9	0.9	1.0	0.9	0.9	0.9
D08 Hitchcock Rd Grove	0.8	0.6	0.5^^	1.2	1.4	1.7	1.8	1.9^^	1.8	1.8	1.9	1.8	1.8^^
D10 Haerses Rd (Pt 3, EPL12513)	0.5#	1.2	1.1^^	1.4	1.3	1.4##	1.5	1.4	1.8#	2.4^^	2.6	2.6^^	2.7#
D11					1.3	1.0	1.2#	1.2	1.4^^	1.5	1.4#	1.3	1.2
D12					1.5	1.4	1.3	1.3	1.2	1.3	1.2	1.1	1.1

Note: * : Sand present in sample
: Vegetation / algae present in sample
: Bird dropping present in sample
^ : Dust/sediment present in sample
^^ : Insects / spider web present in sample
+: Dust gauge broken

Charts 1 to 4 illustrate the annual average dust deposition results for the reporting periods of 2015-2016, 2016-2017, 2017-2018 and 2018-2019, respectively.

TEOM PM_{10}

In accordance with Condition 8 of Schedule 3, DA250-09-01, and Condition 10 of Schedule 3, DA165-7-2005, the concentration of particulates with an aerodynamic diameter less than ten microns (PM_{10}) is monitored via the continuous dust monitor (TEOM) near Maroota Public School. The TEOM records data for the whole 360º angles, of

which two arcs of data, 270º-315º (westerly to north-westerly) and 180º-240º (southerly to south-westerly), indicate potential contributions from the Old Northern Road and Haerses Road quarries, respectively. Chart 9 illustrates the PM_{10} results for this reporting period, in comparison with relevant consent criteria. Charts 5 to 8 show the PM_{10} results for the reporting periods of 2015-2016, 2016-2017, 2017-2018 and 2018-2019, respectively.

A number of PM10 exceedance events occurred in the reporting period. Six average 24-hour PM10 results have exceeded the EPL 42 ug/m3 and the NEPM 50 ug/m3 criteria.

Reporting of TSP results commenced in December 2017 and are shown in Charts 9 and 10. No TSP exceedance occurred in this period.

A copy of the full reports containing TEOM, TSP and weather station data provided by CBased Environmental Pty Ltd are contained in Appendix B.

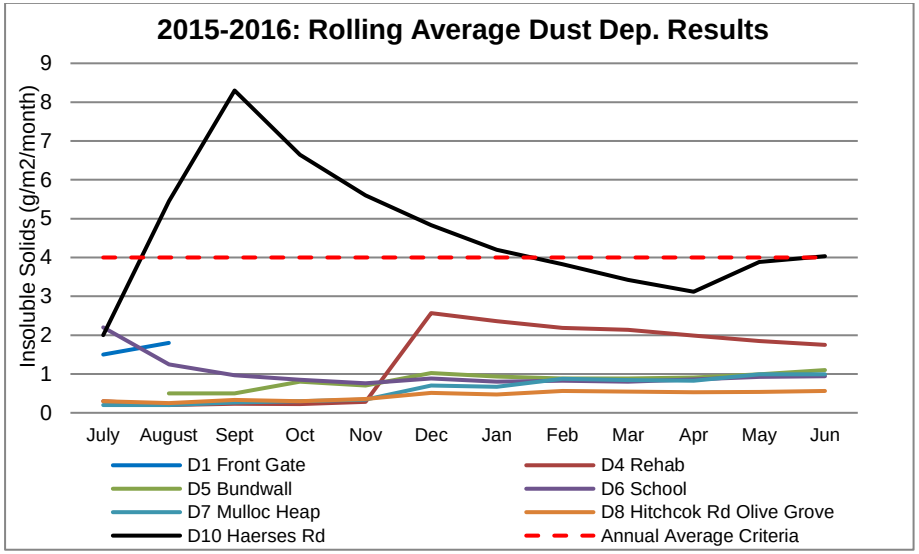


Chart 1: 2015 – 2016 Rolling Average of Dust Deposition Results

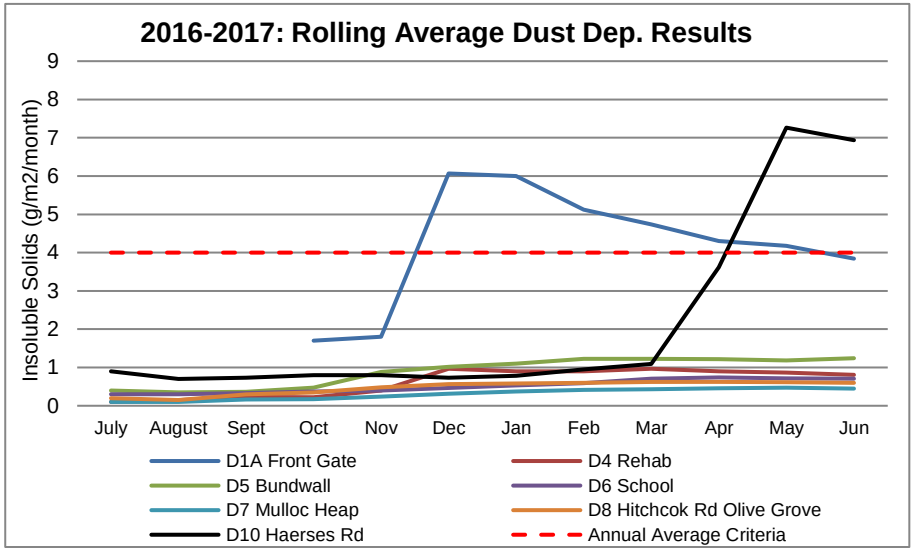


Chart 2: 2016 – 2017 Rolling Average of Dust Deposition Results

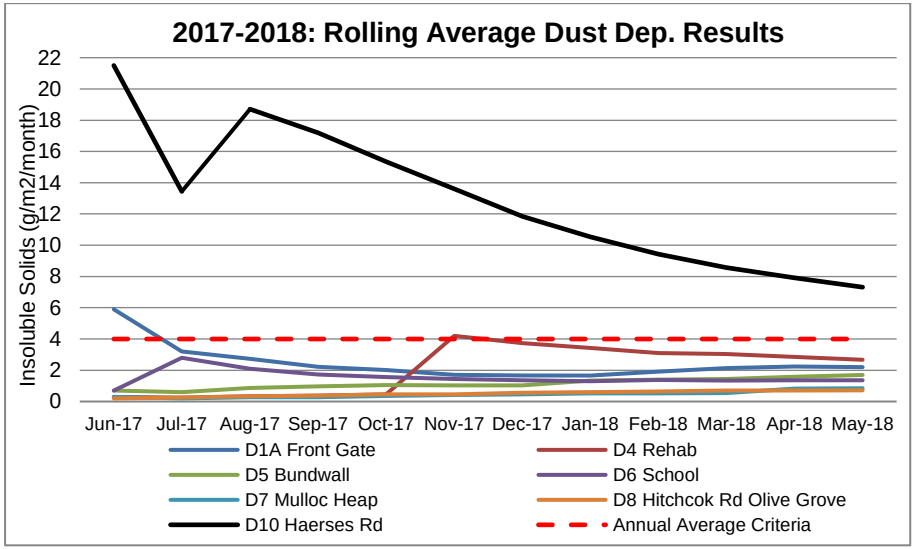


Chart 3: 2017 – 2018 Rolling Average of Dust Deposition Results

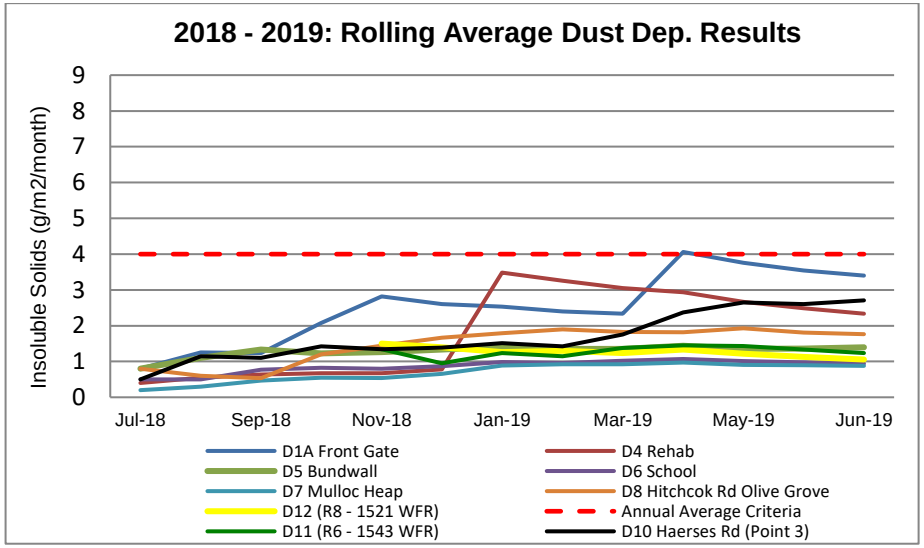


Chart 4: 2018 – 2019 Rolling Average of Dust Deposition Results

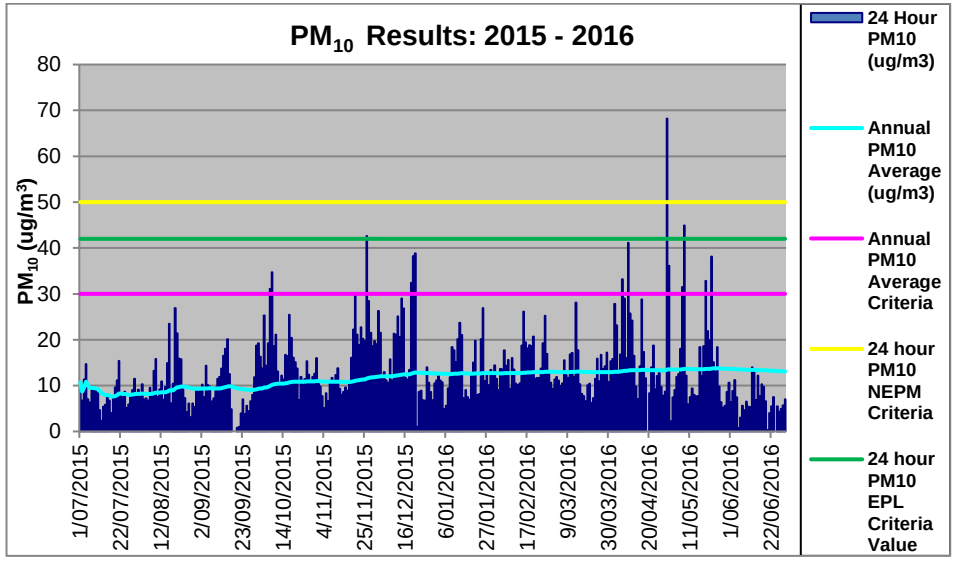


Chart 5: 2015-2016 PM10 Results and Criteria

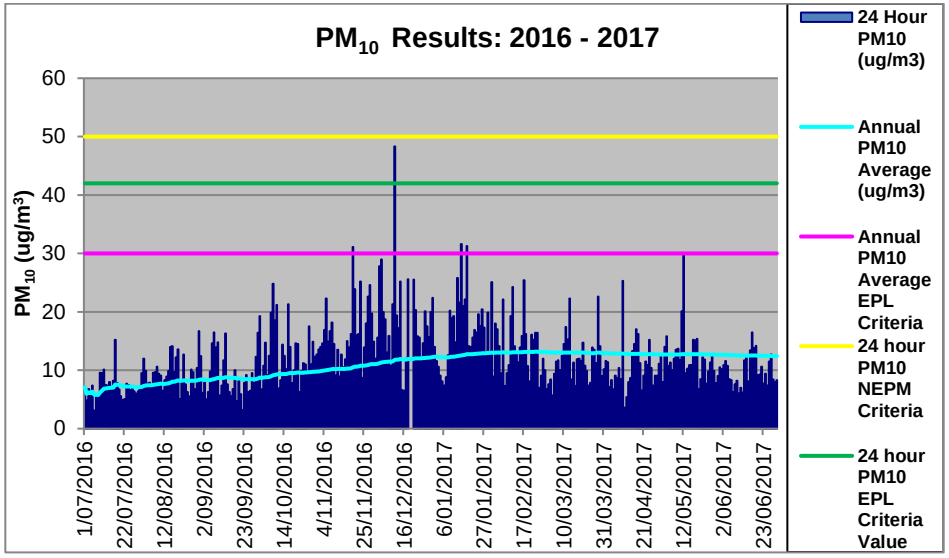


Chart 6: 2016-2017 PM10 Results and Criteria

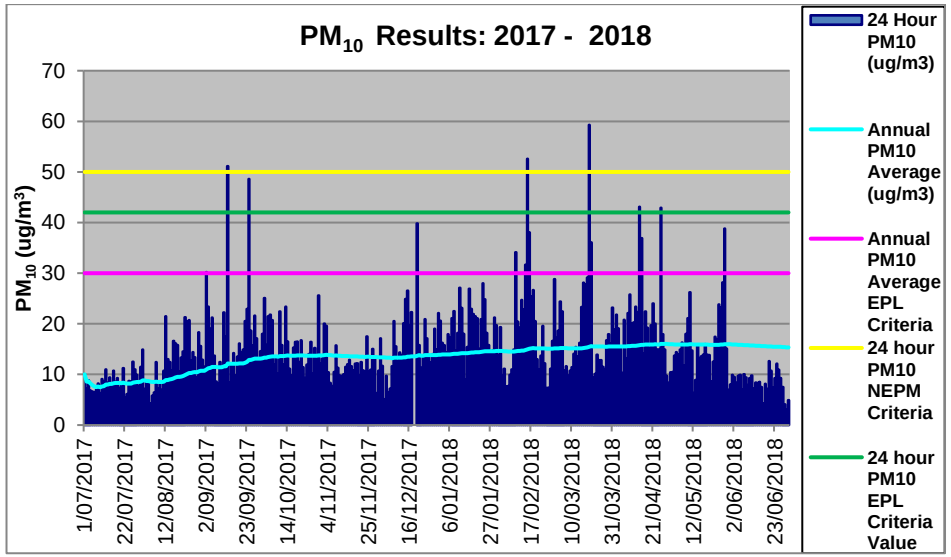


Chart 7: 2017-2018 PM10 Results and Criteria

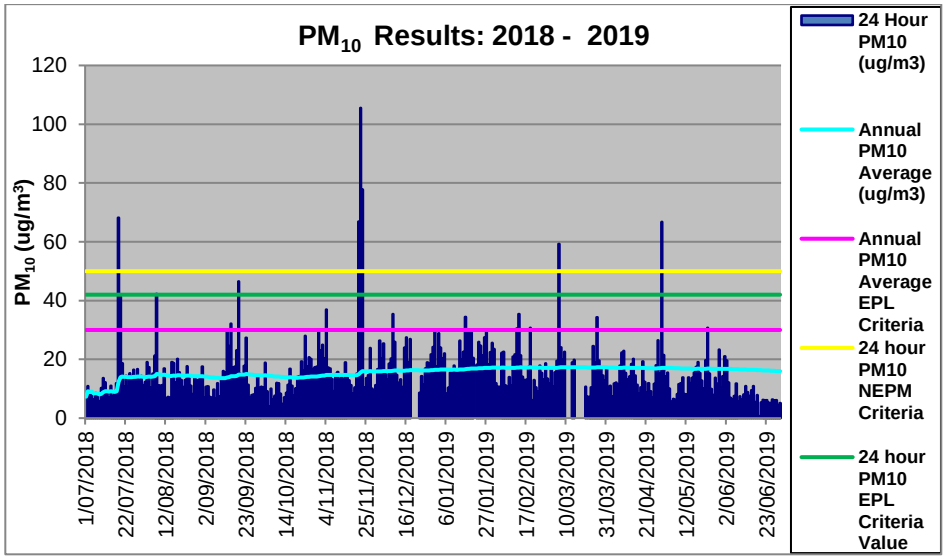


Chart 8: 2018-2019 PM10 Results and Criteria

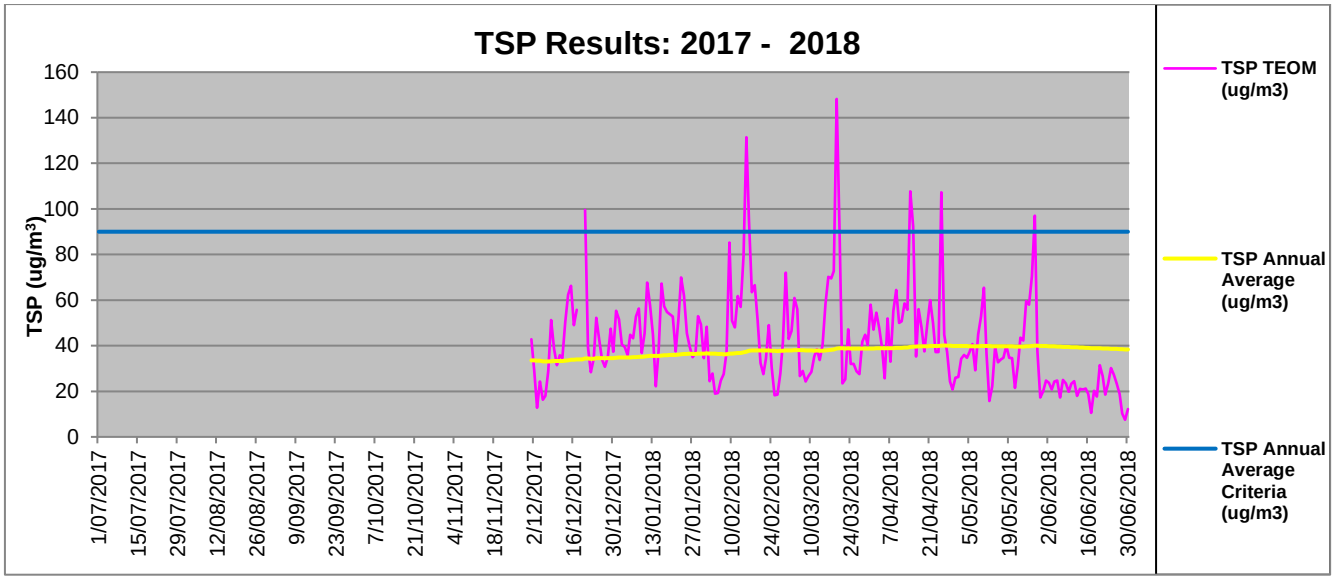


Chart 9: 2017-2018 TSP Results and Criteria

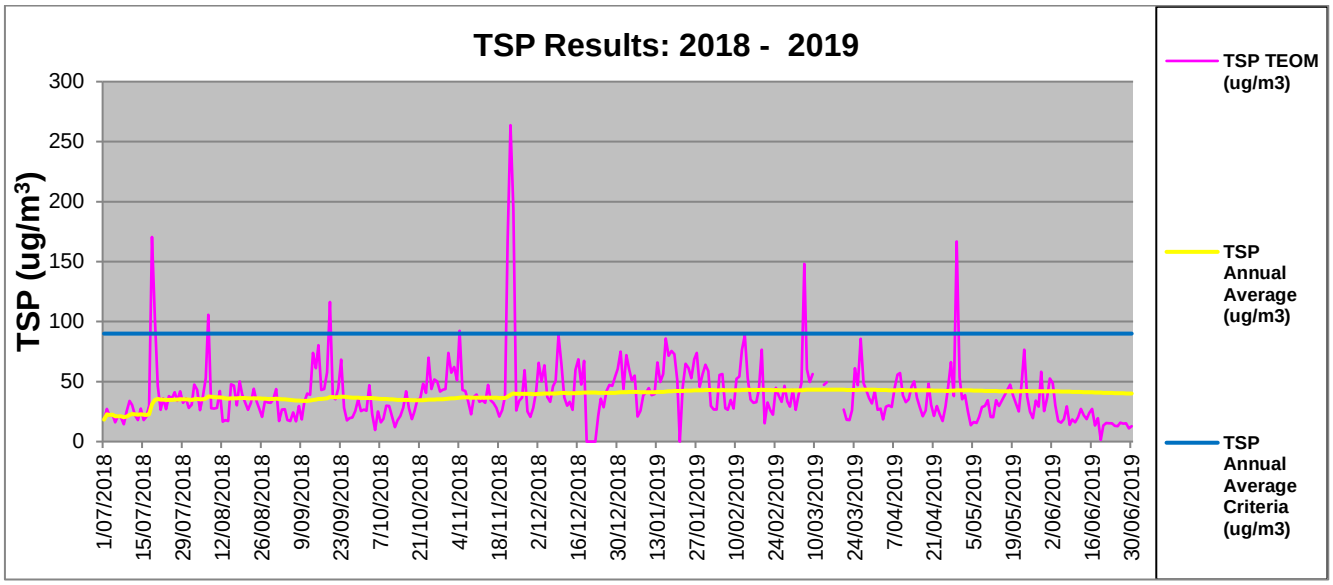


Chart 10: 2018-2019 TSP Results and Criteria

5.1.4 Analysis

Old Northern Road – Dust Deposition

Reporting Period 2018-2019

Five dust deposition gauges monitor dust impacts from the Old Northern Road quarry.

Monthly results and annual dust deposition averages for D01A (Front Gate), D04 (Bund), D05 (Mulloc Heap), D06 (School) and D07 (Bund) for the July 2018 and June 2019 period were generally in compliant. High monthly results were recorded at D01(A) (4.6, 5.8 and 19.6 g/m^2/month in October, November and April) and D04 (17.0 g/m^2/month in January). All annual averages were in compliant.

The EIS prepared for the extension of the quarry on Old Northern Road Lots 1 and 2 (ERM, 2001) predicted dust deposition at the nearest receptors to be between 2.2 and 2.9g/m²/month. The majority of the monthly dust deposition results at the Old Northern Road quarry were below these predictions for the reporting period, with the exception of the isolated exceedances at D01(A) and D04. Field observations and laboratory analysis indicated that the exceedance samples contained visible insects, sediment and vegetation/algae. High dust deposition at D01(A) is most likely attributed to paddock slashing, ploughing, sowing and fertiliser application in the adjacent agricultural field which coincided with preparation for summer and winter crops. High result at D04 was likely due to earthwork activity associated with earthworks for siltpond rehabilitation adjcent to the dust gauge.

This confirms that quarry operations did not cause dust deposition at significant distances from the quarry which would potentially impact nearby receivers.

Historical Data

It can be seen from Charts 5 to 8 that the majority of the dust deposition results are in compliance over the previous 4 years of monitoring.

D01 (front gate) was relocated in September 2016 (renamed to D01(A)) and returned high dust results during active months of agricultural operations during the 2016-2017 and 2017-2018 reporting periods.

D05 (bund wall) recorded high results during the reporting periods 2013-2014 which were likely due to excavation and stripping operations in Lots 1 and 2, and material haulage adjacent to D05.

Annual averages for D04 (Rehab), D06 (School) and D07 (Mulloc Heap) have been consistently compliant over the last four reporting periods.

Haerses Road – Dust Deposition

Reporting Period 2018-2019

Four dust deposition gauges are located at Haerses Road quarry, being D08, D10, D11 and D12.

Dust gauges D11 and D12 were commissioned in October 2019 to monitor air quality impact associated with the newly approved extraction area under Modification 1.

No exceedances of the annual average of 4.00 g/m^2/month were recorded for dust gauge D08. The highest and lowest monthly averages for D08 are 3.2 g/m^2/month (October 2018) and 0.4 g/m2/month (August and September 2018), respectively.

The EIS for Haerses Road (ERM, 2005) predicted dust deposition during quarrying Stages 1 and 5 to be between 2.2 and 3.0 g/m²/month for all receptors. Annualised dust deposition levels at D08 for the Haerses Road quarry were consistently less than 1.8 g/m²/month for the reporting period.

High monthly result was recorded at D10 in March 2019. Field observation indicated that this exceedance at D10 resulted from an extended dry weather period, together with agricultural and nursery activities in the adjacent areas.

Quarry activities have not yet commenced in the newly approved extraction areas under Modification 1. Therefore, dust deposition results obtained from dust gauges D11 and D12 represent background dust levels without any influence from quarry operations. Both dust gauges D11 and D12 returned low monthly and annualised average dust levels which comply with the consent and EPA dust criteria.

Historical Data

It can be seen from Charts 5 to 8 that the annual averages of D08 did not exceed the criteria in the last four reporting periods. Exceedances for D10 over the last four reporting periods were attributed to poor air quality from localised and regional hazard reduction burns, on-site residents undertaking slashing maintenance and neighbouring or adjacent agricultural activities, tree felling, mulching and earthworks.

Old Northern Road and Haerses Road – PM10

Reporting Period 2018-2019

The EIS predicted a 6th highest PM_{10} 24 hour average of 42 µg/m³ and PM_{10} annual average of 7 µg/m³ (maximum values for 7 discrete receptors modelled). The air quality statement of evidence presented in the Land and Environment Court of NSW for Lots 1 and 2 (ERM, 2003) predicted that the highest 24 hour PM_{10} ground level concentration would be 37 µg/m³ at receptor 3. Consent DA250-09-01 and the Environment Protection Licence subsequently set a maximum rolling 24-hour average of 42 µg/m³ for the site.

The rolling 24 hour PM_{10} mean values (light blue line on Chart 8) remained below the EPA long term criteria of 30µg/m³ (pink line on Chart 8) for this reporting period.

The majority of the 24 hour average PM_{10} levels (dark blue columns on Chart 8) remained below the 24 hour EPL management level of 42 µg/m³ (green line on Chart 8) and the 24 hour NEPM short term criteria level of 50 µg/m³ (yellow line on Chart 8). The 24 hour PM_{10} average exceedances were recorded on six days during this reporting period. Table 12 lists the 24 hour average PM_{10} exceedances.

Table 12: PM10 – EPL and NEPM Management criteria exceedance

Exceedance Event Date	24 Hour Average Exceedance (ug/m³)	Exceeded criteria (ug/m³)	Comment
18 July 2018	68.2	EPL: 42 ug/m3 NEPM: 50 ug/m3	Self-Reported to EPA (Ref: C09845-2018). Residual poor air quality which resulted in the rise in PM10. Bureau of Meteorology forecasted areas of haze around Sydney. PM10 exceedance not attributed to quarry operations.
19 September 2018	46.5	EPL: 42 ug/m3	Self-Reported to EPA (Ref: C13145-2018). Bureau of Meteorology forecasted gusty north-westerly winds. PM10 exceedance not attributed to quarry operations. No quarry operations on Lots 1, 2 and 29 during high PM10 readings. Increased frequence of water cart usage for the day.
21 November 2018	66.9	EPL: 42 ug/m3 NEPM: 50 ug/m3	Self-Reported to EPA (Ref: C159453 on 21/11/18). Bureau of Meteorology issued a warning of a dust storm moving over Sydney from Western NSW.Quarry operations ceased

22 November 2018	105.5	EPL: 42 ug/m3 NEPM: 50 ug/m3	on Lots 1, 2 and 29 until PM10 levels fall below the criteria. PM10 exceedance not attributed to quarry operations. High PM10 readings occurred over 21/11/18 to 23/11/18.
23 November 2018	77.7	EPL: 42 ug/m3 NEPM: 50 ug/m3	
6 March 2019	59.2	EPL: 42 ug/m3 NEPM: 50 ug/m3	Self-Reported to EPA (Ref: C03674-2019 and C03675-2019). Bureau of Meteorology forecasted a number of storm cells and gust winds blowing across Sydney. OEH air quality monitoring stations demonstrated poor air quality readings. Quarry operations concluded at the time of the receival of exceedance alarm.
29 April 2019	66.7	EPL: 42 ug/m3 NEPM: 50 ug/m3	Self-Reported to EPA (Ref: C06233-2019 and C06237-2019). High PM10 readings attributed to the smoke settlement and poor air quality from the scheduled hazard reduction burns across the Greater Sydney and Hunter regions. Warnings have also been issued by the Rural Fire Service of smoke settling in some areas across Sydney.

Historical Data

It can be seen from Charts 5 to 8 that all the annual average PM10 results recorded at the TEOM comply with the annual average PM10 criteria of 30μg/m³ over the previous four years of annual review reporting.

A number of 24-hour average exceedances were recorded over the last four reporting periods with causes attributed to activities not related to quarry operations. The single 24 hour average exceedance in 2014-2015 was due to a dust storm which had swept across the north-western Sydney region. Exceedances during the 2015-2016 were attributed to several hazard reduction burns and dry westerly winds blowing over the region. The single 24 hour average exceedance in 2016-2017 was not quarry related as the exceedance fell on a Sunday on which the quarry did not operate, with predominantly southerly winds. Exceedances during the 2017-2018 were attributed to

The annual PM_{10} average for the 2018-2019 reporting period was 16.0 μg/m³, well below the EPA criterion of 30μg/m³. This annual average is slightly higher than previous records of 15.3 μg/m³ (2017-2018), 12.4μg/m³ (2016-2017), 11.6 μg/m³ (2015-2016) and 13.4 μg/m³ (2014-2015). However, this year's annual PM_{10} average of 16.0μg/m³ is higher than the predicted value of 7 μg/m³ in the EIS. The higher annual PM10 averages over the past 4 years are likely due to relatively dryer and dustier conditions compared to historical records.

Old Northern Road and Haerses Road – TSP

Reporting Period 2018-2019

The Total Suspended Particules (TSP) results are reported in Charts 9 and 10. The annual TSP average for this reporting period is 40.0 µg/m³ which is lower than the annual TSP average criteria of 90 µg/m³ set out by the consent and EPL.

Historical Data

Reporting of TSP commenced in December 2017 during the last reporting period and yieled an annual average TSP of 38.3 µg/m³ which is slightly lower than the 40.0 µg/m³ annual average derived from this reporting period.

5.1.5 Changes to Environmental Procedures

No changes to the environmental procedures are proposed or deemed necessary for air quality management.

It is recommended that in the event of significant visible dust due to operations or high winds, cease activity until dust can be effectively managed or conditions become more favourable.

5.2 Noise Management

5.2.1 Noise Sources and Mitigation Measures

The objectives, criteria limits, procedures, response, reporting and responsibilities of noise management are contained in the Noise Management Plans of both quarries.

The following potential sources of noise from Dixon Sand quarries and mitigation measures have been identified in Table 13.

Table 13: Potential sources of Noise and mitigation measures.

Potential Noise Sources	Mitigation Measures
• Extraction by bulldozers and excavators; • Moving of materials and stockpiling by dump trucks and excavators; • Truck haulage including bogie trucks, truck and dogs; • Wet/dry processing of sand; and • Ancillary activities including maintenance undertaken in the workshop	• Construction of noise bunds in strategic locations as stipulated in the EIS/EAs and consent conditions; • Compliance with approved hours of operation; • Regular maintenance of road surfaces, vehicles and equipment to reduce noise emissions; and • Enforcement of speed limits for trucks and limited use of exhaust brakes in residential and school areas. • Enforcement of a 20km/h speed limit on quarry access road and haul roads. • Switch off plant when not in use and use of automatic idle shutdown.

The Noise Management Plan for the Old Northern Road quarry requires attended noise monitoring to be undertaken every six months.

The Noise Management Plan for the Haerses Road quarry requires attended noise monitoring to be undertaken every twelve months.

5.2.2 Compliance Limits

Old Northern Road Noise Criteria

The Old Northern Road noise criteria are listed in Table 14. The approved hours of operation are contained in Table 15. Noise monitoring for the quarry is based on these criteria.

Table 14: Old Northern Road Noise Criteria.

Consent Condition	Conditions
DA250-09-01, Condition 3 of Schedule 2 and	The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 2 at any residence on privately-owned land or at the Maroota Public School. *Table 2: Noise criteria dB(A)* **Receiver** / **Averaging Period** / **Shoulder (6.00 am to 7.00 am)** / **Day (7.00 am to 6.00 pm)** Any residence on privately owned land / $L_{Aeq\ (15\ minute)}$ / 37 / 44 Any classroom at Maroota Public School / $L_{Aeq\ (1\ hour)}$ / - / 45 Noise generated by the development is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy. Appendix 6 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 2 do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement. *Note: Should an agreement with a landowner be terminated for any reason, the Applicant must comply with the noise criteria in Table 2.*

Table 15: Old Northern Road Approved Hours of Operation.

Consent Condition	Condition
DA250-09-01, Condition 1 of Schedule 2	The Applicant must comply with the operating hours set out in Table 1. *Table 1: Operating hours* **Activity** / **Permissible Hours** Quarrying operations (excluding truck arrival, loading and dispatch) / 7.00 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays Truck arrival (unladen) / 5.45 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays Truck loading Truck dispatch Truck arrival (laden) / 6.00 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays Bund construction or rehabilitation works within 250 m of Maroota Public School / 7.00 am to 6.00 pm Monday to Friday during school holiday periods unless otherwise approved in writing by the EPA Maintenance / May be conducted at any time, provided that these activities are not audible at any privately-owned residence

DA250-09-01, Condition 2 of Schedule 2	The following activities may be carried out outside the hours specified in condition 1 above: (a) delivery or dispatch of materials as requested by the NSW Police Force or other public authorities; and (b) emergency work to avoid the loss of lives, property or to prevent environmental harm. In such circumstances, the Applicant must notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.

Haerses Road Noise Criteria

Haerses Road's noise criteria are listed in Table 16. Approve hours of operation are contained in Table 17. Noise monitoring for the quarry is based on these criteria.

Table 16: Haerses Road Noise Criteria

Consent Condition	Conditions
DA165-7-2005, Condition 3 of Schedule 2	The Applicant must ensure that operational noise generated by the development (excluding acoustic bund construction) does not exceed the criteria in Table 2 at any residence on privately-owned land.

Table 2: Operational noise criteria dB(A)

Receiver	Day	Shoulder (6.00 am to 7.00 am)	
	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{A(max)}$
R1	37	37	45
R2	40	40	
R3	38	38	
R4	37	37	
R6	37	35	
R7	36	35	
R8	36	35	
All other receivers	35	35	

Noise generated by the development is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the *NSW Industrial Noise Policy*. Appendix 5 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 2 do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Note:
- *Should an agreement with a landowner be terminated for any reason, the Applicant must comply with the noise criteria in Table 2.*

Table 17: Haerses Road Approved Hours of Operation.

Consent Condition	Condition
DA165-7-2005, Condition 1 of Schedule 2	The Applicant must comply with the operating hours set out in Table 1.

<table>
<tr><td></td><td>
Table 1: Operating hours
<table>
<tr><th>Activity</th><th>Permissible Hours</th></tr>
<tr><td rowspan="2">Quarrying operations (excluding truck arrival, loading and dispatch)</td><td>7.00 am to 6.00 pm Monday to Saturday</td></tr>
<tr><td>At no time on Sundays or public holidays</td></tr>
<tr><td rowspan="2">Truck arrival, loading and dispatch</td><td>6.00 am to 6.00 pm Monday to Saturday</td></tr>
<tr><td>At no time on Sundays or public holidays</td></tr>
<tr><td rowspan="2">Acoustic bund construction and road and intersection works on Haerses Road and Wisemans Ferry Road</td><td>8.00 to 5.00 pm Monday to Friday</td></tr>
<tr><td>At no time on Saturdays, Sundays or public holidays</td></tr>
<tr><td>Maintenance</td><td>At any time, provided that these activities are not audible at any privately-owned residence outside of permissible hours for quarrying operations</td></tr>
</table>
</td></tr>
<tr><td>DA165-7-2005, Condition 2 of Schedule 2</td><td>The following activities may be carried out outside the hours specified in condition 1 above:
(a) delivery or dispatch of materials as requested by the NSW Police Force or other public authorities; and
(b) emergency work to avoid the loss of lives, property or to prevent environmental harm.
In such circumstances, the Applicant must notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.</td></tr>
</table>

5.2.3 Results

Attended noise monitoring was undertaken in December 2018 and June 2019 for the Old Northern Road Quarry, and in June 2019 for Haerses Road Quarry. Attended noise monitoring was conducted at receivers (where permission to enter the property was granted) and at-source, in accordance with the staging requirement of the Noise Management Plans. Due to high levels of background noise in the surrounding area from sources such as traffic and other quarry operations in the vicinity, additional calculations were undertaken to predict the 'quarry borne' noise contribution at sensitive receivers. Prediction of quarry borne noise impacts are determined using setback noise calculation methodology, in accordance with Chapter 4 of the *Interim Construction Noise Guidelines* and Noise Policy for Industry (EPA, 2017) (formerly Industrial Noise Policy, (EPA, 2000). These calculated values exclude the influence of background noise sources, and are only undertaken where quarry operations are not clearly audible above background noise at sensitive receiver monitoring points. Noise predictions require an additional 15 minute measurement to be taken within close proximity of quarry operations, whereby there is minimal interference from background noise.

Results for predicted noise impacts for Old Northern Road and Haerses Road quarries are contained in Tables 18, 19 and 20 respectively.

Table 18: Predicted Noise Impacts for Old Northern Road Quarry, December 2018.

Receiver Location	Distance betw. Receiver and At source mon (m)	Monitoring Period	Comments	Predicted Noise Level at Receiver (setback calculation from at-source monitoring) (dBA)	Noise Criteria (dBA)			Compliance
					Shoulder (6-7am) Leq15min	Day (7am-6pm) Leq15min	Day (7am-6pm) Leq1hour	
Maroota Public School	1150 (to Lot 196)	Shoulder	School not operating – no criteria set for Shoulder period	Not Applicable	-	-	-	N/A
		Day	Quarry operations intermittently audible	33.2			45	Yes
	605 (to Lots 1&2)	Shoulder	School not operating – no criteria set for Shoulder period	Not Applicable	-	-	-	N/A
		Day	No attended noise monitoring conducted	35.2			45	Yes
R1*	795 (to Lot 196)	Shoulder	No extraction during shoulder period	< 37	37			Yes
		Day	No attended noise monitoring conducted	36.5		44		Yes
	615 (to Lots 1&2)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	No attended noise monitoring conducted	35.0		44		Yes
R2	908 (to Lot 196)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	Quarry operations intermittently audible	35.3		44		Yes
	710 (to Lots 1&2)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	No attended noise monitoring conducted	33.8		44		Yes
R3	1075 (to Lot 196)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	Quarry operations slightly audible	33.8		44		Yes
	712 (to Lots 1&2)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	No attended noise monitoring conducted	33.8		44		Yes
R4	1170 (to Lot 196)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	No attended noise monitoring conducted	37.5		44		Yes
	733 (to Lots 1&2)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	Quarry operations inaudible	33.5		44		Yes
R5	1210 (to Lot 196)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	No attended noise monitoring conducted	32.8		44		Yes
	733 (to Lots 1&2)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	Quarry operations inaudible	33.3		44		Yes
R6	472 (to Lot 196)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	Quarry operations audible	40.9		44		Yes
	845 (to Lots 1&2)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	No attended noise monitoring conducted	32.3		44		Yes

*Note: A noise agreement between Dixon Sand and receiver R1 is in place and therefore the noise criteria do not apply.

Table 19: Predicted Noise Impacts for Old Northern Road Quarry, June 2019.

Receiver Location	Distance betw. Receiver and At source mon (m)	Monitoring Period	Comments	Predicted Noise Level at Receiver (setback calculation from at-source monitoring) (dBA)	Noise Criteria (dBA)			Compliance
					Shoulder (6-7am) Leq15min	Day (7am-6pm) Leq15min	Day (7am-6pm) Leq1hour	
Maroota Public School	530	Shoulder	School not operating – no criteria set for Shoulder period	Not Applicable	-	-	-	N/A
		Day	Quarry ops slightly audible	**37.7**			45	Yes
R1*	380	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day	No attended noise monitoring conducted	**40.6**		**44**		Yes
R2	485	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day	Quarry inaudible	**38.5**		**44**		Yes
R3	551	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day	Quarry intermittently audible	**37.4**		**44**		Yes
R4	612	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day	Quarry intermittently audible	**36.5**		**44**		Yes
R5	641	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day	Quarry intermittently audible	**36.1**		**44**		Yes
R6	640	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day		**36.1**		**44**		Yes

*Note: A noise agreement between Dixon Sand and receiver R1 is in place and therefore the noise criteria do not apply.

Table 20: Predicted Noise Levels using Setback Calculations for Haerses Road Quarry, June 2019.

Receiver Location	Distance betw. Receiver and At source mon (m)	Monitoring Period	Comments	Predicted Noise Level at Receiver (setback calculation from at-source monitoring) (dBA)	Noise Criteria (dBA)			Compliance
					Day (7am-6pm) Leq15min	Shoulder (6-7am) Leq15min	Shoulder (6-7am) LA(max)	
R1	1,505	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**37**	45	Yes
		Day	Did not conduct attended noise monitoring	**29.3**	**37**			Yes
R2*	1,490	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**40**	45	Yes
		Day	Did not conduct attended noise monitoring	**29.4**	**40**			Yes
R3	1,142	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**38**	45	Yes
		Day	Quarry operation in Stage 2 inaudible at R3 during attended noise monitoring	**31.7**	**38**			Yes
R4	1,110	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**37**	45	Yes
		Day	Did not conduct attended noise monitoring	**31.9**	**37**			Yes
R5	1,006	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**32.8**	**35**			Yes
R6	768	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**35.1**	**37**			Yes
R7	1,030	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**32.6**	**36**			Yes
R8	846	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**34.3**	**36**			Yes
R9	997	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**32.8**	**35**			Yes
R10	1,250	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**30.9**	**35**			Yes
R11	1,295	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**30.6**	**35**			Yes

*Note: A noise agreement between Dixon Sand and receiver R2 is in place and therefore the noise criteria do not apply.

5.2.4 Analysis

It must be noted that setback calculations represent the worst-case noise impact scenarios as no topographical or building material noise attenuation has been taken into account. It would be reasonable to state that the setback calculations for predicted noise impacts are likely to be higher than the actual noise levels experienced at the receivers.

Old Northern Road - Attended Noise Monitoring – December 2018

No measured noise levels are considered to have been enhanced by meteorological conditions as outlined in Appendix 6 of the development consent. Meteorological conditions recorded at the weather station installed by the Dixon Sand adjacent to the Maroota Public School, as required by the Environment Protection Licence No. 3916, do not include corrections for the meteorological condition. During attended noise monitoring at receivers, ambient and extraneous noise from sources such as insects, birdcalls and local traffic dominated the acoustic environment.

Setback calculations utilising at-source noise monitoring results have been undertaken to determine the predicted noise impacts at receivers R1 to R6 (inclusive) and the Maroota Public School. Table 18 demonstrates that the predicted noise impact levels at all receivers are below the daytime noise management criteria contained in the DA250-09-01. Predicted noise impact levels during shoulder period can assumed to be less than those calculated for daytime due to restricted quarry operations.

At the Maroota Public School, setback calculations indicate that the daytime predicted quarry borne noise level experienced at the receiver are L_{Aeq} 33.2 dBA and L_{Aeq} 35.2 dBA for operations on Lot 196 and Lots 1&2 respectively. These predicted noise levels are lower than the daytime noise criteria of 45 dBA defined by the development consent. Day time attended noise monitoring for quarry operations on Lots 1&2 at the Maroota Public School recorded an L_{Aeq15} of 50.8 dBA which was highly influenced by external noise sources from the Old Northern road local traffic, birdcalls and cicadas. Quarry operations were intermittently audible during the attended noise monitoring. The development consent does not stipulate noise criteria during shoulder period as the school is not in operation during these times.

The results of the attended noise monitoring and predicted noise impacts from setback calculations indicate that Dixon Sand's Old Northern Road quarry operations were in compliance with the noise assessment criteria at receivers R1 to R6 (inclusive) and at the Maroota Public School under the meteorological conditions at the time of monitoring.

An agreement between Dixon Sand and receiver R1 is in place and therefore, noise management levels defined by the development consent are not applicable.

Old Northern Road - Attended Noise Monitoring – June 2019

At the Maroota Public School, setback calculations indicate that the daytime predicted quarry borne noise levels experienced at the receiver are LAeq 37.7 dBA and LAeq 35.0 dBA for quarry operations on Lots 1 and 2 and Lot 196, respectively. The predicted quarry borne noise levels are lower than the daytime noisecriteria of 45 dBA defined by the development consent. Attended noise monitoring on the western perimeter of the school indicated that the environment is highly influenced by external noise sources from the Old Northern road local traffic and birdcalls. Quarry operations were intermittently audible during the attendednoise monitoring. The consent does not stipulate noise criteria during shoulder period as the school is not in operation.

No attended noise monitoring was undertaken at receiver R1 due to a noise agreement currently in place between Dixon Sand and the receiver.

Setback calculations utilising at-source noise monitoring results have been undertaken to determine the predicted noise impacts at receivers R1 to R6 (inclusive). Predicted noise impacts contained in Table 19 indicate that the predicted noise impact levels at all receivers are below the daytime noise management criteria contained in the DA250-09-01. Predicted noise impact levels during shoulder period can assumed to be less than those calculated for daytime due to restricted quarry operations.

The results of the attended noise monitoring and predicted noise impacts from setback calculations indicate that Dixon Sand's Old Northern Road quarry operations were in compliance with the noise assessment criteria at receivers R1 to R6 (inclusive) and the MPS (Maroota Public School) under the meteorological conditions at the time of monitoring.

Haerses Road - Attended Noise Monitoring – June 2019

Dixon Sand is permitted to commence loading and dispatch from 6:00 am on Mondays to Fridays and Saturdays. However, at the time of monitoring, Haerses Road quarry did not operate between 6:00 and 7:00am. Attended noise monitoring during shoulder periods at receiver R3 therefore does not take in account any noise generated from Haerses Road Quarry operations. Results from attended noise monitoring during the shoulder periods indicate that the dominant noise sources are from Wisemans Ferry Road traffic and surrounding activities including birdcalls and domestic livestock.

Weather data contained in Appendix A indicates that temperature inversions were unlikely to have occurred during the shoulder period monitoring. However, as the quarry did not operate during the shoulder period, attended noise monitoring results suggest that receivers experience high noise levels from non-quarry borne noise sources.

Attended noise monitoring during the daytime period indicates that quarry borne noises were inaudible at receiver R3. It was observed that noise from Wisemans Ferry Road traffic, birdcalls and rooster calls and frog calls contributed significantly to the measured noise levels.

Setback calculations contained in Table 20 indicate that the daytime predicted quarry borne noise contributions at receivers R1 to R11 (inclusive) are lower than the daytime noise management criteria.

The results of the attended noise monitoring and predicted noise impacts from setback calculations indicate that Dixon Sand's Haerses Road Quarry operations were in compliance with the noise assessment criteria at receivers R1 to R11 (inclusive) under the meteorological conditions at the time of monitoring.

An agreement between Dixon Sand and receivers on Hitchcock Road and R2 is in place and therefore, noise management levels defined by the development consent are not applicable.

5.2.5 Changes to Environmental Procedures

Noise bund walls are to be constructed and maintained as per the strategies outlined in the Old Northern Road Noise Management Plan and Haerses Road Acoustic Bund Construction Noise Management Plan.

Undertake noise monitoring in accordance with the Noise Management Plans.

5.3 Traffic and Transport

5.3.1 Ongoing Management Measures

Vehicle Movements

Vehicle movement records have been sent to Council on a monthly basis and Section 94 Contribution payments made. There were no exceedances of permitted vehicle movements during the reporting period.

Monthly Inspections

Observations of road conditions and maintenance requirements are inclusive in the monthly site inspection checklists. An example of the monthly site inspection checklist is attached in Appendix E.

Community Liaison

Liaison between Dixon Sand and the representative of Maroota Public School is conducted on a regular basis during the Community Consultative Committee meetings which are held bi-annually. Details of the CCC meetings and community engagement and contributions are discussed further in Section 8.

5.3.2 Traffic Related Complaints

Five and two traffic related complaints for the Old Northern Road and Haerses Road quarries were received during the 2018-2019 reporting period respectively. The complaints details, recommendations and outcomes summarised in Table 21 below. All complaints have been closed out apart from one on-going complaint.

Please note that Dixon Sand has no jurisdiction over haulage trucks outside the quarry premise as these are not contracted or owned by Dixon Sand.

The enforcement of truck noise compliance rests with RMS and the EPA. Dixon Sand does not operate its own truck fleet and is restricted by its legal jurisdiction in prohibiting the use of the trucks' safety features. Dixon Sand however can assist in the education campaign through our induction, traffic management policies and inter-pit agreement.

A copy of the complaint registers containing the complaints received during the reporting period is contained in Appendix K.

Table 21: Traffic Complaints, recommended action(s) and outcome

Old Northern Road Quarry **Complaint No. 1**	
Date complaint received	Mid February 2019
Issue	Haulage truck crossing over double lines along Wisemans Ferry Road. No accident or near missed had occurred. The complainant was unable to provide any form of truck identification and unsure if the truck is quarry related. The complainant notified another local quarry of this same issue.
Recommended Action(s)	As the identity of the truck is not known, no specific action can be taken.
Outcome	Dixon Sand is committed to carrying out driver inductions and on-going re-induction to reinforce the requirements outlined in the traffic management policy. No further action required.
Close out Date	1 March 2019

Complaint No. 1	
Date complaint received	26 February 2019
Issue	The complainant advised that two trucks were driving over the speed limit of 20 km/h along the quarry access road.
Recommended Action(s)	Remind all drivers they must not exceed the speed limit along the access road. Provide explanation to the drivers the reasoning behind the speed limit of 20km/hr i.e. safety, health issues associated with dust as well as dust affecting adjacent tomato crop.
Outcome	The weighbridge operator cautioned all drivers driving on the day and reminded them the speed limit is to be adhered to.In addition, signage is displayed with this message which is visible to all drivers at the weighbridge office.
Close out Date	26 February 2019
Complaint No. 3	
Date complaint received	19 March 2019
Issue	The Complainant said that a truck was tailgating cars along Wisemans Ferry Road and provided the registration number. No other identification of the truck was provided.
Recommended Action(s)	Dixon Sand's weighbridge dockets for today were checked and the truck did not pick up from the quarry. Also checked Dixon Sand's registration database and there is no truck with the registration listed. Suggest Dixon Sand's management is informed and they decide on appropriate action. Management to contact other quarries whom are signatories of the Maroota Local Traffic Management to determine if the truck is associated with the quarries in the area.
Outcome	Management contacted PF Formation and Hodgson Quarries whom confirmed that the truck in question is not a customer from their quarry. Concluded that the truck in question is not associated with the Sand quarries under the Maroota Local Traffic Management. No further action required.
Close out Date	26 March 2019
Complaint No. 4	
Date complaint received	1 May 2019
Issue	The Complainant said a truck which turned into Dixon Sand's quarry in the last 5 minutes had tailgated a car forcing the car driver to leave the road. In addition, the truck had exceeded the speed limit. The truck registration was provided. The Complainant preferred not to disclose their contact details despite being explained that Dixon Sand would make contact to provide feedback on the actions taken following the complaint.
Recommended Action(s)	To inform the Quarry Manager of the issue. To re-enforce the driver the requirements of the Traffic Management Plan and policies.
Outcome	The Quarry Manager spoke to the truck driver who admitted to not leaving enough distance between the car. The truck driver was informed that any other breach would not be tolerated and consequences through the inter-pit policy. The weighbridge operator re-iterated the quarry's traffic management plan and policies. Continue to monitor.
Close out Date	31 May 2019
Complaint No. 5	
Date complaint received	27 June 2019

Issue	The complainant (one of Dixon Sand's Quarry Manager) asked the weighbridge operator to note that a specific truck which picks up products from the quarry had used engine brakes excessively resulting in excessive noise in the Maroota area.
Recommended Action(s)	The weighbridge operator notified the Environmental Officer whom discussed the issue with the Quarry Manager. The Quarry Manager requested the Weighbridge Operator to contact the truck company and request their management team to speak to their driver and advice them to limit the use of engine brakes.
Outcome	The driver's manager was notified and a request for the manager to speak and caution the driver to limit the use of engine brakes.
Close out Date	28 June 2019
Haerses Road Quarry **Complaint No. 1**	
Date complaint received	1 and 2 May 2019
Issue	1st May 2019 • Point 1 - A truck departed the quarry area approx 07:25 used engine braking for approx 8 seconds • Point 2 - A truck (no livery) was on the way to the quarry and the complainant could hear the truck under light load for approx 2km and upon return (left the quarry area approx 07:45) used engine braking for approx 8 seconds • Point 3 - A truck uses his engine brake loaded or empty as does one of the trucks from another company (loaded only) but impossible to tell which one it is from a distance 2nd May 2019 • Point 4 - On 2nd May 2019 Noted 20+ trucks all using engine brakes for extended periods of time. No specific truck identification such as registration plate, truck type, colour or company branding/signage were provided.
Recommended Action(s)	Investigate if the trucks fitting the descriptions picked up from Dixon Sand or the other two quarries whom are signatories of the Maroota Local Traffic Management Plan (Inter-pit Policy).
Outcome	Dixon Sand had recently issued the "Announcement: Truck Driver's Code of Conduct and Traffic Policies" to the truck drivers, reminding them of their responsibilities under Dixon Sand's traffic policies and highlighting important requirements. Outcome – replied the Complainant on 01/05/2019 • Point 1 - The truck picked up from Dixon Sand Quarry. The truck driver was immediately reminded of their obligations under the quarry's traffic management policies. • Point 2 - The truck did not pick up from Dixon Sand. • Point 3 - Will attempt to identify whom the other trucks two trucks picked up from. Outcome – replied the Complainant on 28/05/2019 • Point 3 - Dixon Sand contacted the other quarries whom are signatories of the inter-pit policy and confirm that the truck did not pick up from any of the quarries on 01/05/2019. David Dixon contacted

	management of the truck company whom confirmed that their trucks do not exclusively transport quarry materials in the area. The truck company is reminded of Dixon Sand's Traffic Management Policy and were committed to request their drivers to limit the use of exhaust brakes.
Close out Date	28 May 2019
Complaint No. 2	
Date complaint received	19 June 2019
Issue	Follow up complaint (on-going) Complainant claimed that: • Point 1 - the same truck in question had reverted to using compression braking again only a few weeks after previously having been warned. • There is still a large volume of trucks speeding, driving over centre lines, driving off the verge, and using their compression brakes without reason or cause
Recommended Action(s)	Investigate if the identified truck in Point 1 was using the compression brakes and request the limit of compression brake usage.
Outcome	The identified truck was asked to limit the compression braking and use these only when necessary. An email has been sent to the Complainant to extend the invitation for a meeting to discuss the matter.
Close out Date	Open - ongoing

5.3.3 Compliance

Assessment of compliance with the relevant conditions is summarised in Table 22.

Table 22: Road and Traffic Compliance.

DA250-09-01 (Mod 5)	DA165-7-2005 (Mod 1)	Condition	Compliance	Comments
Condition 5(b) of Schedule 2		continue to receive and process extractive material from Haerses Road Sand Quarry, and dispatch quarry products from the site, until 14 February 2046.	Yes	Material transported from Haerses Road to Old Northern Road during this reporting period.
Condition 7 of Schedule 2		Truck movements at the site (i.e. one-way trip, either arrival or dispatch), including truck movements between the site and the Haerses Road Sand Quarry, must not exceed: (a) 180 per day; and (b) 40 between 5.45 am and 7.00 am.	Yes	Maximum recorded daily truck movements were **166 in/out bound.** Maximum number of morning trucks was **20 inbound**

<table>
<tr><th>DA250-09-01 (Mod 5)</th><th>DA165-7-2005 (Mod 1)</th><th>Condition</th><th>Compliance</th><th>Comments</th></tr>
<tr><td>Condition 12 of Schedule 2</td><td></td><td>The Applicant must pay Council an annual financial contribution toward the maintenance of local roads used for haulage of quarry products. The contribution must be determined in accordance with The Hills Shire Council Contributions Plan No. 6 Extractive Industries, or any subsequent relevant contributions plan adopted by Council.</td><td>Yes</td><td>Refer to Appendix I for contribution remittances</td></tr>
<tr><td>Condition 1 of Schedule 3</td><td></td><td>The Applicant must comply with the operating hours set out in Table 1.</td><td>Yes</td><td>Refer to truck records</td></tr>
<tr><td colspan="5">
Table 1: Operating hours
<table>
<tr><th>Activity</th><th>Permissible Hours</th></tr>
<tr><td>Quarrying operations (excluding truck arrival, loading and dispatch)</td><td>7.00 am to 6.00 pm Monday to Saturday
At no time on Sundays or public holidays</td></tr>
<tr><td>Truck arrival (unladen)</td><td>5.45 am to 6.00 pm Monday to Saturday
At no time on Sundays or public holidays</td></tr>
<tr><td>Truck loading
Truck dispatch
Truck arrival (laden)</td><td>6.00 am to 6.00 pm Monday to Saturday
At no time on Sundays or public holidays</td></tr>
<tr><td>Bund construction or rehabilitation works within 250 m of Maroota Public School</td><td>7.00 am to 6.00 pm Monday to Friday during school holiday periods unless otherwise approved in writing by the EPA</td></tr>
<tr><td>Maintenance</td><td>May be conducted at any time, provided that these activities are not audible at any privately-owned residence</td></tr>
</table>
</td></tr>
<tr><td>Condition 2 of Schedule 3</td><td></td><td>The following activities may be carried out outside the hours specified in condition 1 above:
(a) delivery or dispatch of materials as requested by the NSW Police Force or other public authorities; and
(b) emergency work to avoid the loss of lives, property or to prevent environmental harm.</td><td>Yes</td><td>Condition not triggered</td></tr>
<tr><td>Condition 21 of Schedule 3</td><td></td><td>The Applicant must keep accurate records of all laden truck movements to and from the site (including time of arrival and dispatch) and publish a summary of records on its website every 6 months.</td><td>Yes</td><td>Refer to Summary Truck Record on Dixon Sand's website: http://www.dixonsand.com.au/environment</td></tr>
</table>

DA250-09-01 (Mod 5)	DA165-7-2005 (Mod 1)	Condition	Compliance	Comments
Condition 22 of Schedule 3		The Applicant must: (a) advise its drivers and its clients not to arrive at the site prior to 5:45 am on any day; (b) ensure that all laden trucks have their loads covered when arriving at or leaving the site; (c) ensure that all laden trucks are cleaned of material that may fall from vehicles, before leaving the site; and (d) use its best endeavours to ensure that appropriate signage is displayed on all trucks used to transport product from the development so they can be easily identified by road users.	Yes	Requirements outlined in the Traffic Management Plan
Condition 2 of Schedule 3		The Applicant must prepare a Traffic Management Plan for the development to the satisfaction of the Secretary. This plan must: (a) be prepared in consultation with the RMS and Council; (b) be submitted to the Secretary for approval within 3 months of the approval of Modification 5, unless otherwise agreed by the Secretary; (c) describe the processes in place to control the arrival and dispatch of trucks; (d) include a Drivers' Code of Conduct that details the safe and quiet driving practices that must be used by drivers travelling to and from the site, particularly in the vicinity of the Maroota Public School; (e) describe the measures to be put in place to ensure compliance with the Drivers' Code of Conduct; (f) include specific measures to minimise the impact of heavy vehicles, including restrictions on routes and times (particularly in relation to peak hours, holiday periods and times immediately before and after school hours, i.e. 8.30 am – 9.00 am and 3.00 pm – 3.30 pm); and (g) propose measures to minimise the transmission of dust and tracking of material onto the surface of the public road from vehicles leaving the quarry. The Applicant must implement the approved Traffic Management Plan as approved by the Secretary.	Yes	Refer to the Traffic Management Plan

<table>
<tr><th>DA250-09-01 (Mod 5)</th><th>DA165-7-2005 (Mod 1)</th><th>Condition</th><th>Compliance</th><th>Comments</th></tr>
<tr><td></td><td>Condition 8 of Schedule 2</td><td>Truck movements at the site (i.e. either arrival or dispatch), including truck movements between the site and the Old Northern Road Quarry, must not exceed:
(a) 56 per day; and
(b) 20 between 6.00 am and 7.00 am.</td><td>Yes</td><td>Refer to Truck Record</td></tr>
<tr><td></td><td>Condition 10 of Schedule 2</td><td>The Applicant must:
(a) maintain accurate records of all VENM and ENM received at the site (including the date, time and quantity received); and
(b) include a copy of this data in the Annual Review.</td><td>Yes</td><td>Commencement of VENM importation occurred in June 2019. Refer to Section 5.4.2</td></tr>
<tr><td></td><td>Condition 15 of Schedule 2</td><td>The Applicant must pay Council a monthly financial contribution toward the maintenance of local roads used for haulage of quarry products. The contribution must be determined in accordance with The Hills Shire Council Contributions Plan No. 6 Extractive Industries, or any subsequent relevant contributions plan adopted by Council.</td><td>Yes</td><td>Refer to Appendix I for contribution remittances</td></tr>
<tr><td></td><td>Condition 1 of Schedule 3</td><td>The Applicant must comply with the operating hours set out in Table 1.</td><td>Yes</td><td>Refer to truck record</td></tr>
<tr><td colspan="5">
Table 1: Operating hours
<table>
<tr><th>Activity</th><th>Permissible Hours</th></tr>
<tr><td>Quarrying operations (excluding truck arrival, loading and dispatch)</td><td>7.00 am to 6.00 pm Monday to Saturday
At no time on Sundays or public holidays</td></tr>
<tr><td>Truck arrival, loading and dispatch</td><td>6.00 am to 6.00 pm Monday to Saturday
At no time on Sundays or public holidays</td></tr>
<tr><td>Acoustic bund construction and road and intersection works on Haerses Road and Wisemans Ferry Road</td><td>8.00 to 5.00 pm Monday to Friday
At no time on Saturdays, Sundays or public holidays</td></tr>
<tr><td>Maintenance</td><td>At any time, provided that these activities are not audible at any privately-owned residence outside of permissible hours for quarrying operations</td></tr>
</table>
</td></tr>
<tr><td></td><td>Condition 2 of Schedule 3</td><td>The following activities may be carried out outside the hours specified in condition 1 above:
(a) delivery or dispatch of materials as requested by the NSW Police Force or other public authorities; and
(b) emergency work to avoid the loss of lives, property or to prevent environmental harm.</td><td>Yes</td><td>Condition not triggered</td></tr>
</table>

DA250-09-01 (Mod 5)	DA165-7-2005 (Mod 1)	Condition	Compliance	Comments
	Condition 20 of Schedule 3	Prior to carrying out any development, the Applicant must upgrade Haerses Road to meet the requirements for 'internal haul roads', under Baulkham Hills Development Control Plan No. 16 – Extractive Industries, to the satisfaction of Council.	Yes	Completed
	Condition 21 of Schedule 3	The Applicant must: (a) maintain safe access to the site for the public and emergency services for the duration of the development; and (b) reinstate the extracted length of Haerses Road to the satisfaction of Council. *Notes:* • *The Applicant must ensure that the final alignment and design of Haerses Road is approved by Council prior to the commencement of the development.* • *The Applicant must bear the full costs associated with the design, survey and construction of the road works, including the relocation of utilities, if required.* • *All works are to be in accordance with Council's Design Guidelines and Work Specifications for Subdivisions and Developments.* • *Following the reconstruction of Haerses Road, the Applicant must rehabilitate any temporary access roads that were established on site.*	Yes	Ongoing Condition not yet triggered – to be completed Completed Completed Completed Condition not yet triggered – to be completed
	Condition 22 of Schedule 3	Prior to carrying out any development, the Applicant must: (a) provide for appropriate sight distances at the intersection of Haerses Road and Wisemans Ferry Road, by clearing and/or loping vegetation along the eastern approach of Wisemans Ferry Road; and (b) provide warning signage ("Truck Turning") on the eastern and western approaches of Wisemans Ferry Road, to the satisfaction of RMS.	Yes	Completed

DA250-09-01 (Mod 5)	DA165-7-2005 (Mod 1)	Condition	Compliance	Comments
	Condition 23 of Schedule 3	Within 12 months of the commencement of the development, the Applicant must construct a Type 'AUR' treatment at the intersection of Haerses Road and Wisemans Ferry Road to the satisfaction of RMS. Until the intersection works have been completed to the satisfaction of RMS, the Applicant must limit the number of trucks entering the site to 15 truck movements per day. *Notes:* • *Prior to the Construction Certificate being released the Applicant must:* - *enter into a Memorandum of Understanding with the RMS that the Type 'AUR' intersection treatment shall be fully constructed and handed over to the RMS within 12 months of the commencement of the development; and* - *issue a bank guarantee in favour of the RMS for the total cost of the intersection works (the cost to be determined following the approval of detailed design plans by the RMS).* • *The Applicant shall ensure that the intersection works comply with the RMS Road Design Guide.* • *The Applicant shall bear the full costs associated with the design, survey and construction of the works, including the relocation of utilities, if required.*	Yes	Completed
	Condition 24 of Schedule 3	Prior to transporting any quarry products derived from quarrying operations within the Mod 1 extraction area, the Applicant must construct a channelised right-turn 'CHR' treatment at the intersection of Haerses Road and Wisemans Ferry Road to the satisfaction of RMS. The Applicant must: (a) submit detailed design plans to RMS for approval prior to the issue of a construction certificate by Council or the commencement of road works; and (b) design and construct the intersection treatment in accordance with the Austroads *Guide to Road Design*.	Yes	In progress – to be completed
	Condition 25 of Schedule 3	Prior to commencement of the works referred to in condition 24 above, the Applicant must prepare and implement a Traffic Control Plan for the development to the satisfaction of the RMS.	Yes	To be completed

DA250-09-01 (Mod 5)	DA165-7-2005 (Mod 1)	Condition	Compliance	Comments
	Condition 26 of Schedule 3	The Applicant must keep accurate records of all laden truck movements to and from the site (including time of arrival and dispatch) and publish a summary of these records on its website every 6 months.	Yes	Refer to Traffic Management Plan and Truck Records
	Condition 27 of Schedule 3	The Applicant must: (a) ensure that all laden trucks have their loads covered when arriving at or leaving the site; (b) ensure that all laden trucks are cleaned of material that may fall from vehicles, before leaving the site; and (c) use its best endeavours to ensure that appropriate signage is displayed on all trucks used to transport product from the development so they can be easily identified by road users.	Yes	Refer to Traffic Management Plan

DA250-09-01 (Mod 5)	DA165-7-2005 (Mod 1)	Condition	Compliance	Comments
	Condition 28 of Schedule 3	The Applicant must prepare a Traffic Management Plan for the development to the satisfaction of the Secretary. This plan must: (a) be prepared in consultation with the RMS and Council; (b) be submitted to the Secretary for approval within 6 months of the determination of Modification 1, unless otherwise agreed by the Secretary; (c) describe the processes in place to control the arrival and dispatch of trucks; (d) include a Drivers' Code of Conduct that details the safe and quiet driving practices that must be used by drivers travelling to and from the site, particularly in the vicinity of Maroota Public School; (e) describe the measures to be put in place to ensure compliance with the Drivers' Code of Conduct; (f) include specific measures to minimise the impact of heavy vehicles, including restrictions on routes and times (particularly in relation to peak hours, holiday periods and times immediately before and after school hours, i.e. 8.30 am – 9.00 am and 3.00 pm – 3.30 pm); and (g) propose measures to minimise the transmission of dust and tracking of material onto the surface of the public road from vehicles leaving the quarry. The Applicant must implement the approved Traffic Management Plan as approved by the Secretary.	Yes	Refer to Traffic Management Plan

5.3.4 Analysis

The production and truck movement data outlined above is evidence that Dixon Sand has operated in compliance with the consent conditions during the 2018-2019 reporting period.

Five and two traffic related complaints were received for the Old Northern Road and Haerses Road quarries respectively. The complaints were related to trucks using exhaust / compression brakes, driving over the speed limit on the access road and driving over centre lines. All of the actions by the trucks occurred outside the quarry premise, apart from trucks driving over the speed limit on the quarry access road. All complaints were investigated and any identifiable trucks were cautioned and reminded of the obligations under the driver's code of conduct. All complaints have been resolved and closed out apart from one on-going complaint which is related to a submission for the proposed Haerses Road Modification 3.

It should be noted that Dixon Sand has no jurisdiction over the trucks once they have left Dixon Sand's premises. A review of the truck record indicates all trucks are operating in accordance with the consented hours of operation. No further actions are required.

5.3.5 Findings

The findings show that mitigation measures proposed in the EIS are being implemented adequately. The permitted truck movements and hours of operations have been adhered to.

5.3.6 Changes to Environmental Procedures

No changes to the environmental procedures are proposed or deemed necessary for road and traffic management.

5.4 Waste Management

5.4.1 Waste Generation

During the reporting period, waste oil and grease were removed from the site by a licensed contractor for refining and recycling. Scrap metals were transported by a licensed waste transporter and recycled at a licensed metal recycling facility.

Glass, paper, cardboard and plastic (general solid waste – non-putrescible) were recycled via Council's fortnightly scheduled bin collection service. Food waste and other general solid waste (putrescible) were disposed of and collected via Council's weekly scheduled bin collection. Other bulky waste associated with workshop activities was disposed of in skip bins and transported offsite by a licensed waste transporter. Used printer ink cartridges were disposed of at the designated drop off bin at the local Post Office.

No building or putrescible wastes have been disposed of on the site.

The amount of waste transported off site from the Old Northern Road and Haerses Road for disposal, recycled and processed during the monitoring period is contained in Tables 23 and 24.

Table 23: Old Northern Road – Total Waste Generated, July 2018 to June 2019.

Waste Type	Disposal / Recycling / Processing	Amount of Waste Generated
Putrescible	The Hills Shire Council Waste Contractor weekly bin collection (3 x 240L Red bin)	Approx. 78 m^3
Recyclables	The Hills Shire Council Waste Contractor fortnightly bin collection (1 x 240L Yellow bin)	Approx. 13 m^3
Scrap Metals	Recycled at SIMS Metal and John Heine and Son	63.56 tonnes
Non-putrescible waste from workshop	Skip Bins provided and picked up by Asquith Mini Skips	52 m^3
Grease	Collected and transported by Grease Eater	2,700 litres
Waste Oil	Collected and transported by Southern Oil	5,700 litres
Sewage	Onsite sewage treatment through EnviroCycle	Estimated to be 0.225 Mega litres (average 15 employees per operating day)
Ink Cartridge	Drop off at Post Office	<0.5 m^3

Table 24: Haerses Road – Total Waste Generated, July 2018 to June 2019.

Waste Type	Disposal / Recycling / Processing	Amount of Waste Generated
Putrescible	The Hills Shire Council Waste Contractor weekly pickup (1 x 240L Red bin)	Approx. 26 m^3
Recyclables	The Hills Shire Council Waste Contractor fortnightly pickup (1 x 240L Yellow bin)	Approx. 13 m^3
General Waste – Non-putrescible	Skip bins provided by Cleanaway Waste Contractor	24 m^3

The waste tracking registers are contained in Appendix L.

5.4.2 Waste Importation

Condition 9 of Schedule 2 of DA165-7-2005 permits the importation of up to 100,000 tonnes of Excavated Natural Material (ENM) and Virgin Excavated Natural Material (VENM) per calendar year to Haerses Road quarry. Importation of VENM commenced during this reporting period. A total of 1,950 tonnes of VENM was received during this reporting period.

5.4.3 Changes to Environmental Procedures

No changes to the waste management procedure are proposed for the 2018-2019 reporting period.

Continual efforts to minimise waste generation and maximise recycling and reuse of materials are to be undertaken such as; labelling of bins for waste segregation, waste reduction posters and toolbox talks to raise awareness.

6. Water Management

6.1 Monitoring and Compliance Limits

DA250-09-01 Modification 4 required Dixon Sand to install and monitor 2 additional monitoring bores whereby monitoring has commenced since September 2015.

DA165-7-2005 Modification 1 and 2 require 13 additional monitoring wells to be installed (in clusters) in the 100m buffer zone to the Maroota Tertiary Sand Groundwater Source in the expanded extraction area. These new monitoring bores have been installed in May 2018 and are an addition to the nine existing bores.

Old Northern Road Groundwater Levels

Groundwater levels for the Old Northern Road quarry have been measured on a monthly basis at five boreholes since 2003. Five additional boreholes were installed and monitored monthly since June 2011. Borehole MW4 has been decommissioned as the area is now under extraction. Boreholes BH8 and BH9 have been installed on Lot 2 to satisfy Condition 3.25 of Schedule 2, DA250-09-01. Borehole BH2 was damaged in December 2019 from a moving vehicle and therefore monitoring has been suspended until the monitoring well is rectified.

Borehole locations are listed in Table 25.

Table 25: Boreholes for groundwater monitoring at the Old Northern Road quarry.

Monitoring Bore	Location Reference	Borehole Type	Aim of Monitoring
MW1	Quarry Lot 2, southern boundary	Old bore	Localised perched aquifer
MW2	Quarry Lot 1, west of existing house	Old bore	Localised perched aquifer
MW3	DS2, northern boundary of Quarry Lot 1	Old bore	Localised perched aquifer
MW4*	DS3, western boundary of Quarry Lot 2 –	Old bore	Localised perched aquifer
MW5	Quarry Lot 196, south of main dam	Old bore	Localised perched aquifer
BH1	Western boundary of Quarry Lot 196	New bore	Sydney Basin Central Groundwater Source
BH2	Located in Lot 1, DP204159	New bore	Sydney Basin Central Groundwater Source
BH3	Located in Lot 1, DP204159	New bore	Sydney Basin Central Groundwater Source
BH6	Northern boundary of Quarry on Lot 1	New bore	Sydney Basin Central Groundwater Source
BH7	Southern boundary of Quarry on Lot 2	New bore	Sydney Basin Central Groundwater Source
BH8	Within the 100m buffer to MTSGS on Lot 2	New bore	Shallow bore
BH9	Within the 100m buffer to MTSGS on Lot 2	New bore	Deeper bore targeting the Sydney Basin Central Groundwater Source

Note: MW4 decommissioned due to its location being in the active extraction area.*

Old Northern Road Groundwater Quality

The Soil and Water Management Plan requires groundwater quality sampling to be undertaken on a 6-monthly basis. Groundwater quality sampling was undertaken in December 2018 and June 2019. Groundwater samples were obtained and sampled by a NATA qualified laboratory for analysis of electrical conductivity, total suspended solids and turbidity. pH measurements were taken in the field due to short sample holding time.

Old Northern Road Surface Water Monitoring and Discharge Event

Condition M2.3 of EPL 3916 requires Dixon Sand to monitor (by sampling and obtaining results by analysis) the concentration of the pollutants utilising the specified methodology, units of measure and sampling frequency outlined in Table 26. Water discharged at the main storage dam weir must meet these criteria outlined in the EPL 3916.

Table 26: Groundwater monitoring bores for Old Northern Road quarry site.

Pollutant	Units of Measure	Frequency	Sampling Method
pH	pH	Daily during any discharge	Grab sample
Total Suspended Solids	Milligrams per litre	Daily during any discharge	Grab sample
Turbidity	Nephelometric turbidity units	Daily during any discharge	Grab sample

Haerses Road Groundwater Levels

Out of the fourteen boreholes originally installed at Hearses Road quarry, seven of the original boreholes are currently active and monitored. Boreholes H1, H4, H5, H8, H10 and H11 have been decommissioned due to their locations being in the active quarry operational areas. Monitoring ceased at borehole H3 due the bore running dry. In 2011 two additional boreholes, Boreholes BH4 and BH5 were added to Haerses Road quarry water monitoring program, bringing the total number of boreholes monitored to nine. Additional 13 boreholes (Cluster bores located in the MTSGS 100m buffer) required to be installed by DA 165-7-2005 Modification 1 and 2 were installed in May 2018 and groundwater levels and quality monitoring program for these bores commenced in August 2018 with continuous data loggers installed. Active groundwater bores at the Haerses Road quarry are listed in Table 27.

Table 27: Groundwater monitoring bores for Haerses Road quarry site.

Monitoring Bore	Location Reference	Aim of Monitoring
H2	Stage 4, adjacent to the dam	MTSGS
H6	Stage 5, northern boundary	MTSGS
H7	Stage 5, southern boundary	MTSGS
H9	Stage 3, behind tomato vines	MTSGS
H12	Stage 3, adjacent to the shed	MTSGS
H13	South of the quarry boundary, outside Stage 2	MTSGS
H14	Fire trail, south of quarry boundary	MTSGS
BH4	South-west of quarry, outside Stage 2.	SCBGS
BH5	Stage 2, western boundary	SCBGS
BH01A	100m MTSGS Buffer – Site 1	Perched groundwater in weathered Hawkesbury sandstone

BH01B	100m MTSGS Buffer – Site 1	Perched groundwater in unweathered Hawkesbury sandstone
BH01C	100m MTSGS Buffer – Site 1	SCBGS
BH02A	100m MTSGS Buffer – Site 2	Perched groundwater in weathered Hawkesbury sandstone
BH02B	100m MTSGS Buffer – Site 2	Perched groundwater in unweathered Hawkesbury sandstone
BH02C	100m MTSGS Buffer – Site 2	SCBGS
BH03A	100m MTSGS Buffer – Site 3	Perched groundwater in weathered Hawkesbury sandstone
BH03B	100m MTSGS Buffer – Site 3	Perched groundwater in unweathered Hawkesbury sandstone
BH03C	100m MTSGS Buffer – Site 3	SCBGS
BH05B	Lot 216, adjacent to BH5	Perched groundwater in unweathered Hawkesbury sandstone
BH06A	100m MTSGS Buffer – Site 4	Perched groundwater in weathered Hawkesbury sandstone
BH06B	100m MTSGS Buffer – Site 4	Perched groundwater in unweathered Hawkesbury sandstone
BH06C	100m MTSGS Buffer – Site 4	SCBGS

Haerses Road Groundwater Quality

Groundwater quality monitoring at Haerses Road quarry are undertaken 6-monthly in December 2018 and June 2019, in accordance with the Soil and Water Management Plan. Groundwater samples were obtained and analysed by a NATA qualified laboratory for analysis of electrical conductivity, total suspended solids and turbidity. pH measurements were undertaken in the field due to short sample holding time.

6.2 Extraction Limits

Old Northern Road Extraction Limits

Extraction limits for the Old Northern Road quarry are defined by DA250-09-01 and listed in Table 28 below.

Table 28: Old Northern Road Quarry Extraction limits

DA250-09-01 Conditions	Extraction limit
Condition 17 of Schedule 2	Extraction below a depth of 15.24 m below original ground level is restricted to Lot 196 DP 752025 within the hatched area shown in the figure in Appendix 2 and to a depth not greater than 127.5 m AHD.
Condition 18 of Schedule 2	Extraction on Lot 29 DP 752025 is limited to a depth not greater than 15.24 m below original ground level.
Condition 19 of Schedule 2	Extraction on Lots 1 and 2 DP 547255, with the exception of the MTSGS buffer zone, is limited to a depth not greater than 170 m AHD in the east, gradually reducing to 153 m AHD in the west, and as shown conceptually in the figure in Appendix 4.
Condition 20 of Schedule 2	The Applicant must ensure that no extraction occurs with 2 m of the highest recorded wet weather groundwater level within the MTSGS buffer zone.
Condition 21 of Schedule 2	The Applicant must: (a) establish the highest recorded wet weather groundwater level within the MTSGS buffer zone based on all available (and at least 12 months) site specific groundwater monitoring data;

	(b) engage a suitably qualified and experienced expert to establish the maximum depths to which extraction can be undertaken within the MTSGS buffer zone to comply with condition 20 above; and (c) submit a Maximum Extraction Depth Map (contour map or similar) for the development, which demonstrates compliance with conditions 17 to 20 above (inclusive), to the Secretary for approval within 3 months of the approval of Modification 5.
Condition 22 of Schedule 2	The Applicant must comply with the extraction depths specified in the Maximum Extraction Depth Map to the satisfaction of the Secretary.

Haerses Road Extraction Limits

Extraction limits for the Haerses Road quarry are defined by DA165-7-2005 and listed in Table 29 below.

Table 29: Haerses Road Quarry Extraction limits

DA165-7-2005 Conditions	Extraction limit
Condition 19 of Schedule 2	The Applicant must not undertake any extraction within 2 metres of the highest recorded wet weather groundwater level of both the MTSGS and the SCBGS.
Condition 20 of Schedule 2	Within 6 months of the determination of Modification 1, the Applicant must: (a) establish the highest recorded wet weather groundwater levels for the site based on all available local and site-specific groundwater monitoring data; and (b) engage a suitably qualified and experienced person to prepare a Maximum Extraction Depth Map (contour map or similar) for the development to ensure compliance with condition 19 above and submit this map to the Secretary for approval. Within 14 days of the approval of the Maximum Extraction Depth Map, the Applicant must submit a copy of the approved map and the supporting groundwater monitoring data to DoI.
Condition 21 of Schedule 2	The Applicant must comply with the extraction depths specified in the approved Maximum Extraction Depth Map, to the satisfaction of the Secretary.
Condition 22 of Schedule 2	The Applicant must review and update the Maximum Extraction Depth Map: (a) annually, for the duration of the baseline groundwater monitoring program (see condition 17 of Schedule 3); and (b) within 3 months of the completion of each Independent Environmental Audit (see condition 13 of Schedule 5), to the satisfaction of the Secretary.

6.3 Results

Old Northern Road Groundwater Levels

Chart 11 depicts the long term recorded groundwater levels, with monitoring commencing in June 2003. Chart 12 illustrates the groundwater levels for this reporting period.

Old Northern Road Surface Water Monitoring and Discharge Event

No surface water discharge occurred in the reporting period and therefore, no water sample at Monitoring Point 1 identified by EPL 3916 was obtained for analysis.

Charts 45 to 48 illustrate the analysed pH, electrical conductivity, turbidity and total suspended solids of the water samples obtained from the surface monitoring SW19.

Haerses Road Groundwater Levels

Chart 13 depicts the long term recorded groundwater levels, with monitoring commencing in March 2005. Charts 14 to 34 (inclusive) illustrate the groundwater levels for this reporting period.

Old Northern Road Groundwater Quality

Charts 35 and 36 show the analysed groundwater pH for Old Northern Road's old and new boreholes, respectively. Charts 37 and 38 show the analysed electrical conductivity for the old and new boreholes, respectively.

Haerses Road Groundwater Quality

Charts 39 and 40 show the analysed groundwater pH for Haerses Road's old and new boreholes, respectively.

Charts 43 shows the analysed groundwater pH for the Haerses Road buffer boreholes.

Charts 41 and 42 show the analysed electrical conductivity for the old and new boreholes, respectively.

Charts 44 shows the analysed groundwater electrical conductivity for the Haerses Road buffer boreholes.

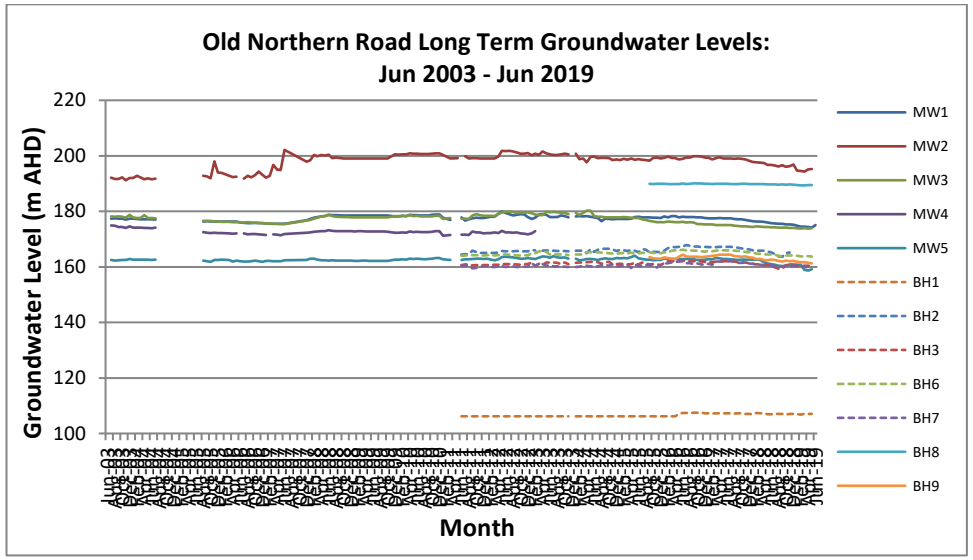


Chart 11: Old Northern Road Long Term Groundwater Levels

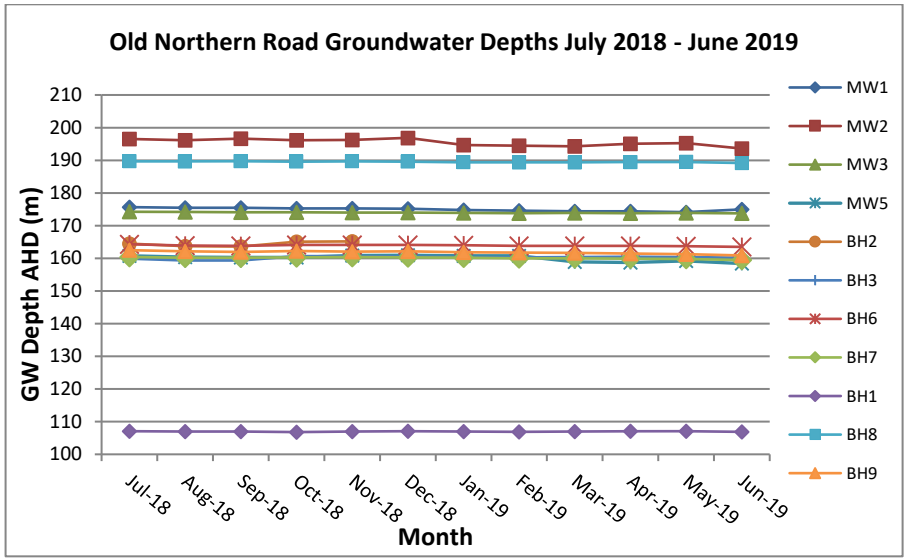


Chart 12: Old Northern Road Groundwater Levels July 2018 – June 2019

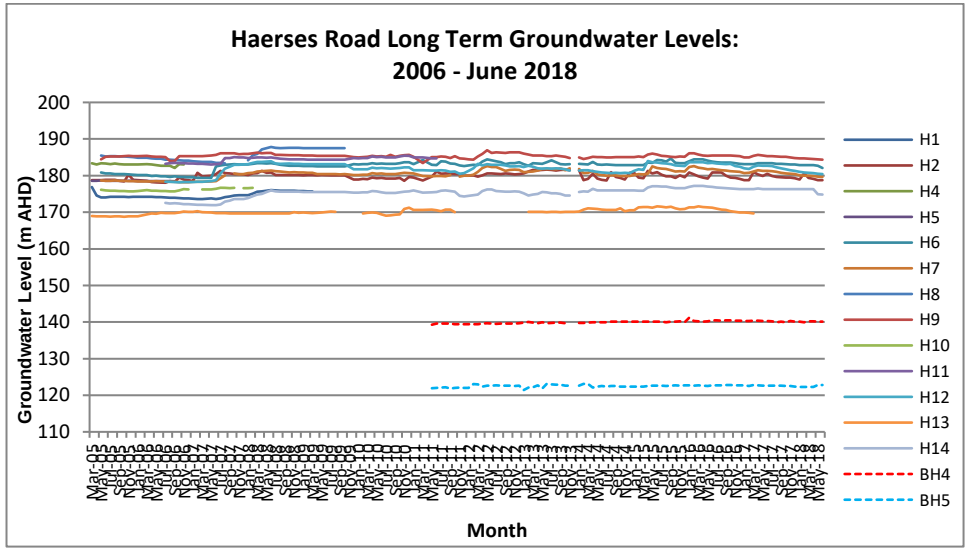


Chart 13: Haerses Road Long Term Groundwater Levels

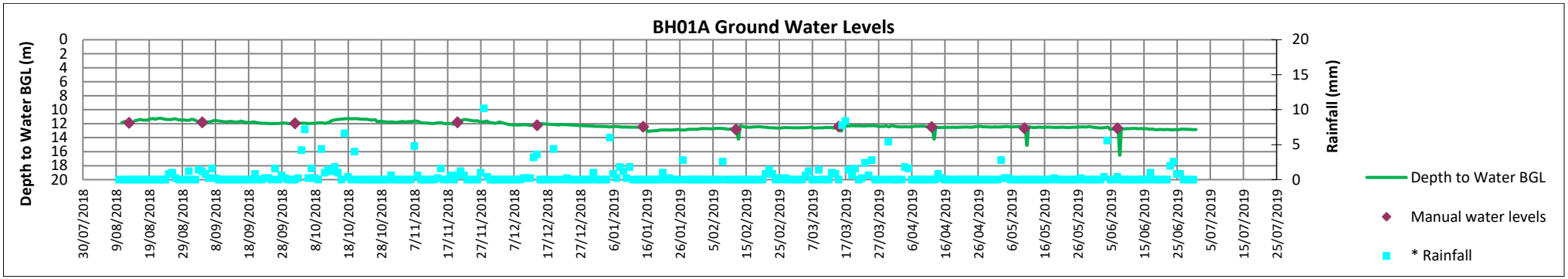


Chart 14: Haerses Road – BH01A Groundwater Levels

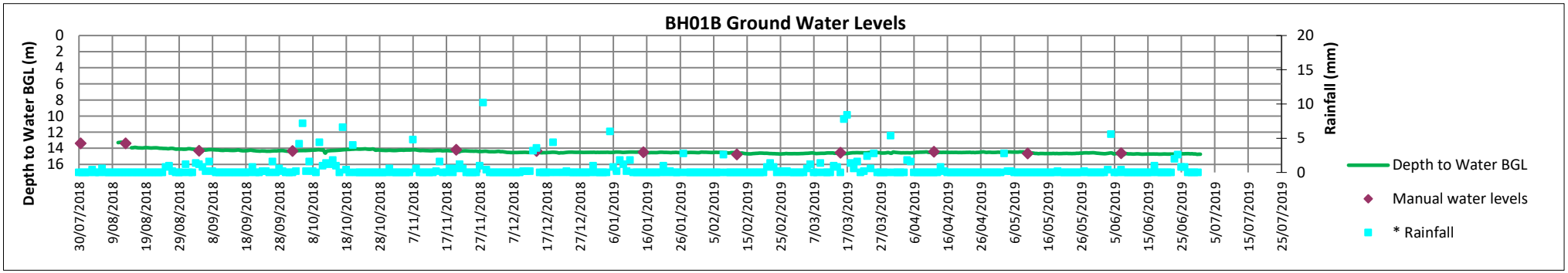


Chart 15: Haerses Road – BH01B Groundwater Levels

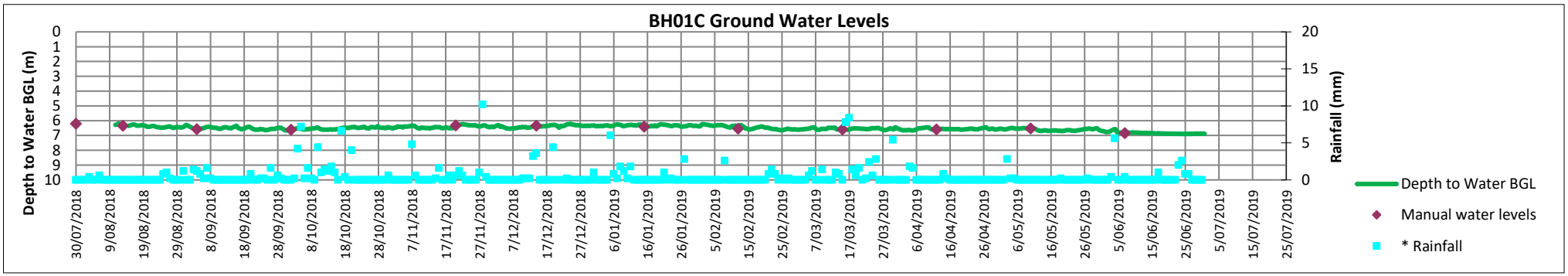


Chart 16: Haerses Road – BH01C Groundwater Levels

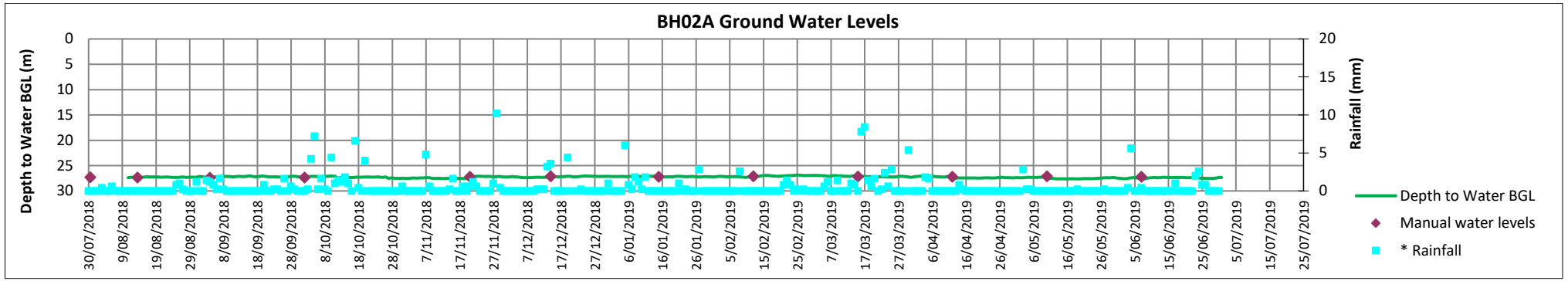


Chart 17: Haerses Road – BH02A Groundwater Levels

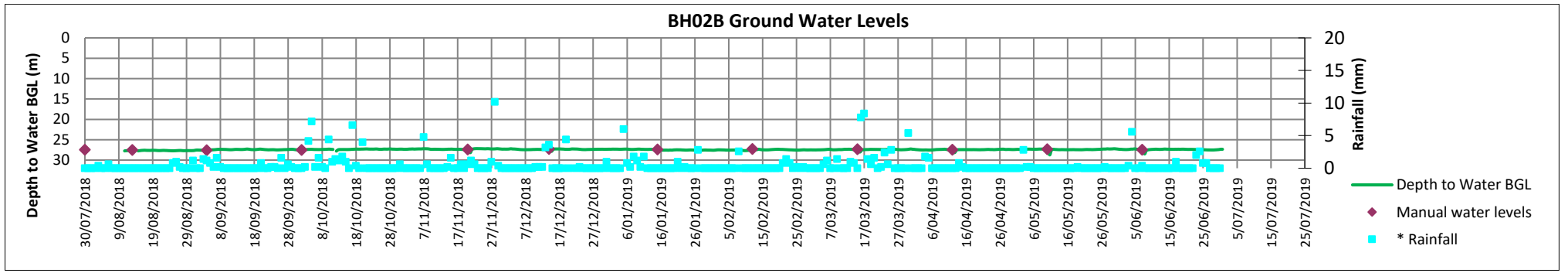


Chart 18: Haerses Road – BH02B Groundwater Levels

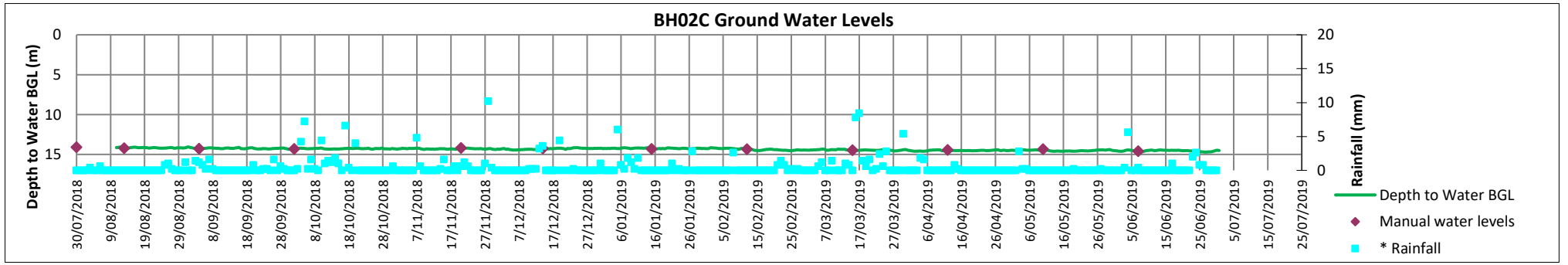


Chart 19: Haerses Road – BH02C Groundwater Levels

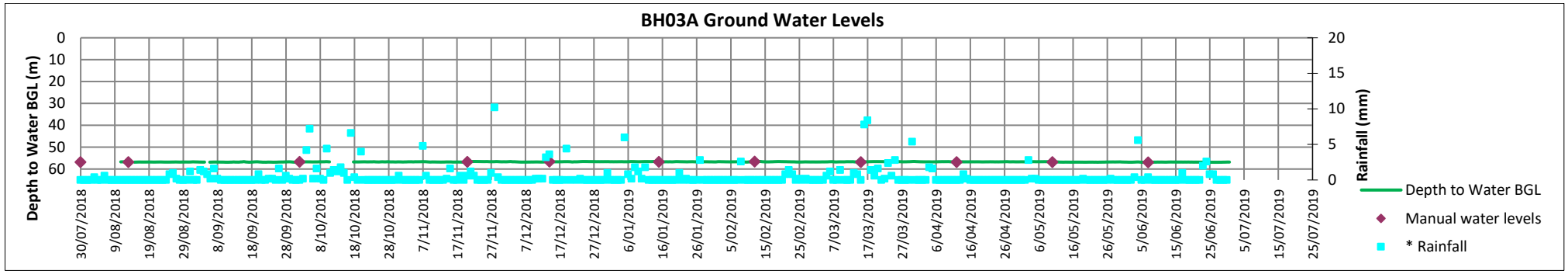


Chart 20: Haerses Road – BH03A Groundwater Levels

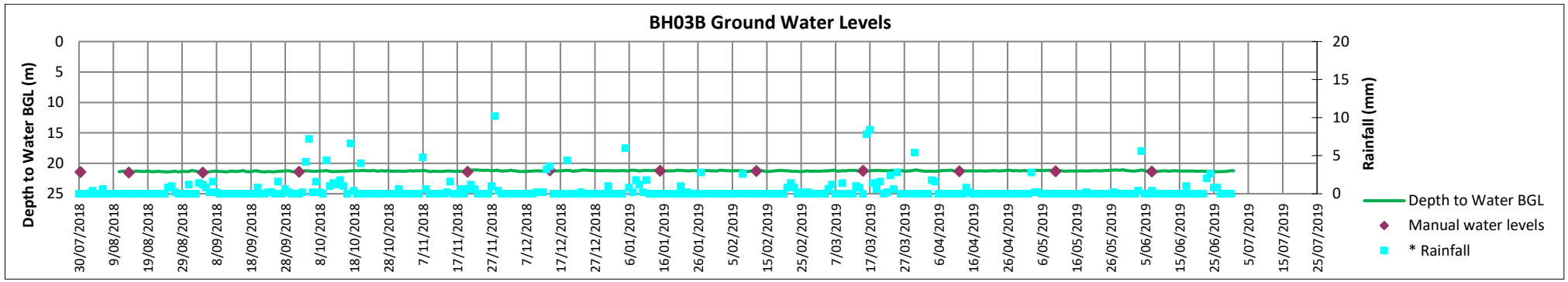


Chart 21: Haerses Road – BH03B Groundwater Levels

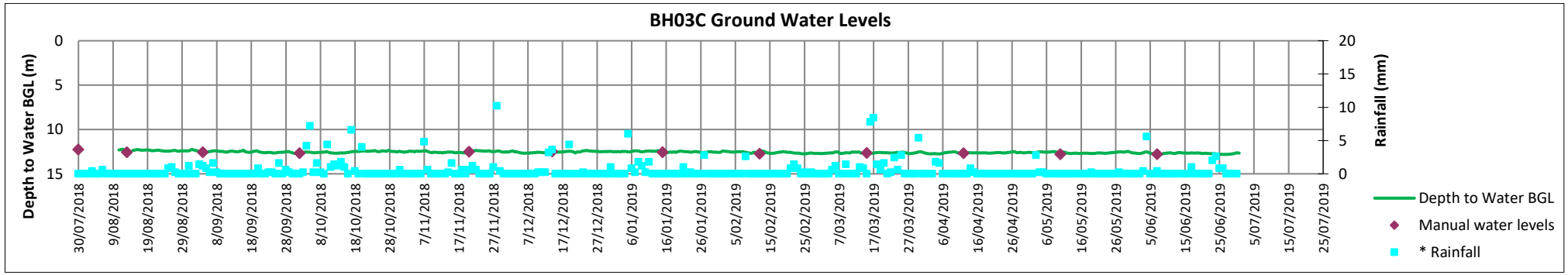


Chart 22: Haerses Road – BH03C Groundwater Levels

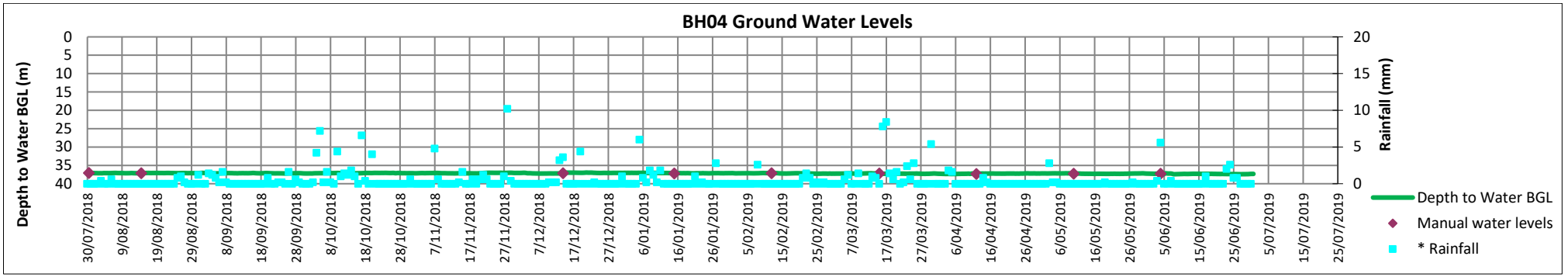


Chart 23: Haerses Road – BH4 Groundwater Levels

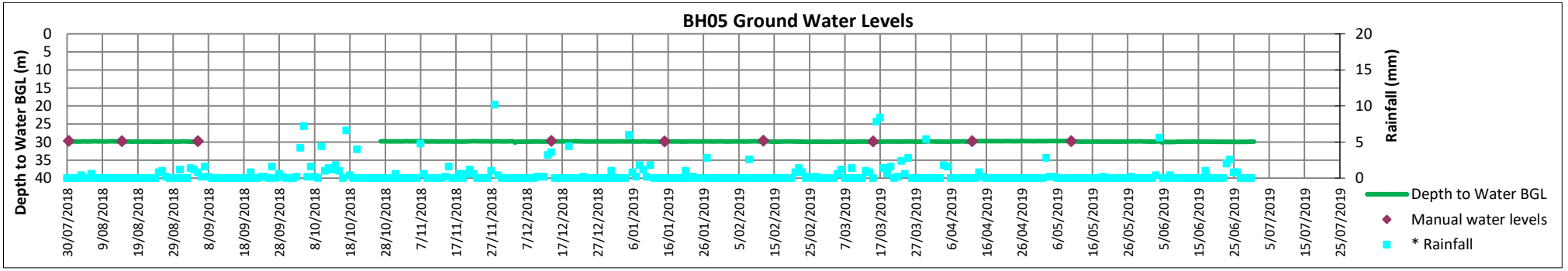


Chart 24: Haerses Road – BH5 Groundwater Levels

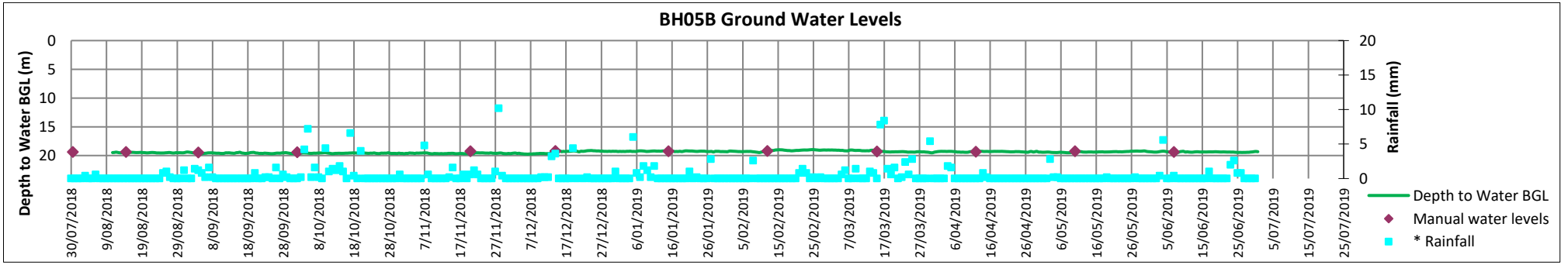


Chart 25: Haerses Road – BH05B Groundwater Levels

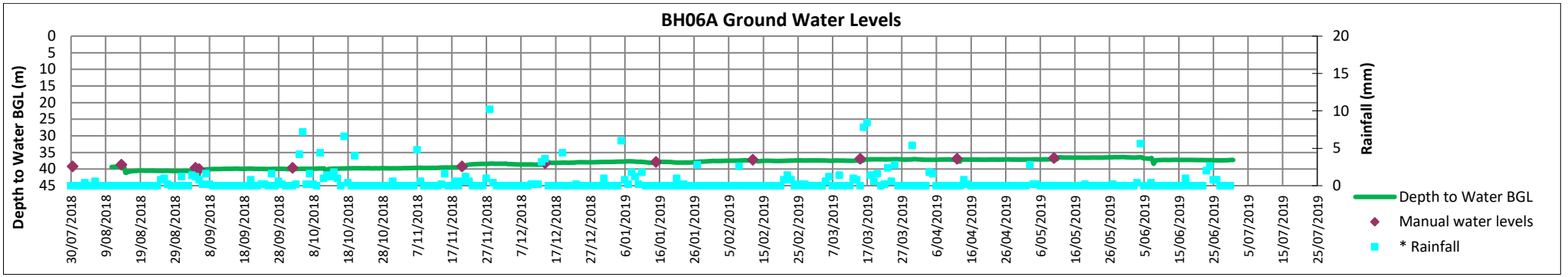


Chart 26: Haerses Road – BH06A Groundwater Levels

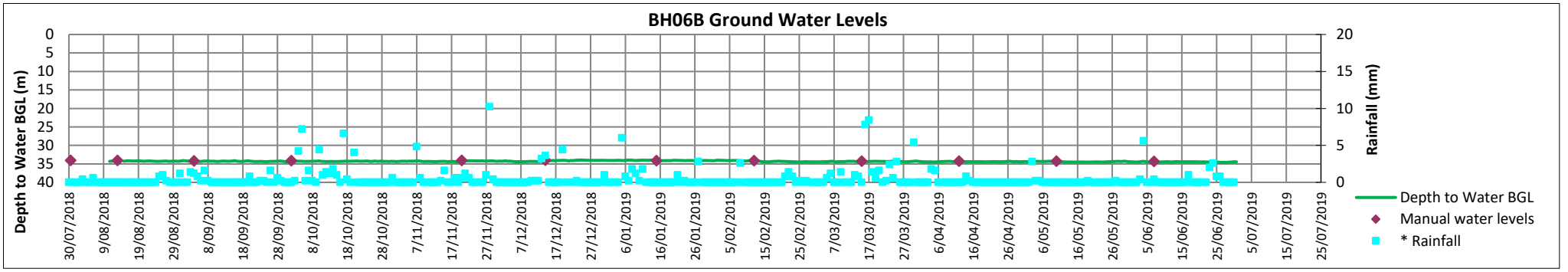


Chart 27: Haerses Road – BH06B Groundwater Levels

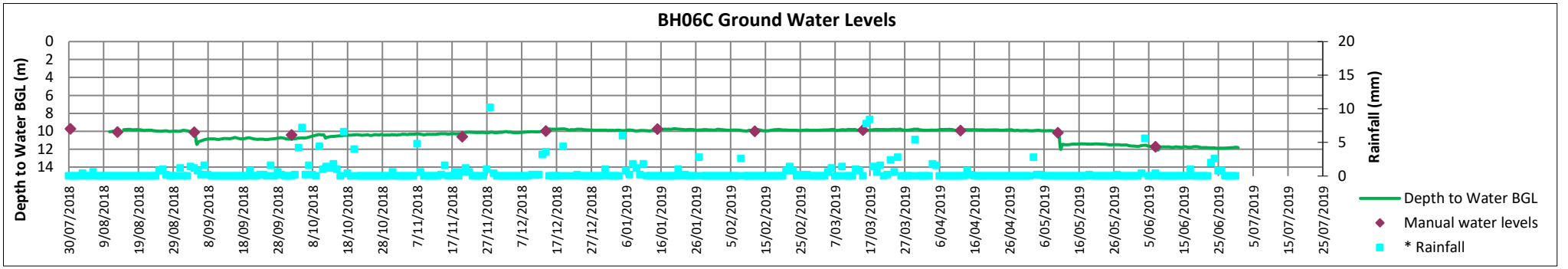


Chart 28: Haerses Road – BH06C Groundwater Levels

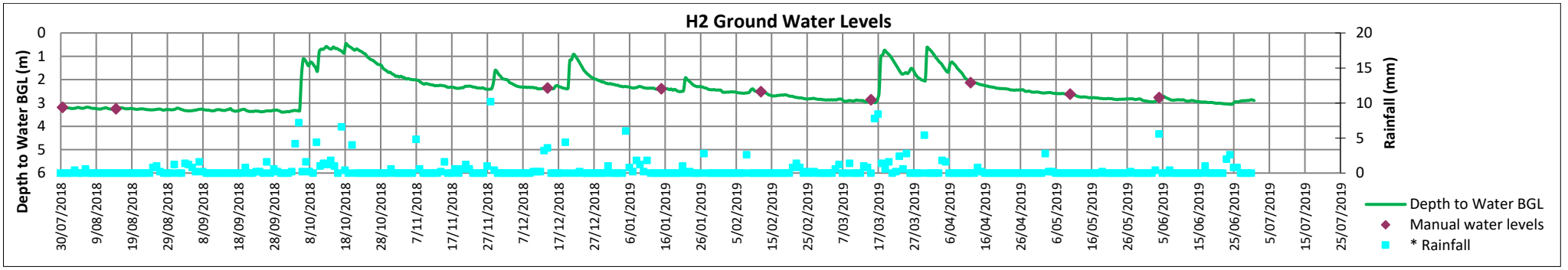


Chart 29: Haerses Road – H2 Groundwater Levels

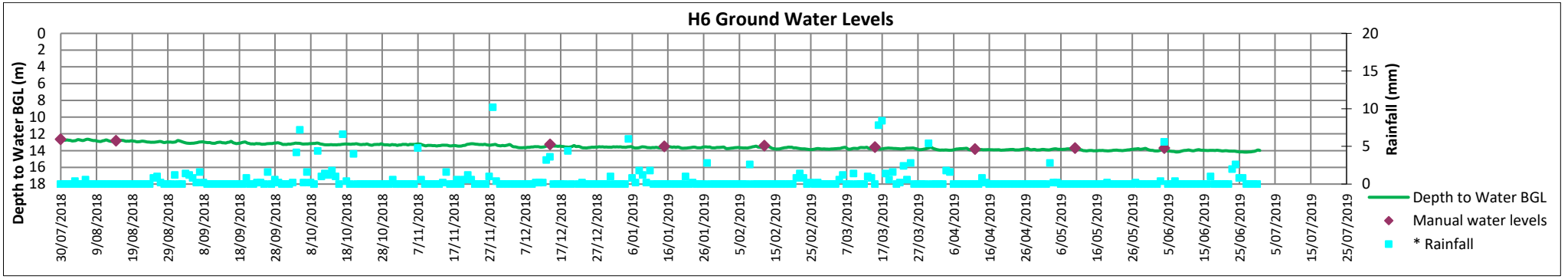


Chart 30: Haerses Road – H6 Groundwater Levels

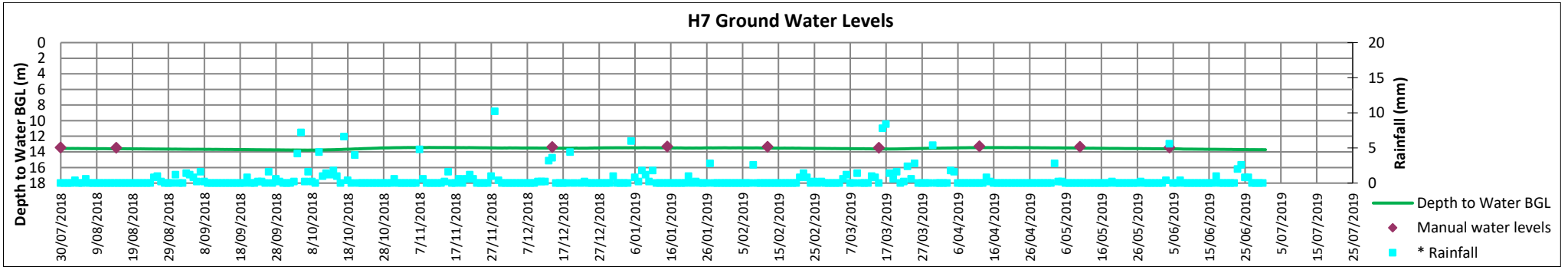


Chart 31: Haerses Road – H7 Groundwater Levels

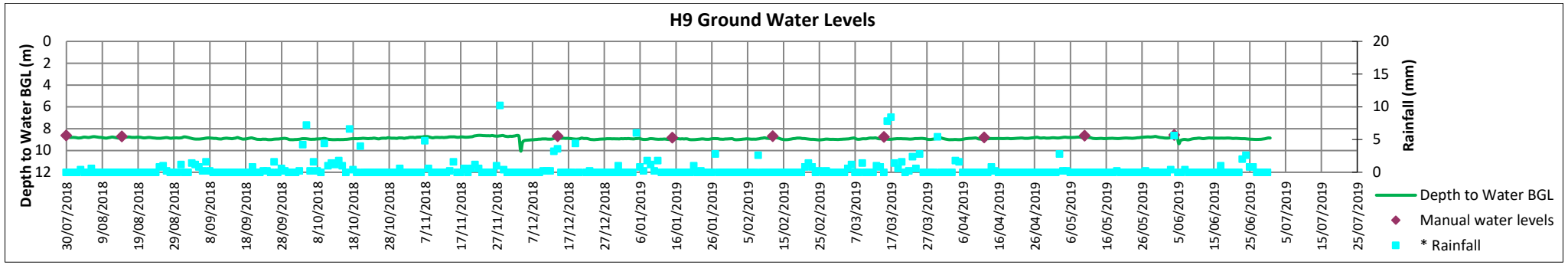


Chart 32: Haerses Road – H9 Groundwater Levels

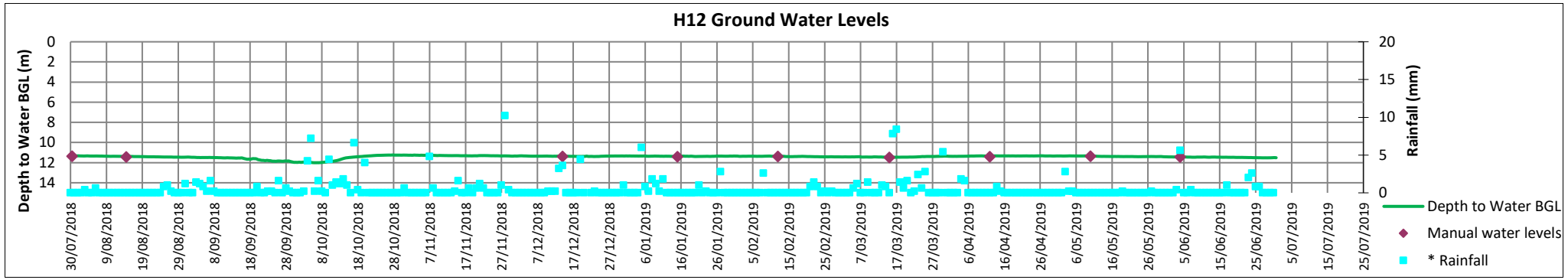


Chart 33: Haerses Road – H12 Groundwater Levels

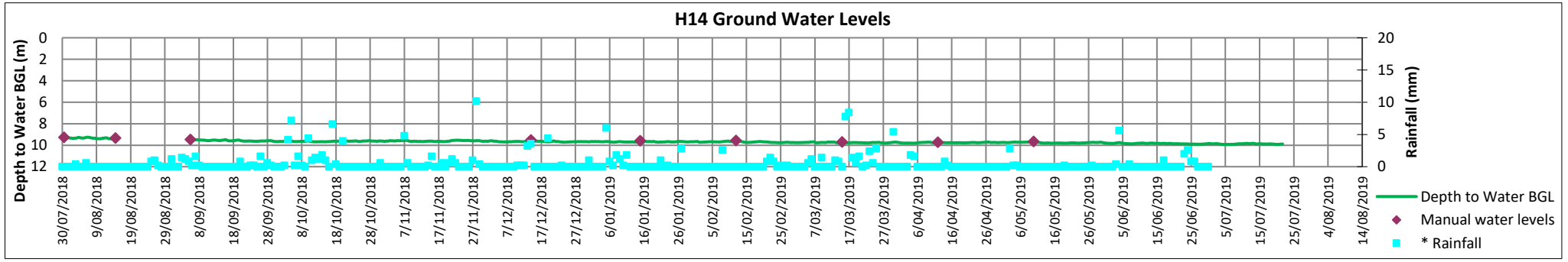


Chart 34: Haerses Road – H14 Groundwater Levels

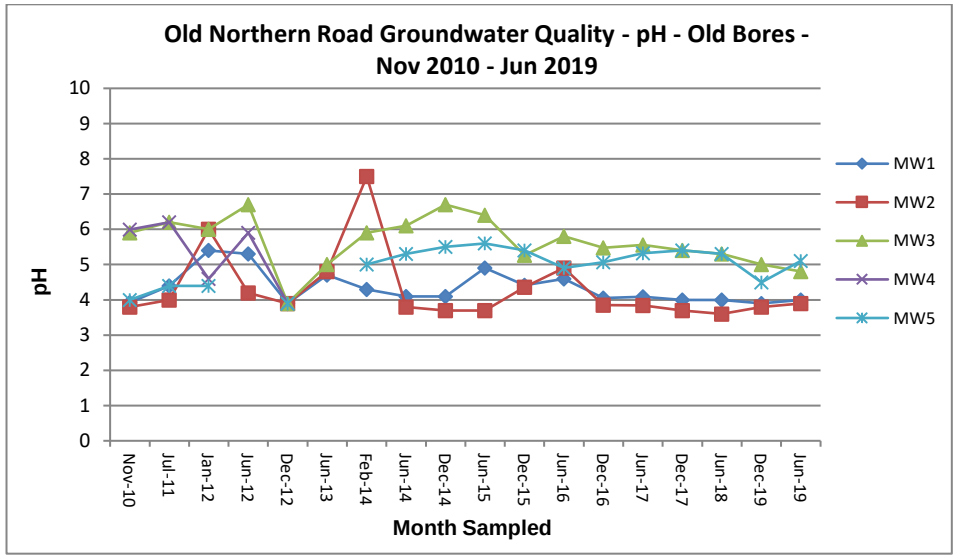


Chart 35: Old Northern Road Long Term pH – Old Boreholes

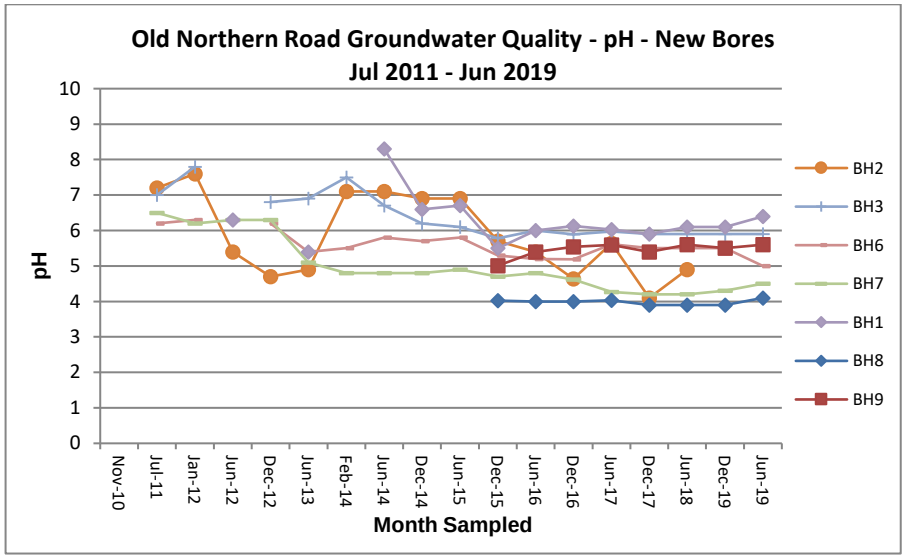


Chart 36: Old Northern Road Long Term pH – New Boreholes

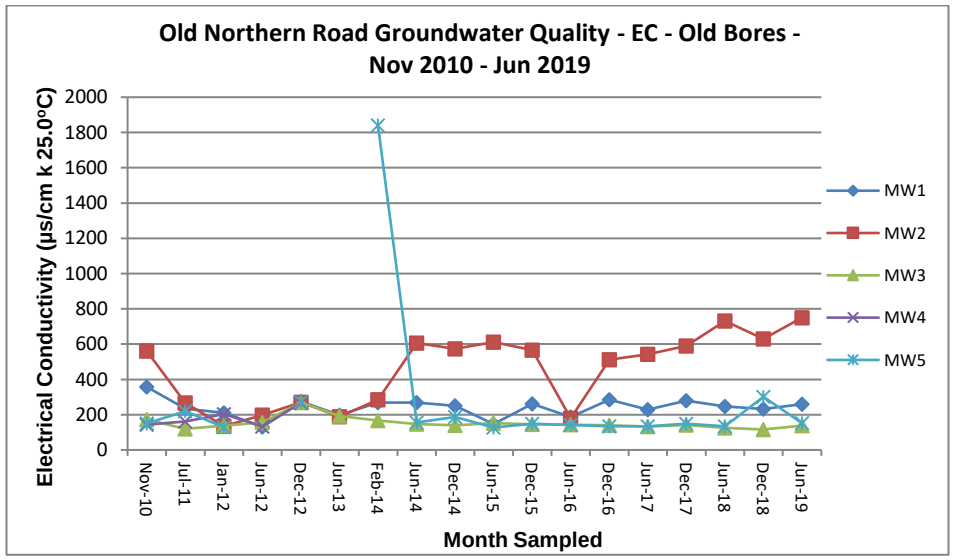


Chart 37: Old Northern Road Long Term EC – Old Boreholes

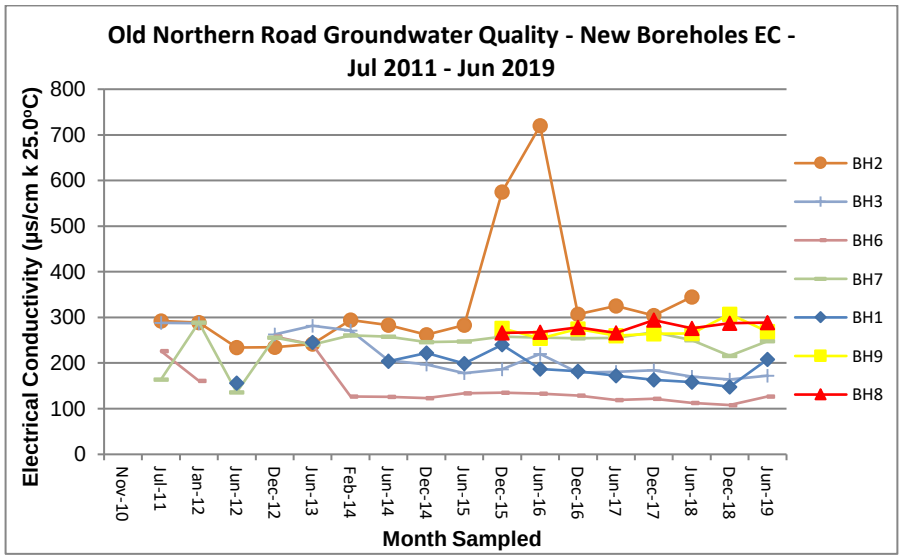


Chart 38: Old Northern Road Long Term EC – New Boreholes

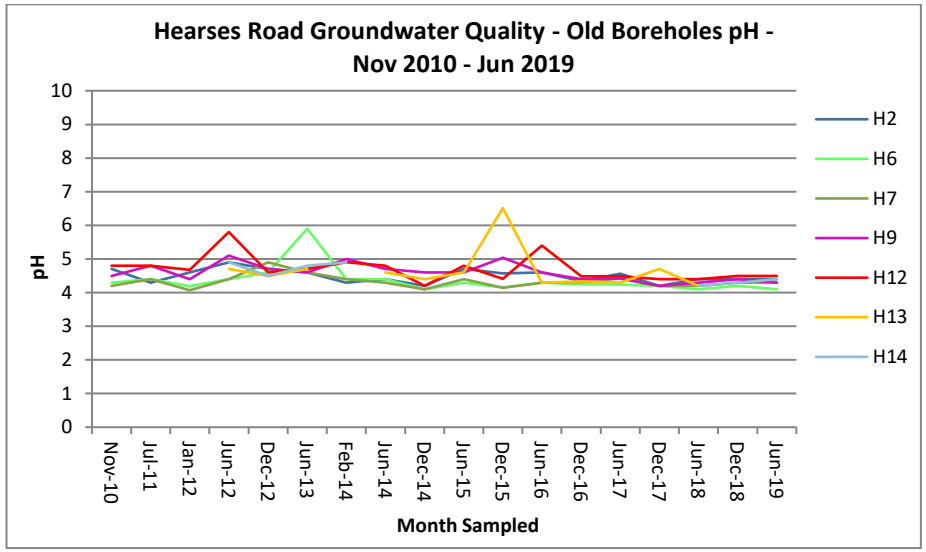


Chart 39: Haerses Road Long Term pH – Old Boreholes

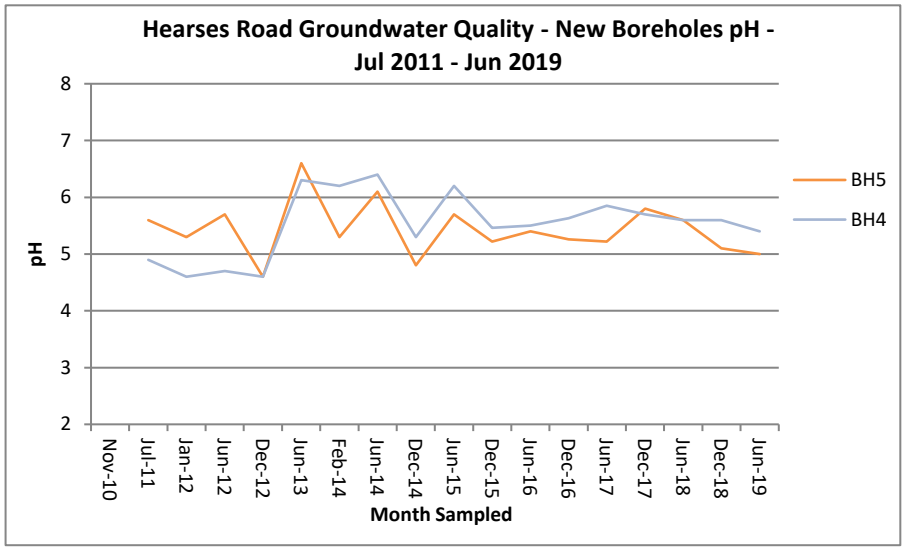


Chart 40: Haerses Road Long Term pH – New Boreholes

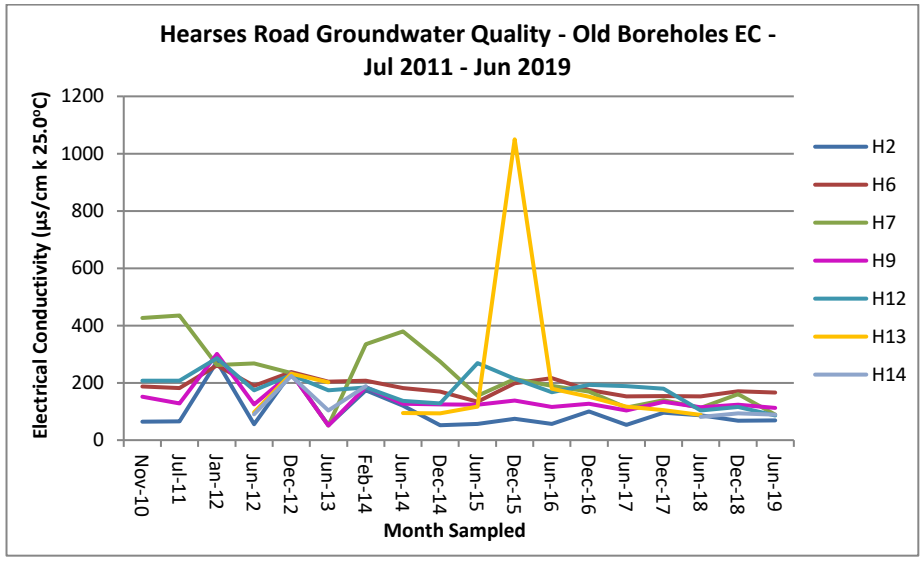


Chart 41: Haerses Road Long Term EC – Old Boreholes

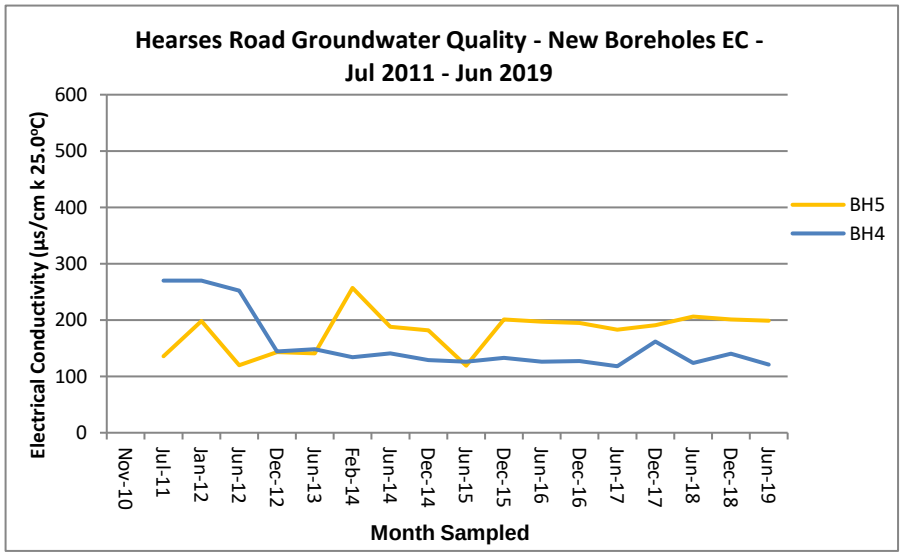


Chart 42: Haerses Long Term EC – New Boreholes

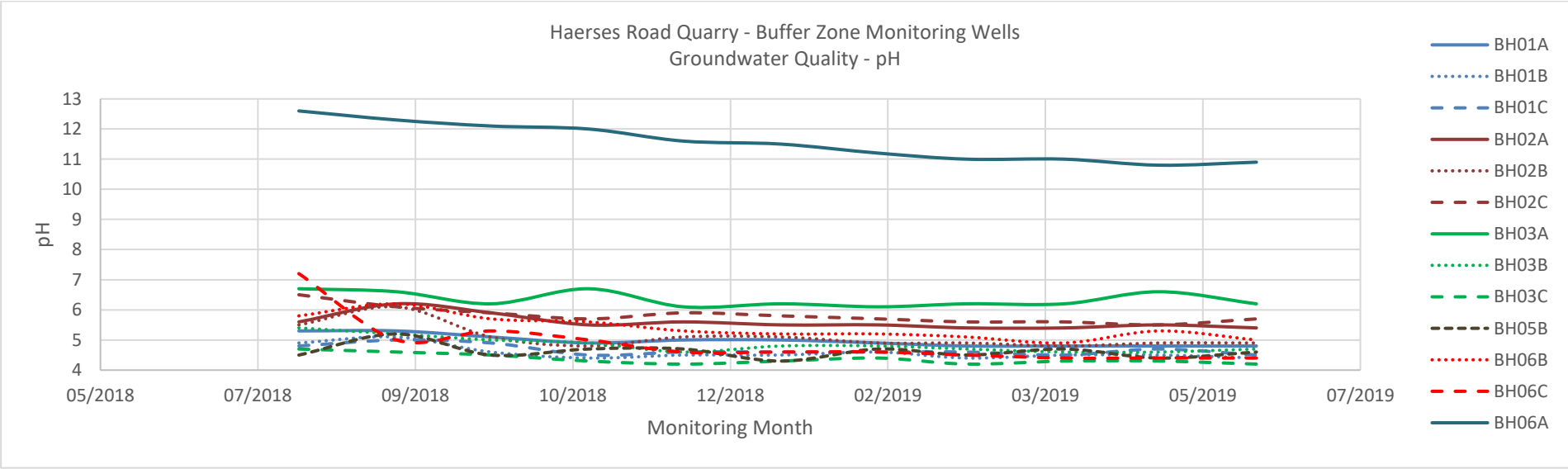


Chart 43: Haerses Road Long Term pH – Buffer Bores

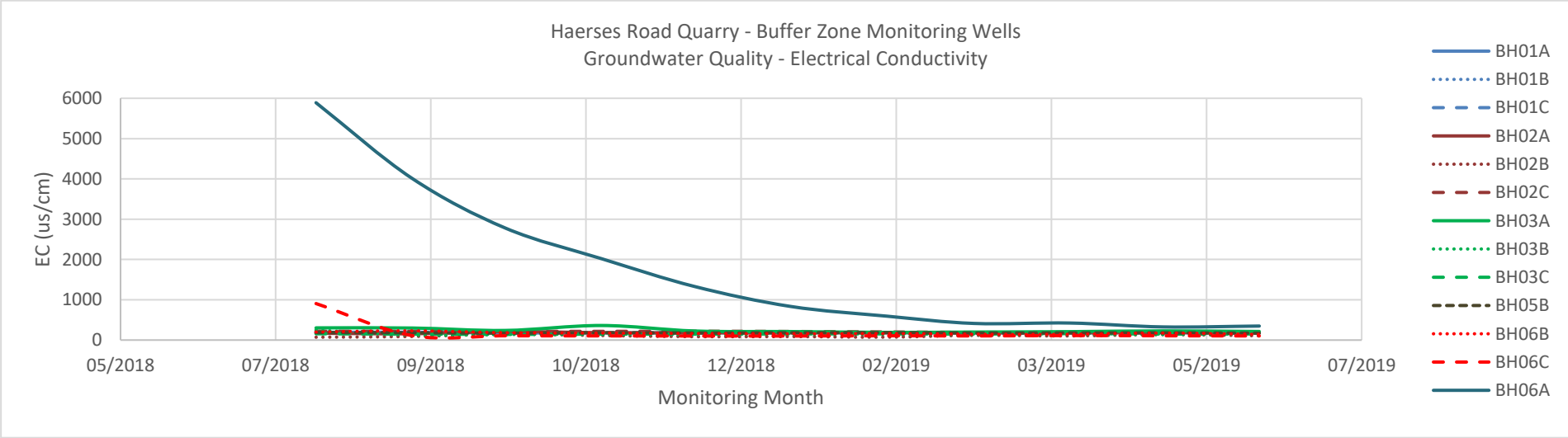


Chart 44: Haerses Road Long Term EC – Buffer Bores

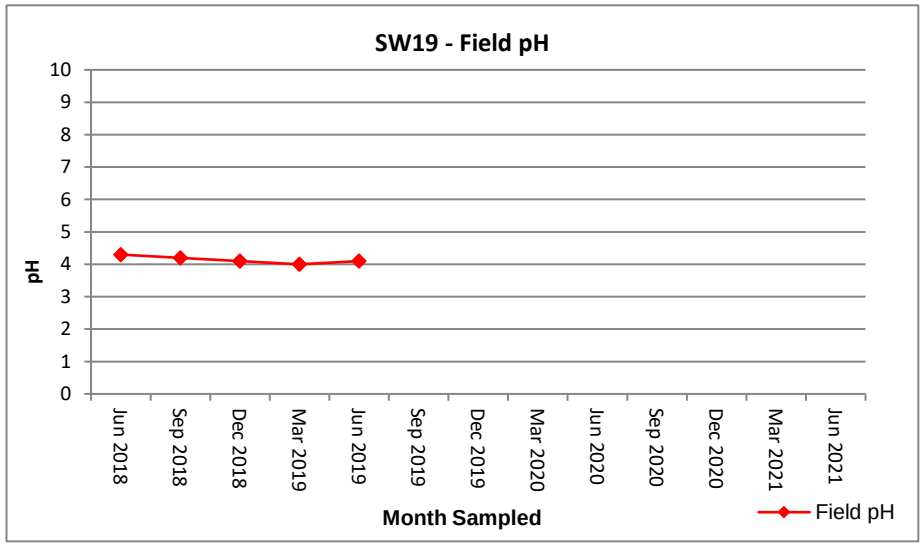


Chart 45: Old Northern Road SW19 pH

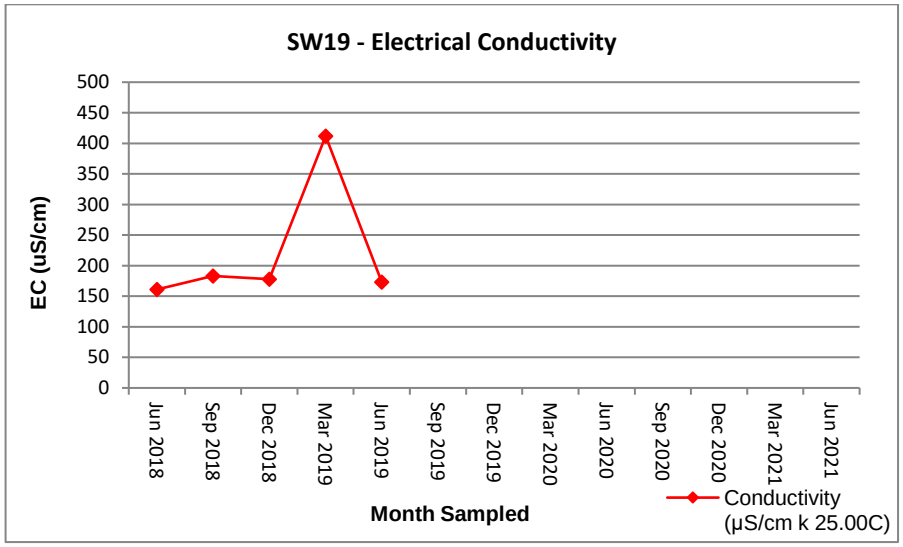


Chart 46: Old Northern Road SW19 EC

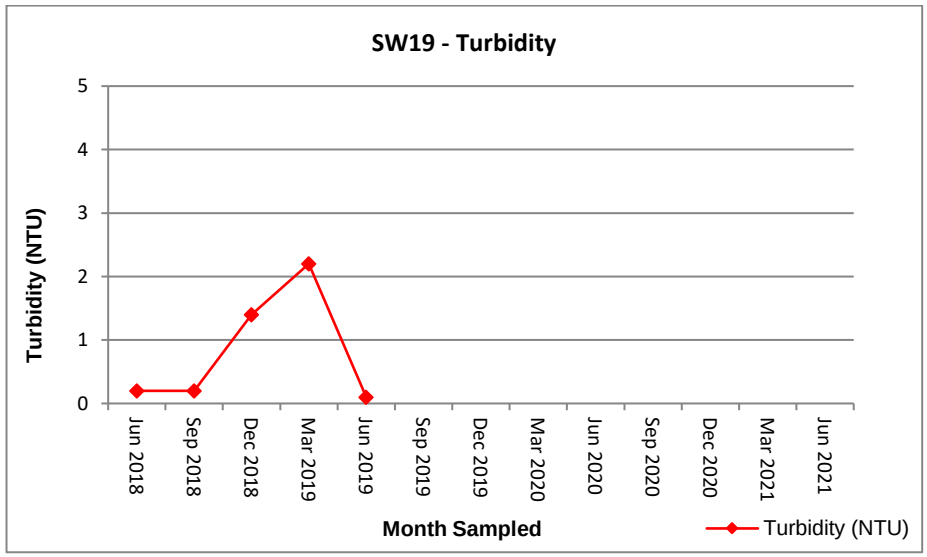


Chart 47: Old Northern Road SW19 Turbidity

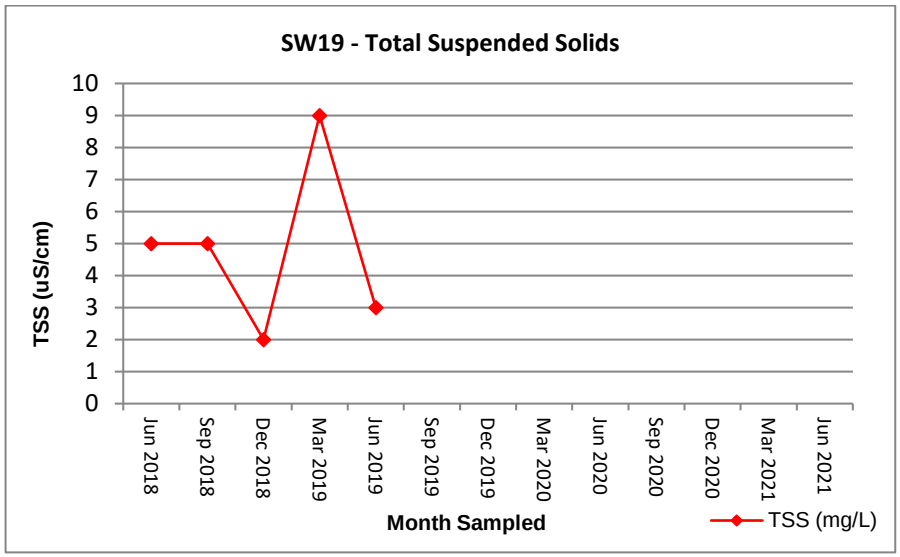


Chart 48: Old Northern Road SW19 Total Suspended Solids

3.2 Analyses

Old Northern Road Groundwater Levels and Quality

During the 2018 – 2019 reporting period, average groundwater depths ranged between 106.97 and 189.52m AHD for new boreholes, and between 160.02.4m and 195.50m AHD for old boreholes.

Results for old boreholes which monitor localised perched groundwater aquifers indicate more fluctuations between water levels across the monitoring months. However, it was observed that these fluctuations directly correlate to the amount of rainfall received and direct groundwater recharge. Perched aquifers have been shown to be more responsive to surface water infiltration from rainfall events which have been evident since the commencement of the monitoring program. Results show that groundwater levels in new boreholes remain predominantly static with some fluctuation throughout this monitoring period due to prolonged dry weather condition. It must be noted that less rainfall was recorded for this reporting period which is reflected in the receding groundwater levels across the boreholes.

pH and electrical conductivity (EC) results for both old and new boreholes have remained relatively stable from 2010 to the current reporting period, showing minimal fluctuations with occasional occurrences of anomalies due to human-induced environmental change such as application of fertiliser directly adjacent to the monitoring bore.

With stable groundwater levels, acceptable groundwater quality and no occurrence of environmental spills, it has been concluded that the Old Northern Road quarry operations are not impacting on the MTSGS and SBCGS groundwater levels and quality.

Old Northern Road Surface Water Quality and Discharge Event

No surface water discharge at the main dam (Monitoring Point 1 of EPL #3916) has taken place during the period between July 2018 and June 2019 and therefore, no surface water sampling was required.

Quarterly sampling and analysis of surface water quality at SW19 re-commenced in June 2018.

pH readings of water sampled from SW19 were constant since the recommencement of surface water quality monitoring. EC, Turbidity and TSS fluctuated with increased flow of surface water whilst sampling.

Haerses Road Groundwater Levels and Quality

Boreholes: H-series, BH4 and BH5

To comply with the requirements of development consent condition, data loggers were installed in all the H-boreholes and BH4 and BH5 at the end of July 2018. Results for old boreholes which monitor localised perched groundwater aquifers indicate greater fluctuations between water levels across the monitoring period. However, it was observed that these fluctuations directly correlate to the amount of rainfall received and resulting groundwater recharge. Perched aquifers have been shown to be more responsive to surface water infiltration from rainfall events which have been evident since the commencement of the monitoring program. Results show that groundwater levels in new boreholes remain predominantly static since the commencement of the monitoring program. However it was been observed that the groundwater levels have reduced slightly due to prolonged dry weather conditions. It must be noted that less rainfall was recorded for this reporting period which is reflected in the receding groundwater levels across the boreholes.

pH and EC results for both old and new boreholes have remained relatively stable from 2010/2011 through to the current reporting period, showing minimal fluctuations. An increase in total suspended solids (TSS) and turbidity across some boreholes is likely attributable to the change in groundwater sampling technique during 2017. Borehole H13 was previously impacted in 2015-2016 by the localised organic fertiliser application. Water quality parameters obtained from H13 during this reporting period have returned to levels similar those previously recorded. Borehole H13 have been decommissioned due to its location being the designated location of processing plant and stockpiling of material on Lot 216. Borehole H14 was unblocked in May 2018 and groundwater depth and quality sampling resumed.

Boreholes in MTSGS Buffer Zone and BH05B

The drilling and installation of monitoring bores were constructed in May 2018 at four sites (three cluser monitoring bores per site) near the centre of the MTSGS buffer zone and an additional monitoring bore was construced near the existing BH5. Data loggers were installed in all of the new monitoring wells in the MTSGS buffer zone at the end of July 2018. Data loggers record water levels twice daily. Groundwater levels of the bores, as depicted in Charts 14 to 22 (inclusive) and Charts 25 to 28 (inclusive), are relatively constant. The minor reduction in groundwater levels were due to monthly sampling of water using low-flow pump out methodology for laboratory analysis. pH and electrical conductivity analysis indicate that fluctuations and high readings during the first 2-3 months were to be expected and stabilised thereafter. BH01A registered extremely high pH at the levels of 12 to 13 initially for the first 2-3 months with stabilisation occurring at approximate pH11. BH01A also registered extremely high electrical conductivity in the first 6 months which now stabilises at levels less than 500 uS/cm. pH levels in the remaining buffer bores range approximately between pH 4 and 7. Electrical conductivity in the remaining buffer bores registed less than 500 uS/cm.

With stable groundwater levels, acceptable groundwater quality and no occurrence of environmental spills, it can be concluded that the Haerses Road quarry operations are not impacting on the MTSGS and SCBGS groundwater levels and quality.

6.5 Chages to Environmental Procedures

Current groundwater management measures are considered adequate. No changes to environmental procedures are proposed.

Monitoring of the extraction limit will continue in order to ensure compliance. The Maximum Extraction Depth plans for Old Northern Road and Haerses Road quarries will require review following the next Independent Environmental Audit scheduled in October/November 2019.

Any planned surface water discharge at Monitoring Point 1 (weir of the main storage dam) will require grab samples prior to discharge for laboratory analysis to ensure pH, TSS and turbidity are within the specified EPL concentration limits.

Quarterly sampling of surface water at SW19 to continue.

7. Rehabilitation

Rehabilitation and weed management at Old Northern Road and Hearses Road quarries are currently undertaken on a monthly basis by a bush regeneration contractor, Bush-It Pty Ltd. An Annual Rehabilitation Report provided by the contractor for the 2018 – 2019 reporting period is attached as Appendix G.

Approximately 90 percent of the time spent (638.5 hours) on regeneration works was conducted at Old Northern Road quarry with the remaining 10 percent of the time spent (93.5 hours) at Haerses Road quarry.

7.1 Old Northern Road Rehabilitation

Buffer Area – *Kunzea rupestris* Survey

The overall health of the Kunzea rupestris population is considered reasonable despite the current dry weather conditions. Some diebacks and plant loss have been observed however the remaining plants appeared to be in good health. Some new recruitment was evident particularly on the western rock platform where vacant soil is present. Budding and some flowers were observed during the survey in September 2019.

Other Threatened Species Survey

The *Melaleuca deanei* within the Banksia heath community remains undisturbed and have been cordoned off. The plant appears to have not suffered any ill effects from previous multiple small branch removal during propagation. No flowers observed as survey was undertaken outside the flowering period. In total, 31 stems in 18 clumps covers an area of 25m^2 with the highest shrubs being approximately 2.5m tall.

Darwinia fasicularis ssp. *oligantha* was observed to be plentiful in the location of the *Kunzea rupestris* population and surrounding area. Plants were flowering well and new recruits were evident throughout the area.

The *Tetratheca glandulosa* plant previously observed onsite could not be located and it is likely the plant has died from the dry weather conditions of fallen victim to predation from herbivore grazers.

Lot 196 Precincts 3 and 5

Good regrowth from native seed stock contained in the soil utilised for rehabilitation have been observed on the embankment near the front gate of the quarry. Additional planting was conducted to increase flora diversity. Effects from dry weather conditions can be seen across the site with some plant die-back.

Native Vegetation Corridor

Rehabilitation Area - Planted

The planted rehabilitation has been planted with 47 native species including the two threatened species *Melaleuca deanei* and *Darwinia fascicularis* ssp *oligantha* which were propagated from the original plants. In total there were 16 live specimens of *Melaleuca deanei*, 25 live specimens of *Darwinia fascicularis* ssp *oligantha* and 4 live specimens of Acacia byoneana located within the planted rehabilitation area.

Rehabilitation Area - Translocated

Overall coverage of vegetation from the translocation and continued recruitment from seed bank storage appears to be ample. Translocated *Darwinia fascicularis* ssp *oligantha* is numerous, particularly on the western side of the site. All age classes were observed from small seedlings to adult shrubs which were flowering well at the time of the survey

period. There is currently no upper canopy within this area however *Eucalyptus sp*., *Corymbia sp*. and *Angophora hispida* recruits were observed. Shrubs and ground cover plants are reasonably abundant throughout the area.

Rehabilitation Area – Soil Seed Bank

Ample natural recruitment of native species is occurring across the site with recruitment of *Darwinia fascicularis* ssp *oligantha* evident. No canopy stratum is present although juvenile *Eucalyptus sp* were observed. *Acacia suaveolens* dominates the recovering shrub layer with *Grevillea buxifolia* and *Banksia ericifolia* also widespread. Ground cover species are present throughout. There are currently 2 surviving planted *Melaleuca deanei* and 20 planted *Darwinia fascicularis* ssp *oligantha* all in healthy condition.

Vegetation Monitoring

Native Vegetation Corridor

Five of the nine vegetation monitoring sites at the Old Northern Road quarry are located in the NVC including the planted rehabilitation area which was discussed above. From the remaining four sites only one could be safely accessed for monitoring. One of the monitoring site is currently disturbed and in preparation for sand extraction whilst the other two sites contain thickets of Lantana camera deeming the quadrat unsafe to survey.

The fifth site also contained thickets of *Lantana camera* however a section of native vegetation adjacent to the marked location was surveyed to provide some detail of biodiversity condition within the NVC.
The vegetation in the surveyed area is described in the Biodiversity Rehabilitation Management Plan 2018 as being *Eucalyptus punctata* woodland. The vegetation community in this location appears to be in a transition zone with influences from dry ridgetop woodland, heathland and gully forests emerging in one location. The species recorded within the survey site came to the determination that the VIS classification for this PCT best fit is *1328 - Yellow Bloodwood - Narrow-leaved Apple heathy woodland on hinterland plateaux of the Central Coast, Sydney Basin Bioregion.*
The overall health of the vegetation and biodiversity in the location of the survey site was moderate. There has been historic disturbance in the area most likely from livestock grazing and timber removal. The continued dry conditions throughout 2018 and 2019 have no doubt impacted upon the diversity of vegetation observed and identified during the survey period, in particular the forbs and ferns. Following a return to normal weather conditions it is expected the diversity of ground cover herbs will increase thus improving the overall biodiversity of the site.
The remaining areas throughout the NVC appear to be severely impacted from the presence of *Lantana camara*. An effort to remove and control the species appears to have begun within the *Eucalyptus punctata* woodland however much more work is needed to manage the species across the entire site.

Areas outside the NVC

There were four monitoring sites identified outside of the NVC which were proposed to be surveyed. One of these locations were unable to be accessed due to sand extraction currently taking place. Another of the locations was not able to be accessed due to impenetrable thickets of *Lantana camara*. Therefore only two locations were surveyed to provide baseline data for ongoing assessment.
The vegetation found at both sites was similar and therefore were both determined to be PCT *1181 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion*. The site to the north of the large farm dam contained forest which demonstrated a much older structure with limited disturbance obvious. Large trees with hollow limbs and a reasonable diversity of species were found across this site. This survey location had been impacted from edge

effects with *Lantana camara* growing along the road edge. Stage 4 of sand extraction on Lot 1 DP547255 will see the removal of this survey site in time. Therefore this site will provide baseline data for the benchmark values of long term rehabilitation of the PCT within the NVC and buffer area in the southeast corner of the site.
The second survey location outside of the NVC is within the 250m buffer area to Maroota Public School in the southeast corner of the site. This area has had historic disturbance most likely from timber harvesting. An abundance of *Eucalyptus piperita* are regenerating within this quadrat at around the same age class which suggests at some stage the area was once cleared. Despite this, the diversity within the survey site is reasonable and the biodiversity values are moderate. The area where this quadrat is located will not be subjected to clearing so will therefore provide an opportunity for monitoring the effects of sand extraction in nearby retained vegetation. The remaining vegetation within the 250m buffer area appeared to have some impacts from the spread and growth of *Lantana camera* therefore a second survey quadrat within this area was not undertaken. Providing efforts are made to reduce the impacts from the species by the next reporting period are undertaken a further survey location may be introduced for the 2020 annual report.

Haerses Road Biodiversity Offset Area

Survey was undertaken at the five monitoring sites. Baseline data has been collected and will enable a measurable value of success for management actions which may be implemented over the life of the offset. It is expected that over time there will be an increase in biodiversity, habitat features, on-going evidence of natural recruitment and a decrease in exotic fauna and flora presence.

7.2 Haerses Road Rehabilitation

Offset Area 1 – Rehabilitation / Translocation area

Bush rehabilitation and regeneration at the Haerses Road translocation area has been undertaken since 2009. Considerable progress has been achieved. *Ageratina adenophora* (Crofton Weed) is present in the wetter areas and drainage lines whilst *Andropogon virginicus* (Whiskey Grass) and *Eragrostic curvula* (African Love Grass) have been found within the fence line of the area. Planted Eucalypt species within the offset translocation area have been culled to provide opportunity for native ground covers, shrubs and sub-canopy species to recruit and to increase biodiversity.

Offset Area 2 - 30 metres from Wisemans Ferry Road

Continued treatment for Blackberry weed in close proximity to the planting was undertaken. Supplementary planting would be required to replace the planted specimen affected by the dry weather condition.

The full Bushland Regeneration and Rehabilitation Annual Report 2018-19 (BushIT, 2019) and Annual Biodiversity & Rehabilitation Management Report 2019 (South East Environmental, 2019) can be accessed in Appendices G and H respectively.

7.3 Change in Environmental Procedures

Old Northern Road Lot 196 Rehabilitation

Continual of routine weed control and monitoring of regenerating native species. Additional planting particularly upper stratum species may be required.

Old Northern Road Lots 1 and 2

Continual of routine control of *Ricinus communis* (Castor Oil) and *Tagetes sp.* to prevent these species appearing elsewhere on site where disturbance will containue to occur. Continual of *Lantana camera* management and review techniques recommended in the Ecological Monitoring Report (South East Environmental, 2019).

Haerses Road Biodiversity Offset Area (for Old Northern Road development consent)

Continual removal of invasive grass and annual species along the border of the North-western border of the area. Re-establishing a sediment fence in the lower drainage area to prevent sediment and A. adenophora moving into the healthy vegetation community.

Old Northern Road NVC

Removal of support ties and tree guards are recommended to reduce the risk of loss or deformity of the trees and allow plants to grow in a more natural shape without restriction of outwards movement.

Haerses Road 30 metre Buffer to Wisemans Ferry Road

Continue management of Blackberry. Undertake supplementary planting where required.

Haerses Road Translocation Area

Monitor and control of newly opened areas inside the translocation to better assist establishment of regenerating native ground covers and shrubs which have died back due to dry weather conditions.

Threatened species propagation

Continual propagation of *Melaleuca deanei* for supplementary planting

Pest fauna species survey and management

Continual of pest fauna species monitoring and take action where required.

Haerses Road and Porters Road Biobank Sites

Monitoring and management of the Haerses Road and Porters Road biobank sites to be undertaken in accordance with the Biobanking Agreement once finalised.

8. Community and Social Impacts

8.1 Compliance

Dixon Sand is required to adhere to the following community related consent conditions:

Table 30: Community related consent conditions

Development Consent	Consent Condition	Requirement	Compliance
DA250-09-01	Condition 8 of Schedule 5	The Applicant must establish and operate a Community Consultative Committee (CCC) for the development to the satisfaction of the Secretary. The CCC must be established by 10 October 2018 and operated in general accordance with the Department's Community Consultative Committee Guidelines, November 2016 (or later version). Notes: • The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent. • In accordance with the guidelines, the Committee should comprise an independent chair and appropriate representation from the Applicant, Council and the local community. • The CCC established and operated prior to the approval of Modification 5 must continue to be operated in accordance with the procedures required by the consent prior to the approval of Modification 5 until such time as the CCC required by this condition is established.	The current CCC members were re-appointed by the DP&E on 1st March 2018 (note joint CCC for the Old Northern Road and Haerses Road quarries).
DA250-09-01	Condition 1(e) of Schedule 5	describe the procedures to be implemented to: • keep the local community and relevant agencies informed about the operation and environmental performance of the development; • receive, record, handle and respond to complaints; • resolve any disputes that may arise during the course of the development; • respond to any non-compliance; • respond to emergencies; and	Refer to the Environmental Management Systems
DA165-7-2005	Condition 1(e) of Schedule 5		
DA250-09-01	Condition 1(f) of Schedule 5	include a Community Relations Plan, developed in consultation with Council, the CCC, and the Maroota Public School, which includes:	The Community Relations Plan is included as Appendix 11 of the revised Environmental Management System

Development Consent	Consent Condition	Requirement	Compliance

		• identification of stakeholders potentially affected by the development;
		• detailed strategies to ensure open communication between the Applicant, the community and Maroota Public School;
		• detailed strategies to monitor and evaluate social impacts of the development on the local community and Maroota Public School; and
		• measures to improve community relations including:
		  ○ quarry open days and education sessions to promote better understanding of quarry operations in the wider community;
		  ○ participation in community activities; and
		  ○ strategies involving in-kind exchanges of expertise and resources for activities such as bush regeneration, Landcare, Streamwatch, and other community-based environmental programs;	

DA165-7-2005	Condition 8 of Schedule 5	The Applicant must establish and operate a Community Consultative Committee (CCC) for the development to the satisfaction of the Secretary. The CCC must be established by 30 June 2018 and operated in general accordance with the Department's Community Consultative Committee Guidelines, November 2016 (or later version). Notes: • The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent. • In accordance with the guidelines, the Committee should comprise an independent chair and appropriate • representation from the Applicant, Council and the local community. • The CCC established and operated prior to the approval of Modification 1 must continue to be operated in accordance with the procedures required by the consent prior to the approval of Modification 1 until such time as the CCC required by this condition is established.	The current CCC members were re-appointed by the DP&E on 1st March 2018 (note joint CCC for the Old Northern Road and Haerses Road quarries).

Development Consent	Consent Condition	Requirement	Compliance
		• The Applicant may, with the approval of the Secretary, combine the function of this CCC with the functions of other CCCs in the area.	

8.2 Complaints and Follow-up Actions

Five and two complaints were received for the Old Northern Road and Haerses Road quarries respectively during the 2018-2019 reporting period. A summary of the complaints is contained in Section 5.3.2.

A copy of the complaints register (updated July 2019) containing all the complaints to date is contained in Appendix K.

8.3 Community Consultative Committee, Meetings and Guidelines

Two CCC meetings were held in the 2018 - 2019 reporting period, in accordance with the consent conditions and CCC Guidelines (2016). The CCC meetings were held on 20th November 2018 and 14th May 2019. The minutes from each meeting are provided in Appendix J.

8.4 Community and Stakeholder Liaison

The local community is provided with an opportunity to comment on Dixon Sand's environmental performance through direct contact with quarry staff or through the contact portal via the company's website.

Stakeholder Liaison and Correspondences

Dixon Sand staff made contact with local community members on a number of occasions. These include:

- Liaising with the neighbouring property owner to the Old Northern Road quarry regarding general maintenance,
- Installation of signage for the neighbouring properties,
- Notifying the Maroota Public School regarding noise monitoring undertaken in December 2018 and June 2019,
- Seeking permission from the property owners identified as receivers for the DA165-7-2005 (Modification 1) adjacent to Haerses Road to conduct attended noise monitoring on the property in June 2019, and
- Bi-annual CCC meetings in November 2018 and May 2019.

A copy of the Community Liaison Register is contained in Appendix K.

Local Initiatives

Dixon Sand made contributions to a number of community initiatives during the 2018-2019 reporting period, including:

- demonstration of quarry plant at the Maroota Muster,

- monetary contribution to the Maroota Public School,
- monetary contribution to the Cattai Public School,
- monetary contribution to the Royal Flying Doctor Service,
- publication of environmental monitoring data, and provision of all current consents and site management plans for public viewing on the Dixon Sand website; and

8.6 Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) can be defined as “using, conserving and enhancing the community’s resources so that the ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased” (Commonwealth of Australia, 1992).

The four principles of ESD are listed in Schedule 2 of the Environmental Planning and Assessment Regulation 2000 as follows:

- the precautionary principle;
- inter-generational equity;
- conservation of biological diversity and ecological integrity; and
- Improved valuation, pricing and incentive mechanisms.

Both Dixon Sand’s Old Northern Road and Haerses Road quarries continue to manage all potential threats to the quality of the environment, determined with a reasonable degree of certainty through the use of scientific investigation and analysis of the individual and cumulative environmental impacts of the proposal.

Long-term environmental fluctuations have been, and will continue to be, monitored for the duration of extraction such as groundwater levels and quality, noise, air quality and threatened flora and fauna. Groundwater levels, for example, are being monitored to ensure extraction does not breach the groundwater table.

Threatened flora and fauna present on site is monitored annually to ensure they are not impacted by quarry activities. Similarly, noise and air quality monitoring will continue throughout the life of the developments. Mitigation measures are in place to minimise the potential adverse impacts likely to affect social and intergenerational equity. These measures relate to erosion and sediment control, surface and groundwater management, air quality control, and noise and waste management. Continual community relation strategies will ensure the community is well informed and has an effective means of voicing concerns and receiving feedback.

Dixon Sand aims to protect the biological diversity and ecological integrity of the sites through;

- progressive rehabilitation of the extracted areas using agricultural and native species;
- monitoring and maintenance of buffer areas to ecologically sensitive sites;
- establishment of native vegetation offset areas, biodiversity offset area and native rehabilitation areas to maximise native fauna habitats and enhance vegetation corridor for flora and fauna migration, and
- providing a final landform that integrates elements of the local area.

The value placed on environmental resources by Dixon Sand is represented as costs associated with the implementation of monitoring and mitigation measures throughout the life of the development consents.

8.7 Changes to Social Monitoring Procedures

No changes are proposed for the social management procedures.

9. Bushfire Management

9.1 Compliance

DA250-09-01 and DA165-7-2005 require Dixon Sand to ensure that the quarries are suitably equipped to respond to any fires on site. The quarries are to assist the Rural Fire Service and emergency services to the extent practicable if there is a fire in the vicinity of the site.

A Bushfire Management Plan has been prepared for the quarries. An annual meeting between Dixon Sand and the representative of the Rural Fire Service was conducted on 27th August 2018 on the quarry premises to review the Bushfire Management Plans, risk assessment and procedures in the event of a bushfire. The meeting minutes are contained in Appendix M.

The outcome of the meeting was communicated to Dixon Staff in the form of a toolbox talk.

10. Competency, Training and Awareness

The quarry management team is to ensure all personnel, including contractors, are provided with appropriate environmental training and awareness to ensure they understand their environmental awareness, responsibilities and how to mitigate the impacts. Training is undertaken using the following avenues:

- Compulsory site environmental induction for employees and contractors,
- Truck driver induction training,
- Pollution incident response management plan (PIRMP) and mock scenario training,
- Two-stage pre-clearing procedures and fauna handling and rescue procedures training,
- Environmental hazard identification workshop,
- Regular toolbox talks, and
- Bushfire Management and Emergency evacuation training.

11. Incidents and Non-Compliances

11.1 Environmental Incidents

No environmental spills have occurred during this reporting period. No archaeological artefacts or areas have been uncovered during this reporting period.

11.2 Non-Compliances

Dust related non-compliances were recorded in this reporting period.

Non-compliance # 1: 24 Hour PM10 Exceedance

TEOM exceedances and explanations are provided in Table 12, Section 5.1.4.

TEOM exceedances were attributed to forecasted adverse weather events resulting in elevated PM10 levels.

11.3 Section 191 Improvement Notice

The Department of Planning and Environment (Resources Regulator) carried out a general site inspection on 13th November 2018. An improvement notice under section 191 of the *Work Health and Safety Act* 2011 (Notice No. N191-2018/00764) was issued to Dixon Sand on 27th November 2018 requiring remediation of the contravention or likely contravention with the following specific requirement:

- Review and update the Safety Data Sheet register
- Protect used batteries to prevent arcing
- Rectify the handrail on the diesel trailer to prevent persons from falling from the small platform
- Keep immediate area surrounding the fire extinguisher clear of clutter
- Review and update site emergency plan

Dixon Sand provided the DP&E (Resources Regulator) with a proposed actions plan and completed actions on 24th December 2018. All items have been closed out.

11. Proposed Actions to be completed in the next Reporting Period

11.1 Vegetation Clearing and Extraction

Haerses Road

Work associated with Modification 1 will continue into the next reporting period.

11.2 Rehabilitation and Bush Regeneration

Old Northern Road

Rehabilitation will continue in the Native vegetation Corridor (NVC) on Lot 29 and Precincts 3 and 5 on Lot 196.

Propagation of threatened species will continue. Weed management practices will continue on site.

Removal of plant guards and timber stakes will be undertaken as planted specimens establishes.

Haerses Road

Rehabilitation to continue in Stage 1 cell. Rehabilitation works will continue in the Offset Area 1, Offset Area 2 and the Biodiversity Offset Area (Old Northern Road DA250-09-01 Mod 4). Erosion and sediment controls will be maintained. A focus should also be placed on weed control, particularly *Lantana camara* which has a priority ranking under the *Biosecurity Act* 2016. Ecological monitoring associated with Modification 1 will commence.

Monitoring and management of the Haerses Road and Porters Road biobank sites to be undertaken in accordance with the Biobanking Agreement once finalised.

12. Conclusion

In general, Dixon Sand has maintained acceptable environmental performance outcomes throughout the reporting period. The company has committed to ongoing endeavours to minimise environmental impacts and potential exceedances related to quarry operations.

Appendix A – Dust Deposition Reports

vgt
Laboratories Pty Ltd
PO Box 2335 Greenhills NSW 2323
P (02)4028 6412 E mail@vgt.com.au
www.vgt.com.au ABN 77 621 943 600

Report Number: 6193

Date Issued: 3/08/2018 Revision Number: 00

Site/Job: Dixon Maroota Dusts

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 7 samples were received on 26/07/2018 and tested at 4/30 Glenwood Dr Thornton, NSW 2322

Client Sample Reference	Date Sampled	Licence Ref /GPS	Laboratory ID	Matrix	Comment or Non-compliances
D08&9 Hitchcock Rd Olive Grove	26/07/2018 08:48		6193/1	Dust	
D10 Hearses Rd	26/07/2018 08:54		6193/2	Dust	
D06 School	26/07/2018 09:00		6193/3	Dust	
D05 Bund	26/07/2018 09:10		6193/4	Dust	
D04 Rehab	26/07/2018 09:25		6193/5	Dust	Needs to be relocated from mining area. steep drop
D07 Mullock	26/07/2018 09:37		6193/6	Dust	
D01(A) Front Gate	26/07/2018 09:16		6193/7	Dust	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Senior Chemist

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Test Report Number: 6193

Date Issued: 3/08/2018
Tested between: 26/07/18 and 3/08/18

Results

Sample #	Sample Description	Date On	Date Off Units Method Code Limit of Report	Number of Days days VGT-WI/14	Insoluble Solids g/m2/mth VGT-WI/14 0.1	Ash g/m2/mth VGT-WI/14 0.1	Combustible Matter g/m2/mth VGT-WI/14 0.1	Calculated Rain mm VGT-WI/14 1
6193/1	D08&9 Hitchcock Rd Olive Grove	28/06/2018 09:30	26/07/2018 08:48	28	0.8	0.7	0.1	16
6193/2	D10 Hearses Rd	28/06/2018 09:35	26/07/2018 08:54	28	0.5	0.3	0.2	14
6193/3	D06 School	28/06/2018 09:45	26/07/2018 09:00	28	0.4	0.2	0.2	15
6193/4	D05 Bund	28/06/2018 09:55	26/07/2018 09:10	28	0.8	0.7	0.1	17
6193/5	D04 Rehab	28/06/2018 10:20	26/07/2018 09:25	28	0.4	0.3	0.1	15
6193/6	D07 Mullock	28/06/2018 10:29	26/07/2018 09:37	28	0.2	0.1	0.1	14
6193/7	D01(A) Front Gate	28/06/2018 10:00	26/07/2018 09:16	28	0.8	0.7	0.1	15

Results have been approved and report finalised on 3/08/2018

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Sampling Report Number: 6193

Date Issued: 3/08/2018
Sampling Conditions: Fine 11°-12°C

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6193/1	D08&9 Hitchcock Rd Olive Grove	26/07/2018 08:48	T.Walker	AS3580.10.1	CuSO4	Clear
6193/2	D10 Hearses Rd	26/07/2018 08:54	T.Walker	AS3580.10.1	CuSO4	Clear
6193/3	D06 School	26/07/2018 09:00	T.Walker	AS3580.10.1	CuSO4	Clear
6193/4	D05 Bund	26/07/2018 09:10	T.Walker	AS3580.10.1	CuSO4	Clear
6193/5	D04 Rehab	26/07/2018 09:25	T.Walker	AS3580.10.1	CuSO4	Clear
6193/6	D07 Mullock	26/07/2018 09:37	T.Walker	AS3580.10.1	CuSO4	Clear
6193/7	D01(A) Front Gate	26/07/2018 09:16	T.Walker	AS3580.10.1	CuSO4	Clear

Sampling procedures have been approved and report finalised on 3/08/2018
Where method is "unknown" sampling procedures are not endorsed.

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vgt
Laboratories Pty Ltd
PO Box 2335 Greenhills NSW 2323
P (02)4028 6412 E mail@vgt.com.au
www.vgt.com.au ABN 77 621 943 600

Report Number: 6323

Date Issued: 30/08/2018 Revision Number: 00

Site/Job: Dixon Maroota Dusts

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 7 samples were received on 23/08/2018 and tested at 4/30 Glenwood Dr Thornton, NSW 2322

Client Sample Reference	Date Sampled	Licence Ref /GPS	Laboratory ID	Matrix	Comment or Non-compliances
D08&9 Hitchcock Rd Olive Grove	23/08/2018 10:04		6323/1	Dust	
D10 Hearses Rd	23/08/2018 10:14		6323/2	Dust	Vegetation, insects
D06 School	23/08/2018 10:24		6323/3	Dust	
D05 Bund	23/08/2018 10:36		6323/4	Dust	
D04 Rehab	23/08/2018 11:01		6323/5	Dust	
D07 Mullock	23/08/2018 11:15		6323/6	Dust	
D01(A) Front Gate	23/08/2018 10:48		6323/7	Dust	Dust

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Senior Chemist

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Test Report Number: 6323

Date Issued: 30/08/2018
Tested between: 23/08/18 and 30/08/18

Results

Sample #	Sample Description	Date On	Date Off Units Method Code Limit of Report	Number of Days days VGT-WI/14	Insoluble Solids g/m2/mth VGT-WI/14 0.1	Ash g/m2/mth VGT-WI/14 0.1	Combustible Matter g/m2/mth VGT-WI/14 0.1	Calculated Rain mm VGT-WI/14 1
6323/1	D08&9 Hitchcock Rd Olive Grove	26/07/2018 08:48	23/08/2018 10:04	28	0.4	0.4	<0.1	<1
6323/2	D10 Hearses Rd	26/07/2018 08:54	23/08/2018 10:14	28	1.8	1.2	0.6	3
6323/3	D06 School	26/07/2018 09:00	23/08/2018 10:24	28	0.5	0.3	0.2	2
6323/4	D05 Bund	26/07/2018 09:10	23/08/2018 10:36	28	1.4	1.2	0.2	2
6323/5	D04 Rehab	26/07/2018 09:25	23/08/2018 11:01	28	0.7	0.5	0.2	2
6323/6	D07 Mullock	26/07/2018 09:37	23/08/2018 11:15	28	0.4	0.2	0.2	2
6323/7	D01(A) Front Gate	26/07/2018 09:16	23/08/2018 10:48	28	1.7	1.6	0.1	2

Results have been approved and report finalised on 30/08/2018

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 6323

Date Issued: 30/08/2018
Sampling Conditions: Cloudy 13°C

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6323/1	D08&9 Hitchcock Rd Olive Grove	23/08/2018 10:04	T.Walker	AS3580.10.1	CuSO4	Clear
6323/2	D10 Hearses Rd	23/08/2018 10:14	T.Walker	AS3580.10.1	CuSO4	Clear
6323/3	D06 School	23/08/2018 10:24	T.Walker	AS3580.10.1	CuSO4	Clear
6323/4	D05 Bund	23/08/2018 10:36	T.Walker	AS3580.10.1	CuSO4	Clear
6323/5	D04 Rehab	23/08/2018 11:01	T.Walker	AS3580.10.1	CuSO4	Clear
6323/6	D07 Mullock	23/08/2018 11:15	T.Walker	AS3580.10.1	CuSO4	Clear
6323/7	D01(A) Front Gate	23/08/2018 10:48	T.Walker	AS3580.10.1	CuSO4	Clear

Sampling procedures have been approved and report finalised on 30/08/2018
Where method is "unknown" sampling procedures are not endorsed.

NATA Accredited Laboratory – 20375

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vgt
Laboratories Pty Ltd
PO Box 2335 Greenhills NSW 2323
P (02)4028 6412 E mail@vgt.com.au
www.vgt.com.au ABN 77 621 943 600

Report Number: 6406

Date Issued: 28/09/2018 Revision Number: 00

Site/Job: Dixon Maroota Dusts

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 7 samples were received on 20/09/2018 and tested at 4/30 Glenwood Dr Thornton, NSW 2322

Client Sample Reference	Date Sampled	Licence Ref /GPS	Laboratory ID	Matrix	Comment or Non-compliances
D08&9 Hitchcock Rd Olive Grove	20/09/2018 09:05		6406/1	Dust	Minor insects
D10 Hearses Rd	20/09/2018 09:15		6406/2	Dust	Minor insects
D06 School	20/09/2018 09:25		6406/3	Dust	Minor insects
D05 Bund	20/09/2018 09:37		6406/4	Dust	Minor insects
D04 Rehab	20/09/2018 10:02		6406/5	Dust	Minor insects
D07 Mullock	20/09/2018		6406/6	Dust	
D01(A) Front Gate	20/09/2018 09:48		6406/7	Dust	Minor insects, sand

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Senior Chemist

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Test Report Number: 6406

Date Issued: 28/09/2018
Tested between: 20/09/18 and 28/09/18

Results

Sample #	Sample Description	Date On	Date Off Units Method Code Limit of Report	Number of Days days AS 3580.10.1	Insoluble Solids g/m2/mth AS 3580.10.1 0.1	Ash g/m2/mth AS 3580.10.1 0.1	Combustible Matter g/m2/mth AS 3580.10.1 0.1	Calculated Rain mm AS 3580.10.1 1
6406/1	D08&9 Hitchcock Rd Olive Grove	23/08/2018 10:04	20/09/2018 09:05	28	0.4	0.5	<0.1	27
6406/2	D10 Hearses Rd	23/08/2018 10:14	20/09/2018 09:15	28	1.0	0.7	0.3	23
6406/3	D06 School	23/08/2018 10:24	20/09/2018 09:25	28	1.3	0.8	0.5	26
6406/4	D05 Bund	23/08/2018 10:36	20/09/2018 09:37	28	1.8	1.4	0.4	32
6406/5	D04 Rehab	23/08/2018 11:01	20/09/2018 10:02	28	0.8	0.7	0.1	27
6406/6	D07 Mullock	23/08/2018 11:15	20/09/2018	28	0.8	0.7	0.1	28
6406/7	D01(A) Front Gate	23/08/2018 10:48	20/09/2018 09:48	28	1.2	0.9	0.3	29

Results have been approved and report finalised on 28/09/2018

NATA Accredited Laboratory – 20375

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Sampling Report Number: 6406

Date Issued: 28/09/2018
Sampling Conditions: Showers 8°-12°C

vgt Laboratories Pty Ltd

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6406/1	D08&9 Hitchcock Rd Olive Grove	20/09/2018 09:05	T.Walker	AS3580.10.1	CuSO4	Clear
6406/2	D10 Hearses Rd	20/09/2018 09:15	T.Walker	AS3580.10.1	CuSO4	Clear
6406/3	D06 School	20/09/2018 09:25	T.Walker	AS3580.10.1	CuSO4	Clear
6406/4	D05 Bund	20/09/2018 09:37	T.Walker	AS3580.10.1	CuSO4	Clear
6406/5	D04 Rehab	20/09/2018 10:02	T.Walker	AS3580.10.1	CuSO4	Clear
6406/6	D07 Mullock	20/09/2018	T.Walker	AS3580.10.1	CuSO4	Clear
6406/7	D01(A) Front Gate	20/09/2018 09:48	T.Walker	AS3580.10.1	CuSO4	Clear

Sampling procedures have been approved and report finalised on 28/09/2018
Where method is "unknown" sampling procedures are not endorsed.

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NATA WORLD RECOGNISED ACCREDITATION

vgt
Laboratories Pty Ltd
PO Box 2335 Greenhills NSW 2323
P (02)4028 6412 E mail@vgt.com.au
www.vgt.com.au ABN 77 621 943 600

Report Number: 6493

Date Issued: 30/10/2018 Revision Number: 00

Site/Job: Dixon Maroota Dusts

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 7 samples were received on 18/10/2018 and tested at 4/30 Glenwood Dr Thornton, NSW 2322

Client Sample Reference	Date Sampled	Licence Ref /GPS	Laboratory ID	Matrix	Comment or Non-compliances
D08&9 Hitchcock Rd Olive Grove	18/10/2018 10:40		6493/1	Dust	
D10 Hearses Rd	18/10/2018 10:28		6493/2	Dust	
D06 School	18/10/2018 11:21		6493/3	Dust	
D05 Bund	18/10/2018 11:28		6493/4	Dust	
D04 Rehab	18/10/2018 10:56		6493/5	Dust	
D07 Mullock	18/10/2018 11:06		6493/6	Dust	
D01(A) Front Gate	18/10/2018 11:14		6493/7	Dust	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Senior Chemist

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Test Report Number: 6493

Date Issued: 30/10/2018
Tested between: 18/10/18 and 29/10/18

Results

Sample #	Sample Description	Date On	Date Off Units Method Code Limit of Report	Number of Days days AS 3580.10.1	Insoluble Solids g/m2/mth AS 3580.10.1 0.1	Ash g/m2/mth AS 3580.10.1 0.1	Combustible Matter g/m2/mth AS 3580.10.1 0.1	Calculated Rain mm AS 3580.10.1 1
6493/1	D08&9 Hitchcock Rd Olive Grove	20/09/2018 09:05	18/10/2018 10:40	28	3.2	2.1	1.1	197
6493/2	D10 Hearses Rd	20/09/2018 09:15	18/10/2018 10:28	28	2.4	1.9	0.5	188
6493/3	D06 School	20/09/2018 09:25	18/10/2018 11:21	28	1.0	0.5	0.5	209
6493/4	D05 Bund	20/09/2018 09:37	18/10/2018 11:28	28	0.9	0.7	0.2	227
6493/5	D04 Rehab	20/09/2018 10:02	18/10/2018 10:56	28	0.8	0.5	0.3	195
6493/6	D07 Mullock	20/09/2018 10:14	18/10/2018 11:06	28	0.8	0.7	0.1	205
6493/7	D01(A) Front Gate	20/09/2018 09:48	18/10/2018 11:14	28	**4.6**	4.1	0.5	117

Results have been approved and report finalised on 30/10/2018

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 6493

Date Issued: 30/10/2018
Sampling Conditions: Cloudy 20°-22°C

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6493/1	D08&9 Hitchcock Rd Olive Grove	18/10/2018 10:40	T.Walker	AS3580.10.1	CuSO4	
6493/2	D10 Hearses Rd	18/10/2018 10:28	T.Walker	AS3580.10.1	CuSO4	
6493/3	D06 School	18/10/2018 11:21	T.Walker	AS3580.10.1	CuSO4	
6493/4	D05 Bund	18/10/2018 11:28	T.Walker	AS3580.10.1	CuSO4	
6493/5	D04 Rehab	18/10/2018 10:56	T.Walker	AS3580.10.1	CuSO4	
6493/6	D07 Mullock	18/10/2018 11:06	T.Walker	AS3580.10.1	CuSO4	
6493/7	D01(A) Front Gate	18/10/2018 11:14	T.Walker	AS3580.10.1	CuSO4	Full, insects, algae

Sampling procedures have been approved and report finalised on 30/10/2018
Where method is "unknown" sampling procedures are not endorsed.

NATA Accredited Laboratory – 20375

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

vgt
Laboratories Pty Ltd
PO Box 2335 Greenhills NSW 2323
P (02)4028 6412 E mail@vgt.com.au
www.vgt.com.au ABN 77 621 943 600

Report Number: 6666

Date Issued: 27/11/2018 Revision Number: 00

Site/Job: Dixon Maroota Dusts

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 9 samples were received on 15/11/2018 and tested at 4/30 Glenwood Dr Thornton, NSW 2322

Client Sample Reference	Date Sampled	Licence Ref /GPS	Laboratory ID	Matrix	Comment or Non-compliances
D08&9 Hitchcock Rd Olive Grove	15/11/2018 11:21		6666/1	Dust	
D10 Hearses Rd	15/11/2018 10:45		6666/2	Dust	
D06 School	15/11/2018 11:30		6666/3	Dust	
D05 Bund	15/11/2018 11:40		6666/4	Dust	
D04 Rehab	15/11/2018 12:03		6666/5	Dust	Not tested. Bottle broken
D07 Mullock	15/11/2018 12:15		6666/6	Dust	
D01(A) Front Gate	15/11/2018 11:52		6666/7	Dust	
D11	15/11/2018 10:28		6666/8	Dust	New installation - short sampling period
D12	15/11/2018 11:01		6666/9	Dust	New installation - short sampling period

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Test Report Number: 6666

Date Issued: 27/11/2018
Tested between: 15/11/18 and 27/11/18

Results

Sample #	Sample Description	Date On	Date Off Units Method Code Limit of Report	Number of Days days AS 3580.10.1	Insoluble Solids g/m2/mth AS 3580.10.1 0.1	Ash g/m2/mth AS 3580.10.1 0.1	Combustible Matter g/m2/mth AS 3580.10.1 0.1	Calculated Rain mm AS 3580.10.1 1
6666/1	D08&9 Hitchcock Rd Olive Grove	18/10/2018 10:40	15/11/2018 11:21	28	2.4	1.5	0.9	33
6666/2	D10 Hearses Rd	18/10/2018 10:28	15/11/2018 10:45	28	1.0	0.7	0.3	30
6666/3	D06 School	18/10/2018 11:21	15/11/2018 11:30	28	0.7	0.5	0.2	33
6666/4	D05 Bund	18/10/2018 11:28	15/11/2018 11:40	28	1.4	1.2	0.2	35
6666/5	D04 Rehab	18/10/2018 10:56	15/11/2018 12:03	[NT]	[NT]	[NT]	[NT]	[NT]
6666/6	D07 Mullock	18/10/2018 11:06	15/11/2018 12:15	28	0.5	0.6	<0.1	30
6666/7	D01(A) Front Gate	18/10/2018 11:14	15/11/2018 11:52	28	**5.8**	2.4	3.4	32
6666/8	D11	30/10/2018	15/11/2018 10:28	**16**	1.1	0.7	0.4	19
6666/9	D12	30/10/2018	15/11/2018 11:01	**16**	1.5	0.7	0.8	19

Results have been approved and report finalised on 27/11/2018

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 6666

Date Issued: 27/11/2018
Sampling Conditions: Fine 23-27°C

vgt Laboratories Pty Ltd

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6666/1	D08&9 Hitchcock Rd Olive Grove	15/11/2018 11:21	T.Walker	AS3580.10.1	CuSO4	
6666/2	D10 Hearses Rd	15/11/2018 10:45	T.Walker	AS3580.10.1	CuSO4	
6666/3	D06 School	15/11/2018 11:30	T.Walker	AS3580.10.1	CuSO4	
6666/4	D05 Bund	15/11/2018 11:40	T.Walker	AS3580.10.1	CuSO4	
6666/5	D04 Rehab	15/11/2018 12:03	T.Walker	AS3580.10.1	CuSO4	Small crack in bottle
6666/6	D07 Mullock	15/11/2018 12:15	T.Walker	AS3580.10.1	CuSO4	
6666/7	D01(A) Front Gate	15/11/2018 11:52	T.Walker	AS3580.10.1	CuSO4	Major dust. Fallowing field both sides of road.
6666/8	D11	15/11/2018 10:28	T.Walker	AS3580.10.1	CuSO4	New installation - short sampling period
6666/9	D12	15/11/2018 11:01	T.Walker	AS3580.10.1	CuSO4	New installation - short sampling period

Sampling procedures have been approved and report finalised on 27/11/2018
Where method is "unknown" sampling procedures are not endorsed.

NATA Accredited Laboratory – 20375

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

NATA WORLD RECOGNISED ACCREDITATION

vgt
Laboratories Pty Ltd
PO Box 2335 Greenhills NSW 2323
P (02)4028 6412 E mail@vgt.com.au
www.vgt.com.au ABN 77 621 943 600

Report Number: 6812

Date Issued: 9/01/2019 Revision Number: 00

Site/Job: Dixon Maroota Dusts

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 9 samples were received on 13/12/2018 and tested at 4/30 Glenwood Dr Thornton, NSW 2322

Client Sample Reference	Date Sampled	Licence Ref /GPS	Laboratory ID	Matrix	Comment or Non-compliances
D08&9 Hitchcock Rd Olive Grove	13/12/2018 09:31		6812/1	Dust	
D10 Hearses Rd	13/12/2018 09:39		6812/2	Dust	
D06 School	13/12/2018 09:23		6812/3	Dust	
D05 Bund	13/12/2018 10:23		6812/4	Dust	
D04 Rehab	13/12/2018 10:40		6812/5	Dust	
D07 Mullock	13/12/2018 10:48		6812/6	Dust	
D01(A) Front Gate	13/12/2018 10:30		6812/7	Dust	
D11 Goldstien	13/12/2018 09:50		6812/8	Dust	
D12 Ram	13/12/2018 10:08		6812/9	Dust	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

NATA Accredited Laboratory – 20375

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WORLD RECOGNISED ACCREDITATION

Anthony Crane
Laboratory Manager

Test Report Number: 6812

Date Issued: 9/01/2019
Tested between: 13/12/18 and 9/01/19

Results

Sample #	Sample Description	Date On	Date Off Units Method Code Limit of Report	Number of Days days AS 3580.10.1	Insoluble Solids g/m2/mth AS 3580.10.1 0.1	Ash g/m2/mth AS 3580.10.1 0.1	Combustible Matter g/m2/mth AS 3580.10.1 0.1	Calculated Rain mm AS 3580.10.1 1
6812/1	D08&9 Hitchcock Rd Olive Grove	15/11/2018 11:21	13/12/2018 09:31	28	2.8	1.6	1.2	54
6812/2	D10 Hearses Rd	15/11/2018 10:45	13/12/2018 09:39	28	1.6	0.6	1.0	56
6812/3	D06 School	15/11/2018 11:30	13/12/2018 09:23	28	1.2	0.8	0.4	69
6812/4	D05 Bund	15/11/2018 11:40	13/12/2018 10:23	28	1.7	1.3	0.4	79
6812/5	D04 Rehab	15/11/2018 12:03	13/12/2018 10:40	28	1.2	0.8	0.4	68
6812/6	D07 Mullock	15/11/2018 12:15	13/12/2018 10:48	28	1.2	1.0	0.2	69
6812/7	D01(A) Front Gate	15/11/2018 11:52	13/12/2018 10:30	28	1.5	1.2	0.3	75
6812/8	D11 Goldstien	15/11/2018 10:28	13/12/2018 09:50	28	0.8	0.5	0.3	61
6812/9	D12 Ram	15/11/2018 11:01	13/12/2018 10:08	28	1.3	0.9	0.4	64

Results have been approved and report finalised on 9/01/2019

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 6812

Date Issued: 9/01/2019
Sampling Conditions: Showers 21°C

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6812/1	D08&9 Hitchcock Rd Olive Grove	13/12/2018 09:31	T.Walker	AS3580.10.1	CuSO4	Minor insects
6812/2	D10 Hearses Rd	13/12/2018 09:39	T.Walker	AS3580.10.1	CuSO4	Owl pellet in funnel, algae
6812/3	D06 School	13/12/2018 09:23	T.Walker	AS3580.10.1	CuSO4	
6812/4	D05 Bund	13/12/2018 10:23	T.Walker	AS3580.10.1	CuSO4	
6812/5	D04 Rehab	13/12/2018 10:40	T.Walker	AS3580.10.1	CuSO4	
6812/6	D07 Mullock	13/12/2018 10:48	T.Walker	AS3580.10.1	CuSO4	
6812/7	D01(A) Front Gate	13/12/2018 10:30	T.Walker	AS3580.10.1	CuSO4	
6812/8	D11 Goldstien	13/12/2018 09:50	T.Walker	AS3580.10.1	CuSO4	
6812/9	D12 Ram	13/12/2018 10:08	T.Walker	AS3580.10.1	CuSO4	

Sampling procedures have been approved and report finalised on 9/01/2019
Where method is "unknown" sampling procedures are not endorsed.

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Report Number: 6889

Date Issued: 22/01/2019 Revision Number: 00

Site/Job: Dixon Maroota Dusts

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 9 samples were received on 10/01/2019 and tested at 4/30 Glenwood Dr Thornton, NSW 2322

Client Sample Reference	Date Sampled	Licence Ref /GPS	Laboratory ID	Matrix	Comment or Non-compliances
D08&9 Hitchcock Rd Olive Grove	10/01/2019 09:06		6889/1	Dust	
D10 Hearses Rd	10/01/2019 09:14		6889/2	Dust	
D06 School	10/01/2019 09:54		6889/3	Dust	
D05 Bund	10/01/2019 10:02		6889/4	Dust	
D04 Rehab	10/01/2019 10:24		6889/5	Dust	
D07 Mullock	10/01/2019 10:34		6889/6	Dust	
D01(A) Front Gate	10/01/2019 10:12		6889/7	Dust	
D11 Goldstien	10/01/2019 09:25		6889/8	Dust	
D12 Ram	10/01/2019 09:43		6889/9	Dust	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

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WORLD RECOGNISED ACCREDITATION

Anthony Crane
Laboratory Manager

Test Report Number: 6889

Date Issued: 22/01/2019
Tested between: 10/01/19 and 22/01/19

Results

Sample #	Sample Description	Date On	Date Off Units Method Code Limit of Report	Number of Days days AS 3580.10.1	Insoluble Solids g/m2/mth AS 3580.10.1 0.1	Ash g/m2/mth AS 3580.10.1 0.1	Combustible Matter g/m2/mth AS 3580.10.1 0.1	Calculated Rain mm AS 3580.10.1 1
6889/1	D08&9 Hitchcock Rd Olive Grove	13/12/2018 09:31	10/01/2019 09:06	28	2.5	1.6	0.9	125
6889/2	D10 Hearses Rd	13/12/2018 09:39	10/01/2019 09:14	28	2.3	1.6	0.7	124
6889/3	D06 School	13/12/2018 09:23	10/01/2019 09:54	28	1.7	1.2	0.5	128
6889/4	D05 Bund	13/12/2018 10:23	10/01/2019 10:02	28	1.9	1.2	0.7	137
6889/5	D04 Rehab	13/12/2018 10:40	10/01/2019 10:24	28	**17.0**	15.3	1.7	125
6889/6	D07 Mullock	13/12/2018 10:48	10/01/2019 10:34	28	2.3	1.8	0.5	121
6889/7	D01(A) Front Gate	13/12/2018 10:30	10/01/2019 10:12	28	2.1	1.6	0.5	115
6889/8	D11 Goldstien	13/12/2018 09:50	10/01/2019 09:25	28	1.8	1.0	0.8	125
6889/9	D12 Ram	13/12/2018 10:08	10/01/2019 09:43	28	1.0	0.7	0.3	120

Results have been approved and report finalised on 22/01/2019

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 6889

Date Issued: 22/01/2019
Sampling Conditions: 100% cloudcover, 21°C

vgt Laboratories Pty Ltd

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6889/1	D08&9 Hitchcock Rd Olive Grove	10/01/2019 09:06	D.Walker	AS3580.10.1	CuSO4	
6889/2	D10 Hearses Rd	10/01/2019 09:14	D.Walker	AS3580.10.1	CuSO4	
6889/3	D06 School	10/01/2019 09:54	D.Walker	AS3580.10.1	CuSO4	Minor insects
6889/4	D05 Bund	10/01/2019 10:02	D.Walker	AS3580.10.1	CuSO4	Minor insects
6889/5	D04 Rehab	10/01/2019 10:24	D.Walker	AS3580.10.1	CuSO4	Algae
6889/6	D07 Mullock	10/01/2019 10:34	D.Walker	AS3580.10.1	CuSO4	
6889/7	D01(A) Front Gate	10/01/2019 10:12	D.Walker	AS3580.10.1	CuSO4	Full, minor insects, minor algae
6889/8	D11 Goldstien	10/01/2019 09:25	D.Walker	AS3580.10.1	CuSO4	Minor vegetation
6889/9	D12 Ram	10/01/2019 09:43	D.Walker	AS3580.10.1	CuSO4	

Sampling procedures have been approved and report finalised on 22/01/2019
Where method is "unknown" sampling procedures are not endorsed.

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Report Number: 6997

Date Issued: 15/02/2019 Revision Number: 00

Site/Job: Dixon Maroota Dusts

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 9 samples were received on 7/02/2019 and tested at 4/30 Glenwood Dr Thornton, NSW 2322

Client Sample Reference	Date Sampled	Licence Ref /GPS	Laboratory ID	Matrix	Comment or Non-compliances
D08&9 Hitchcock Rd Olive Grove	07/02/2019 09:28		6997/1	Dust	
D10 Hearses Rd	07/02/2019 10:01		6997/2	Dust	
D06 School	07/02/2019 10:25		6997/3	Dust	
D05 Bund	07/02/2019 10:36		6997/4	Dust	
D04 Rehab	07/02/2019 10:54		6997/5	Dust	
D07 Mullock	07/02/2019 11:01		6997/6	Dust	
D01(A) Front Gate	07/02/2019 10:44		6997/7	Dust	
D11 Goldstien	07/02/2019 09:46		6997/8	Dust	
D12 Ram	07/02/2019 10:17		6997/9	Dust	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

NATA Accredited Laboratory – 20375

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WORLD RECOGNISED ACCREDITATION

Anthony Crane
Laboratory Manager

Test Report Number: 6997

Date Issued: 15/02/2019
Tested between: 7/02/19 and 15/02/19

Results

Sample #	Sample Description	Date On	Date Off Units Method Code Limit of Report	Number of Days days AS 3580.10.1	Insoluble Solids g/m2/mth AS 3580.10.1 0.1	Ash g/m2/mth AS 3580.10.1 0.1	Combustible Matter g/m2/mth AS 3580.10.1 0.1	Calculated Rain mm AS 3580.10.1 1
6997/1	D08&9 Hitchcock Rd Olive Grove	10/01/2019 09:06	07/02/2019 09:28	28	2.7	1.2	1.5	52
6997/2	D10 Hearses Rd	10/01/2019 09:14	07/02/2019 10:01	28	0.8	0.8	<0.1	67
6997/3	D06 School	10/01/2019 09:54	07/02/2019 10:25	28	0.8	0.5	0.3	68
6997/4	D05 Bund	10/01/2019 10:02	07/02/2019 10:36	28	0.9	0.5	0.4	75
6997/5	D04 Rehab	10/01/2019 10:24	07/02/2019 10:54	28	1.9	0.8	1.1	71
6997/6	D07 Mullock	10/01/2019 10:34	07/02/2019 11:01	28	1.2	0.7	0.5	71
6997/7	D01(A) Front Gate	10/01/2019 10:12	07/02/2019 10:44	28	1.5	1.0	0.5	76
6997/8	D11 Goldstien	10/01/2019 09:25	07/02/2019 09:46	28	0.9	<0.1	0.9	66
6997/9	D12 Ram	10/01/2019 09:43	07/02/2019 10:17	28	1.4	0.1	1.3	71

Results have been approved and report finalised on 15/02/2019

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 6997

Date Issued: 15/02/2019
Sampling Conditions: Fine 26°-28°C

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6997/1	D08&9 Hitchcock Rd Olive Grove	07/02/2019 09:28	T.Walker	AS3580.10.1	CuSO4	Minor insects
6997/2	D10 Hearses Rd	07/02/2019 10:01	T.Walker	AS3580.10.1	CuSO4	
6997/3	D06 School	07/02/2019 10:25	T.Walker	AS3580.10.1	CuSO4	
6997/4	D05 Bund	07/02/2019 10:36	T.Walker	AS3580.10.1	CuSO4	
6997/5	D04 Rehab	07/02/2019 10:54	T.Walker	AS3580.10.1	CuSO4	
6997/6	D07 Mullock	07/02/2019 11:01	T.Walker	AS3580.10.1	CuSO4	
6997/7	D01(A) Front Gate	07/02/2019 10:44	T.Walker	AS3580.10.1	CuSO4	
6997/8	D11 Goldstien	07/02/2019 09:46	T.Walker	AS3580.10.1	CuSO4	
6997/9	D12 Ram	07/02/2019 10:17	T.Walker	AS3580.10.1	CuSO4	

Sampling procedures have been approved and report finalised on 15/02/2019
Where method is "unknown" sampling procedures are not endorsed.

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Report Number: 7106

Date Issued: 19/03/2019 Revision Number: 00

Site/Job: Dixon Maroota Dusts

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 9 samples were received on 7/03/2019 and tested at 4/30 Glenwood Dr Thornton, NSW 2322

Client Sample Reference	Date Sampled	Licence Ref /GPS	Laboratory ID	Matrix	Comment or Non-compliances
D08&9 Hitchcock Rd Olive Grove	07/03/2019 09:40		7106/1	Dust	
D10 Hearses Rd	07/03/2019 09:51		7106/2	Dust	
D06 School	07/03/2019 10:42		7106/3	Dust	
D05 Bund	07/03/2019 10:54		7106/4	Dust	
D04 Rehab	07/03/2019 11:17		7106/5	Dust	
D07 Mullock	07/03/2019 11:30		7106/6	Dust	
D01(A) Front Gate	07/03/2019 11:05		7106/7	Dust	
D11 Goldstien	07/03/2019 10:04		7106/8	Dust	
D12 Ram	07/03/2019 10:28		7106/9	Dust	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

NATA Accredited Laboratory – 20375

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

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Anthony Crane
Laboratory Manager

Lisa Thomson
Laboratory Manager

Test Report Number: 7106

Date Issued: 19/03/2019
Tested between: 7/03/19 and 19/03/19

Results

Sample #	Sample Description	Date On	Date Off Units Method Code Limit of Report	Number of Days days AS 3580.10.1	Insoluble Solids g/m2/mth AS 3580.10.1 0.1	Ash g/m2/mth AS 3580.10.1 0.1	Combustible Matter g/m2/mth AS 3580.10.1 0.1	Calculated Rain mm AS 3580.10.1 1
7106/1	D08&9 Hitchcock Rd Olive Grove	07/02/2019 09:28	07/03/2019 09:40	28	1.2	0.8	0.4	35
7106/2	D10 Hearses Rd	07/02/2019 10:01	07/03/2019 09:51	28	**4.4**	2.9	1.5	33
7106/3	D06 School	07/02/2019 10:25	07/03/2019 10:42	28	1.5	1.0	0.5	47
7106/4	D05 Bund	07/02/2019 10:36	07/03/2019 10:54	28	1.4	1.0	0.4	41
7106/5	D04 Rehab	07/02/2019 10:54	07/03/2019 11:17	28	1.6	1.2	0.4	37
7106/6	D07 Mullock	07/02/2019 11:01	07/03/2019 11:30	28	0.9	0.7	0.2	36
7106/7	D01(A) Front Gate	07/02/2019 10:44	07/03/2019 11:05	28	1.8	1.2	0.6	48
7106/8	D11 Goldstien	07/02/2019 09:46	07/03/2019 10:04	28	2.3	1.5	0.8	27
7106/9	D12 Ram	07/02/2019 10:17	07/03/2019 10:28	28	1.0	0.6	0.4	26

Results have been approved and report finalised on 19/03/2019

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 7106

Date Issued: 19/03/2019
Sampling Conditions: 100% cloud cover, 21°C

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
7106/1	D08&9 Hitchcock Rd Olive Grove	07/03/2019 09:40	T.Walker	AS3580.10.1	CuSO4	
7106/2	D10 Hearses Rd	07/03/2019 09:51	T.Walker	AS3580.10.1	CuSO4	Minor vegetation, slashing
7106/3	D06 School	07/03/2019 10:42	T.Walker	AS3580.10.1	CuSO4	
7106/4	D05 Bund	07/03/2019 10:54	T.Walker	AS3580.10.1	CuSO4	
7106/5	D04 Rehab	07/03/2019 11:17	T.Walker	AS3580.10.1	CuSO4	
7106/6	D07 Mullock	07/03/2019 11:30	T.Walker	AS3580.10.1	CuSO4	
7106/7	D01(A) Front Gate	07/03/2019 11:05	T.Walker	AS3580.10.1	CuSO4	
7106/8	D11 Goldstien	07/03/2019 10:04	T.Walker	AS3580.10.1	CuSO4	Minor insects
7106/9	D12 Ram	07/03/2019 10:28	T.Walker	AS3580.10.1	CuSO4	

Sampling procedures have been approved and report finalised on 19/03/2019
Where method is "unknown" sampling procedures are not endorsed.

NATA Accredited Laboratory – 20375

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Report Number: 7392

Date Issued: 10/05/2019 Revision Number: 00

Site/Job: Dixon Maroota Dusts

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 9 samples were received on 2/05/2019 and tested at 4/30 Glenwood Dr Thornton, NSW 2322

Client Sample Reference	Date Sampled	Licence Ref /GPS	Laboratory ID	Matrix	Comment or Non-compliances
D08&9 Hitchcock Rd Olive Grove	02/05/2019 09:14		7392/1	Dust	
D10 Hearses Rd	02/05/2019 09:24		7392/2	Dust	Paddock NE of gauge cleared to base earth
D06 School	02/05/2019 10:16		7392/3	Dust	
D05 Bund	02/05/2019 10:29		7392/4	Dust	
D04 Rehab	02/05/2019 10:58		7392/5	Dust	
D07 Mullock	02/05/2019 11:10		7392/6	Dust	
D01(A) Front Gate	02/05/2019 10:44		7392/7	Dust	
D11 Goldstien	02/05/2019 09:42		7392/8	Dust	Mature trees obstructing clear sky
D12 Ram	02/05/2019 10:01		7392/9	Dust	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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

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Test Report Number: 7392

Date Issued: 10/05/2019
Tested between: 2/05/19 and 10/05/19

Results

Sample #	Sample Description	Date On	Date Off Units Method Code Limit of Report	Number of Days days AS 3580.10.1	Insoluble Solids g/m2/mth AS 3580.10.1 0.1	Ash g/m2/mth AS 3580.10.1 0.1	Combustible Matter g/m2/mth AS 3580.10.1 0.1	Calculated Rain mm AS 3580.10.1 1
7392/1	D08&9 Hitchcock Rd Olive Grove	04/04/2019 09:21	02/05/2019 09:14	28	3.0	1.7	1.3	24
7392/2	D10 Hearses Rd	04/04/2019 09:28	02/05/2019 09:24	28	**5.4**	1.5	3.9	19
7392/3	D06 School	04/04/2019 10:00	02/05/2019 10:16	28	0.4	0.4	<0.1	24
7392/4	D05 Bund	04/04/2019 10:10	02/05/2019 10:29	28	0.5	0.4	0.1	25
7392/5	D04 Rehab	04/04/2019 10:30	02/05/2019 10:58	28	0.3	0.2	0.1	23
7392/6	D07 Mullock	04/04/2019 10:36	02/05/2019 11:10	28	0.3	0.3	<0.1	24
7392/7	D01(A) Front Gate	04/04/2019 10:19	02/05/2019 10:44	28	0.7	0.7	<0.1	24
7392/8	D11 Goldstien	04/04/2019 09:36	02/05/2019 09:42	28	1.3	0.5	0.8	16
7392/9	D12 Ram	04/04/2019 09:52	02/05/2019 10:01	28	0.5	0.4	0.1	20

Results have been approved and report finalised on 10/05/2019

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 7392

Date Issued: 10/05/2019
Sampling Conditions: Cloudy 20°C

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Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
7392/1	D08&9 Hitchcock Rd Olive Grove	02/05/2019 09:14	T.Walker	AS3580.10.1	CuSO4	Minor insects, bird droppings
7392/2	D10 Hearses Rd	02/05/2019 09:24	T.Walker	AS3580.10.1	CuSO4	Insects, vegetation, algae
7392/3	D06 School	02/05/2019 10:16	T.Walker	AS3580.10.1	CuSO4	Clear
7392/4	D05 Bund	02/05/2019 10:29	T.Walker	AS3580.10.1	CuSO4	Clear
7392/5	D04 Rehab	02/05/2019 10:58	T.Walker	AS3580.10.1	CuSO4	Clear
7392/6	D07 Mullock	02/05/2019 11:10	T.Walker	AS3580.10.1	CuSO4	Clear
7392/7	D01(A) Front Gate	02/05/2019 10:44	T.Walker	AS3580.10.1	CuSO4	Clear
7392/8	D11 Goldstien	02/05/2019 09:42	T.Walker	AS3580.10.1	CuSO4	Minor insects, vegetation
7392/9	D12 Ram	02/05/2019 10:01	T.Walker	AS3580.10.1	CuSO4	

Sampling procedures have been approved and report finalised on 10/05/2019
Where method is "unknown" sampling procedures are not endorsed.

NATA Accredited Laboratory – 20375

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

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Report Number: 7541

Date Issued: 11/06/2019 Revision Number: 00

Site/Job: Dixon Maroota Dusts

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 9 samples were received on 30/05/2019 and tested at 4/30 Glenwood Dr Thornton, NSW 2322

Client Sample Reference	Date Sampled	Licence Ref /GPS	Laboratory ID	Matrix	Comment or Non-compliances
D08&9 Hitchcock Rd Olive Grove	30/05/2019 10:04		7541/1	Dust	
D10 Hearses Rd	30/05/2019 10:15		7541/2	Dust	
D06 School	30/05/2019 09:56		7541/3	Dust	
D05 Bund	30/05/2019 09:44		7541/4	Dust	
D04 Rehab	30/05/2019 09:19		7541/5	Dust	
D07 Mullock	30/05/2019 09:29		7541/6	Dust	
D01(A) Front Gate	30/05/2019 09:08		7541/7	Dust	
D11 Goldstien	30/05/2019 10:27		7541/8	Dust	Mature trees obstructing clear sky
D12 Ram	30/05/2019 10:45		7541/9	Dust	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Test Report Number: 7541

Date Issued: 11/06/2019
Tested between: 30/05/19 and 11/06/19

Results

Sample #	Sample Description	Date On	Date Off Units Method Code Limit of Report	Number of Days days AS 3580.10.1	Insoluble Solids g/m2/mth AS 3580.10.1 0.1	Ash g/m2/mth AS 3580.10.1 0.1	Combustible Matter g/m2/mth AS 3580.10.1 0.1	Calculated Rain mm AS 3580.10.1 1
7541/1	D08&9 Hitchcock Rd Olive Grove	02/05/2019 09:14	30/05/2019 10:04	28	0.5	0.4	0.1	6
7541/2	D10 Hearses Rd	02/05/2019 09:14	30/05/2019 10:15	28	1.5	1.2	0.3	7
7541/3	D06 School	02/05/2019 09:14	30/05/2019 09:56	28	0.6	0.5	0.1	9
7541/4	D05 Bund	02/05/2019 09:14	30/05/2019 09:44	28	1.4	1.0	0.4	9
7541/5	D04 Rehab	02/05/2019 09:14	30/05/2019 09:19	28	0.7	0.4	0.3	8
7541/6	D07 Mullock	02/05/2019 09:14	30/05/2019 09:29	28	0.8	0.7	0.1	8
7541/7	D01(A) Front Gate	02/05/2019 09:14	30/05/2019 09:08	28	1.2	0.9	0.3	9
7541/8	D11 Goldstien	02/05/2019 09:14	30/05/2019 10:27	28	0.7	0.2	0.5	7
7541/9	D12 Ram	02/05/2019 09:14	30/05/2019 10:45	28	0.5	0.3	0.2	9

Results have been approved and report finalised on 11/06/2019

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Sampling Report Number: 7541

Date Issued: 11/06/2019
Sampling Conditions: Fine 8°-10°C

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
7541/1	D08&9 Hitchcock Rd Olive Grove	30/05/2019 10:04	T.Walker	AS3580.10.1	CuSO4	
7541/2	D10 Hearses Rd	30/05/2019 10:15	T.Walker	AS3580.10.1	CuSO4	Minor vegetation, insects
7541/3	D06 School	30/05/2019 09:56	T.Walker	AS3580.10.1	CuSO4	
7541/4	D05 Bund	30/05/2019 09:44	T.Walker	AS3580.10.1	CuSO4	Minor insects, bird droppings
7541/5	D04 Rehab	30/05/2019 09:19	T.Walker	AS3580.10.1	CuSO4	
7541/6	D07 Mullock	30/05/2019 09:29	T.Walker	AS3580.10.1	CuSO4	
7541/7	D01(A) Front Gate	30/05/2019 09:08	T.Walker	AS3580.10.1	CuSO4	
7541/8	D11 Goldstien	30/05/2019 10:27	T.Walker	AS3580.10.1	CuSO4	Vegetation
7541/9	D12 Ram	30/05/2019 10:45	T.Walker	AS3580.10.1	CuSO4	

Sampling procedures have been approved and report finalised on 11/06/2019
Where method is "unknown" sampling procedures are not endorsed.

NATA Accredited Laboratory – 20375

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

vgt
Laboratories Pty Ltd
PO Box 2335 Greenhills NSW 2323
P (02)4028 6412 E mail@vgt.com.au
www.vgt.com.au ABN 77 621 943 800

Report Number: 7648

Date Issued: 11/07/2019 Revision Number: 00

Site/Job: Dixon Maroota Dusts

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 9 samples were received on 27/06/2019 and tested at 4/30 Glenwood Dr Thornton, NSW 2322

Client Sample Reference	Date Sampled	Licence Ref /GPS	Laboratory ID	Matrix	Comment or Non-compliances
D08&9 Hitchcock Rd Olive Grove	27/06/2019 08:58		7648/1	Dust	
D10 Hearses Rd	27/06/2019 09:46		7648/2	Dust	
D06 School	27/06/2019 10:14		7648/3	Dust	
D05 Bund	27/06/2019 10:23		7648/4	Dust	
D04 Rehab	27/06/2019 10:48		7648/5	Dust	
D07 Mullock	27/06/2019 11:02		7648/6	Dust	
D01(A) Front Gate	27/06/2019 10:33		7648/7	Dust	
D11 Goldstien	27/06/2019 09:24		7648/8	Dust	Mature trees obstructing clear sky
D12 Ram	27/06/2019 09:58		7648/9	Dust	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Test Report Number: 7648

Date Issued: 11/07/2019
Tested between: 27/06/19 and 11/07/19

Results

Sample #	Sample Description	Date On	Date Off Units Method Code Limit of Report	Number of Days days AS 3580.10.1	Insoluble Solids g/m2/mth AS 3580.10.1 0.1	Ash g/m2/mth AS 3580.10.1 0.1	Combustible Matter g/m2/mth AS 3580.10.1 0.1	Calculated Rain mm AS 3580.10.1 1
7648/1	D08&9 Hitchcock Rd Olive Grove	30/05/2019 10:04	27/06/2019 08:58	28	1.2	0.6	0.6	52
7648/2	D10 Hearses Rd	30/05/2019 10:15	27/06/2019 09:46	28	**4.6**	3.6	1.0	52
7648/3	D06 School	30/05/2019 09:56	27/06/2019 10:14	28	0.5	0.3	0.2	51
7648/4	D05 Bund	30/05/2019 09:44	27/06/2019 10:23	28	1.9	1.5	0.4	50
7648/5	D04 Rehab	30/05/2019 09:19	27/06/2019 10:48	28	0.6	0.4	0.2	49
7648/6	D07 Mullock	30/05/2019 09:29	27/06/2019 11:02	28	0.6	0.5	0.1	47
7648/7	D01(A) Front Gate	30/05/2019 09:08	27/06/2019 10:33	28	1.7	1.6	0.1	52
7648/8	D11 Goldstien	30/05/2019 10:27	27/06/2019 09:24	28	0.4	0.4	<0.1	53
7648/9	D12 Ram	30/05/2019 10:45	27/06/2019 09:58	28	0.5	0.5	<0.1	52

Results have been approved and report finalised on 11/07/2019

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 7648

Date Issued: 11/07/2019
Sampling Conditions: Cloudy 13°C

vgt Laboratories Pty Ltd

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
7648/1	D08&9 Hitchcock Rd Olive Grove	27/06/2019 08:58	T.Walker	AS3580.10.1	CuSO4	Monir insects
7648/2	D10 Hearses Rd	27/06/2019 09:46	T.Walker	AS3580.10.1	CuSO4	Minor vegetation
7648/3	D06 School	27/06/2019 10:14	T.Walker	AS3580.10.1	CuSO4	
7648/4	D05 Bund	27/06/2019 10:23	T.Walker	AS3580.10.1	CuSO4	
7648/5	D04 Rehab	27/06/2019 10:48	T.Walker	AS3580.10.1	CuSO4	
7648/6	D07 Mullock	27/06/2019 11:02	T.Walker	AS3580.10.1	CuSO4	
7648/7	D01(A) Front Gate	27/06/2019 10:33	T.Walker	AS3580.10.1	CuSO4	
7648/8	D11 Goldstien	27/06/2019 09:24	T.Walker	AS3580.10.1	CuSO4	
7648/9	D12 Ram	27/06/2019 09:58	T.Walker	AS3580.10.1	CuSO4	

Sampling procedures have been approved and report finalised on 11/07/2019
Where method is "unknown" sampling procedures are not endorsed.

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Appendix B – TEOM PM10, TSP and Weather Station Reports

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

July 2018

Amended

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 30 August 2018

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited (CBE) is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for Fine Particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring program includes;

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report was prepared by CBased Environmental and includes the following;

- TEOM (PM_{10}) monitoring results for July 2018; and
- Meteorological results for July 2018.

Current year to date annual average for PM_{10} is calculated from the 1st July 2018 for TEOM's coinciding with the Dixon Sand project year.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- One TEOM PM_{10} 24-hour average result was above the short-term Dixon Sand Quarry consent, 24-hour impact criteria of 50ug/m^3 (18/7/2018);
- The current TEOM PM_{10} annual average is below the Dixon Sand Quarry consent, annual average criteria of 30ug/m3.
- Currently, calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.
- One TEOM PM_{10} 24-hour average result was above the Dixon Sand Quarry EPL limit of 42ug/m^3 (18/7/2018);

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Note that an annual amount of data has not yet been collected.

Approximately 100% of meteorological data was recovered for July 2018.
Approximately 100% of TEOM data was recovered for July 2018.

2.0 Sampling Program

The TEOM is operated to the applicable Australian Standard and OEH (EPA) approved method. All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

The following Australian Standards were used:

AS3580.9.8 (2001) "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*."

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

The location of the air quality monitoring equipment met the Australian Standard AS 3580.1.1 (2007) "*Methods for sampling and analysis of ambient air Part 1.1 Guide to siting air monitoring equipment*". Air Quality monitoring site descriptions and locations are provided in **Table 1**:

Table 1: Dixon Sands Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Reporting Period Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**. During the monitoring period one individual 24-hour TEOM PM_{10} result was above the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m^3 (18 July 2018).

The current TEOM PM_{10} annual average runs from the 1st July 2018. At present it is below the Dixon Sand Quarry long term annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: an annual amount of data has not yet been collected.

A quarterly calibration was undertaken on the TEOM during June 2018 and is next due in September 2018. Calibration certificates are provided in **Appendix 1**.

Table 2: Average Daily 24 Hr TEOM PM_{10} and TSP for July 2018 from AQMS and Annual Average PM_{10} calculated from the 1 July 2018.

Date	TEOM PM_{10} ($\mu g/m^3$)	Annual PM_{10} Average ($\mu g/m^3$)	TSP* ($\mu g/m3$)	TSP Annual** ($\mu g/m3$)
1/07/2018	7.3	7.3	18.3	18.3
2/07/2018	10.9	9.1	27.3	22.8
3/07/2018	8.6	8.9	21.5	22.3
4/07/2018	9.0	9.0	22.5	22.4
5/07/2018	6.4	8.4	16.0	21.1
6/07/2018	8.6	8.5	21.5	21.2
7/07/2018	8.0	8.4	20.0	21.0
8/07/2018	5.8	8.1	14.5	20.2
9/07/2018	10.2	8.3	25.5	20.8
10/07/2018	13.6	8.8	34.0	22.1
11/07/2018	12.2	9.1	30.5	22.9
12/07/2018	8.8	9.1	22.0	22.8
13/07/2018	7.1	9.0	17.8	22.4
14/07/2018	11.0	9.1	27.5	22.8
15/07/2018	7.2	9.0	18.0	22.5
16/07/2018	8.2	8.9	20.5	22.3
17/07/2018	11.9	9.1	29.8	22.8
18/07/2018	**68.2**	12.4	170.5	31.0
19/07/2018	41.3	13.9	103.3	34.8
20/07/2018	18.6	14.1	46.5	35.4
21/07/2018	10.6	14.0	26.5	34.9
22/07/2018	14.4	14.0	36.0	35.0
23/07/2018	10.8	13.9	27.0	34.6
24/07/2018	15.2	13.9	38.0	34.8
25/07/2018	14.3	13.9	35.8	34.8
26/07/2018	16.4	14.0	41.0	35.1
27/07/2018	13.6	14.0	34.0	35.0
28/07/2018	16.7	14.1	41.8	35.3
29/07/2018	12.9	14.1	32.3	35.2
30/07/2018	14.4	14.1	36.0	35.2
31/07/2018	11.2	14.0	28.0	35.0

*Calculated from PM10

**Calculated from PM10 Annual Average

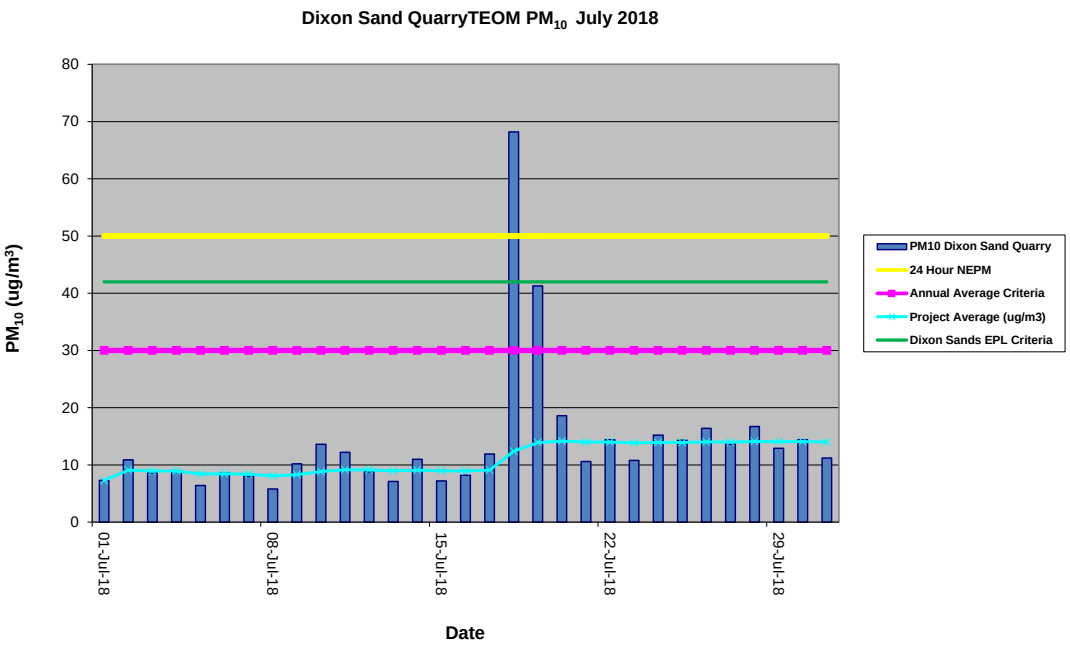


Figure 1: TEOM PM_{10} 24 hr, Annual Average and Criteria

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

The summary of results is presented in **Table 3. Figure 2 and 3** display the charts of meteorological parameters for the month. A windrose is provided in **Figure 4.** This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual calibration was undertaken on the weather station during March 2018 and is next due in March 2019.

Table 3: Meteorological Data Summary for July 2018

Date	Min Temp	Av Temp	Max Temp	RAIN mm	Min WS	Av WS	Max WS	Min Humidity	Av Humidity	Max Humidity	Min Pressure	Av pressure	Max Pressure
1/07/2018	5.3	10.2	16.0	0.0	0.1	2.4	10.3	48.8	68.7	95.4	1005.1	1007.2	1009.2
2/07/2018	8.5	10.3	13.2	0.0	0.0	3.4	10.2	74.2	90.7	99.3	1006.2	1007.9	1009.6
3/07/2018	7.7	11.4	16.2	0.0	0.1	2.9	7.7	62.7	84.7	99.3	1004.3	1006.0	1007.5
4/07/2018	8.2	13.0	18.1	0.0	0.2	3.3	13.0	67.6	85.5	99.2	1001.5	1003.8	1005.9
5/07/2018	10.2	16.6	23.1	0.0	0.2	5.5	17.7	47.1	71.1	99.3	992.4	997.3	1001.5
6/07/2018	10.6	17.5	22.6	0.0	0.3	6.5	31.0	39.6	53.8	68.6	984.8	989.4	992.4
7/07/2018	8.0	10.8	15.4	0.0	0.4	6.1	28.3	37.0	50.3	59.4	986.2	989.1	991.9
8/07/2018	7.5	11.2	16.1	0.0	0.9	5.9	20.7	37.6	49.7	58.9	990.7	993.2	997.1
9/07/2018	7.0	11.0	16.0	0.0	0.2	3.4	15.9	35.7	54.9	73.8	996.9	1000.9	1004.5
10/07/2018	4.5	9.8	16.0	0.0	0.2	2.7	14.0	44.0	66.6	88.2	1002.3	1003.9	1005.9
11/07/2018	5.9	10.7	16.1	0.0	0.0	2.9	10.2	52.2	75.5	92.1	999.3	1001.0	1002.8
12/07/2018	5.6	10.5	16.9	0.0	0.1	3.0	11.8	30.1	65.6	99.2	993.5	996.5	999.7
13/07/2018	5.7	9.6	15.9	0.0	0.1	3.7	14.5	33.8	52.3	67.2	992.9	994.8	996.8
14/07/2018	4.2	9.2	15.5	0.0	0.1	2.7	9.8	29.4	52.8	70.5	994.3	996.1	997.8
15/07/2018	2.9	9.4	17.2	0.0	0.0	2.9	8.5	11.1	40.2	71.7	990.8	993.0	995.2
16/07/2018	4.8	10.1	16.5	0.0	0.2	4.2	14.2	20.5	37.7	57.3	988.8	990.9	993.1
17/07/2018	9.0	14.5	20.4	0.0	0.2	6.9	21.3	14.5	25.7	37.3	989.2	991.8	994.4
18/07/2018	10.9	15.9	20.9	0.0	0.2	4.2	20.7	15.9	33.0	52.4	989.9	994.2	996.3
19/07/2018	9.1	14.9	20.9	0.0	0.2	5.8	26.4	16.5	33.6	48.1	988.6	992.6	995.8
20/07/2018	9.1	13.0	18.5	0.0	0.6	8.2	29.9	23.5	35.0	47.6	983.2	987.8	994.7
21/07/2018	6.2	10.5	15.9	0.0	0.2	3.1	9.7	27.3	43.8	60.5	994.6	998.3	1001.2
22/07/2018	4.3	9.2	15.6	0.0	0.1	2.7	12.6	27.7	54.8	70.0	997.4	1000.1	1002.7
23/07/2018	5.1	11.7	18.3	0.0	0.3	4.7	16.9	21.3	40.0	66.5	991.1	995.0	998.8
24/07/2018	12.4	16.6	22.7	0.0	0.3	5.8	21.1	10.3	20.8	29.6	989.0	990.9	992.5
25/07/2018	9.9	15.4	21.3	0.0	0.2	5.4	19.6	23.1	34.3	46.7	992.2	993.7	995.8
26/07/2018	8.2	13.2	19.6	0.0	0.2	3.4	12.6	31.6	55.1	74.4	992.8	995.4	997.5
27/07/2018	7.2	12.8	18.9	0.0	0.3	2.9	9.0	25.6	49.1	74.8	991.8	994.1	995.8
28/07/2018	9.3	14.5	20.6	0.0	0.1	4.1	12.7	25.3	43.7	55.8	989.3	992.8	995.5
29/07/2018	11.9	16.5	22.5	1.4	1.2	7.8	27.7	29.1	52.3	87.6	982.8	986.9	991.0
30/07/2018	8.1	12.3	18.1	0.0	0.2	4.5	15.5	21.2	39.7	55.4	990.7	993.3	995.8
31/07/2018	7.4	13.2	20.3	0.0	0.3	5.7	18.7	18.6	38.3	58.0	991.3	993.8	995.6
Monthly	2.9	12.4	23.1	1.4	0.0	4.4	31.0	10.3	51.6	99.3	982.8	995.9	1009.6

Figure 2: Rainfall, Temperature and Humidity Charts

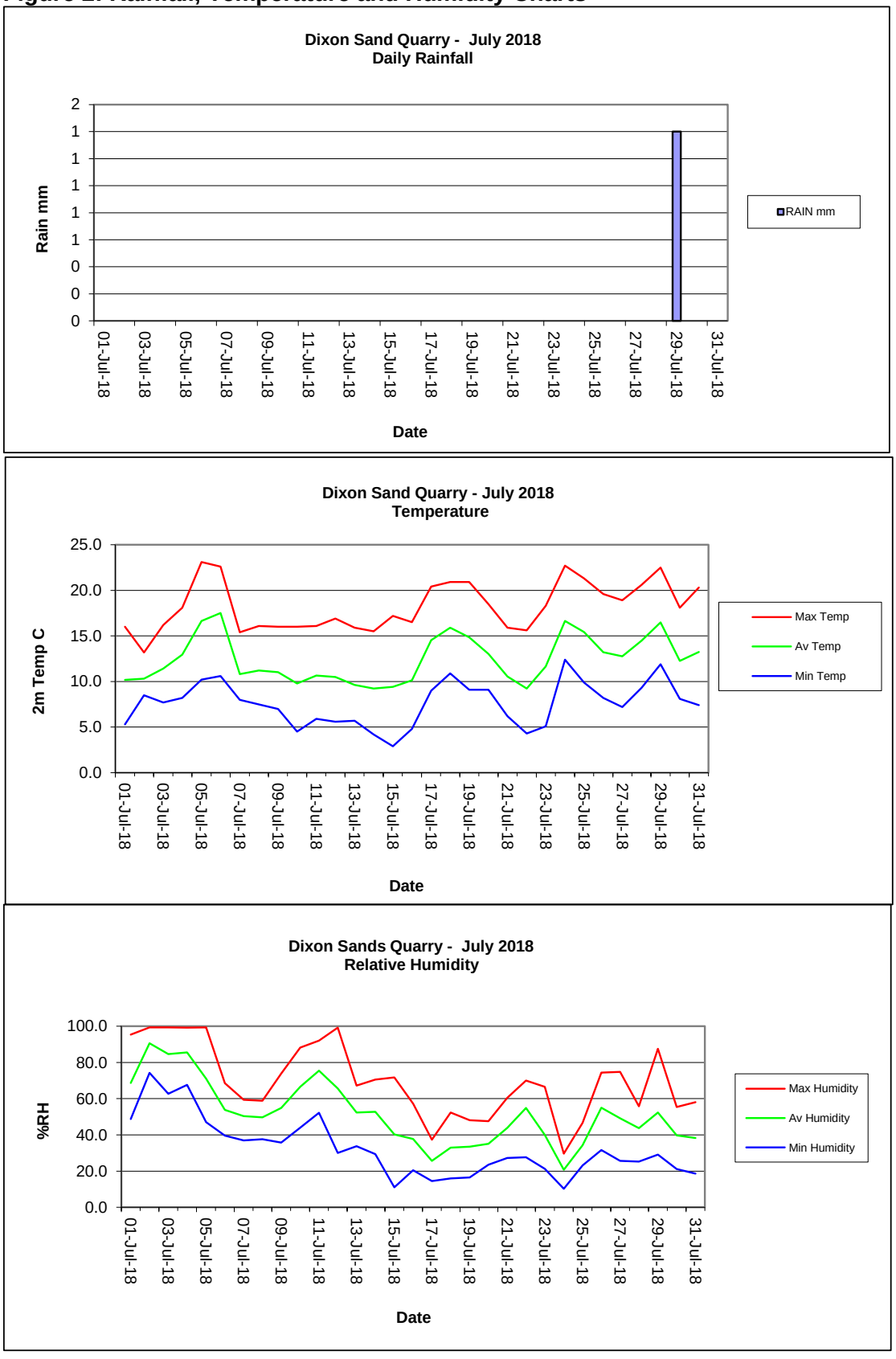
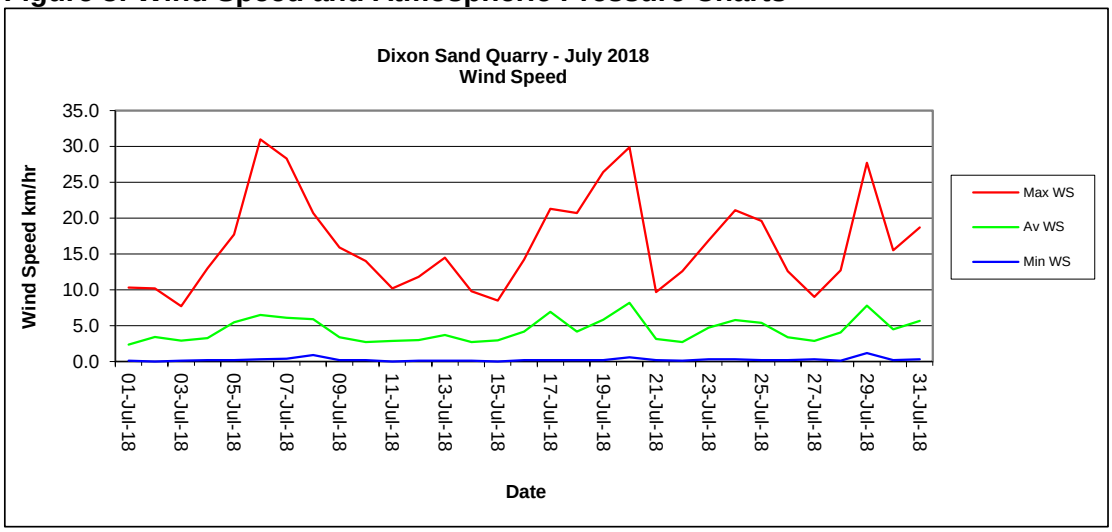


Figure 3: Wind Speed and Atmospheric Pressure Charts



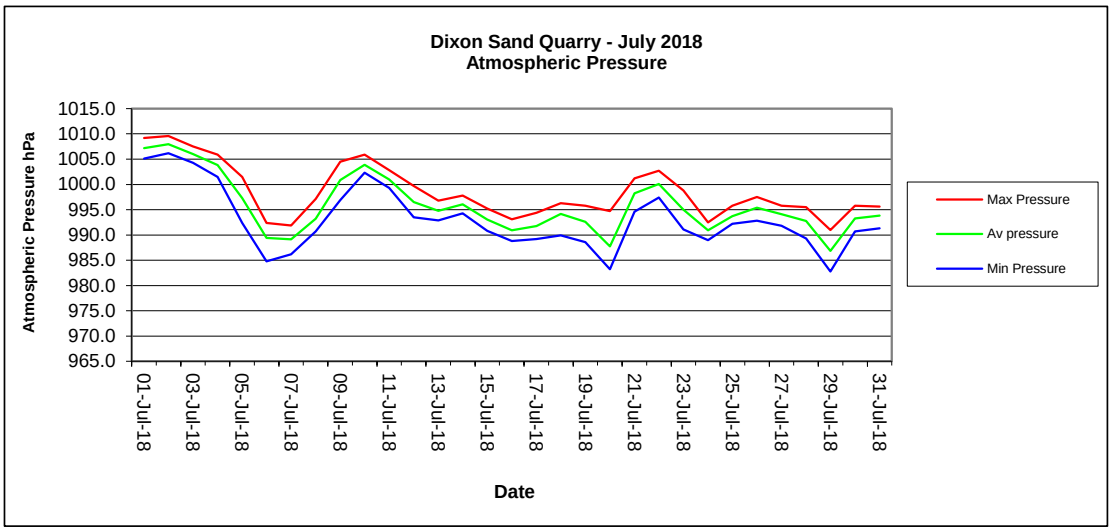
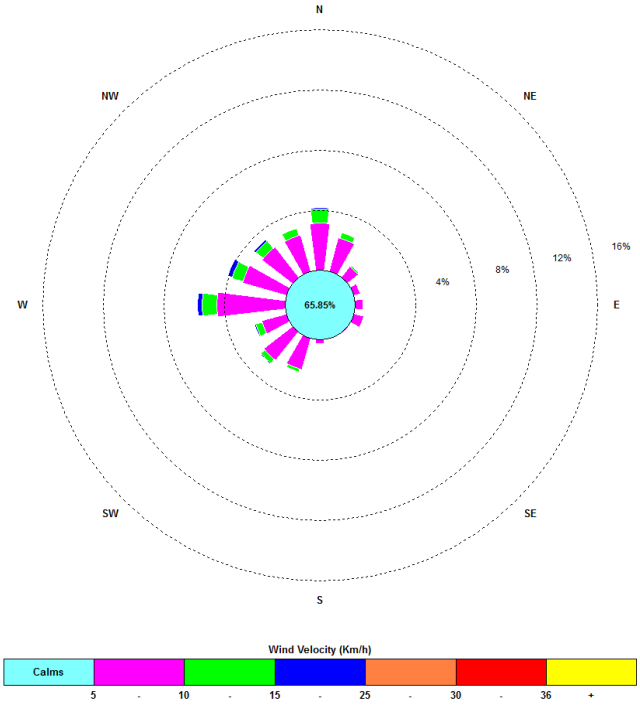


Figure 4: Windrose Plot (km/h)

00:00 1 July 2018 – 23:55 31 July 2018



Appendix 1

Calibration Documents (when required)

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

August 2018

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 24 September 2018

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited (CBE) is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for Fine Particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring program includes;

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report was prepared by CBased Environmental and includes the following;

- TEOM (PM_{10}) monitoring results for August 2018; and
- Meteorological results for August 2018.

Current year to date annual average for PM_{10} is calculated from the 1st July 2018 for TEOM's coinciding with the Dixon Sand project year.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- All TEOM PM_{10} 24-hour average results were below the short-term Dixon Sand Quarry consent, 24-hour impact criteria of 50ug/m^3;
- The current TEOM PM_{10} annual average is below the Dixon Sand Quarry consent, annual average criteria of 30ug/m3.
- Currently, calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.
- One TEOM PM_{10} 24-hour average result was above the Dixon Sand Quarry EPL limit of 42ug/m^3 (7/8/2018);

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Note that an annual amount of data has not yet been collected.

Approximately 100% of meteorological data was recovered for August 2018.
Approximately 100% of TEOM data was recovered for August 2018.

2.0 Sampling Program

The TEOM is operated to the applicable Australian Standard and OEH (EPA) approved method. All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

The following Australian Standards were used:

AS3580.9.8 (2001) "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*."

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

The location of the air quality monitoring equipment met the Australian Standard AS 3580.1.1 (2007) "*Methods for sampling and analysis of ambient air Part 1.1 Guide to siting air monitoring equipment*". Air Quality monitoring site descriptions and locations are provided in **Table 1**:

Table 1: Dixon Sands Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Reporting Period Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**. During the monitoring period all individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3. The Dixon Sand Quarry EPL limit of 42ug/m^3 was exceeded once (7 August 2018).

The current TEOM PM_{10} annual average runs from the 1st July 2018. At present it is below the Dixon Sand Quarry long term annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: an annual amount of data has not yet been collected.

A quarterly calibration was undertaken on the TEOM during June 2018 and is next due in September 2018. Calibration certificates are provided in **Appendix 1**.

Table 2: Average Daily 24 Hr TEOM PM_{10} and TSP for August 2018 from AQMS and Annual Average PM_{10} calculated from the 1 July 2018.

Date	TEOM PM_{10} ($\mu g/m^3$)	Annual PM_{10} Average ($\mu g/m^3$)	TSP* ($\mu g/m3$)	TSP Annual** ($\mu g/m3$)
1/08/2018	12.3	13.9	30.8	34.8
2/08/2018	19.0	14.1	47.5	35.2
3/08/2018	17.3	14.2	43.3	35.4
4/08/2018	10.5	14.1	26.3	35.2
5/08/2018	15.1	14.1	37.8	35.3
6/08/2018	21.2	14.3	53.0	35.7
7/08/2018	**42.3**	15.0	105.8	37.6
8/08/2018	11.1	14.9	27.8	37.3
9/08/2018	11.0	14.8	27.5	37.1
10/08/2018	11.2	14.7	28.0	36.9
11/08/2018	16.9	14.8	42.3	37.0
12/08/2018	6.6	14.6	16.5	36.5
13/08/2018	7.2	14.4	18.0	36.1
14/08/2018	6.9	14.3	17.3	35.7
15/08/2018	19.1	14.4	47.8	35.9
16/08/2018	18.7	14.5	46.8	36.2
17/08/2018	12.1	14.4	30.3	36.0
18/08/2018	20.1	14.5	50.3	36.3
19/08/2018	15.6	14.6	39.0	36.4
20/08/2018	13.0	14.5	32.5	36.3
21/08/2018	10.6	14.4	26.5	36.1
22/08/2018	12.9	14.4	32.3	36.0
23/08/2018	17.6	14.5	44.0	36.2
24/08/2018	13.7	14.5	34.3	36.2
25/08/2018	11.0	14.4	27.5	36.0
26/08/2018	8.2	14.3	20.5	35.7
27/08/2018	13.6	14.3	34.0	35.7
28/08/2018	13.0	14.3	32.5	35.6
29/08/2018	12.9	14.2	32.3	35.6
30/08/2018	14.1	14.2	35.3	35.6
31/08/2018	17.5	14.3	43.8	35.7

*Calculated from PM10

**Calculated from PM10 Annual Average

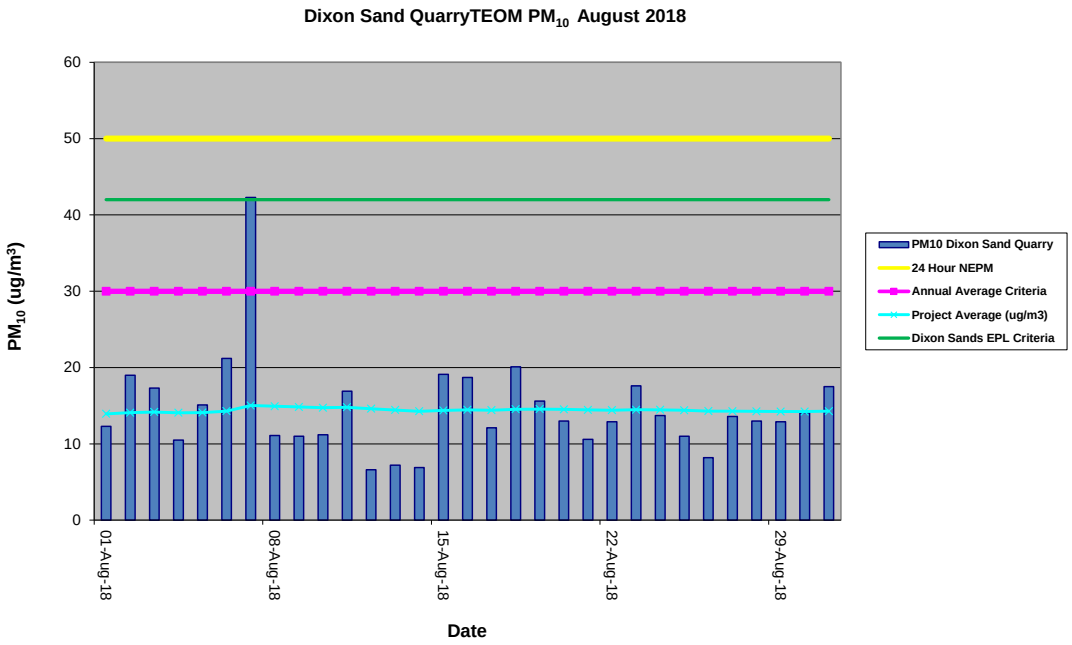


Figure 1: TEOM PM_{10} 24 hr, Annual Average and Criteria

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

The summary of results is presented in **Table 3. Figure 2 and 3** display the charts of meteorological parameters for the month. A windrose is provided in **Figure 4.** This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual calibration was undertaken on the weather station during March 2018 and is next due in March 2019.

Table 3: Meteorological Data Summary for August 2018

Date	Min Temp	Av Temp	Max Temp	RAIN mm	Min WS	Av WS	Max WS	Min Humidity	Av Humidity	Max Humidity	Min Pressure	Av pressure	Max Pressure
1/08/2018	9.8	14.2	19.8	0.0	0.0	4.9	19.4	25.6	38.1	49.2	993.6	996.2	1000.4
2/08/2018	7.1	11.7	17.9	0.0	0.0	3.7	20.0	43.9	64.6	83.9	998.3	1000.5	1003.4
3/08/2018	7.6	14.8	21.5	0.4	0.0	6.3	26.8	28.7	59.8	99.2	987.3	993.0	998.9
4/08/2018	8.9	13.4	17.7	0.0	0.2	4.3	29.5	23.8	44.7	74.4	989.2	992.7	994.9
5/08/2018	7.7	14.2	20.6	0.0	0.2	5.0	14.6	23.3	43.1	66.8	987.6	992.1	995.4
6/08/2018	11.4	14.3	16.8	0.6	0.7	6.6	44.2	34.6	45.8	83.4	981.6	984.8	987.6
7/08/2018	9.2	11.8	15.8	0.0	0.2	6.3	31.0	25.8	39.2	47.3	985.7	988.9	993.3
8/08/2018	6.4	11.9	18.3	0.0	0.0	5.6	21.0	24.5	41.9	58.2	990.6	992.9	995.6
9/08/2018	9.1	12.9	18.9	0.0	0.1	3.6	13.8	29.8	54.7	89.0	995.4	999.1	1001.2
10/08/2018	6.7	14.4	22.1	0.0	0.0	5.8	21.4	19.1	49.3	87.2	993.7	997.5	1001.0
11/08/2018	11.7	17.3	23.8	0.0	1.0	8.4	32.8	17.3	31.7	51.1	985.3	989.3	993.7
12/08/2018	6.9	10.5	15.6	0.0	0.6	5.2	23.6	22.9	44.1	59.8	989.5	994.2	999.4
13/08/2018	5.8	11.4	19.0	0.0	0.2	4.0	15.0	28.8	46.1	57.8	997.0	998.8	1000.3
14/08/2018	7.4	14.4	21.8	0.0	0.3	3.5	10.2	17.7	39.6	63.1	995.3	998.2	1001.1
15/08/2018	11.5	17.1	23.5	0.0	0.6	7.9	32.4	10.8	27.5	49.0	986.9	990.5	995.6
16/08/2018	9.5	16.5	20.9	0.0	0.2	5.6	24.4	17.0	27.7	47.3	986.2	988.6	992.6
17/08/2018	6.7	11.5	18.0	0.0	0.1	3.5	18.6	22.4	38.6	54.8	990.1	992.2	993.7
18/08/2018	8.1	13.0	20.6	0.0	0.5	6.8	31.7	19.3	38.8	51.1	984.9	989.5	992.1
19/08/2018	6.7	10.4	14.8	0.0	0.1	7.3	37.9	25.0	38.6	51.4	988.8	990.8	994.6
20/08/2018	5.2	9.2	14.8	0.0	0.3	5.2	23.3	19.9	39.3	56.0	994.6	996.1	998.0
21/08/2018	6.3	10.9	16.6	0.0	0.4	5.6	20.9	30.8	44.8	56.9	989.7	992.0	995.2
22/08/2018	8.1	11.4	17.6	0.0	0.1	3.9	15.3	26.9	52.2	63.3	990.1	993.0	996.7
23/08/2018	6.9	11.4	15.6	0.0	0.0	3.7	17.4	45.8	69.0	91.7	995.9	998.0	1000.3
24/08/2018	9.3	12.3	17.8	0.0	0.0	3.5	15.8	49.1	80.9	99.2	998.8	1000.2	1001.9
25/08/2018	8.8	11.7	14.9	0.8	0.1	2.2	9.2	71.3	87.6	99.2	996.3	998.5	1000.7
26/08/2018	9.6	11.7	15.6	1.0	0.1	2.0	5.6	62.9	87.3	99.2	991.1	993.7	996.3
27/08/2018	8.3	10.4	12.8	0.2	0.3	3.1	10.0	53.4	78.4	99.3	992.7	997.5	1001.3
28/08/2018	6.7	9.1	14.6	0.0	0.0	4.3	17.1	33.6	57.9	77.0	994.5	997.7	1000.6
29/08/2018	3.4	8.9	16.0	0.0	0.0	3.6	14.3	23.3	56.8	84.5	994.3	996.0	997.2
30/08/2018	3.4	10.3	18.4	0.0	0.1	3.6	20.3	15.5	51.6	74.9	994.3	996.5	999.1
31/08/2018	8.0	11.7	15.4	1.2	0.0	3.8	20.2	52.3	64.4	79.5	979.8	985.7	994.7
Monthly	3.4	12.4	23.8	4.2	0.0	4.8	44.2	10.8	51.1	99.3	979.8	994.0	1003.4

Figure 2: Rainfall, Temperature and Humidity Charts

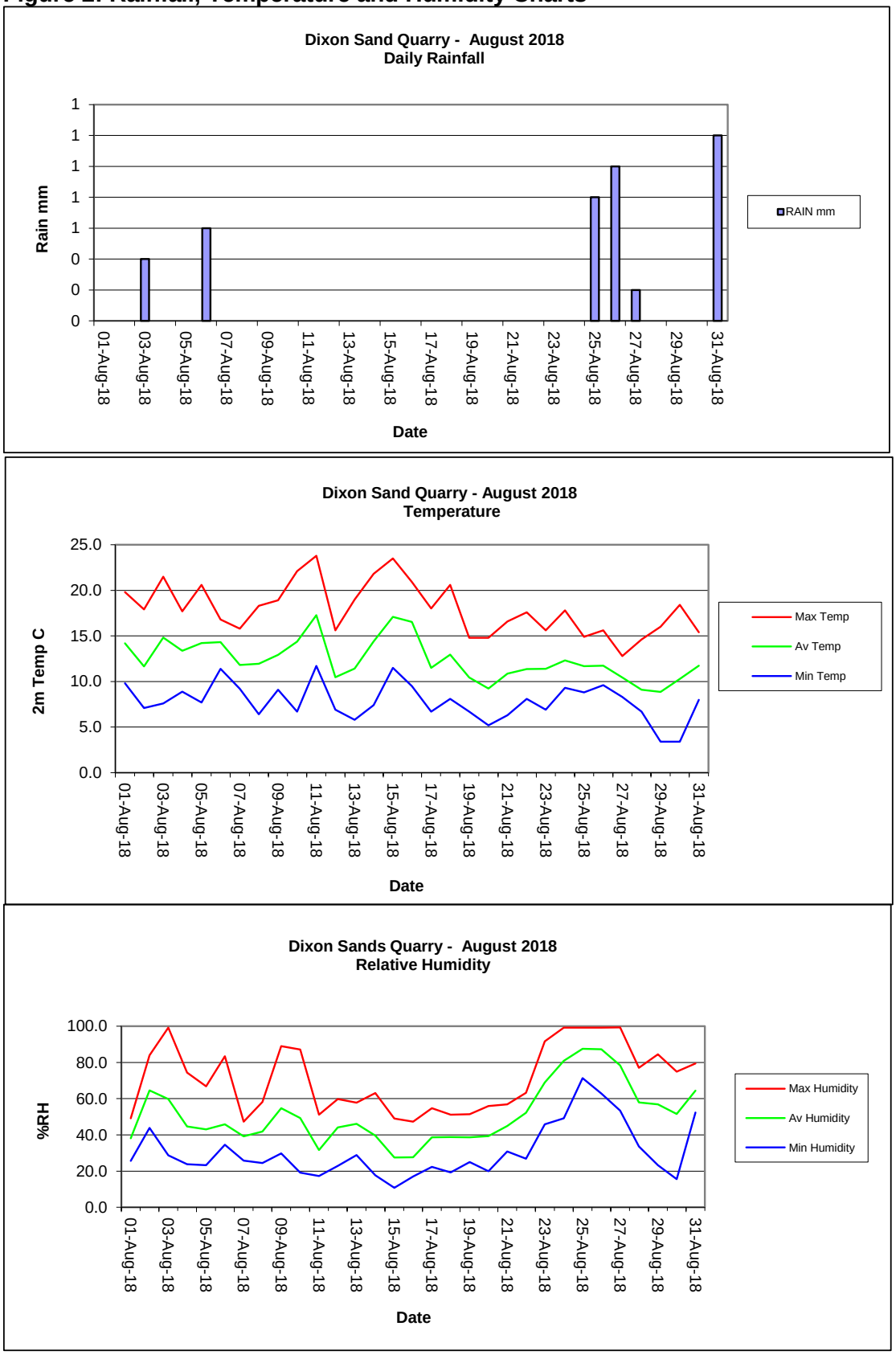
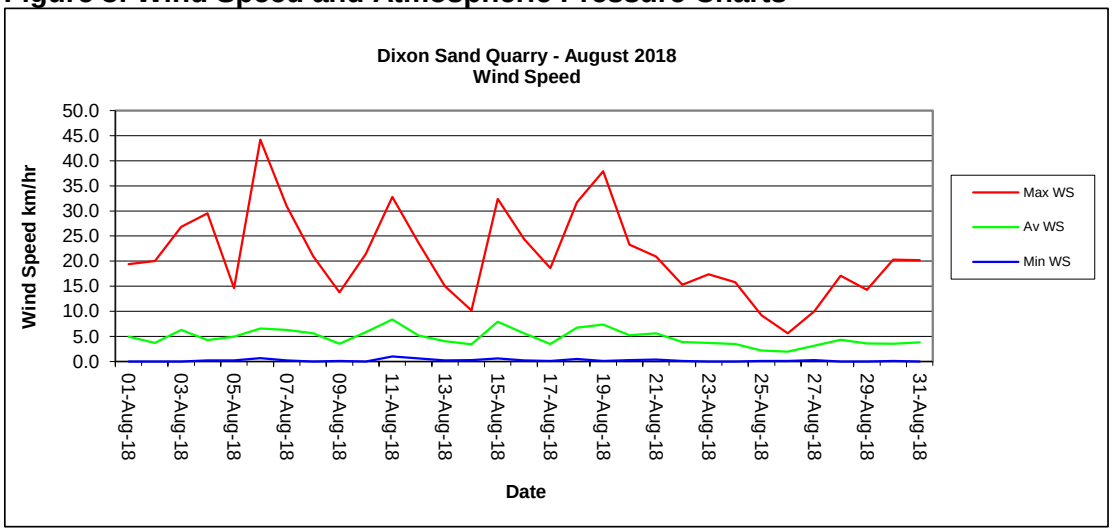


Figure 3: Wind Speed and Atmospheric Pressure Charts



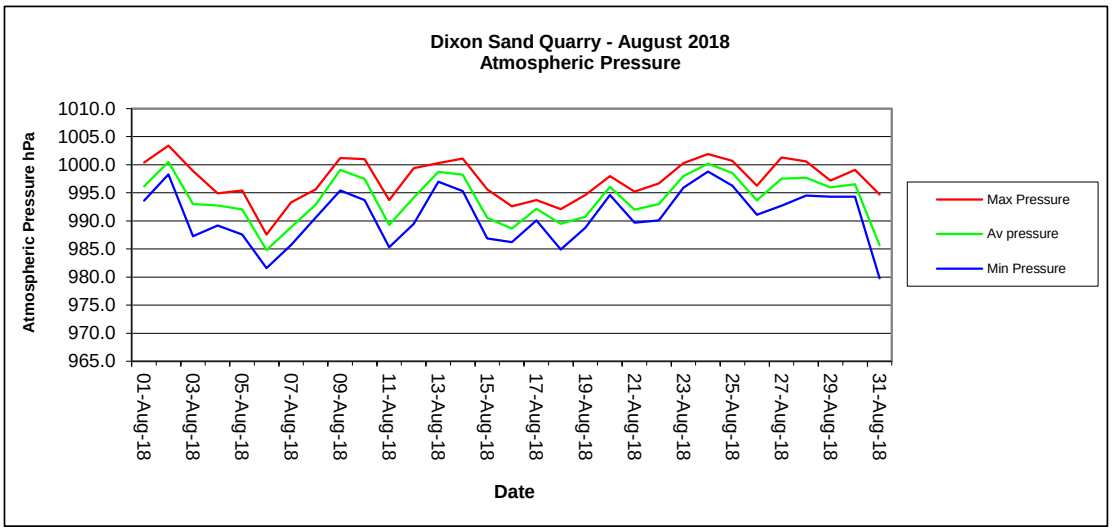
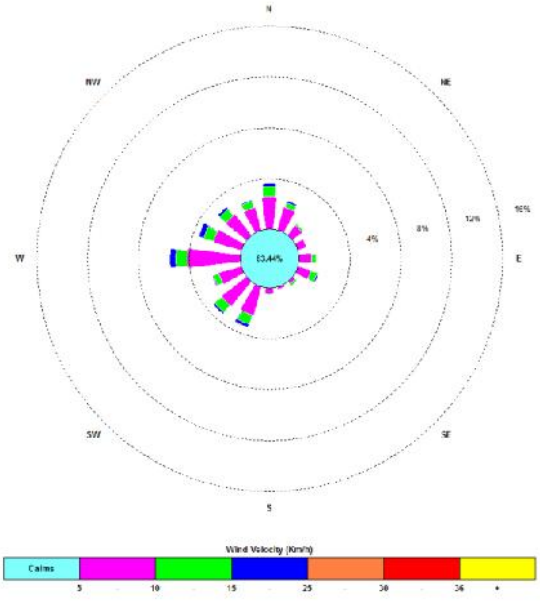


Figure 4: Windrose Plot (km/h)

00:00 1 August 2018 – 23:55 31 August 2018



Appendix 1

Calibration Documents (when required)

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

September 2018

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 9 October 2018

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

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Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Note that an annual amount of data has not yet been collected.

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Approximately 100% of TEOM data was recovered for September 2018.

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3.1 TEOM PM_{10}

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Table 2: Average Daily 24 Hr TEOM PM_{10} and TSP for September 2018 from AQMS and Annual Average PM_{10} calculated from the 1 July 2018.

Date	TEOM PM_{10} (µg/m^3)	Annual PM_{10} Average (µg/m^3)	TSP* (µg/m3)	TSP Annual** (µg/m3)
1/09/2018	6.8	14.2	17.0	35.4
2/09/2018	10.7	14.1	26.8	35.3
3/09/2018	10.8	14.1	27.0	35.2
4/09/2018	7.2	14.0	18.0	34.9
5/09/2018	6.8	13.9	17.0	34.6
6/09/2018	9.7	13.8	24.3	34.5
7/09/2018	6.7	13.7	16.8	34.2
8/09/2018	11.9	13.7	29.8	34.2
9/09/2018	7.4	13.6	18.5	33.9
10/09/2018	13.2	13.6	33.0	33.9
11/09/2018	16.0	13.6	40.0	34.0
12/09/2018	15.6	13.6	39.0	34.1
13/09/2018	29.6	13.8	74.0	34.6
14/09/2018	24.5	14.0	61.3	35.0
15/09/2018	32.1	14.2	80.3	35.5
16/09/2018	17.2	14.3	43.0	35.6
17/09/2018	17.5	14.3	43.8	35.7
18/09/2018	23.1	14.4	57.8	36.0
19/09/2018	**46.5**	14.8	116.3	37.0
20/09/2018	15.0	14.8	37.5	37.0
21/09/2018	14.1	14.8	35.3	37.0
22/09/2018	17.7	14.8	44.3	37.1
23/09/2018	27.3	15.0	68.3	37.4
24/09/2018	11.3	14.9	28.3	37.3
25/09/2018	7.1	14.8	17.8	37.1
26/09/2018	7.8	14.8	19.5	36.9
27/09/2018	8.0	14.7	20.0	36.7
28/09/2018	10.2	14.6	25.5	36.6
29/09/2018	14.0	14.6	35.0	36.6
30/09/2018	10.2	14.6	25.5	36.5

*Calculated from PM10

**Calculated from PM10 Annual Average

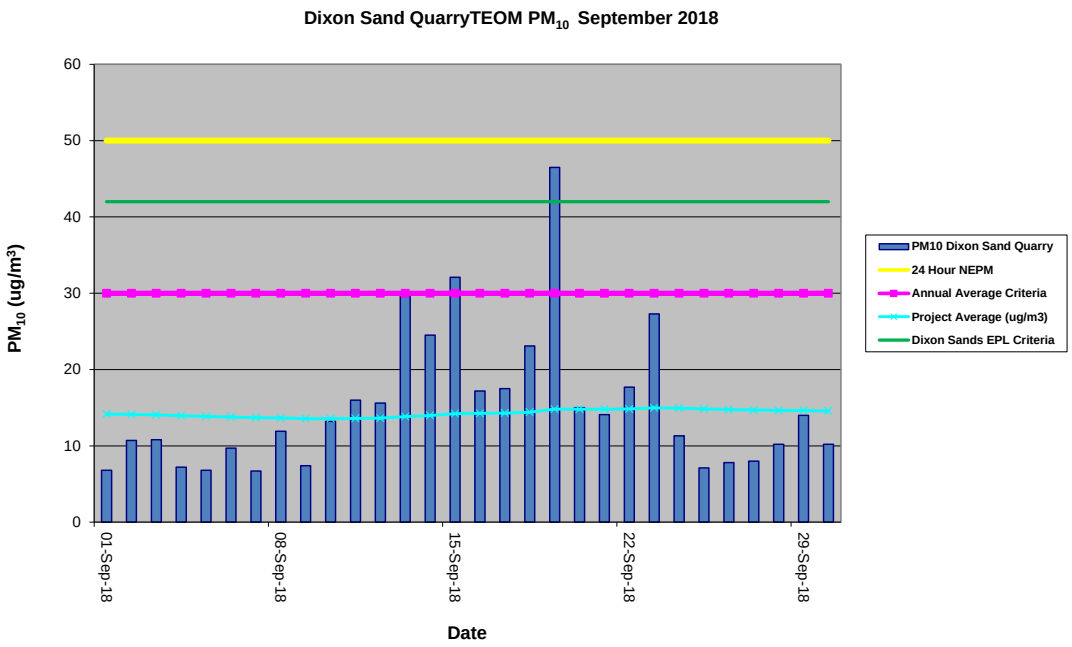

Figure 1: TEOM PM_{10} 24 hr, Annual Average and Criteria

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

The summary of results is presented in **Table 3. Figure 2 and 3** display the charts of meteorological parameters for the month. A windrose is provided in **Figure 4.** This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

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1/09/2018	10.7	14.4	19.3	0.0	0.3	5.5	23.7	33.8	51.7	75.4	982.1	986.8	992.1
2/09/2018	9.4	11.3	15.0	0.0	0.0	3.6	20.1	50.5	62.9	79.9	991.4	996.4	1001.7
3/09/2018	8.1	10.3	14.4	1.4	0.5	4.4	16.1	62.3	80.2	99.3	1001.1	1003.6	1005.8
4/09/2018	8.9	11.7	16.7	1.2	0.0	4.5	19.9	53.8	83.7	99.4	1004.0	1005.4	1006.9
5/09/2018	8.6	11.4	15.8	0.8	0.1	2.6	13.1	68.4	92.5	99.3	1000.5	1002.9	1005.2
6/09/2018	8.1	13.7	20.4	0.2	0.1	3.1	14.2	52.5	85.2	99.4	993.1	996.4	1000.6
7/09/2018	12.4	15.8	19.5	1.6	0.2	5.1	19.5	65.3	81.4	99.2	990.1	992.0	993.4
8/09/2018	10.3	11.6	12.9	0.2	0.4	3.9	21.5	84.1	95.7	99.3	992.0	994.4	997.1
9/09/2018	8.3	14.3	21.5	0.0	0.2	4.0	16.7	23.3	56.8	99.4	994.5	996.9	999.6
10/09/2018	11.5	15.3	21.8	0.0	0.3	5.1	22.7	31.0	59.8	94.2	999.3	1001.5	1003.7
11/09/2018	9.6	15.6	23.8	0.0	0.1	4.7	19.2	33.7	73.9	99.3	993.8	998.4	1002.4
12/09/2018	14.8	21.4	28.6	0.0	0.3	6.7	27.5	14.9	41.0	73.0	990.6	992.8	994.2
13/09/2018	11.2	15.9	22.2	0.0	0.1	4.5	19.1	39.5	74.1	90.8	994.1	996.4	998.3
14/09/2018	13.5	19.0	28.1	0.0	0.3	4.7	21.9	15.3	65.2	93.5	990.4	994.2	998.0
15/09/2018	14.2	21.8	30.8	0.0	0.5	8.6	33.8	9.7	28.9	66.0	980.6	985.7	991.0
16/09/2018	7.0	11.3	16.7	0.0	0.2	6.4	23.8	15.4	36.5	55.0	988.6	995.7	1001.1
17/09/2018	5.3	11.5	18.0	0.0	0.1	4.0	15.5	36.7	55.9	76.8	998.0	1000.2	1003.1
18/09/2018	8.5	16.7	25.4	0.0	0.5	5.1	21.9	21.1	50.9	84.0	989.7	994.2	999.0
19/09/2018	11.5	19.7	26.8	0.0	0.0	7.3	34.8	11.4	32.6	73.2	985.1	988.1	993.3
20/09/2018	8.0	10.8	15.1	0.8	0.0	3.9	15.0	50.3	66.7	94.4	993.0	997.1	1002.4
21/09/2018	6.8	13.3	21.1	0.0	0.0	3.7	11.9	19.9	55.2	81.0	1001.5	1003.5	1005.4
22/09/2018	8.5	16.6	25.0	0.0	0.2	3.4	16.0	15.8	50.2	82.5	999.3	1002.6	1005.4
23/09/2018	9.7	15.2	21.7	0.2	0.1	5.1	31.0	34.3	63.9	94.8	1000.1	1002.5	1006.1
24/09/2018	9.6	11.3	14.1	0.2	0.2	4.4	14.3	61.0	76.5	95.9	1005.2	1006.1	1007.8
25/09/2018	8.3	11.9	17.0	0.0	0.2	3.9	18.9	47.9	75.7	99.3	1000.6	1003.5	1006.0
26/09/2018	8.7	10.7	14.7	1.6	0.0	2.7	11.4	67.8	87.6	99.3	998.0	1000.0	1002.0
27/09/2018	7.0	13.2	21.7	0.0	0.2	4.2	19.8	31.4	77.2	99.4	994.0	997.4	1000.6
28/09/2018	11.1	19.5	29.1	0.6	0.2	6.8	21.8	12.3	46.2	89.6	989.4	992.6	995.4
29/09/2018	9.4	14.7	20.7	0.2	0.2	5.0	22.5	13.1	57.8	99.2	991.6	997.8	1005.3
30/09/2018	7.2	12.4	18.7	0.0	0.2	4.6	19.9	36.1	61.7	81.1	1004.6	1006.4	1008.0
Monthly	5.3	14.4	30.8	9.0	0.0	4.7	34.8	9.7	64.2	99.4	980.6	997.7	1008.0

Figure 2: Rainfall, Temperature and Humidity Charts

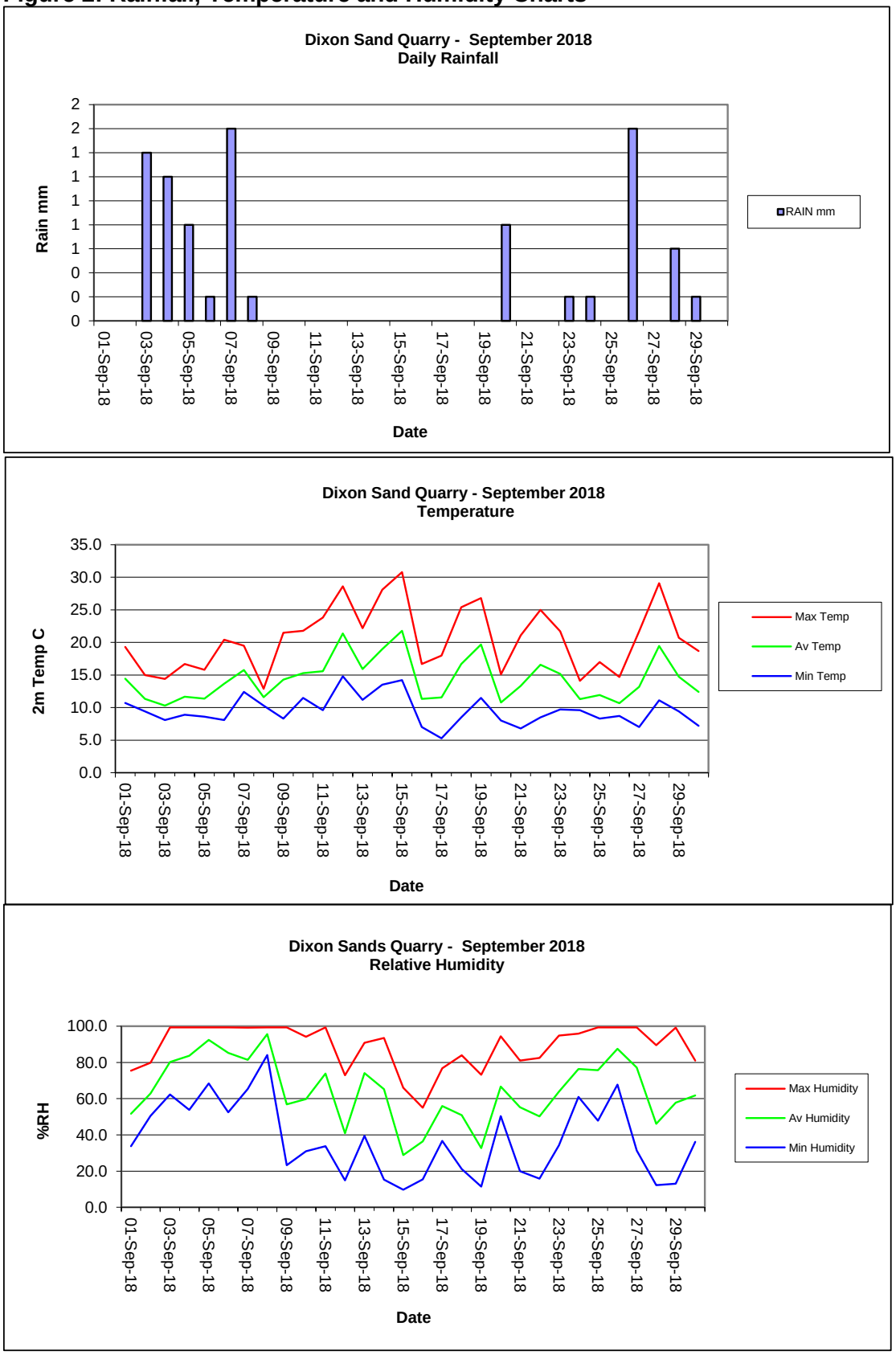
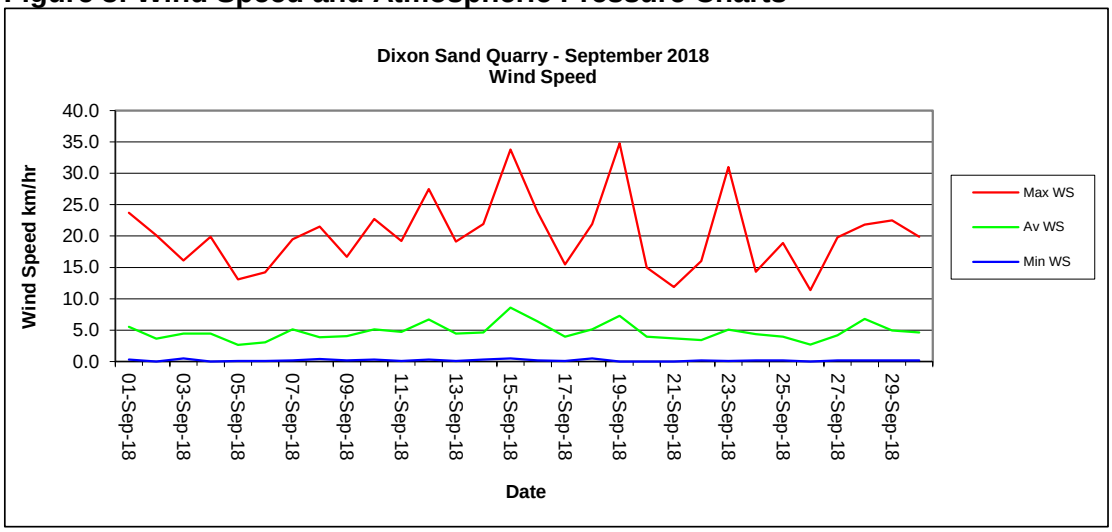


Figure 3: Wind Speed and Atmospheric Pressure Charts



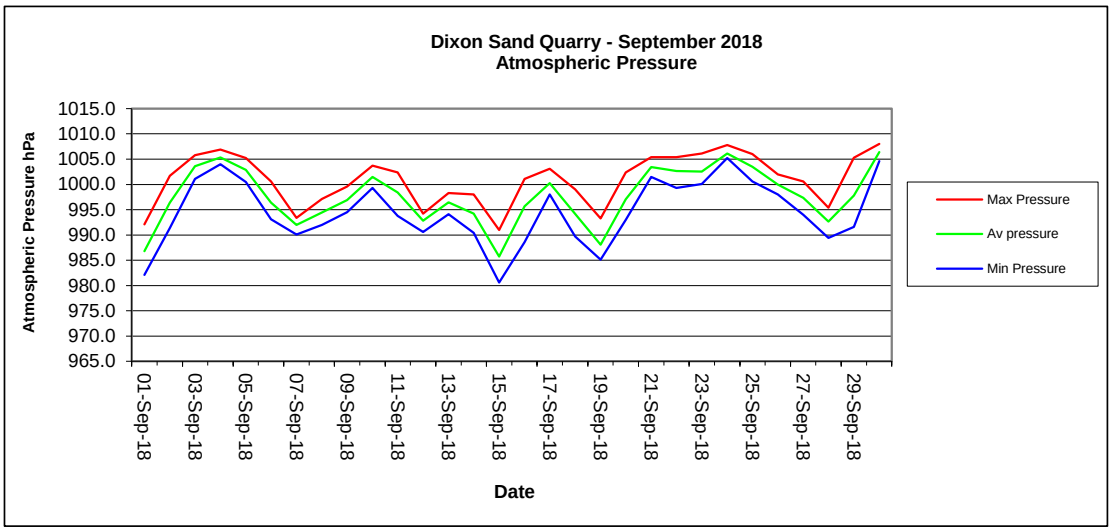
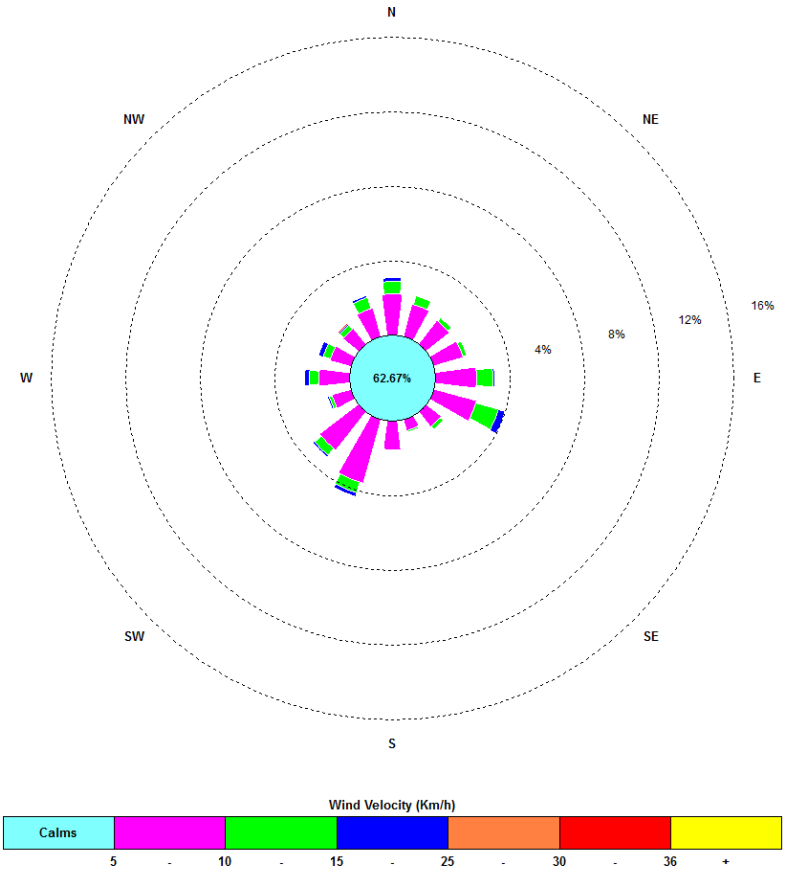


Figure 4: Windrose Plot (km/h)

00:00 1 September 2018 – 23:55 30 September 2018



Appendix 1

Calibration Documents (when required)

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

October 2018

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 14 November 2018

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited (CBE) is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for Fine Particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring program includes;

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report was prepared by CBased Environmental and includes the following;

- TEOM (PM_{10}) monitoring results for October 2018; and
- Meteorological results for October 2018.

Current year to date annual average for PM_{10} is calculated from the 1st July 2018 for TEOM's coinciding with the Dixon Sand project year.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- All TEOM PM_{10} 24-hour average results were below the short-term Dixon Sand Quarry consent, 24-hour impact criteria of 50ug/m^3;
- The current TEOM PM_{10} annual average is below the Dixon Sand Quarry consent, annual average criteria of 30ug/m3.
- Currently, calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.
- All TEOM PM_{10} 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Note that an annual amount of data has not yet been collected.

Approximately 100% of meteorological data was recovered for October 2018.
Approximately 100% of TEOM data was recovered for October 2018.

2.0 Sampling Program

The TEOM is operated to the applicable Australian Standard and OEH (EPA) approved method. All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

The following Australian Standards were used:

AS3580.9.8 (2001) "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*."

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

The location of the air quality monitoring equipment met the Australian Standard AS 3580.1.1 (2007) "*Methods for sampling and analysis of ambient air Part 1.1 Guide to siting air monitoring equipment*". Air Quality monitoring site descriptions and locations are provided in **Table 1**:

Table 1: Dixon Sands Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Reporting Period Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**. During the monitoring period all individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3. The Dixon Sand Quarry EPL limit of 42ug/m^3 was exceeded once (19 September 2018).

The current TEOM PM_{10} annual average runs from the 1st July 2018. At present it is below the Dixon Sand Quarry long term annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: an annual amount of data has not yet been collected.

A quarterly calibration was undertaken on the TEOM during September 2018 and is next due in December 2018. Calibration certificates are provided in **Appendix 1** (when required).

Table 2: Average Daily 24 Hr TEOM PM_{10} and TSP for October 2018 from AQMS and Annual Average PM_{10} calculated from the 1 July 2018.

Date	TEOM PM_{10} ($\mu g/m^3$)	Annual PM_{10} Average ($\mu g/m^3$)	TSP* ($\mu g/m3$)	TSP Annual** ($\mu g/m3$)
1/10/2018	10.7	14.5	26.8	36.4
2/10/2018	10.3	14.5	25.8	36.2
3/10/2018	18.8	14.5	47.0	36.4
4/10/2018	9.1	14.5	22.8	36.2
5/10/2018	3.9	14.4	9.8	35.9
6/10/2018	10.0	14.3	25.0	35.8
7/10/2018	6.4	14.3	16.0	35.6
8/10/2018	7.6	14.2	19.0	35.5
9/10/2018	12.0	14.2	30.0	35.4
10/10/2018	11.9	14.1	29.8	35.4
11/10/2018	8.3	14.1	20.8	35.2
12/10/2018	4.8	14.0	12.0	35.0
13/10/2018	7.1	13.9	17.8	34.8
14/10/2018	8.6	13.9	21.5	34.7
15/10/2018	11.3	13.9	28.3	34.6
16/10/2018	16.8	13.9	42.0	34.7
17/10/2018	11.0	13.9	27.5	34.6
18/10/2018	7.5	13.8	18.8	34.5
19/10/2018	10.1	13.8	25.3	34.4
20/10/2018	14.0	13.8	35.0	34.4
21/10/2018	14.3	13.8	35.8	34.4
22/10/2018	19.3	13.8	48.3	34.6
23/10/2018	16.2	13.8	40.5	34.6
24/10/2018	28.0	14.0	70.0	34.9
25/10/2018	17.5	14.0	43.8	35.0
26/10/2018	20.7	14.1	51.8	35.1
27/10/2018	20.1	14.1	50.3	35.3
28/10/2018	16.7	14.1	41.8	35.3
29/10/2018	17.3	14.1	43.3	35.4
30/10/2018	17.5	14.2	43.8	35.4
31/10/2018	29.6	14.3	74.0	35.8

*Calculated from PM10

**Calculated from PM10 Annual Average

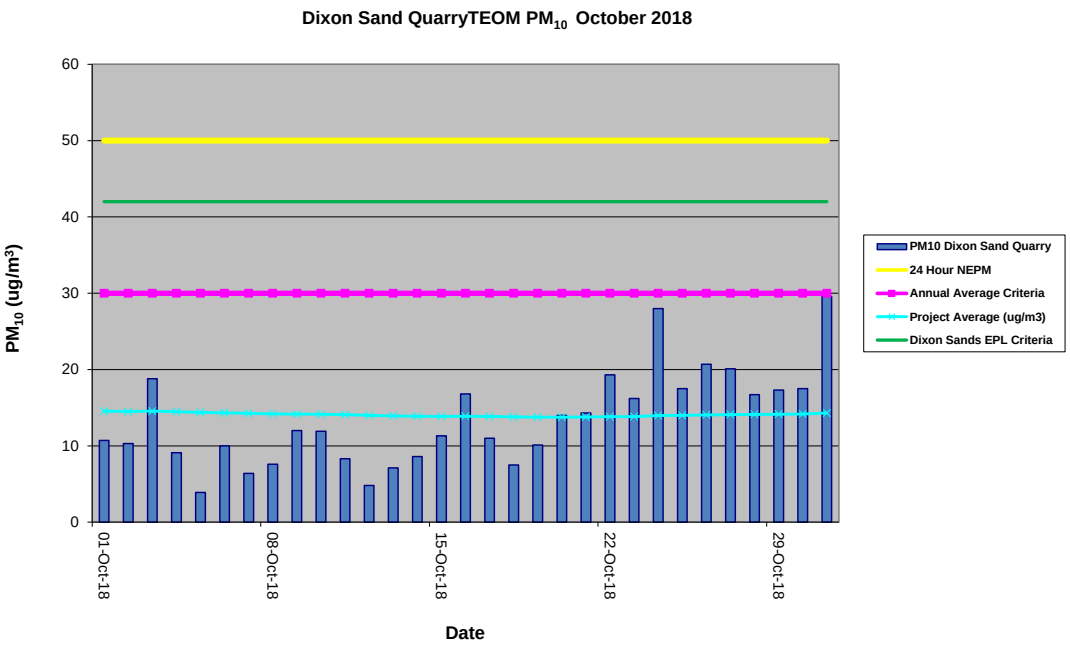


Figure 1: TEOM PM_{10} 24 hr, Annual Average and Criteria

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

The summary of results is presented in **Table 3. Figure 2 and 3** display the charts of meteorological parameters for the month. A windrose is provided in **Figure 4.** This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual calibration was undertaken on the weather station during March 2018 and is next due in March 2019.

Table 3: Meteorological Data Summary for October 2018

Date	Min Temp	Av Temp	Max Temp	RAIN mm	Min WS	Av WS	Max WS	Min Humidity	Av Humidity	Max Humidity	Min Pressure	Av pressure	Max Pressure
1/10/2018	7.7	14.4	21.4	0.0	0.1	3.7	20.4	36.9	66.2	96.6	1002.4	1005.1	1007.3
2/10/2018	10.0	16.7	24.9	0.0	0.2	5.4	25.9	26.9	59.4	85.4	999.8	1002.7	1005.7
3/10/2018	11.6	18.5	26.0	0.2	0.2	4.7	14.4	24.6	58.0	91.1	992.7	995.8	1000.1
4/10/2018	12.6	14.4	16.3	4.2	0.2	4.1	15.3	80.2	96.0	99.4	993.1	994.7	996.4
5/10/2018	10.5	11.8	13.3	7.2	2.3	8.8	25.8	99.4	99.4	99.5	995.5	998.9	1001.6
6/10/2018	10.3	13.0	18.3	0.2	0.9	7.2	25.4	49.9	79.0	99.5	998.5	1000.1	1001.4
7/10/2018	9.6	12.8	16.2	1.6	1.0	6.5	21.1	69.0	86.8	99.4	996.0	997.9	1000.7
8/10/2018	12.8	15.9	21.2	0.2	0.7	4.6	17.5	56.7	81.1	99.4	993.4	995.2	996.8
9/10/2018	12.5	18.5	25.5	0.0	0.2	3.2	9.9	32.6	69.6	99.3	988.6	991.7	995.2
10/10/2018	10.9	13.6	18.3	4.4	0.5	5.2	26.1	74.1	90.7	99.5	990.2	995.4	1000.5
11/10/2018	9.9	11.9	15.5	1.0	0.2	4.1	19.2	56.9	87.6	99.4	999.3	1001.3	1003.8
12/10/2018	10.5	12.4	15.9	1.4	0.4	5.0	20.8	67.8	92.6	99.5	1002.0	1003.5	1005.2
13/10/2018	10.3	13.7	18.2	1.2	0.4	5.3	22.0	66.4	90.5	99.5	1001.0	1002.7	1004.4
14/10/2018	13.7	15.6	20.1	1.8	0.2	6.0	26.4	55.8	88.5	99.5	1001.6	1003.4	1004.8
15/10/2018	12.2	16.3	20.4	1.0	0.1	4.7	23.2	66.3	87.7	99.5	1000.3	1002.6	1004.5
16/10/2018	16.0	18.6	23.5	0.0	0.2	5.1	23.9	57.4	79.0	99.3	996.4	999.2	1002.2
17/10/2018	15.6	18.7	24.1	6.6	0.1	3.7	15.6	55.9	85.2	99.5	992.4	995.1	997.4
18/10/2018	15.2	18.6	24.1	0.4	0.3	3.9	17.8	59.9	88.5	99.5	993.0	994.5	996.1
19/10/2018	16.2	21.2	30.0	0.0	0.1	4.4	20.2	22.6	75.2	99.6	991.3	994.1	996.7
20/10/2018	16.8	21.8	30.3	4.0	0.2	5.0	21.8	37.5	72.6	99.2	986.5	991.0	993.6
21/10/2018	14.0	16.3	19.2	0.0	0.2	3.5	13.2	62.5	85.2	99.5	990.6	993.9	996.8
22/10/2018	14.0	17.8	23.8	0.0	0.1	4.0	22.8	50.8	77.6	91.7	992.3	994.8	997.0
23/10/2018	13.7	21.6	32.1	0.0	0.0	4.3	17.2	18.9	67.7	99.5	987.8	991.6	994.4
24/10/2018	12.7	16.5	24.3	0.0	0.6	4.4	16.5	25.2	71.9	95.2	990.3	997.1	1001.4
25/10/2018	12.3	16.6	22.7	0.0	0.3	3.5	12.0	46.0	75.2	93.0	992.1	996.6	1001.0
26/10/2018	12.9	17.0	23.5	0.0	0.2	5.0	21.9	46.4	79.4	99.5	991.5	993.5	995.7
27/10/2018	13.6	18.9	26.7	0.0	0.1	4.5	18.0	33.6	71.4	99.2	985.4	990.4	995.4
28/10/2018	13.5	15.5	17.8	0.0	0.0	4.0	13.9	56.7	75.6	94.8	990.8	994.2	995.9
29/10/2018	13.5	15.9	20.1	0.0	0.0	3.8	16.0	50.6	69.0	84.8	994.0	996.2	998.8
30/10/2018	12.7	20.0	29.9	0.0	0.1	4.8	22.1	30.3	62.0	86.0	991.0	995.3	998.7
31/10/2018	15.7	21.4	30.0	0.6	0.2	4.6	25.7	29.4	67.7	99.3	993.3	996.0	1000.9
Monthly	7.7	16.6	32.1	36.0	0.0	4.7	26.4	18.9	78.6	99.6	985.4	996.9	1007.3

Figure 2: Rainfall, Temperature and Humidity Charts

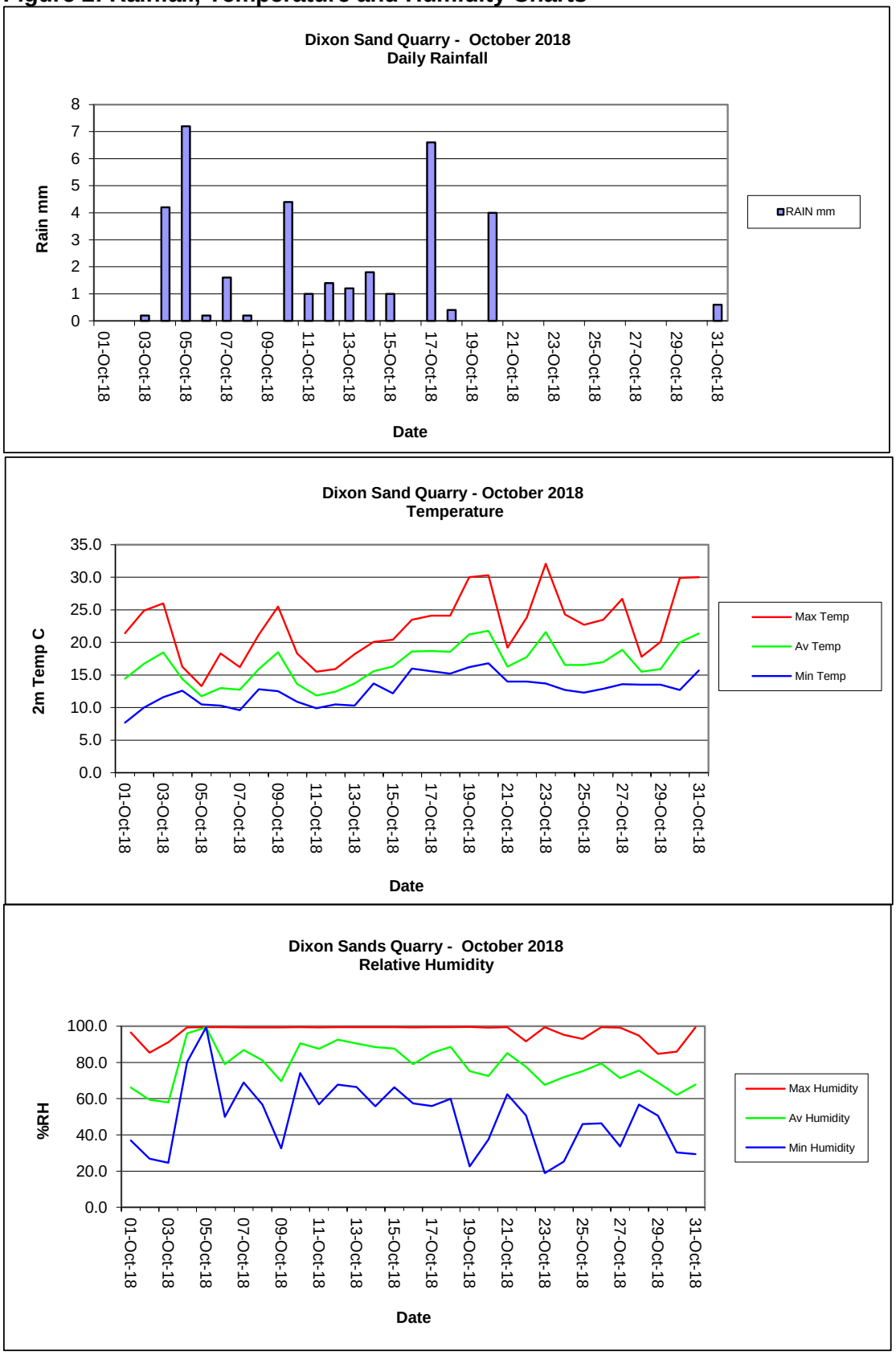
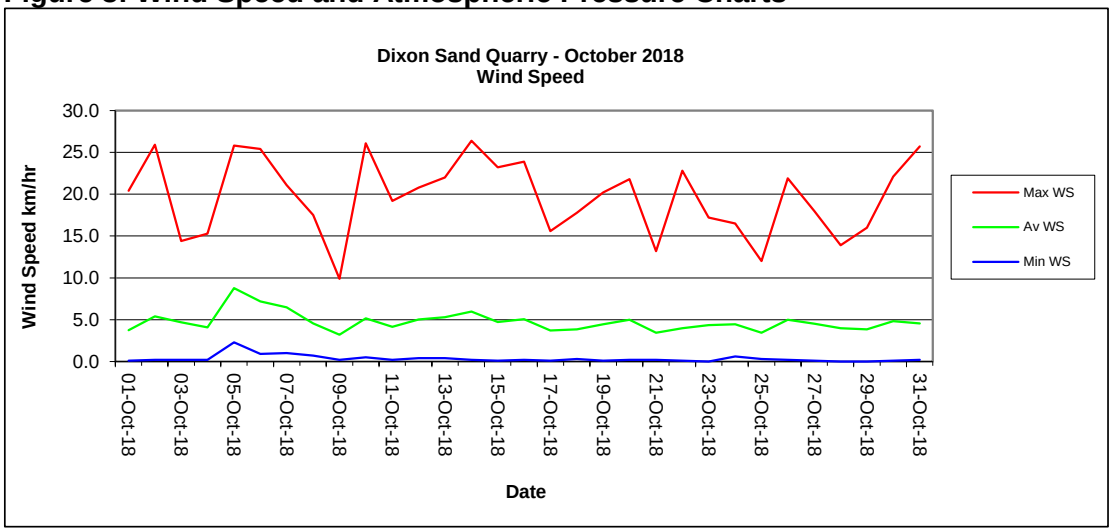


Figure 3: Wind Speed and Atmospheric Pressure Charts



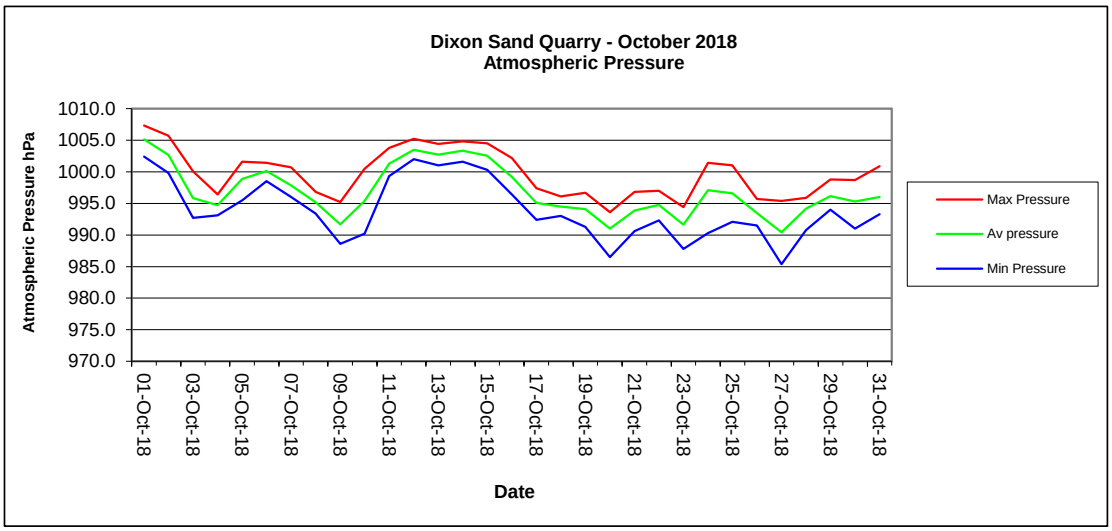
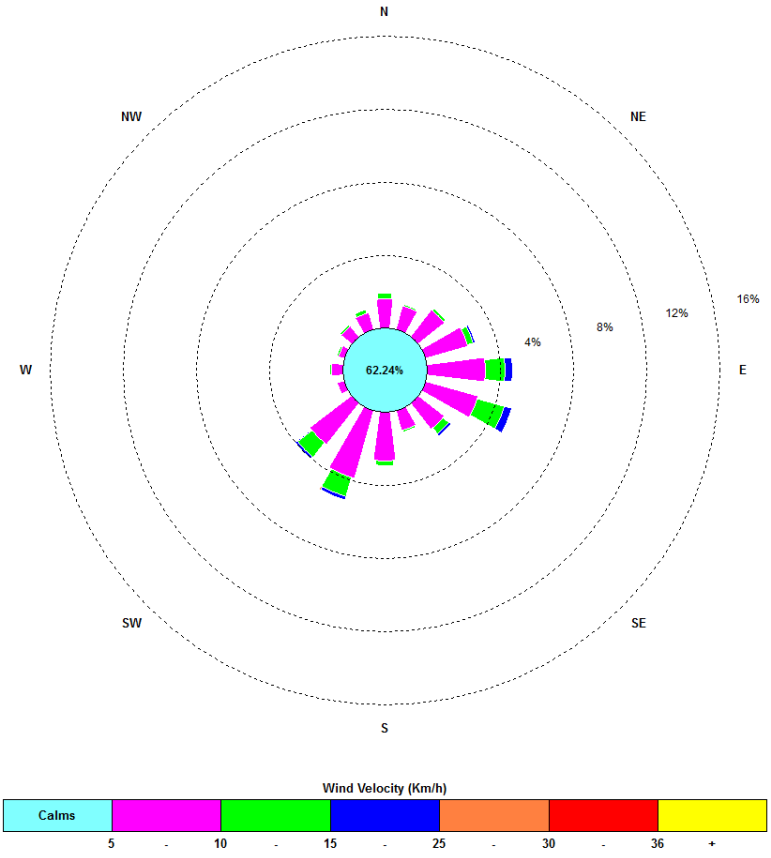


Figure 4: Windrose Plot (km/h)

00:00 1 October 2018 – 23:55 31 October 2018



Appendix 1

Calibration Documents (when required)

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

November 2018

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 24 December 2018

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited (CBE) is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for Fine Particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring program includes;

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report was prepared by CBased Environmental and includes the following;

- TEOM (PM_{10}) monitoring results for November 2018; and
- Meteorological results for November 2018.

Current year to date annual average for PM_{10} is calculated from the 1st July 2018 for TEOM's coinciding with the Dixon Sand project year.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- Three TEOM PM_{10} 24-hour average results were below the short-term Dixon Sand Quarry consent, 24-hour impact criteria of 50ug/m^3 (21, 22 & 23 November 2018);
- The current TEOM PM_{10} annual average is below the Dixon Sand Quarry consent, annual average criteria of 30ug/m3.
- Currently, calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.
- Three TEOM PM_{10} 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3 (21, 22 & 23 November 2018).

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Note that an annual amount of data has not yet been collected.

Approximately 100% of meteorological data was recovered for November 2018.
Approximately 100% of TEOM data was recovered for November 2018.

2.0 Sampling Program

The TEOM is operated to the applicable Australian Standard and OEH (EPA) approved method. All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

The following Australian Standards were used:

AS3580.9.8 (2001) "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*."

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

The location of the air quality monitoring equipment met the Australian Standard AS 3580.1.1 (2007) "*Methods for sampling and analysis of ambient air Part 1.1 Guide to siting air monitoring equipment*". Air Quality monitoring site descriptions and locations are provided in **Table 1**:

Table 1: Dixon Sands Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Reporting Period Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**. During the monitoring period all individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3. The Dixon Sand Quarry EPL limit of 42ug/m^3 was exceeded once (19 September 2018).

The current TEOM PM_{10} annual average runs from the 1st July 2018. At present it is below the Dixon Sand Quarry long term annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: an annual amount of data has not yet been collected.

A quarterly calibration was undertaken on the TEOM during September 2018 and is next due in December 2018. Calibration certificates are provided in **Appendix 1** (when required).

Table 2: Average Daily 24 Hr TEOM PM_{10} and TSP for November 2018 from AQMS and Annual Average PM_{10} calculated from the 1 July 2018.

Date	TEOM PM_{10} ($\mu g/m^3$)	Annual PM_{10} Average ($\mu g/m^3$)	TSP* ($\mu g/m3$)	TSP Annual** ($\mu g/m3$)
1/11/2018	23.0	14.4	57.5	35.9
2/11/2018	24.9	14.5	62.3	36.1
3/11/2018	20.4	14.5	51.0	36.3
4/11/2018	36.9	14.7	92.3	36.7
5/11/2018	17.2	14.7	43.0	36.7
6/11/2018	16.9	14.7	42.3	36.8
7/11/2018	13.3	14.7	33.3	36.8
8/11/2018	9.1	14.7	22.8	36.7
9/11/2018	15.0	14.7	37.5	36.7
10/11/2018	15.7	14.7	39.3	36.7
11/11/2018	13.2	14.7	33.0	36.7
12/11/2018	13.8	14.7	34.5	36.6
13/11/2018	12.9	14.6	32.3	36.6
14/11/2018	18.9	14.7	47.3	36.7
15/11/2018	13.8	14.7	34.5	36.7
16/11/2018	12.8	14.7	32.0	36.6
17/11/2018	11.2	14.6	28.0	36.6
18/11/2018	8.3	14.6	20.8	36.5
19/11/2018	10.5	14.6	26.3	36.4
20/11/2018	15.1	14.6	37.8	36.4
21/11/2018	**66.9**	14.9	167.3	37.3
22/11/2018	**105.5**	15.5	263.8	38.9
23/11/2018	**77.7**	16.0	194.3	39.9
24/11/2018	10.4	15.9	26.0	39.8
25/11/2018	13.6	15.9	34.0	39.8
26/11/2018	14.6	15.9	36.5	39.8
27/11/2018	23.8	16.0	59.5	39.9
28/11/2018	10.0	15.9	25.0	39.8
29/11/2018	8.2	15.9	20.5	39.7
30/11/2018	11.2	15.8	28.0	39.6

*Calculated from PM10

**Calculated from PM10 Annual Average

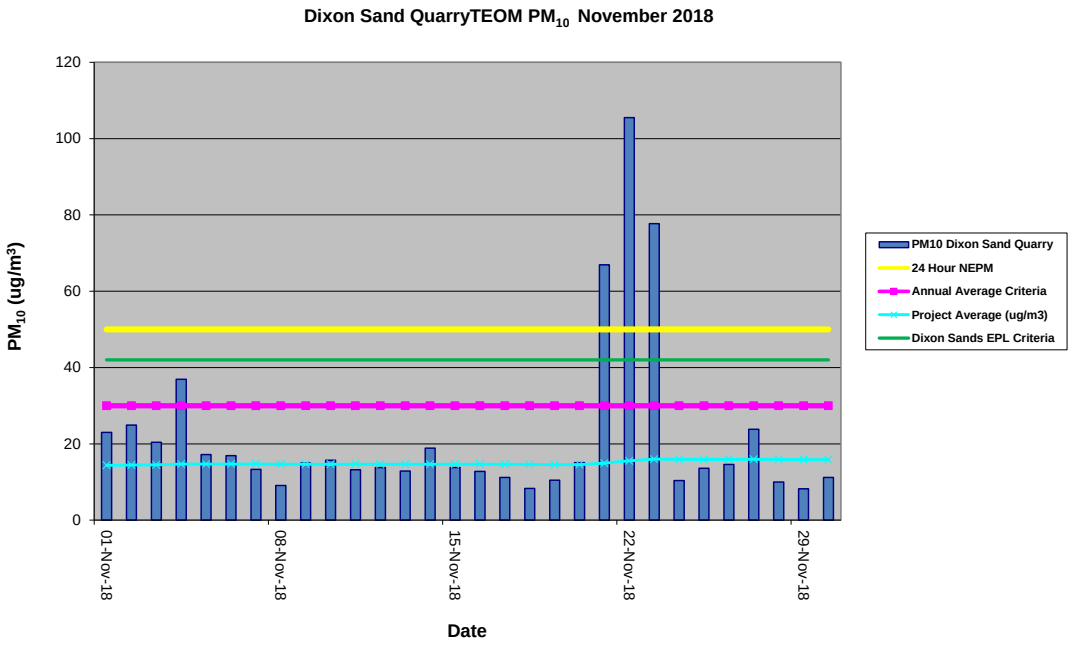


Figure 1: TEOM PM_{10} 24 hr, Annual Average and Criteria

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

The summary of results is presented in **Table 3. Figure 2 and 3** display the charts of meteorological parameters for the month. A windrose is provided in **Figure 4.** This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual calibration was undertaken on the weather station during March 2018 and is next due in March 2019.

Table 3: Meteorological Data Summary for November 2018

Date	Min Temp	Av Temp	Max Temp	RAIN mm	Min WS	Av WS	Max WS	Min Humidity	Av Humidity	Max Humidity	Min Pressure	Av pressure	Max Pressure
1/11/2018	15.7	23.3	34.4	0.0	0.2	5.1	17.8	22.0	69.9	99.4	994.4	997.8	1001.1
2/11/2018	19.5	28.5	35.4	0.0	0.8	7.7	30.5	14.8	37.9	92.6	987.7	993.1	996.1
3/11/2018	18.4	24.7	33.4	0.0	0.2	6.7	24.2	16.1	56.2	80.7	987.7	990.4	995.0
4/11/2018	16.4	20.4	26.6	0.0	0.1	4.1	18.1	43.3	74.6	93.6	987.1	991.4	994.9
5/11/2018	15.4	22.7	30.3	0.0	0.0	3.2	12.8	27.2	63.2	99.5	987.1	988.4	989.9
6/11/2018	21.7	26.6	32.3	0.0	0.0	3.7	18.0	29.8	45.0	60.1	982.1	985.4	989.6
7/11/2018	11.2	21.3	27.8	4.8	0.3	4.3	20.3	35.6	67.0	95.0	981.5	983.9	988.3
8/11/2018	10.3	13.9	19.4	0.6	0.2	4.8	24.3	29.2	67.2	99.4	986.9	993.6	999.6
9/11/2018	10.6	15.8	21.3	0.0	0.0	3.8	16.7	32.3	58.4	75.9	994.1	997.7	1000.5
10/11/2018	11.0	16.8	23.7	0.0	0.2	4.8	26.1	25.7	62.8	93.8	994.9	996.2	998.3
11/11/2018	11.5	17.7	24.9	0.0	0.0	5.2	27.3	32.5	66.9	99.2	996.2	998.3	1000.8
12/11/2018	12.4	18.2	24.4	0.0	0.1	4.7	25.0	44.6	71.6	93.4	997.0	999.5	1001.9
13/11/2018	14.6	20.2	27.4	0.0	0.1	4.9	21.3	22.1	65.6	90.3	992.6	995.7	998.6
14/11/2018	15.9	19.1	22.3	0.2	0.1	3.0	11.4	68.8	82.7	94.2	992.1	993.6	995.2
15/11/2018	13.9	19.2	25.6	1.6	0.1	3.9	17.5	55.8	76.8	99.4	992.8	996.4	1001.2
16/11/2018	12.9	15.2	17.5	0.0	0.0	3.6	13.0	77.5	88.6	99.4	996.1	998.2	1000.6
17/11/2018	13.5	16.5	21.4	0.0	0.2	3.6	19.7	54.9	82.4	99.4	994.9	997.5	1000.9
18/11/2018	13.2	15.9	21.0	0.6	0.2	5.3	24.0	48.6	77.3	99.4	999.7	1000.7	1002.0
19/11/2018	11.8	17.0	22.7	0.0	0.1	4.4	26.1	49.7	71.2	90.8	994.4	997.7	1000.9
20/11/2018	14.7	20.4	27.5	0.6	0.0	4.9	25.2	39.3	65.9	91.6	983.4	989.4	995.9
21/11/2018	18.9	22.1	25.7	1.2	0.7	5.6	24.5	46.2	70.6	93.8	977.4	980.2	984.4
22/11/2018	14.9	19.8	22.9	0.6	0.7	7.6	38.3	15.4	46.3	79.7	976.1	977.9	981.7
23/11/2018	12.9	16.8	21.1	0.0	0.3	8.6	43.6	27.8	37.7	51.7	977.4	979.6	981.8
24/11/2018	13.0	18.5	24.5	0.0	0.1	4.7	25.3	26.2	38.0	56.0	979.5	980.7	981.8
25/11/2018	13.3	18.1	25.1	0.0	0.1	3.9	19.5	27.9	49.4	73.9	976.2	979.7	982.1
26/11/2018	12.6	17.8	24.7	0.0	0.0	4.6	17.3	39.7	64.3	87.0	980.8	983.5	987.1
27/11/2018	15.1	18.9	25.4	1.0	0.0	5.3	27.0	41.3	75.5	99.3	981.1	984.0	986.2
28/11/2018	14.3	16.6	18.4	10.2	0.2	6.5	29.9	82.0	96.6	99.4	975.1	978.9	985.0
29/11/2018	13.1	16.6	22.3	0.4	0.4	6.4	21.0	54.7	76.7	99.2	984.0	987.3	990.9
30/11/2018	13.1	18.6	25.3	0.0	0.0	4.2	23.6	39.7	70.3	93.0	985.8	988.8	991.0
Monthly	10.3	19.2	35.4	21.8	0.0	5.0	43.6	14.8	65.9	99.5	975.1	990.2	1002.0

Figure 2: Rainfall, Temperature and Humidity Charts

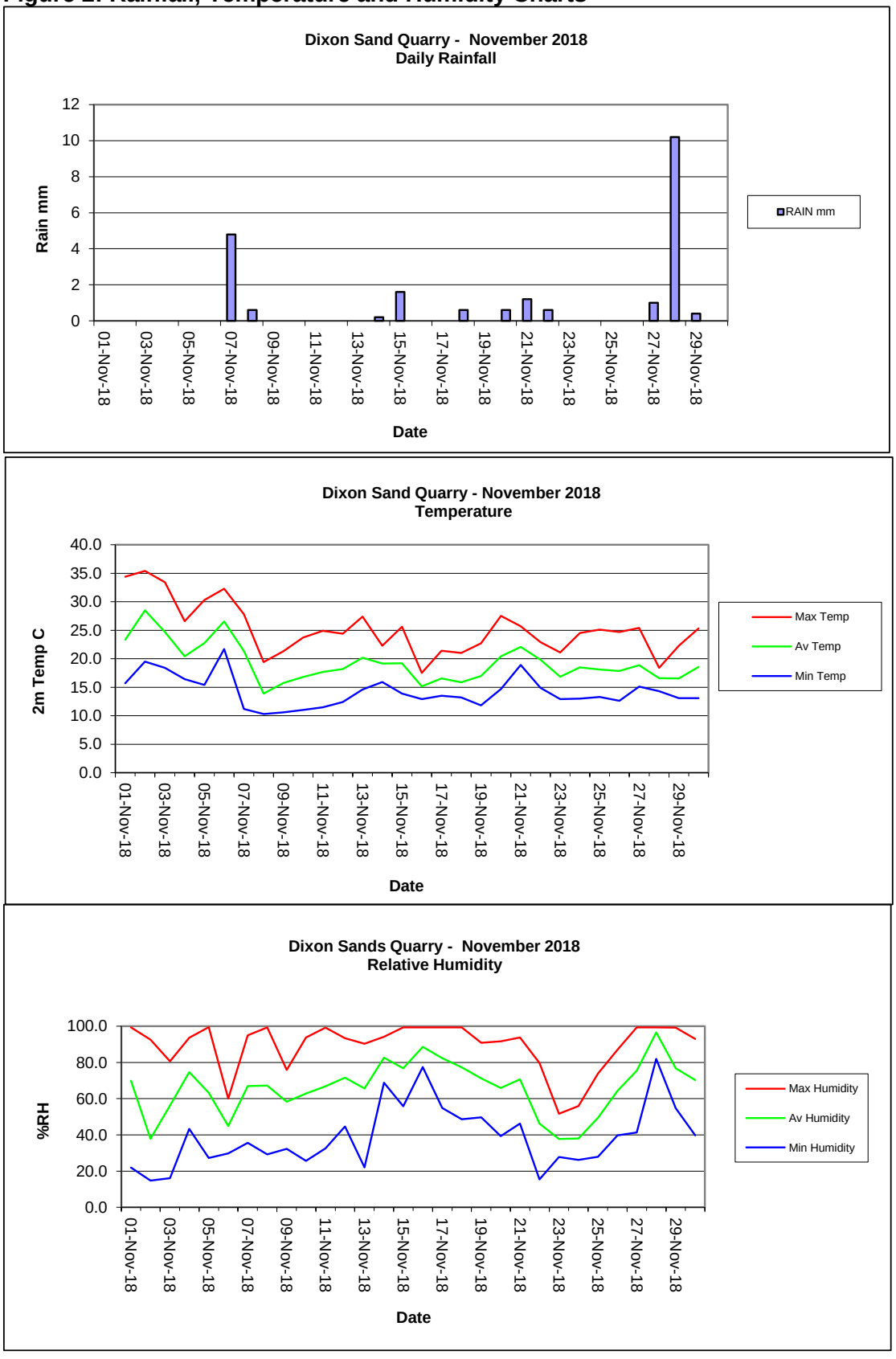
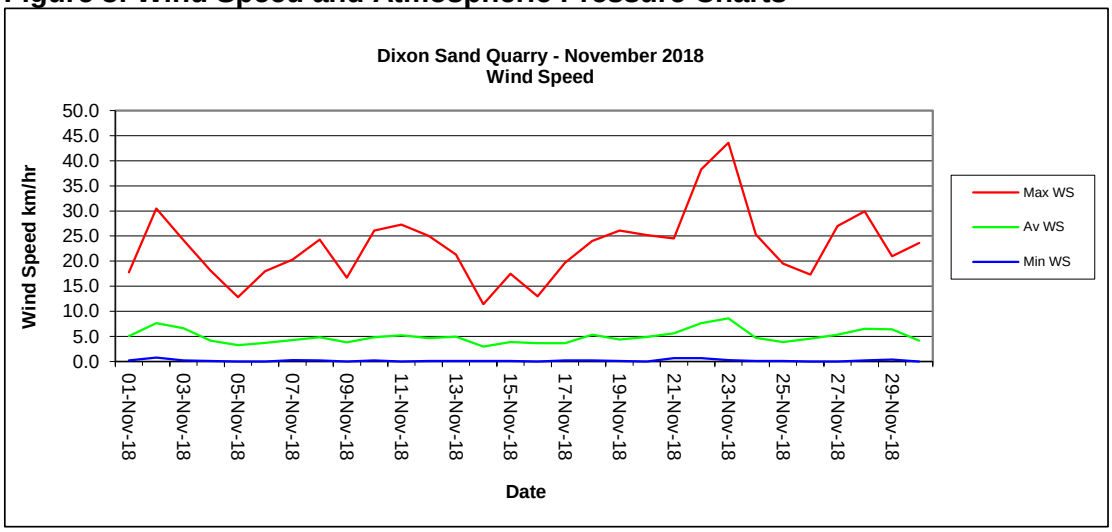


Figure 3: Wind Speed and Atmospheric Pressure Charts



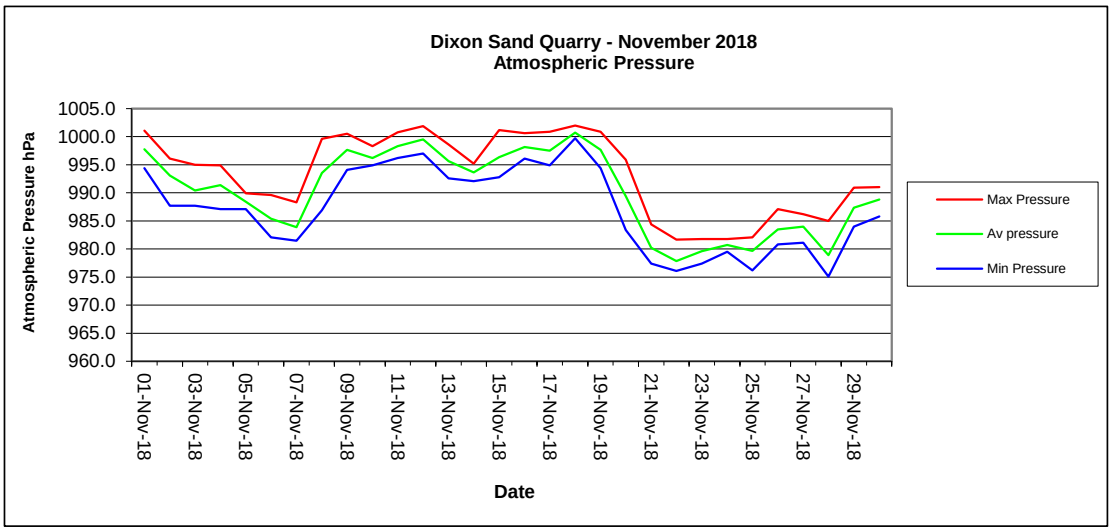
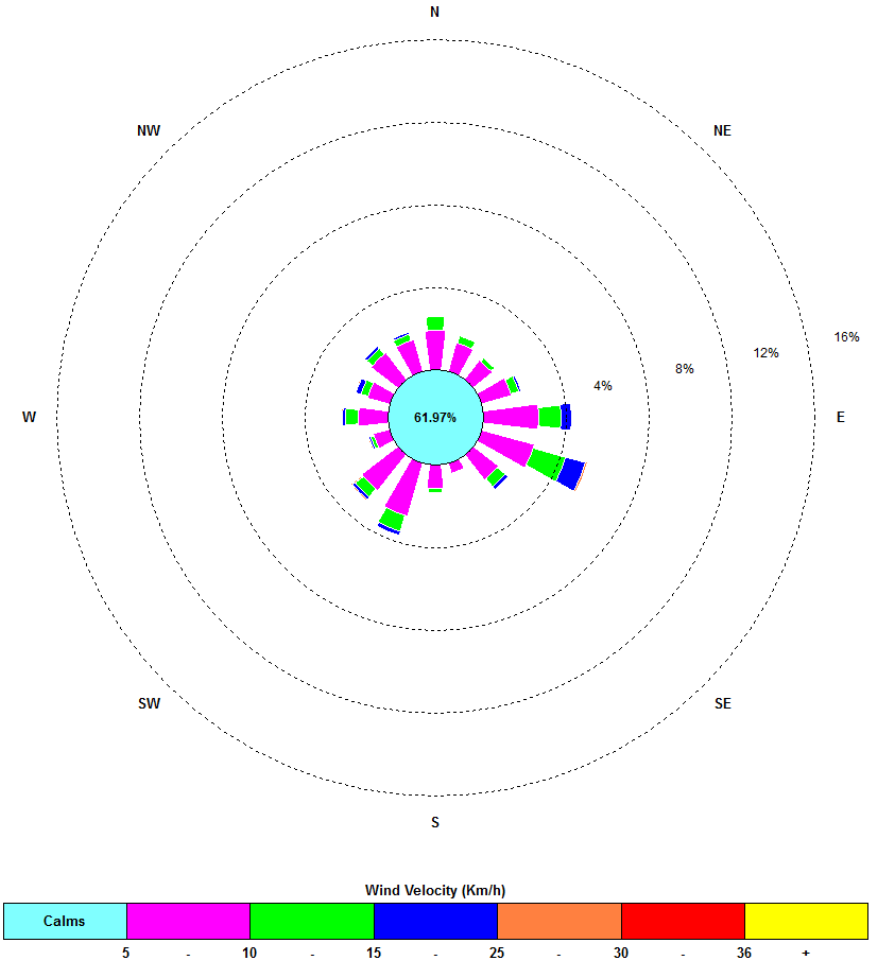


Figure 4: Windrose Plot (km/h)

00:00 1 November 2018 – 23:55 30 November 2018



Appendix 1

Calibration Documents (when required)

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

December 2018

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 23 January 2019

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited (CBE) is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for Fine Particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring program includes;

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report was prepared by CBased Environmental and includes the following;

- TEOM (PM_{10}) monitoring results for December 2018; and
- Meteorological results for December 2018.

Current year to date annual average for PM_{10} is calculated from the 1st July 2018 for TEOM's coinciding with the Dixon Sand project year.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- All TEOM PM_{10} 24-hour average results were below the short-term Dixon Sand Quarry consent, 24-hour impact criteria of 50ug/m^3;
- The current TEOM PM_{10} annual average is below the Dixon Sand Quarry consent, annual average criteria of 30ug/m3.
- Currently, calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.
- All TEOM PM_{10} 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Note that an annual amount of data has not yet been collected.

Approximately 100% of meteorological data was recovered for December 2018.
Approximately 100% of TEOM data was recovered for December 2018.

2.0 Sampling Program

The TEOM is operated to the applicable Australian Standard and OEH (EPA) approved method. All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

The following Australian Standards were used:

AS3580.9.8 (2001) "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*."

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

The location of the air quality monitoring equipment met the Australian Standard AS 3580.1.1 (2007) "*Methods for sampling and analysis of ambient air Part 1.1 Guide to siting air monitoring equipment*". Air Quality monitoring site descriptions and locations are provided in **Table 1**:

Table 1: Dixon Sands Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Reporting Period Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**. During the monitoring period individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m^3.

The current TEOM PM_{10} annual average runs from the 1st July 2018. At present it is below the Dixon Sand Quarry long term annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: an annual amount of data has not yet been collected.

An annual calibration was undertaken on the TEOM during December 2018 and a quarterly calibration is next due in March 2019. Calibration certificates are provided in **Appendix 1** (when required).

Table 2: Average Daily 24 Hr TEOM PM_{10} and TSP for December 2018 from AQMS and Annual Average PM_{10} calculated from the 1 July 2018.

Date	TEOM PM_{10} ($\mu g/m^3$)	Annual PM_{10} Average ($\mu g/m^3$)	TSP* ($\mu g/m3$)	TSP Annual** ($\mu g/m3$)
1/12/2018	16.6	15.8	41.5	39.6
2/12/2018	26.3	15.9	65.8	39.8
3/12/2018	20.1	15.9	50.3	39.9
4/12/2018	25.4	16.0	63.5	40.0
5/12/2018	14.9	16.0	37.3	40.0
6/12/2018	13.2	16.0	33.0	39.9
7/12/2018	18.5	16.0	46.3	40.0
8/12/2018	20.2	16.0	50.5	40.0
9/12/2018	35.4	16.1	88.5	40.3
10/12/2018	25.9	16.2	64.8	40.5
11/12/2018	14.7	16.2	36.8	40.5
12/12/2018	12.0	16.2	30.0	40.4
13/12/2018	13.2	16.1	33.0	40.4
14/12/2018	10.6	16.1	26.5	40.3
15/12/2018	23.9	16.2	59.8	40.4
16/12/2018	27.4	16.2	68.5	40.6
17/12/2018	19.0	16.2	47.5	40.6
18/12/2018	26.9	16.3	67.3	40.8
19/12/2018	ND	16.3	ND	40.8
20/12/2018	ND	16.3	ND	40.8
21/12/2018	ND	16.3	ND	40.8
22/12/2018	ND	16.3	ND	40.8
23/12/2018	8.6	16.3	21.5	40.6
24/12/2018	14.3	16.2	35.8	40.6
25/12/2018	11.4	16.2	28.5	40.6
26/12/2018	16.9	16.2	42.3	40.6
27/12/2018	18.9	16.2	47.3	40.6
28/12/2018	18.6	16.3	46.5	40.6
29/12/2018	21.7	16.3	54.3	40.7
30/12/2018	24.2	16.3	60.5	40.8
31/12/2018	30.0	16.4	75.0	41.0

*Calculated from PM10

**Calculated from PM10 Annual Average

ND = No data. Annual calibration 19 & 20 December, power outage 21 & 22 December

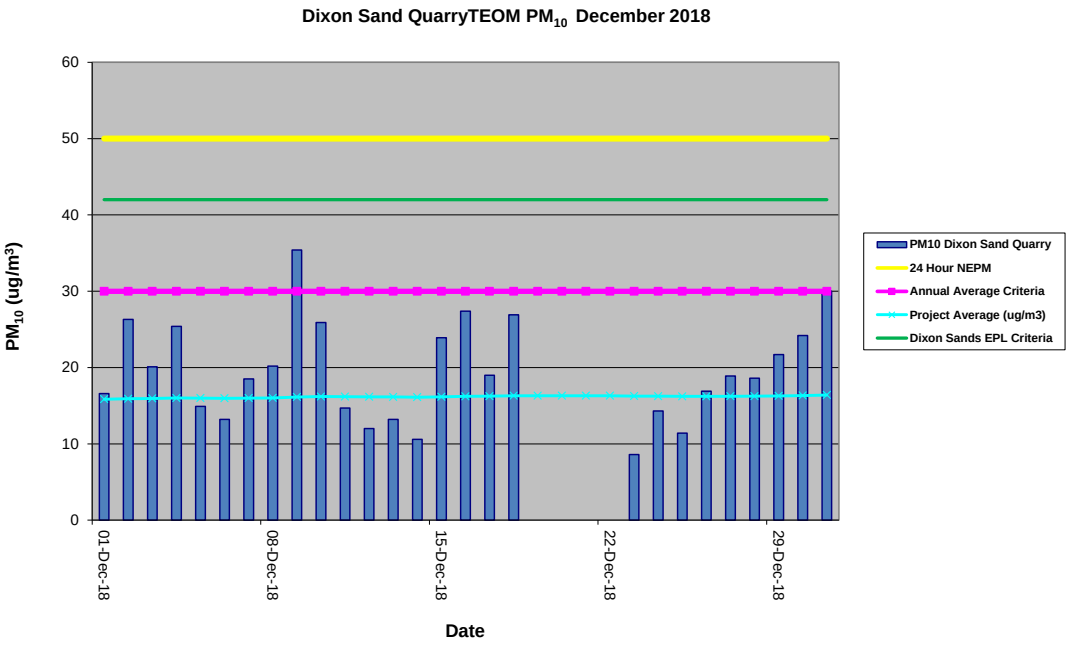


Figure 1: TEOM PM_{10} 24 hr, Annual Average and Criteria

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

The summary of results is presented in **Table 3. Figure 2 and 3** display the charts of meteorological parameters for the month. A windrose is provided in **Figure 4.** This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual calibration was undertaken on the weather station during March 2018 and is next due in March 2019.

Table 3: Meteorological Data Summary for December 2018

Date	Min Temp	Av Temp	Max Temp	RAIN mm	Min WS	Av WS	Max WS	Min Humidity	Av Humidity	Max Humidity	Min Pressure	Av pressure	Max Pressure
1/12/2018	14.1	20.7	30.3	0.0	0.0	4.7	20.8	27.0	73.7	99.4	984.3	987.8	991.3
2/12/2018	16.9	23.7	33.4	0.0	0.4	6.8	37.4	18.8	56.7	99.3	975.4	980.7	987.5
3/12/2018	14.8	21.9	29.4	0.0	0.2	3.6	20.0	16.3	44.8	87.5	984.3	986.9	989.5
4/12/2018	15.5	20.0	24.7	0.0	0.0	6.2	23.2	32.0	58.3	95.1	988.9	992.9	998.9
5/12/2018	15.3	17.4	20.5	0.0	0.4	5.1	18.7	57.4	78.8	99.4	997.2	999.7	1001.9
6/12/2018	14.8	19.4	24.7	0.0	0.1	5.2	25.7	42.4	70.9	99.4	999.2	1000.8	1002.3
7/12/2018	14.3	20.3	27.1	0.0	0.1	5.1	24.5	37.3	62.4	84.7	996.8	999.7	1001.6
8/12/2018	15.0	21.8	30.6	0.0	0.2	4.7	22.2	30.9	66.4	89.9	994.5	997.1	999.5
9/12/2018	16.3	23.0	31.3	0.0	0.2	4.7	19.9	39.7	69.3	99.4	991.2	994.4	996.3
10/12/2018	18.2	22.3	27.9	0.2	0.2	3.9	17.3	46.4	73.9	99.2	991.2	993.7	996.9
11/12/2018	17.3	19.1	22.2	0.2	0.1	3.3	17.6	58.1	78.6	91.2	994.7	996.3	997.7
12/12/2018	16.3	18.6	21.0	0.2	0.1	3.2	13.1	76.9	88.4	99.2	987.7	992.2	995.9
13/12/2018	18.1	21.6	28.0	3.2	0.1	4.3	16.7	59.9	85.1	99.4	975.8	981.2	987.5
14/12/2018	18.2	19.7	21.8	3.6	0.0	2.3	17.7	89.9	99.1	99.5	978.2	981.4	984.7
15/12/2018	19.6	22.6	30.8	0.0	0.1	3.8	17.6	44.7	84.9	99.5	981.3	984.3	986.3
16/12/2018	18.7	24.3	32.0	0.0	0.0	5.7	23.0	31.5	71.9	99.5	982.3	984.9	987.2
17/12/2018	20.2	25.2	31.4	0.0	0.1	5.2	29.7	29.6	59.7	87.5	985.1	987.2	990.1
18/12/2018	20.2	22.3	27.8	0.0	0.1	3.4	9.8	57.4	81.1	99.5	989.6	991.5	993.9
19/12/2018	18.4	20.0	22.1	4.4	0.4	3.3	31.9	88.4	97.6	99.5	986.6	991.8	993.7
20/12/2018	17.5	24.0	36.0	0.0	0.4	4.6	17.6	37.3	81.4	99.6	975.4	984.7	990.3
21/12/2018													
22/12/2018	14.7	17.6	21.2	0.0	0.1	4.4	16.5	53.6	67.9	83.1	991.3	993.8	996.1
23/12/2018	13.4	17.4	23.1	0.2	0.1	4.9	17.4	43.3	68.9	88.2	996.2	998.4	1000.8
24/12/2018	13.1	19.3	26.7	0.0	0.1	4.3	20.2	37.4	68.9	88.6	995.9	998.6	1000.7
25/12/2018	15.5	23.7	33.2	0.0	0.1	4.7	19.4	12.2	58.7	99.4	992.7	995.3	998.0
26/12/2018	18.0	25.4	33.3	0.0	0.1	4.4	18.2	26.0	50.9	84.1	991.5	993.5	995.6
27/12/2018	18.5	26.8	37.1	0.0	0.4	4.8	18.7	17.0	51.6	95.0	988.2	991.1	993.7
28/12/2018	20.6	29.0	38.9	0.0	0.3	5.6	19.8	13.1	38.6	66.4	988.1	990.1	991.7
29/12/2018	18.8	27.7	38.7	0.0	0.5	5.2	22.9	14.7	51.9	91.3	989.1	991.1	992.8
30/12/2018	19.1	27.0	37.7	0.0	0.0	4.0	28.4	13.3	53.9	92.2	990.1	991.7	993.5
31/12/2018	19.9	25.7	35.3	1.0	0.2	3.5	12.0	27.8	60.1	85.4	986.4	990.7	992.9
Monthly	13.1	22.3	38.9	13.0	0.0	4.5	37.4	12.2	68.5	99.6	975.4	991.5	1002.3

No data due to power outage. Limited data for 22 December (14:50 to 23:55 (9hrs))

Figure 2: Rainfall, Temperature and Humidity Charts

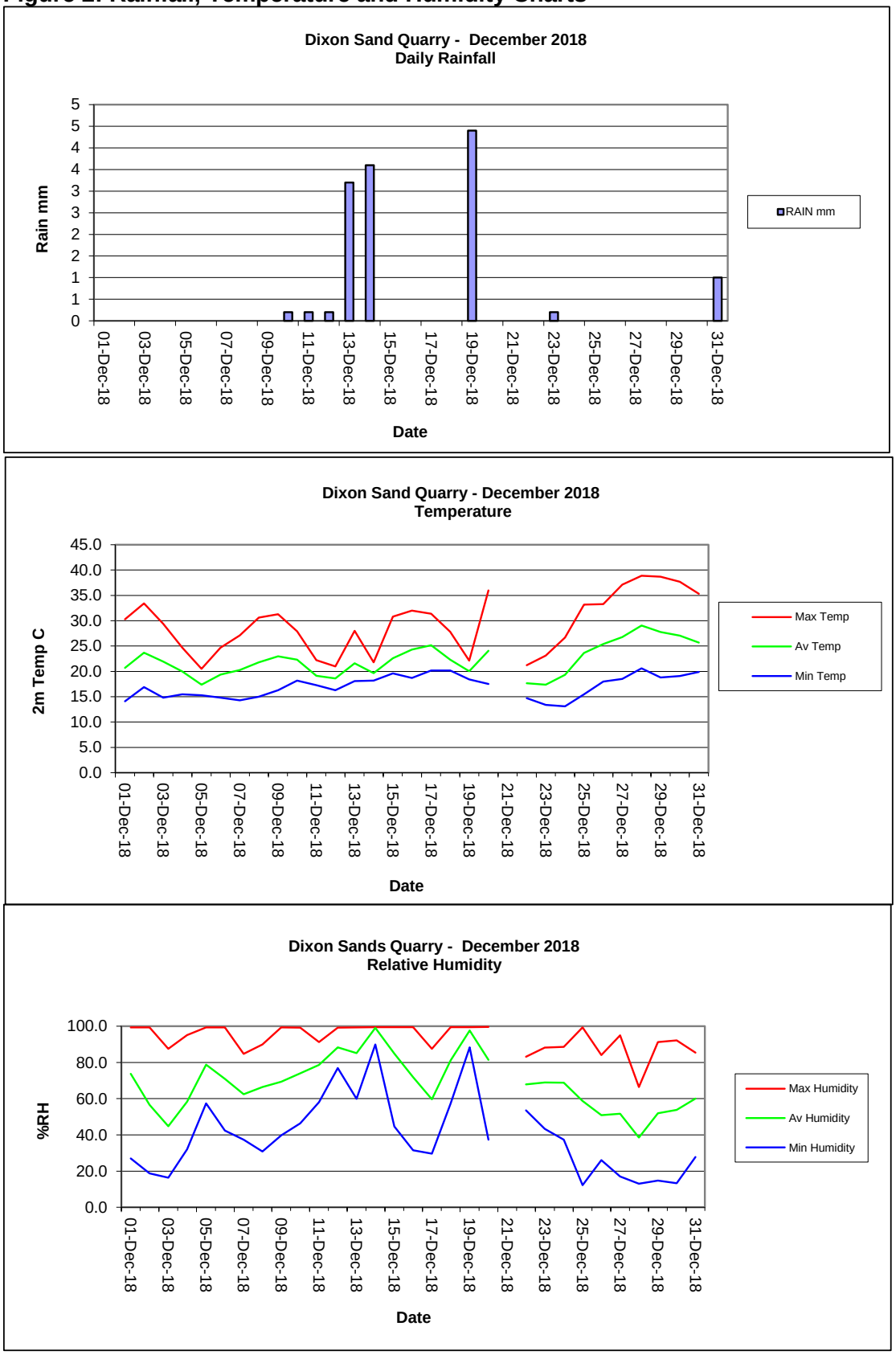
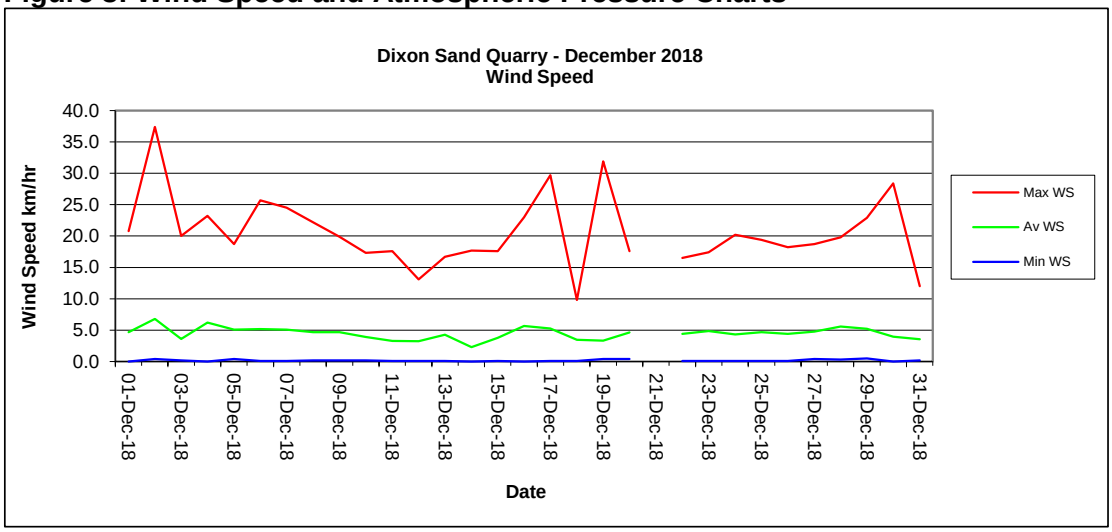


Figure 3: Wind Speed and Atmospheric Pressure Charts



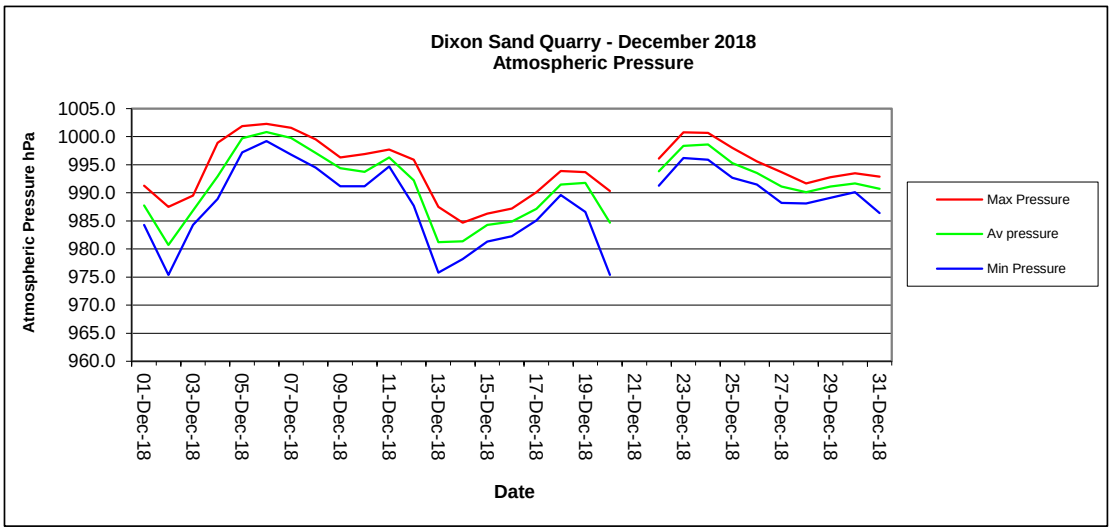
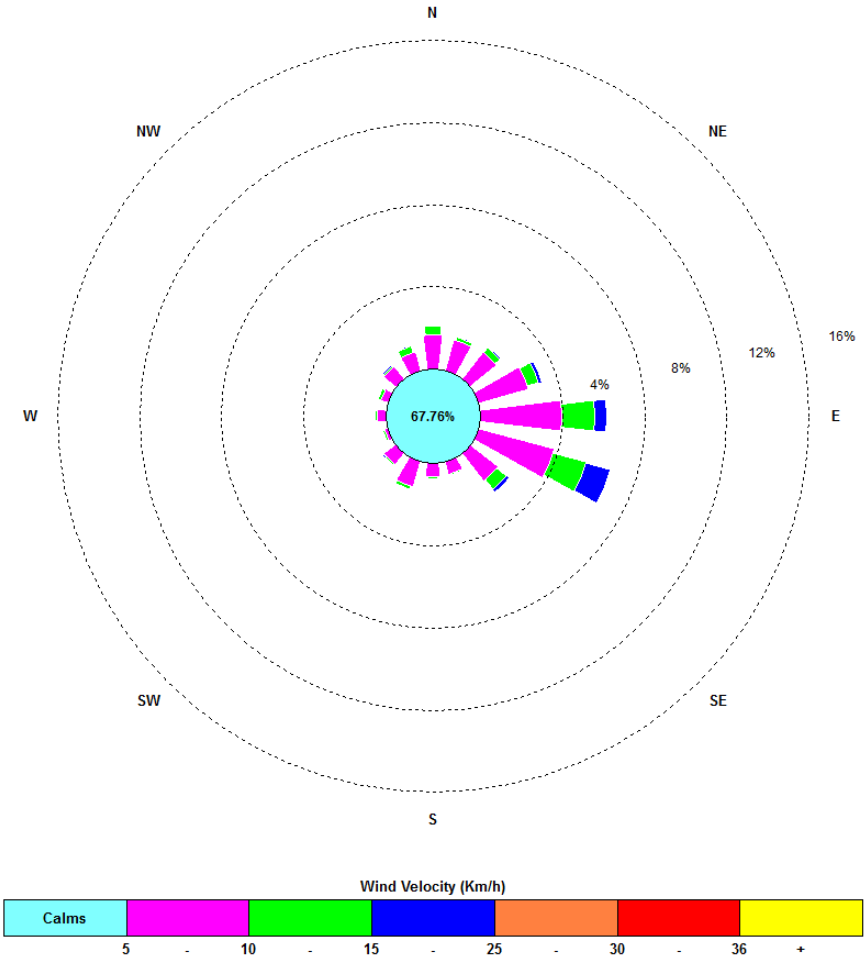


Figure 4: Windrose Plot (km/h)

00:00 1 December 2018 – 23:55 31 December 2018



Appendix 1

Calibration Documents (when required)

Continuous Air Quality
Monthly/Quarterly/6-Monthly/Annual
TEOM Maintenance and Calibration – ~~1405A~~ 1400 abm ✓

teledata

TEOM Client/Site: Dixon Sndy TEOM1 **Date:** 19/12/18

1. TEOM Data Screen **SERIAL No:** 2557D **Firmware:** V 3.017

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Operating Condition	OK 4 ✓	Green - Normal	✓	
Date/time	TEOM: 19/12/18 11:33 Actual: 19/12/18 11:57	Current Date/time correct within 5 minutes		✓ change time
PM10 24hr av	18.9	Positive values	✓	
Filter loading PM10	52	<80 %	✓	
Frequency PM10	253.01345	200-300 Hz	✓	
Noise PM10	0.026	<0.100ug	✓	

Comment: If filter load >80% but <90% and if flows Ok then data is OK. Noise can be higher if particulates are higher – use judgement.

Comments: Charged time OK ✓

Conc A 3.00
Conc B 1.03
✓ GL

2. System Status

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Vacuum pump pressure	0.33	<0.50 atm	✓	
Warnings	NIL	No Warnings	✓	
If any warnings list here:				

Comments: Need new Vac pump ~~20~~ inch Hg ✓ GL. -30 = 1.00 atm
-20 = 0.67 atm

Data Downloaded: YES/(NO) (circle)

Technician Name : COLIN DAVIS **Signed** Colin

3. Instrument Conditions Ambient Conditions and Temperatures

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Ambient Temperature	20.7	-10 to 50 C	✓	
Ambient Dew Point	~~0.97~~ NA	-10 to 50 C	–	
Ambient Pressure	0.970	0.9-1.1 atm	✓	
Ambient Relative Humidity	NA	10-100 %RH	–	
Cap temperature	50.00	50.00 +/- 0.10 C	✓	
Case temperature	50.00	50.00 +/- 0.10 C	✓	
Main (PM10) Air Tube temp	50.00	50.00 +/- 0.10 C	✓	

Comments:

Fadj Main 1.03
Fadj Aux 0.970

4. Instrument Conditions – Flows

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Main (PM10) Flow rate	3.00	2.82 – 3.18 lpm	✓	
Bypass Flow rate	13.68	12.95 – 14.39 lpm	✓	
Total Flow rate	16.68	15.67 – 17.67 lpm	✓	

Comments:

Note: If PM10(Main flow) is outside 2.82-3.18l/s then a disclaimer must be put on results from the last good flow verification

Results: (Tick box)

☑ There were NO equipment faults found. No action required – (file report)

☐ There were faults found (Fails) – Were these fixed on site: YES/NO (circle)
Any Fails that cannot be repaired on site must be reported to CBE:
Office: (02) 65713334 or email cbased@bigpond.com
Date faults notified to CBE: _____

Comments/Action Required:

General Maintenance

1. 1405A: Were Filters replaced (YES/NO)
2. PM10 Inlet head cleaned (YES/NO)
3. If measurement filters were replaced, confirm stable results after change. Stable particulate results confirmed (YES/NO/NA)

Channel	Filter Load %	Frequency Hz initial (Time= 0 min)	Frequency check Time= 1 min	Frequency check Time= 3 min	Frequency check Time = 5 min
PM10	17.0	257.00415	257.00395	257.00390	257.00393

Frequency should not drift by more than 0.0010 between 3 and 5 minute readings (if instrument is thermodynamically stable – no temp alarms) If Fail – install new filter and redo stability test. ✓ all

Note 5 dec places on 1405DB.

4. Instrument clock verified (YES/NO)
Time Corrected - Clock Reset OK (YES/NO/NA)
Comments:

5. Were TEOM in line and rear TEOM filters checked for cleanliness and replaced if necessary? (YES/NO) Changed Coalescing filter
Comments if changed:

6. TEOM Cleaned and Air Conditioner checked (YES/NO). Air Conditioner settings or operational status: Med Cool 5

Tetracal Flow/Temp/Pressure Calibrator Serial No: 1009

Quarterly/Six Monthly/Annual Calibration (circle)

1. Flow Verification – Conducted (YES/NO) (Allow flow correction by wizard if necessary)

PM10 Flow verified Initial Flow l/min 2.96 Error % 1.3 (allowed error <6%) (PASS/FAIL)
Final Flow 1/min 3.00

Bypass Flow verified Initial Flow l/min 12.99 Error % 5.0 (allowed error <6%) (PASS/FAIL)
Final Flow l/min 13.67

If fail then complete a full multipoint recalibration and review previous data from last good flow check. **Comments if Flows recalibrated:**

2. Leak Check – Conducted (YES/NO) (use leak check wizard. Actual = channel flow-zero flow)

PM10 actual 0.02 < Limit 0.15

Bypass actual 0.03 < Limit 0.60

Leak check (PASS/FAIL) – If fail then find leak and retest.
Comments:
ok

Annual Additional Calibration and Maintenance (If Required) YES/No

1. Temperature and Pressure Calibration – Conducted YES/NO
Reference Temperature: 22.7 C TEOM Initial Temperature 20.6 C
If difference +/- 1 C recalibrate sensor. Sensor recalibrated YES/NO.
Final Temperature Reading 22.7 C

Reference Pressure: 0.974 atm TEOM Initial Pressure 0.970 atm
If difference +/- 0.010 atm recalibrate sensor. Sensor recalibrated YES/NO.
Final Pressure Reading 0.974 atm

let 740 mm Hg. = 0.974 atm
22.7°C

Note: Tetracal measures Atmospheric Pressure in mb and 1atm = 1013.25mb. Divide tetracal result by this to change units to atm.

2. Flow Calibration – Conducted YES/NO
PM10 (l/min)
Set point 2.4 l/min:_____
Set point 3.6 l/min:_____
Set point 3.0 l/min:_____ After calibration Final:_____l/min

BYPASS (l/min)
Set point 10.9 l/min:_____
Set point 16.4 l/min:_____
Set point 13.67 l/min:_____ After calibration Final:_____l/min

NA.

Software flow adj

Pre	Fadj	Post	Fadj
1.03		1.03	
0.970		0.99	OK

Hardware flow adj
OK ✓

3. Mass calibration (K0) Verification – Conducted YES/NO
Audit - Actual measured K0 = 14053 TEOM stated K0 13748 Error %: 2.22%
Allowed Error +/- 2.5%. PASS/FAIL
If Error +/- 2.5% repeat. If confirmed consult manufacturer.
Second Error % =_____ PASS/FAIL. Comments: NA
If second test fails consult Lear Siegler or manufacturer.

4. Annual Noise check - Conducted YES/NO
Zero filter applied to TEOM and TEOM operated for at least 12 hours:
Start date/time: 19/12/18 14:35 Finish date/time: 20/12/18 09:00 ~~AM~~
Standard deviation of all recorded data (30 min averages) = 2.2 ug/m³
Noise was less than 5ug/m³ YES/NO (excluded storm)

removed filter → freq stable looks ok.
(Average = 0.4 ng)

5. Maintenance
Air Inlet system cleaned? YES/NO
Pump Reconditioned? YES/NO New Pump vacuum_____atm
Waterproofing checked? YES/NO

Comments:
OK

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

January 2019

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 26 February 2019

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited (CBE) is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for Fine Particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring program includes;

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report was prepared by CBased Environmental and includes the following;

- TEOM (PM_{10}) monitoring results for January 2019; and
- Meteorological results for January 2019.

Current year to date annual average for PM_{10} is calculated from the 1st July 2018 for TEOM's coinciding with the Dixon Sand project year.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- All TEOM PM_{10} 24-hour average results were below the short-term Dixon Sand Quarry consent, 24-hour impact criteria of 50ug/m^3;
- The current TEOM PM_{10} annual average is below the Dixon Sand Quarry consent, annual average criteria of 30ug/m3.
- Currently, calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.
- All TEOM PM_{10} 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Note that an annual amount of data has not yet been collected.

Approximately 100% of meteorological data was recovered for January 2019.
Approximately 100% of TEOM data was recovered for January 2019.

2.0 Sampling Program

The TEOM is operated to the applicable Australian Standard and OEH (EPA) approved method. All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

The following Australian Standards were used:

AS3580.9.8 (2001) "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*."

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

The location of the air quality monitoring equipment met the Australian Standard AS 3580.1.1 (2007) "*Methods for sampling and analysis of ambient air Part 1.1 Guide to siting air monitoring equipment*". Air Quality monitoring site descriptions and locations are provided in **Table 1**:

Table 1: Dixon Sands Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Reporting Period Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**. During the monitoring period individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m^3.

The current TEOM PM_{10} annual average runs from the 1st July 2018. At present it is below the Dixon Sand Quarry long term annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: an annual amount of data has not yet been collected.

An annual calibration was undertaken on the TEOM during December 2018 and a quarterly calibration is next due in March 2019. Calibration certificates are provided in **Appendix 1** (when required).

Table 2: Average Daily 24 Hr TEOM PM_{10} and TSP for January 2019 from AQMS and Annual Average PM_{10} calculated from the 1 July 2018.

Date	TEOM PM_{10} ($\mu g/m^3$)	Annual PM_{10} Average ($\mu g/m^3$)	TSP* ($\mu g/m3$)	TSP Annual** ($\mu g/m3$)
1/01/2019	17.5	16.4	43.8	41.0
2/01/2019	28.8	16.5	72.0	41.2
3/01/2019	23.9	16.5	59.8	41.3
4/01/2019	20.4	16.5	51.0	41.3
5/01/2019	22.0	16.6	55.0	41.4
6/01/2019	8.3	16.5	20.8	41.3
7/01/2019	10.3	16.5	25.8	41.2
8/01/2019	15.5	16.5	38.8	41.2
9/01/2019	16.5	16.5	41.3	41.2
10/01/2019	17.8	16.5	44.5	41.2
11/01/2019	15.5	16.5	38.8	41.2
12/01/2019	15.8	16.5	39.5	41.2
13/01/2019	26.4	16.5	66.0	41.3
14/01/2019	19.9	16.6	49.8	41.4
15/01/2019	22.5	16.6	56.3	41.5
16/01/2019	34.4	16.7	86.0	41.7
17/01/2019	28.6	16.7	71.5	41.8
18/01/2019	30.2	16.8	75.5	42.0
19/01/2019	29.2	16.9	73.0	42.2
20/01/2019	20.5	16.9	51.3	42.2
21/01/2019	ND	16.9	ND	42.2
22/01/2019	18.2	16.9	45.5	42.2
23/01/2019	25.9	16.9	64.8	42.3
24/01/2019	24.6	17.0	61.5	42.4
25/01/2019	21.2	17.0	53.0	42.5
26/01/2019	27.4	17.0	68.5	42.6
27/01/2019	29.6	17.1	74.0	42.8
28/01/2019	18.3	17.1	45.8	42.8
29/01/2019	22.4	17.1	56.0	42.8
30/01/2019	25.6	17.2	64.0	42.9
31/01/2019	23.5	17.2	58.8	43.0

*Calculated from PM10

**Calculated from PM10 Annual Average

ND = No data. Power outage

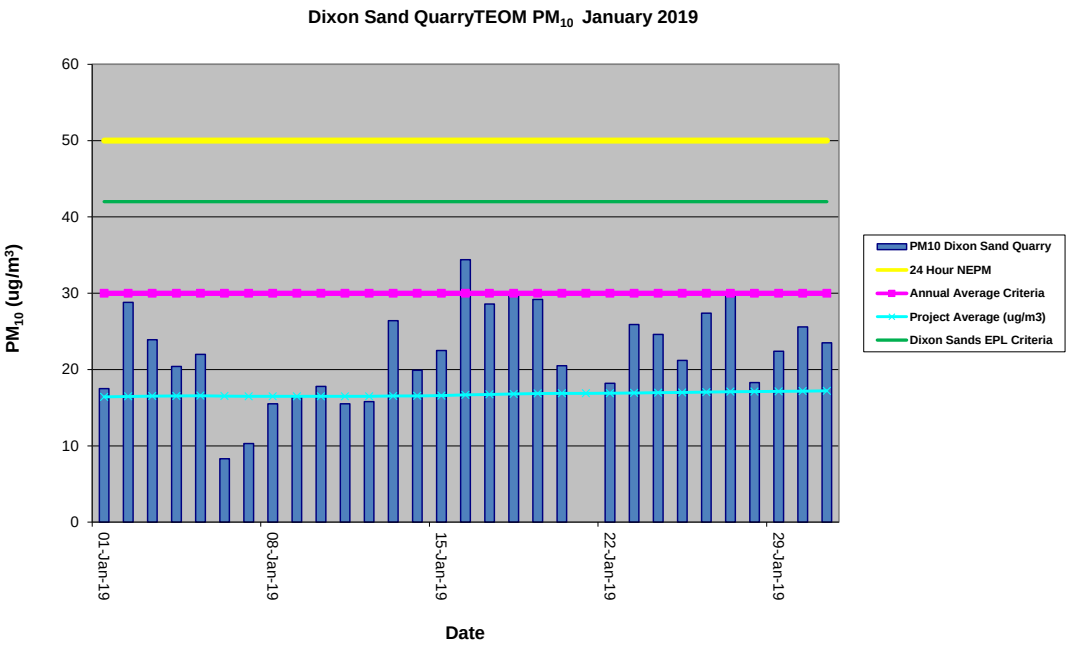


Figure 1: TEOM PM_{10} 24 hr, Annual Average and Criteria

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

The summary of results is presented in **Table 3. Figure 2 and 3** display the charts of meteorological parameters for the month. A windrose is provided in **Figure 4.** This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual calibration was undertaken on the weather station during March 2018 and is next due in March 2019.

Table 3: Meteorological Data Summary for January 2019

Date	Min Temp	Av Temp	Max Temp	RAIN mm	Min WS	Av WS	Max WS	Min Humidity	Av Humidity	Max Humidity	Min Pressure	Av pressure	Max Pressure
1/01/2019	21.7	27.3	33.6	0.0	0.1	5.5	25.9	25.5	52.5	82.4	987.0	989.1	991.7
2/01/2019	19.1	25.1	33.6	0.0	0.0	4.2	29.9	37.2	66.0	88.8	986.5	988.8	990.7
3/01/2019	20.0	23.5	30.9	0.0	0.1	4.9	21.5	45.2	74.6	91.8	989.4	990.9	992.5
4/01/2019	19.2	25.8	34.6	0.0	0.0	4.2	21.4	27.0	70.1	99.6	987.1	990.1	992.5
5/01/2019	18.4	27.6	39.7	6.0	0.4	6.4	29.4	21.1	60.2	99.5	983.1	987.6	993.3
6/01/2019	16.3	17.5	18.7	0.8	0.0	3.6	11.6	89.2	98.2	99.5	989.9	995.0	998.5
7/01/2019	16.2	18.7	21.5	0.2	0.1	3.2	10.4	89.6	99.1	100.0	995.0	996.9	998.6
8/01/2019	19.6	23.1	29.9	1.8	0.0	3.8	17.4	60.4	94.8	100.0	987.0	991.4	995.0
9/01/2019	18.8	23.4	32.4	1.2	0.2	4.9	24.9	44.8	90.2	100.0	988.4	990.4	994.7
10/01/2019	19.1	20.4	23.6	0.2	0.2	2.5	8.2	80.0	98.3	100.0	992.9	995.5	998.1
11/01/2019	18.9	21.9	28.9	1.8	0.0	3.7	18.0	62.6	94.8	100.0	992.6	996.2	998.9
12/01/2019	19.3	25.9	35.9	0.0	0.1	4.1	17.9	26.4	75.5	100.0	992.0	994.1	996.9
13/01/2019	20.3	23.0	27.0	0.0	0.1	4.2	16.8	66.3	94.8	100.0	994.1	997.4	999.4
14/01/2019	19.1	23.8	31.0	0.0	0.0	4.2	17.5	49.1	82.1	99.7	991.2	995.2	998.9
15/01/2019	19.9	27.2	37.0	0.0	0.1	4.9	21.7	31.7	69.3	100.0	986.7	990.2	993.1
16/01/2019	21.1	27.5	37.4	0.0	0.3	4.2	16.6	40.5	73.9	99.5	986.3	988.1	989.9
17/01/2019	21.0	27.3	38.8	0.0	0.3	5.3	21.9	24.4	67.6	99.7	985.7	988.9	991.7
18/01/2019	21.3	28.1	39.2	0.0	0.4	4.9	16.4	26.7	62.6	88.9	985.0	989.3	993.0
19/01/2019	19.3	23.8	29.7	0.0	0.1	2.8	10.6	51.9	75.2	98.1	989.4	994.6	1000.0
20/01/2019	18.5	20.4	22.5	0.0	0.1	3.4	12.7	84.9	94.3	99.7	995.5	998.1	999.9
21/01/2019	19.7	23.0	27.0	1.0	0.4	3.7	16.7	72.1	90.2	99.7	993.9	996.3	998.4
22/01/2019	21.3	25.7	33.1	0.0	0.2	3.8	16.5	44.8	78.1	99.8	989.8	992.5	995.4
23/01/2019	21.5	25.2	33.9	0.2	0.1	4.0	21.7	41.8	73.1	97.6	988.4	990.5	994.4
24/01/2019	20.8	22.8	27.4	0.0	0.2	4.2	12.6	65.0	78.8	94.1	993.2	994.4	996.2
25/01/2019	21.3	26.5	35.2	0.0	0.3	4.5	16.3	41.5	76.1	99.8	986.9	990.8	995.2
26/01/2019	22.9	29.4	40.7	0.0	0.2	5.4	19.5	25.4	61.6	95.6	984.1	986.2	988.4
27/01/2019	21.2	26.1	38.5	2.8	0.1	4.5	26.8	33.6	77.3	99.7	984.5	988.0	993.7
28/01/2019	21.2	23.7	28.5	0.0	0.0	4.4	24.8	67.1	87.4	99.7	991.5	993.1	995.0
29/01/2019	20.9	26.3	34.0	0.0	0.3	5.0	22.4	45.9	73.3	99.7	988.2	991.3	994.6
30/01/2019	21.4	26.5	32.6	0.0	0.0	3.4	11.6	51.4	75.4	99.3	987.5	989.6	991.9
31/01/2019	19.5	27.8	37.4	0.0	1.1	6.0	26.0	24.5	56.7	82.9	985.9	988.8	996.2
Monthly	16.2	24.7	40.7	16.0	0.0	4.3	29.9	21.1	78.1	100.0	983.1	991.9	1000.0

Figure 2: Rainfall, Temperature and Humidity Charts

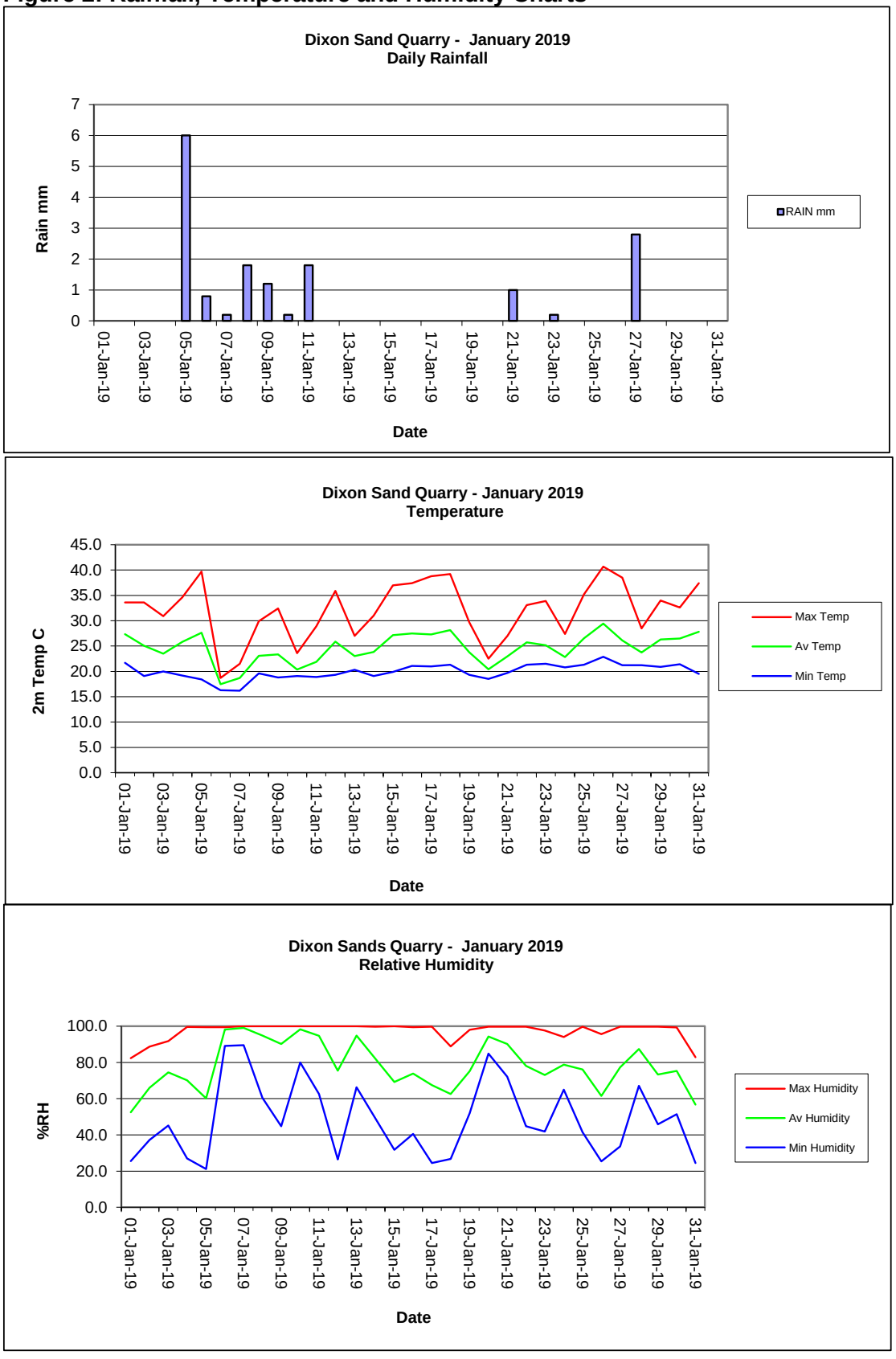


Figure 3: Wind Speed and Atmospheric Pressure Charts

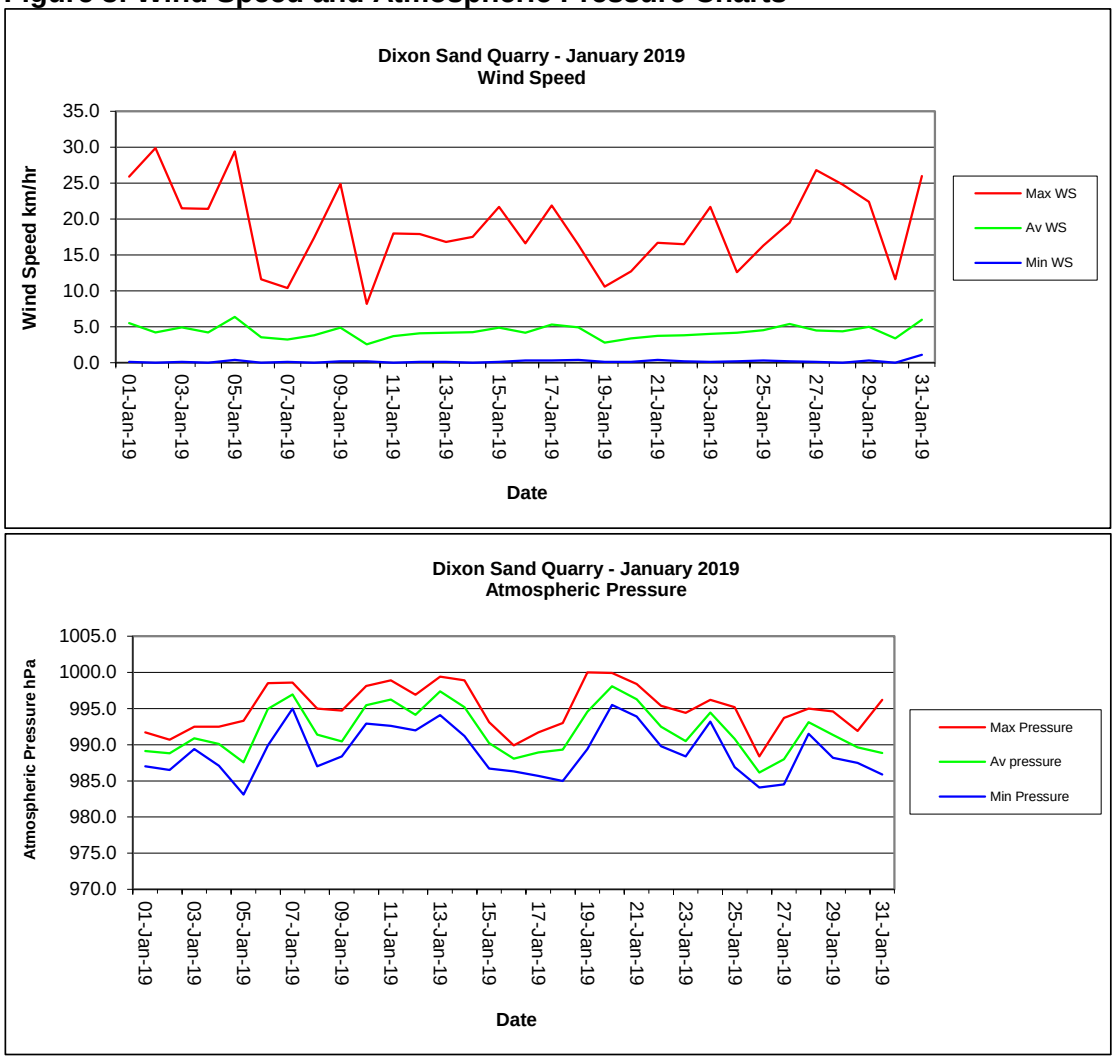
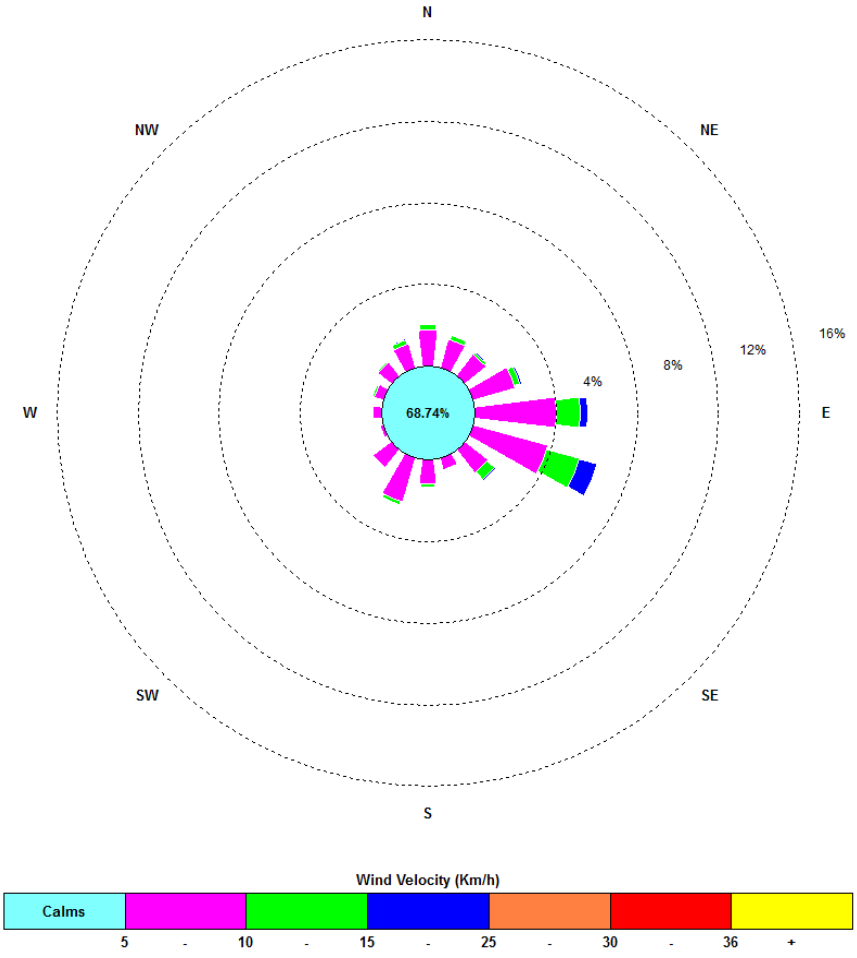


Figure 4: Windrose Plot (km/h)

00:00 1 January 2019 – 23:55 31 January 2019



Appendix 1

Calibration Documents (when required)

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

February 2019

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 19 March 2019

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

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- Currently, calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.
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Approximately 100% of meteorological data was recovered for February 2019.
Approximately 100% of TEOM data was recovered for February 2019.

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Table 1: Dixon Sands Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Reporting Period Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**. During the monitoring period individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m^3.

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2/02/2019	10.7	17.2	26.8	42.9
3/02/2019	10.7	17.1	26.8	42.8
4/02/2019	22.2	17.1	55.5	42.9
5/02/2019	22.5	17.2	56.3	42.9
6/02/2019	11.1	17.1	27.8	42.9
7/02/2019	10.6	17.1	26.5	42.8
8/02/2019	13.9	17.1	34.8	42.7
9/02/2019	11.0	17.1	27.5	42.7
10/02/2019	20.9	17.1	52.3	42.7
11/02/2019	21.7	17.1	54.3	42.8
12/02/2019	30.5	17.2	76.3	42.9
13/02/2019	35.4	17.2	88.5	43.1
14/02/2019	21.3	17.3	53.3	43.2
15/02/2019	14.0	17.3	35.0	43.1
16/02/2019	12.9	17.2	32.3	43.1
17/02/2019	13.1	17.2	32.8	43.0
18/02/2019	17.4	17.2	43.5	43.0
19/02/2019	30.7	17.3	76.8	43.2
20/02/2019	6.1	17.2	15.3	43.1
21/02/2019	13.0	17.2	32.5	43.0
22/02/2019	10.4	17.2	26.0	42.9
23/02/2019	9.0	17.1	22.5	42.9
24/02/2019	17.9	17.1	44.8	42.9
25/02/2019	15.3	17.1	38.3	42.8
26/02/2019	13.2	17.1	33.0	42.8
27/02/2019	18.6	17.1	46.5	42.8
28/02/2019	13.4	17.1	33.5	42.8

*Calculated from PM10

**Calculated from PM10 Annual Average

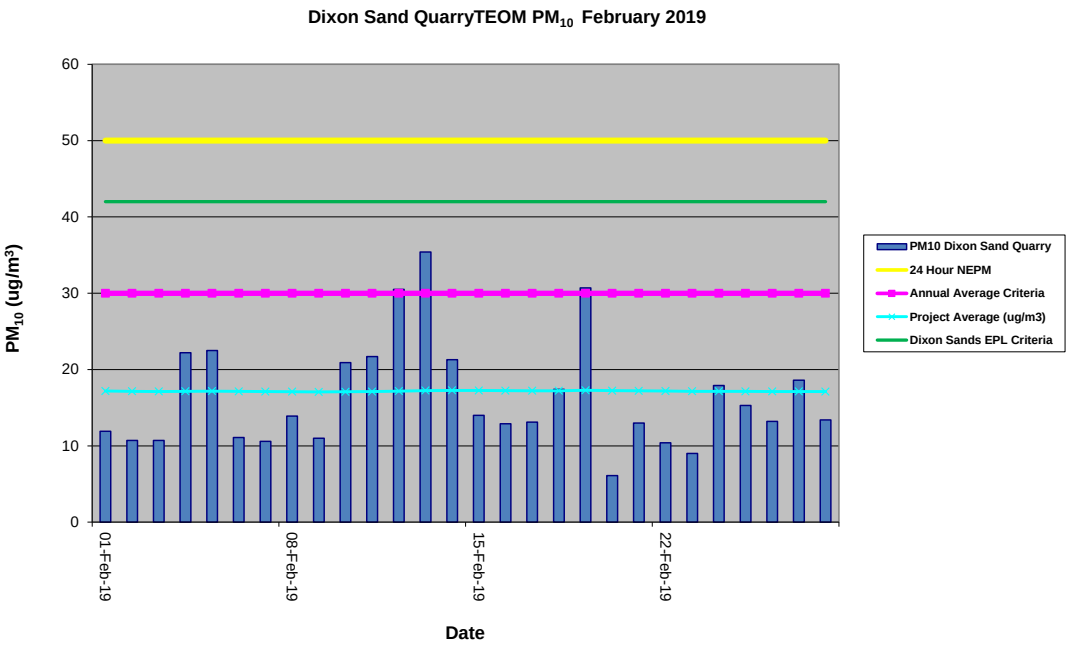


Figure 1: TEOM PM_{10} 24 hr, Annual Average and Criteria

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

The summary of results is presented in **Table 3. Figure 2 and 3** display the charts of meteorological parameters for the month. A windrose is provided in **Figure 4.** This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual calibration was undertaken on the weather station during March 2018 and is next due in March 2019.

Table 3: Meteorological Data Summary for February 2019

Date	Min Temp	Av Temp	Max Temp	RAIN mm	Min WS	Av WS	Max WS	Min Humidity	Av Humidity	Max Humidity	Min Pressure	Av pressure	Max Pressure
1/02/2019	16.4	17.5	19.9	0.0	0.3	5.3	12.8	76.6	95.1	99.7	996.3	998.6	1000.1
2/02/2019	17.2	20.7	23.4	0.0	0.0	4.2	20.7	87.6	98.7	99.7	995.1	997.0	999.2
3/02/2019	19.2	23.9	30.6	0.0	0.0	4.4	18.8	49.4	80.4	99.8	990.0	993.3	996.0
4/02/2019	19.4	25.7	34.1	0.0	0.0	3.2	12.9	32.4	71.0	99.7	988.4	990.4	992.2
5/02/2019	22.0	24.3	28.4	0.0	0.2	4.8	18.8	59.8	75.9	87.6	990.8	992.5	994.8
6/02/2019	20.1	24.0	28.8	0.0	0.1	5.8	24.7	45.9	73.5	99.2	992.3	993.7	995.2
7/02/2019	19.1	24.3	30.1	0.0	0.2	5.1	22.9	43.3	71.2	99.7	988.3	991.8	994.7
8/02/2019	19.3	23.9	32.5	2.6	0.3	3.7	21.2	37.9	75.8	99.7	979.9	985.5	989.7
9/02/2019	19.2	24.5	30.9	0.0	0.3	5.6	24.6	25.6	55.4	99.7	975.5	979.3	984.3
10/02/2019	15.4	19.8	26.3	0.0	0.0	4.2	24.6	20.7	56.0	82.9	983.2	985.7	988.3
11/02/2019	14.2	22.2	33.3	0.0	0.1	3.9	15.6	13.9	59.5	80.3	979.3	983.7	988.0
12/02/2019	18.7	27.5	35.0	0.0	0.2	6.1	27.2	9.2	29.5	72.1	975.1	978.5	981.8
13/02/2019	18.1	21.6	29.2	0.0	0.4	5.0	21.8	18.3	59.0	81.7	976.9	984.3	993.2
14/02/2019	15.6	19.4	24.5	0.0	0.1	4.2	15.7	46.9	60.1	73.9	993.3	996.4	999.7
15/02/2019	14.3	20.0	25.8	0.0	0.1	4.5	21.4	41.3	64.6	91.6	999.4	1000.8	1002.6
16/02/2019	15.9	20.9	27.1	0.0	0.0	3.6	19.1	46.6	65.9	83.8	994.6	997.9	1001.6
17/02/2019	17.7	23.7	32.3	0.0	0.1	4.3	24.7	27.5	62.7	89.1	988.1	991.5	995.2
18/02/2019	17.8	26.1	36.4	0.0	0.2	4.9	23.9	18.3	55.8	94.1	983.0	986.8	990.2
19/02/2019	18.2	24.4	33.8	0.0	0.2	4.7	22.8	28.6	62.9	99.5	983.1	985.9	991.5
20/02/2019	17.1	18.6	21.5	0.0	0.1	4.1	13.5	90.0	99.0	99.6	988.4	989.9	991.6
21/02/2019	18.2	20.1	23.2	0.8	0.2	3.0	9.4	70.8	93.2	99.6	991.1	994.0	997.7
22/02/2019	16.5	18.3	22.2	1.4	0.6	5.2	17.7	64.5	90.4	99.6	996.5	998.3	999.9
23/02/2019	14.8	17.8	21.4	0.8	0.1	4.6	16.3	69.6	87.8	99.6	997.6	1000.3	1003.3
24/02/2019	15.4	19.0	24.2	0.0	0.1	4.3	15.7	40.2	70.8	99.5	1002.8	1004.9	1006.6
25/02/2019	15.0	18.9	24.7	0.2	0.0	4.0	17.4	43.0	73.6	99.3	1002.3	1004.5	1006.4
26/02/2019	14.8	20.7	27.7	0.0	0.0	3.6	14.7	32.5	65.6	88.8	996.4	999.5	1003.2
27/02/2019	16.1	21.1	27.1	0.2	0.0	3.0	16.4	51.1	78.3	99.6	997.9	1000.4	1002.3
28/02/2019	18.0	21.9	27.7	0.0	0.0	3.8	18.6	43.3	75.3	99.7	999.7	1001.5	1003.4
Monthly	14.2	21.8	36.4	6.0	0.0	4.4	27.2	9.2	71.7	99.8	975.1	993.1	1006.6

Figure 2: Rainfall, Temperature and Humidity Charts

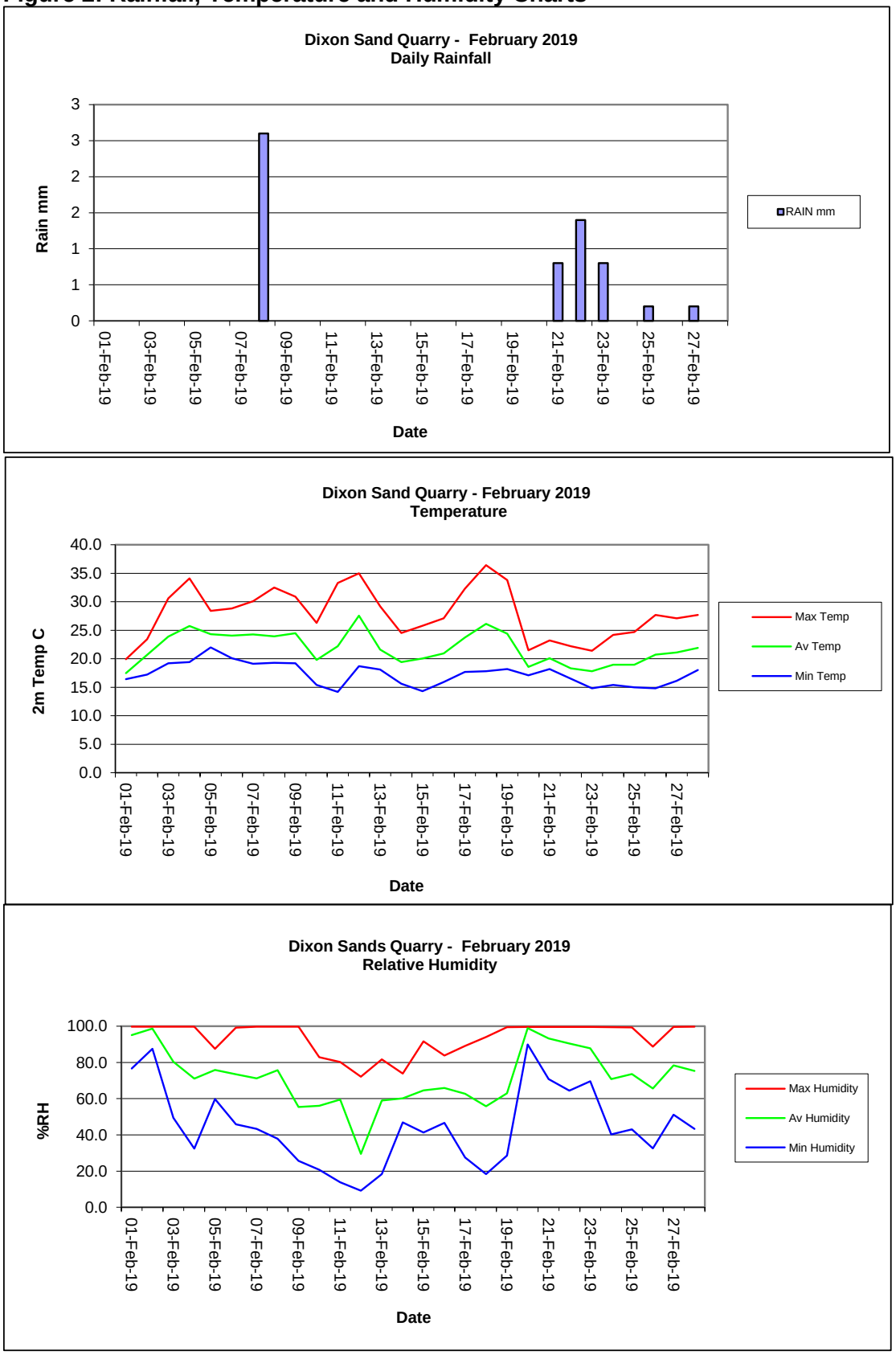


Figure 3: Wind Speed and Atmospheric Pressure Charts

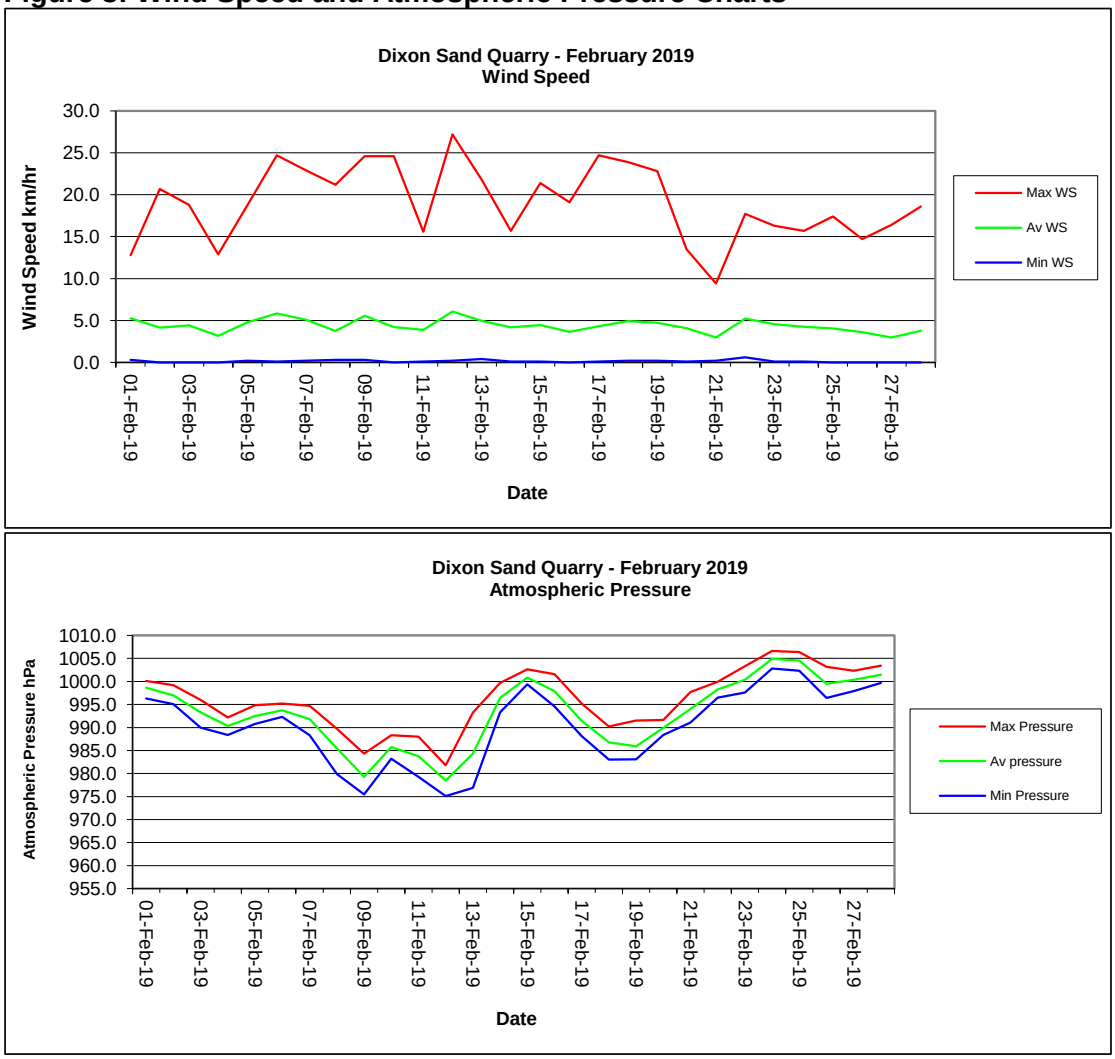
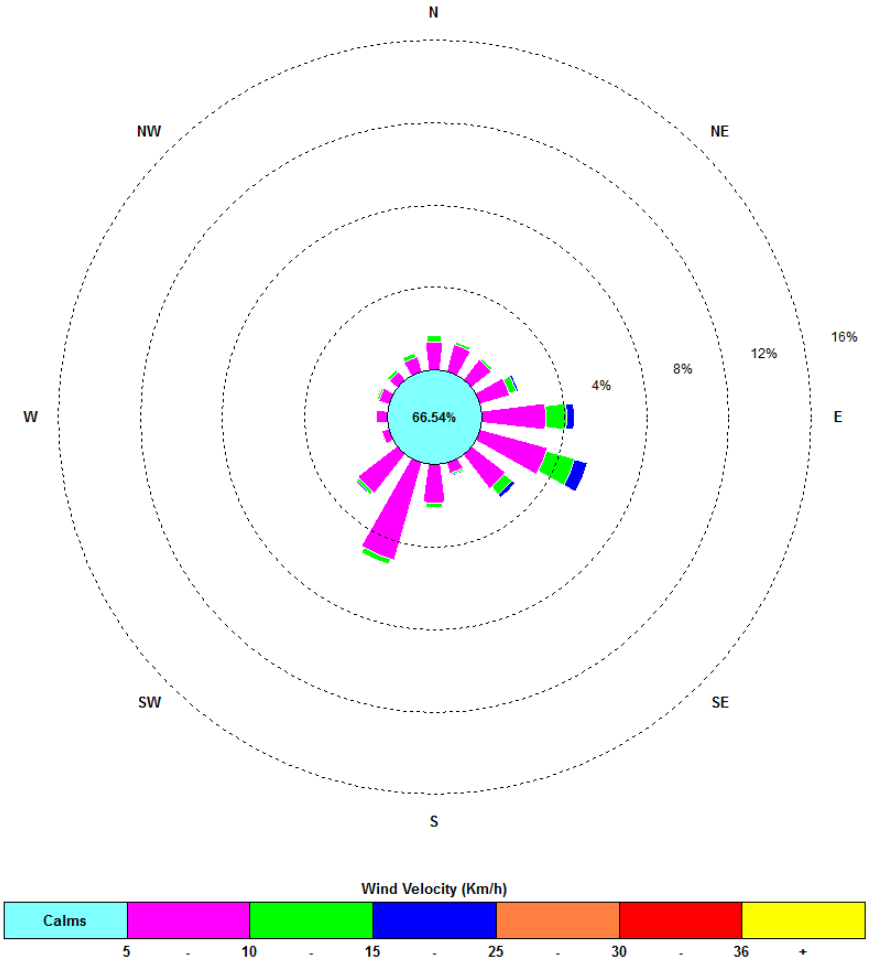


Figure 4: Windrose Plot (km/h)

00:00 1 February 2019 – 23:55 28 February 2019



Appendix 1

Calibration Documents (when required)

Continuous Air Quality
Monthly/Quarterly/6-Monthly/Annual
TEOM Maintenance and Calibration – 1405A

teledata

TEOM Client/Site: Dixon Sands / TEOM 1 **Date:** 20/2/19

Multi trainer 04-1058

1. TEOM Data Screen **SERIAL No:** 05-0721 **Firmware:** V –

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Operating Condition	4 OK ✓	Green - Normal	✓	
Date/time	TEOM: 20/2/19 10:57 Actual: 20/2/19	Current Date/time correct within 5 minutes	✓	
PM10 24hr av	20.0	Positive values	✓	
Filter loading PM10	47	<80 %	✓	
Frequency PM10	254.7725	200-300 Hz	✓	
Noise PM10	0.03	<0.100ug	✓	

Comment: If filter load >80% but <90% and if flows Ok then data is OK. Noise can be higher if particulates are higher – use judgement.

Comments:

2. System Status

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Vacuum pump pressure	0.32	<0.50 atm	✓	
Warnings	NIL	No Warnings	✓	
If any warnings list here:				

Comments:

Data Downloaded: YES/NO (circle)

Technician Name : COLIN DANIEL **Signed** Colin

3. Instrument Conditions Ambient Conditions and Temperatures

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Ambient Temperature	17.6	-10 to 50 C	✓	
Ambient Dew Point	17.5	-10 to 50 C	✓	
Ambient Pressure	0.986	0.9-1.1 atm	✓	
Ambient Relative Humidity	99	10-100 %RH	✓	
Cap temperature	50.00	50.00 +/- 0.10 C	✓	
Case temperature	50.00	50.00 +/- 0.10 C	✓	
Main (PM10) Air Tube temp	50.00	50.00 +/- 0.10 C	✓	

Comments:

4. Instrument Conditions – Flows

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Main (PM10) Flow rate	3.00	2.82 – 3.18 lpm	✓	
Bypass Flow rate	13.67	12.95 – 14.39 lpm	✓	
Total Flow rate	16.67	15.67 – 17.67 lpm	✓	

Comments:

Note: If PM10(Main flow) is outside 2.82-3.18l/s then a disclaimer must be put on results from the last good flow verification

Results: (Tick box)

☑ **There were NO equipment faults found. No action required – (file report)**

☐ **There were faults found (Fails) – Were these fixed on site: YES/NO (circle)**
Any Fails that cannot be repaired on site must be reported to CBE:
Office: (02) 65713334 or email cbased@bigpond.com
Date faults notified to CBE: _____

Comments/Action Required:

Note: Completed flow hardware Calibration with Scott Xie from Ecotech.

General Maintenance

1. 1405A: Were Filters replaced YES/NO
2. PM10 Inlet head cleaned YES/NO
3. If measurement filters were replaced, confirm stable results after change. Stable particulate results confirmed YES/NO/NA

Channel	Filter Load %	Frequency Hz initial (Time= 0 min)	Frequency check Time= 1 min	Frequency check Time= 3 min	Frequency check Time = 5 min
PM10					

Frequency should not drift by more than 0.0010 between 3 and 5 minute readings (if instrument is thermodynamically stable – no temp alarms) If Fail – install new filter and redo stability test.

4. Instrument clock verified YES/NO
Time Corrected - Clock Reset OK YES/NO/NA
Comments:

5. Were TEOM in line and rear TEOM filters checked for cleanliness and replaced if necessary? YES/NO
Comments if changed:

6. TEOM Cleaned and Air Conditioner checked YES/NO. Air Conditioner settings or operational status: ok

Tetracal Flow/Temp/Pressure Calibrator Serial No: 1009

Quarterly/Six Monthly/Annual Calibration (circle)

1. Flow Verification – Conducted YES/NO (Allow flow correction by wizard if necessary)

PM10 Flow verified Initial Flow l/min 2.96 Error % 1.3 (allowed error <6%) PASS/FAIL
Final Flow 1/min 3.00

Bypass Flow verified Initial Flow l/min 13.01 Error % 4.8 (allowed error <6%) PASS/FAIL Slight leak fixed
Final Flow l/min 13.67

If fail then complete a full multipoint recalibration and review previous data from last good flow check. **Comments if Flows recalibrated:**

2. Leak Check – Conducted YES/NO (use leak check wizard. Actual = channel flow-zero flow)

PM10 actual 0.26 < Limit 0.15

Bypass actual 0.06 < Limit 0.60

Leak check PASS/FAIL – If fail then find leak and retest.
Comments:

Note: found a leak when put TEOM back after Flow hardware cal fixed apart from a small leak in mass transducer + Scott said this would not affect data and we could not repair onsite. Check with Client if TEOM can be removed
- leak only when under vacuum pressure up flow all good under normal air pressure.

Annual Additional Calibration and Maintenance (If Required) YES/No

1. Temperature and Pressure Calibration – Conducted YES/NO
Reference Temperature: _____C TEOM Initial Temperature_____C
If difference +/- 1 C recalibrate sensor. Sensor recalibrated YES/NO.
Final Temperature Reading_____ C

Reference Pressure: _____atm TEOM Initial Pressure_____atm
If difference +/- 0.010 atm recalibrate sensor. Sensor recalibrated YES/NO.
Final Pressure Reading _____atm

Note: Tetracal measures Atmospheric Pressure in mb and 1atm = 1013.25mb. Divide tetracal result by this to change units to atm.

2. Flow Calibration – Conducted YES/NO
PM10 (l/min)
Set point 2.4 l/min:_____
Set point 3.6 l/min:_____
Set point 3.0 l/min:_____After calibration Final:_____l/min

BYPASS (l/min)
Set point 10.9 l/min:_____
Set point 16.4 l/min:_____
Set point 13.67 l/min:_____ After calibration Final:_____l/min

3. Mass calibration (K0) Verification – Conducted YES/NO
Audit - Actual measured K0 = _____ TEOM stated K0_____ Error %:_____
Allowed Error +/- 2.5%. PASS/FAIL
If Error +/- 2.5% repeat. If confirmed consult manufacturer.
Second Error % =_____ PASS/FAIL. Comments:
If second test fails consult Lear Siegler or manufacturer.

4. Annual Noise check - Conducted YES/NO
Zero filter applied to TEOM and TEOM operated for at least 12 hours:
Start date/time: _____Finish date/time:_____
Standard deviation of all recorded data (30 min averages) = _____ug/m^3
Noise was less than 5ug/m^3 YES/NO

5. Maintenance
Air Inlet system cleaned? YES/NO
Pump Reconditioned? YES/NO New Pump vacuum_____atm
Waterproofing checked? YES/NO

Comments:

NOTE: Hardwire flow conducted OK

	Initial	Final
Fadj main	1.030	1.005
Fadj bypas	0.995	1.000

✓ good

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

March 2019

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 24 April 2019

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited (CBE) is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for Fine Particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring program includes;

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report was prepared by CBased Environmental and includes the following;

- TEOM (PM_{10}) monitoring results for March 2019; and
- Meteorological results for March 2019.

Current year to date annual average for PM_{10} is calculated from the 1st July 2018 for TEOM's coinciding with the Dixon Sand project year.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- One TEOM PM_{10} 24-hour average result was above the short-term Dixon Sand Quarry consent, 24-hour impact criteria of 50ug/m^3 (6/3/2019);
- The current TEOM PM_{10} annual average is below the Dixon Sand Quarry consent, annual average criteria of 30ug/m3.
- Currently, calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.
- One TEOM PM_{10} 24-hour average results was above the Dixon Sand Quarry EPL limit of 42ug/m^3 (6/3/2019).

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Note that an annual amount of data has not yet been collected.

Approximately 100% of meteorological data was recovered for March 2019.
Approximately 74% of TEOM data was recovered for March 2019.

The TEOM air conditioning unit failed throughout the month and was replaced on 19 March 2019.

2.0 Sampling Program

The TEOM is operated to the applicable Australian Standard and OEH (EPA) approved method. All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

The following Australian Standards were used:

AS3580.9.8 (2001) "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*."

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

The location of the air quality monitoring equipment met the Australian Standard AS 3580.1.1 (2007) "*Methods for sampling and analysis of ambient air Part 1.1 Guide to siting air monitoring equipment*". Air Quality monitoring site descriptions and locations are provided in **Table 1**:

Table 1: Dixon Sands Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Reporting Period Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**. During the monitoring period individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m^3.

The current TEOM PM_{10} annual average runs from the 1st July 2018. At present it is below the Dixon Sand Quarry long term annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: an annual amount of data has not yet been collected.

Data is unavailable for 10 to 12 and 15 to 19 March 2019 due to air conditioning unit failure. The AC was replaced on 19 March 2019. A quarterly calibration was undertaken on 20 February 2019. Calibration certificates are provided in **Appendix 1** (when required).

Table 2: Average Daily 24 Hr TEOM PM_{10} and TSP for March 2019 from AQMS and Annual Average PM_{10} calculated from the 1 July 2018.

Date	TEOM PM_{10} ($\mu g/m^3$)	Annual PM_{10} Average ($\mu g/m^3$)	TSP* ($\mu g/m3$)	TSP Annual** ($\mu g/m3$)
1/03/2019	11.6	17.1	29.0	42.7
2/03/2019	17.2	17.1	43.0	42.7
3/03/2019	10.6	17.1	26.5	42.7
4/03/2019	15.6	17.1	39.0	42.6
5/03/2019	19.5	17.1	48.8	42.7
6/03/2019	**59.2**	17.2	148.0	43.1
7/03/2019	24.1	17.3	60.3	43.2
8/03/2019	19.9	17.3	49.8	43.2
9/03/2019	22.5	17.3	56.3	43.2
10/03/2019	ND	17.3	ND	43.2
11/03/2019	ND	17.3	ND	43.2
12/03/2019	ND	17.3	ND	43.2
13/03/2019	18.9	17.3	47.3	43.3
14/03/2019	19.8	17.3	49.5	43.3
15/03/2019	ND	17.3	ND	43.3
16/03/2019	ND	17.3	ND	43.3
17/03/2019	ND	17.3	ND	43.3
18/03/2019	ND	17.3	ND	43.3
19/03/2019	ND	17.3	ND	43.3
20/03/2019	10.7	17.3	26.8	43.2
21/03/2019	7.3	17.2	18.3	43.1
22/03/2019	7.2	17.2	18.0	43.0
23/03/2019	10.5	17.2	26.3	43.0
24/03/2019	24.5	17.2	61.3	43.0
25/03/2019	18.8	17.2	47.0	43.0
26/03/2019	34.3	17.3	85.8	43.2
27/03/2019	19.6	17.3	49.0	43.2
28/03/2019	17.0	17.3	42.5	43.2
29/03/2019	14.5	17.3	36.3	43.2
30/03/2019	12.7	17.3	31.8	43.2
31/03/2019	16.8	17.3	42.0	43.2

*Calculated from PM10

**Calculated from PM10 Annual Average

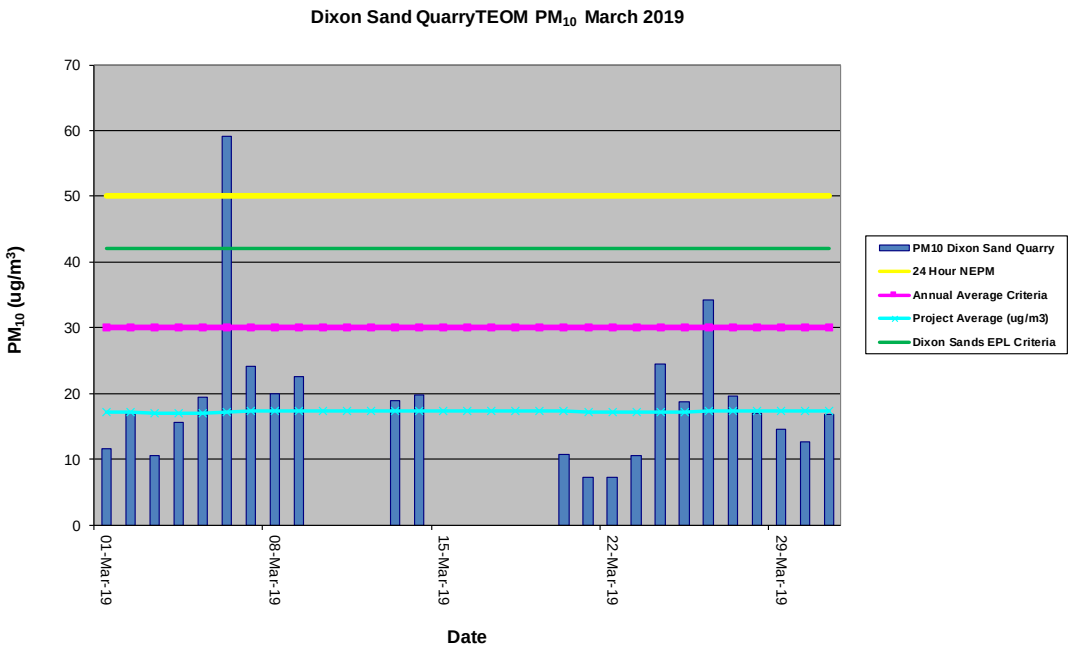


Figure 1: TEOM PM_{10} 24 hr, Annual Average and Criteria

3.2 Meteorological Data

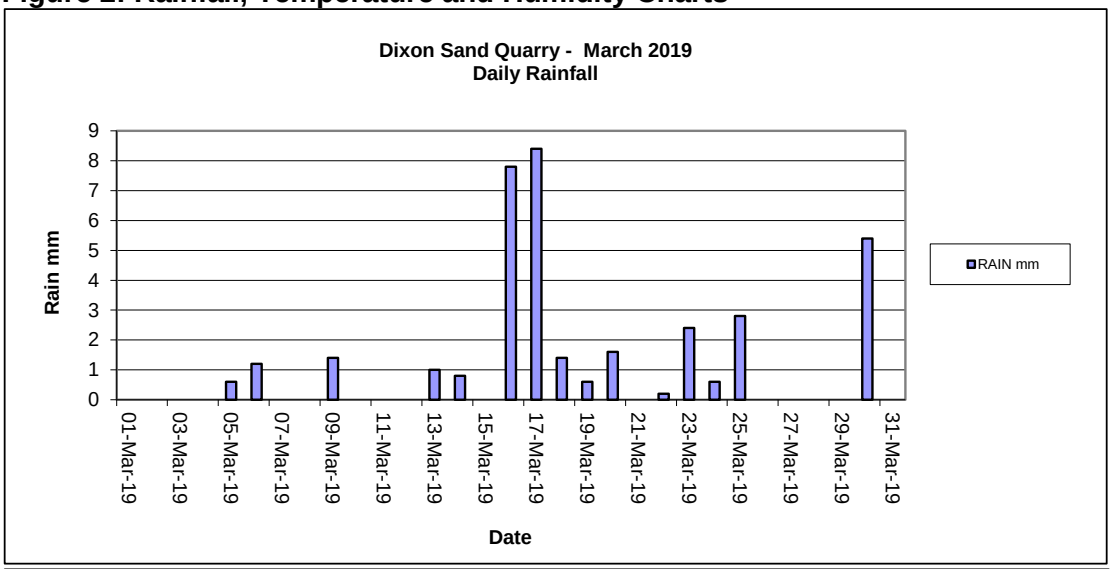
The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

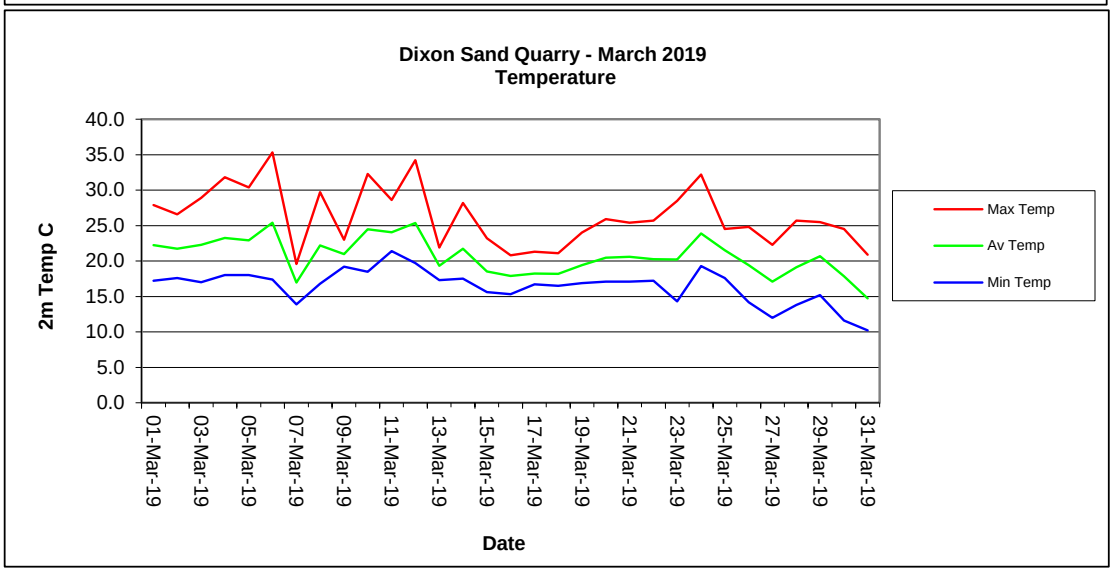
The summary of results is presented in **Table 3. Figure 2 and 3** display the charts of meteorological parameters for the month. A windrose is provided in **Figure 4.** This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

Table 3: Meteorological Data Summary for March 2019

Date	Min Temp	Av Temp	Max Temp	RAIN mm	Min WS	Av WS	Max WS	Min Humidity	Av Humidity	Max Humidity	Min Pressure	Av pressure	Max Pressure
1/03/2019	17.2	22.2	27.9	0.0	0.0	4.8	29.3	42.8	69.5	93.8	1000.8	1002.4	1004.2
2/03/2019	17.6	21.7	26.6	0.0	0.1	4.1	18.2	43.1	72.4	96.1	1000.6	1002.6	1004.6
3/03/2019	17.0	22.3	28.9	0.0	0.1	4.2	20.9	46.1	75.2	99.6	998.2	1000.7	1003.1
4/03/2019	18.0	23.2	31.8	0.0	0.3	4.3	22.0	35.2	73.0	99.2	995.5	998.3	1000.7
5/03/2019	18.0	22.9	30.4	0.6	0.1	3.9	13.9	43.9	78.0	99.7	988.6	993.4	997.6
6/03/2019	17.4	25.4	35.3	1.2	0.2	5.6	22.0	21.1	53.2	87.1	985.3	988.7	995.9
7/03/2019	13.9	17.0	19.6	0.0	0.2	4.0	15.3	55.1	67.8	81.6	995.9	1000.1	1002.2
8/03/2019	16.8	22.2	29.7	0.0	0.0	4.2	18.6	43.7	65.1	78.4	994.3	998.0	1001.4
9/03/2019	19.2	21.0	23.0	1.4	0.1	2.2	9.2	75.7	92.4	99.7	993.6	995.7	997.2
10/03/2019	18.5	24.5	32.3	0.0	0.2	3.9	17.6	35.8	71.7	99.8	986.3	991.2	996.6
11/03/2019	21.4	24.1	28.6	0.0	0.1	5.1	29.0	39.8	60.5	83.7	985.7	987.8	990.2
12/03/2019	19.7	25.4	34.2	0.0	0.2	3.9	16.7	17.0	58.7	93.3	983.0	986.3	991.8
13/03/2019	17.3	19.3	21.9	1.0	0.0	2.6	8.8	73.3	88.8	99.7	991.8	994.4	996.0
14/03/2019	17.5	21.7	28.2	0.8	0.1	4.1	19.5	53.0	86.2	99.8	986.2	990.8	994.7
15/03/2019	15.6	18.5	23.2	0.0	0.0	3.7	18.3	59.7	83.5	99.8	990.1	993.7	997.5
16/03/2019	15.3	17.9	20.8	7.8	0.2	3.2	11.8	75.6	95.4	99.8	995.4	996.9	998.0
17/03/2019	16.7	18.2	21.3	8.4	0.5	4.7	18.7	78.1	95.0	99.8	991.5	993.5	996.7
18/03/2019	16.5	18.2	21.1	1.4	0.0	3.6	13.4	76.4	93.5	99.8	988.7	990.5	992.2
19/03/2019	16.9	19.4	24.0	0.6	0.2	2.0	7.8	68.8	92.7	99.8	989.7	991.2	993.1
20/03/2019	17.1	20.5	25.9	1.6	0.0	3.2	13.3	58.5	89.9	99.8	991.4	992.6	994.2
21/03/2019	17.1	20.6	25.4	0.0	0.1	3.2	16.2	64.9	88.9	99.8	992.8	994.4	996.8
22/03/2019	17.2	20.3	25.7	0.2	0.0	1.7	8.7	69.6	94.1	100.0	993.5	995.2	996.8
23/03/2019	14.3	20.2	28.5	2.4	0.1	3.8	22.5	46.9	84.6	99.8	988.5	991.8	994.6
24/03/2019	19.3	23.9	32.2	0.6	0.1	3.5	12.5	34.0	76.0	99.8	988.3	990.0	991.6
25/03/2019	17.6	21.5	24.5	2.8	0.1	4.3	20.2	63.0	81.0	99.8	986.8	989.0	991.4
26/03/2019	14.2	19.4	24.8	0.0	0.0	3.2	15.8	23.9	56.7	99.2	991.1	994.4	1000.0
27/03/2019	12.0	17.1	22.3	0.0	0.0	3.4	18.2	51.1	70.9	90.9	999.8	1001.2	1002.9
28/03/2019	13.8	19.1	25.7	0.0	0.0	2.7	10.8	46.8	72.8	99.2	995.0	998.0	1001.0
29/03/2019	15.2	20.7	25.5	0.0	0.2	2.6	9.6	46.4	73.0	99.2	985.8	991.2	995.6
30/03/2019	11.6	17.8	24.5	5.4	0.1	4.1	23.8	30.9	76.8	99.8	979.0	983.7	989.3
31/03/2019	10.2	14.7	20.9	0.0	0.2	3.8	17.7	33.6	46.9	63.0	988.8	993.3	998.5
Monthly	10.2	20.7	35.3	36.2	0.0	3.7	29.3	17.0	76.9	100.0	979.0	993.9	1004.6

Figure 2: Rainfall, Temperature and Humidity Charts





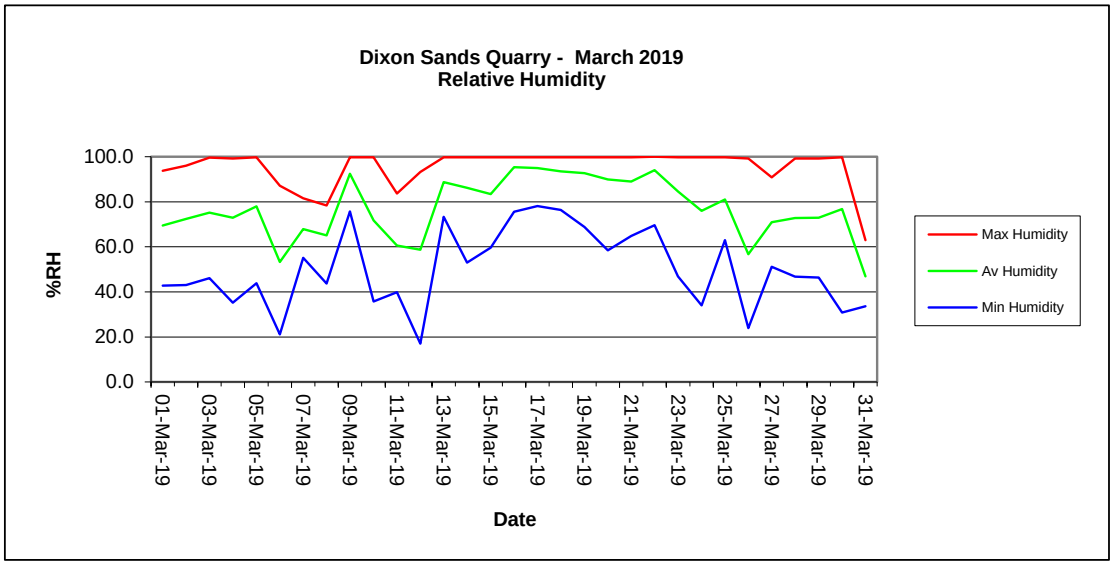


Figure 3: Wind Speed and Atmospheric Pressure Charts

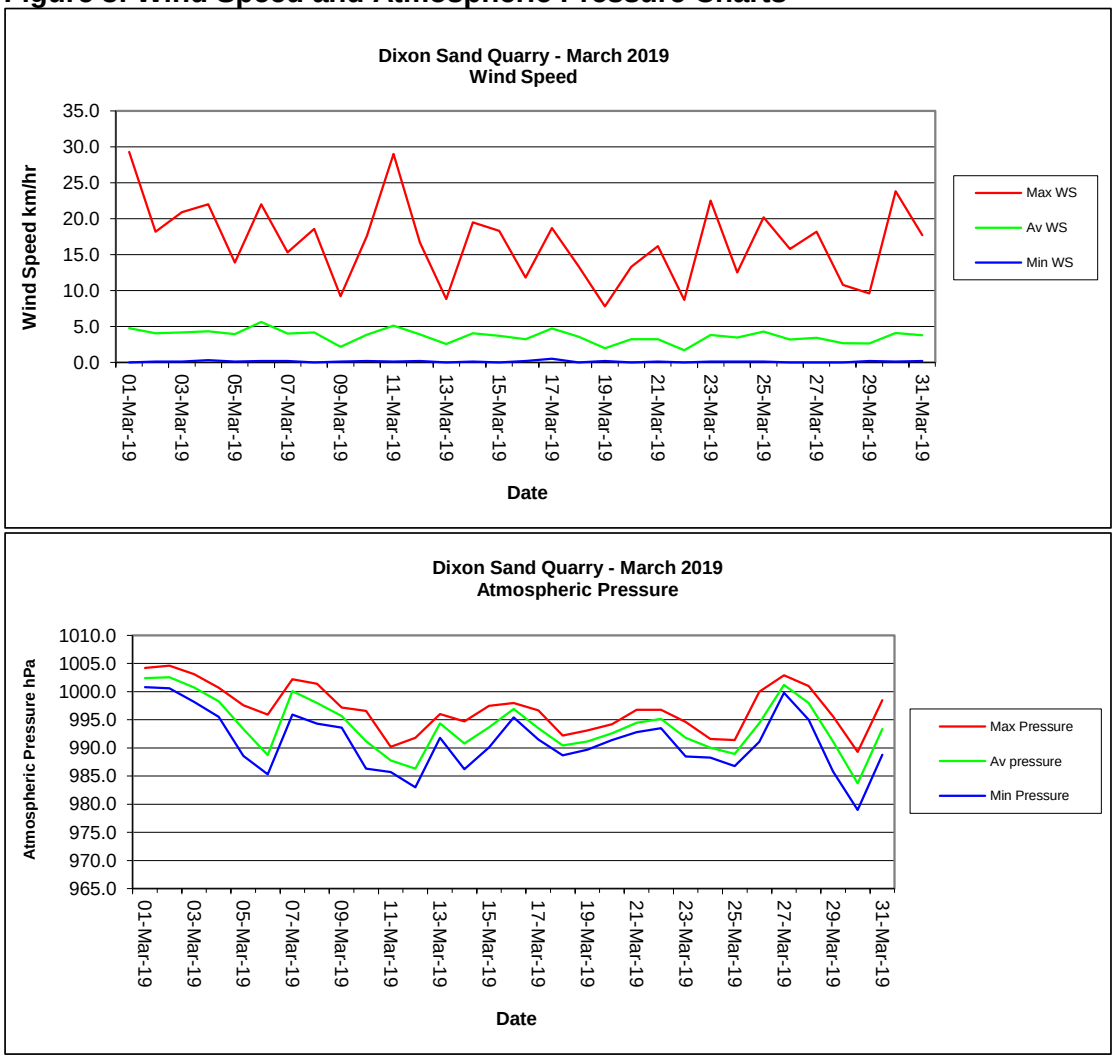
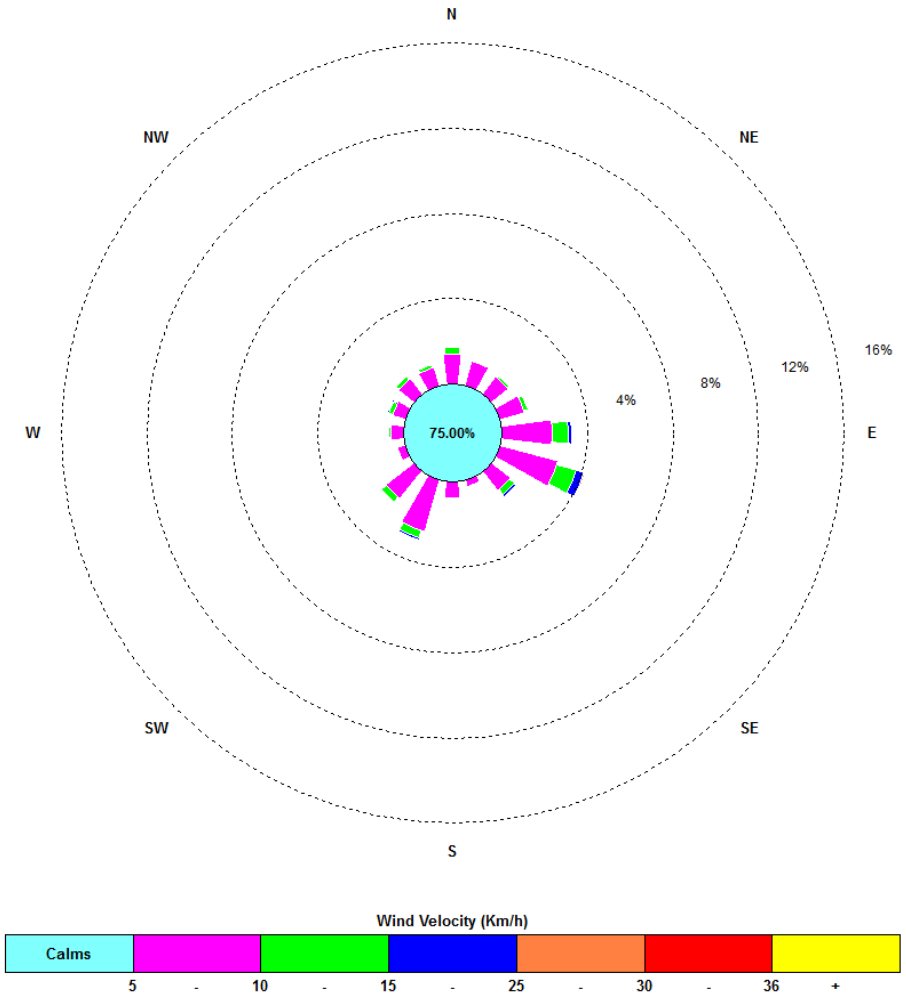


Figure 4: Windrose Plot (km/h)

00:00 1 March 2019 – 23:55 31 March 2019



Appendix 1

Calibration Documents (when required)

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

April 2019

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 21 May 2019

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited (CBE) is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for Fine Particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring program includes;

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report was prepared by CBased Environmental and includes the following;

- TEOM (PM_{10}) monitoring results for April 2019; and
- Meteorological results for April 2019.

Current year to date annual average for PM_{10} is calculated from the 1st July 2018 for TEOM's coinciding with the Dixon Sand project year.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- One TEOM PM_{10} 24-hour average result was above the short-term Dixon Sand Quarry consent, 24-hour impact criteria of 50ug/m^3 (29/04/2019);
- The current TEOM PM_{10} annual average is below the Dixon Sand Quarry consent, annual average criteria of 30ug/m3.
- Currently, calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.
- One TEOM PM_{10} 24-hour average results was above the Dixon Sand Quarry EPL limit of 42ug/m^3 (29/04/2019).

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Note that an annual amount of data has not yet been collected.

Approximately 100% of meteorological data was recovered for April 2019.
Approximately 100% of TEOM data was recovered for April 2019.

2.0 Sampling Program

The TEOM is operated to the applicable Australian Standard and OEH (EPA) approved method. All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

The following Australian Standards were used:

AS3580.9.8 (2001) "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*."

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

The location of the air quality monitoring equipment met the Australian Standard AS 3580.1.1 (2007) "*Methods for sampling and analysis of ambient air Part 1.1 Guide to siting air monitoring equipment*". Air Quality monitoring site descriptions and locations are provided in **Table 1**:

Table 1: Dixon Sands Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Reporting Period Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**. During the monitoring period individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m^3 with the exception of one exceedance of both limits (66.7µg/m^3) on 29 April 2019.

The current TEOM PM_{10} annual average runs from the 1st July 2018. At present it is below the Dixon Sand Quarry long term annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: an annual amount of data has not yet been collected.

A quarterly calibration was undertaken on 20 February 2019. Calibration certificates are provided in **Appendix 1** (when required).

Table 2: Average Daily 24 Hr TEOM PM_{10} and TSP for April 2019 from AQMS and Annual Average PM_{10} calculated from the 1 July 2018.

Date	TEOM PM_{10} ($\mu g/m^3$)	Annual PM_{10} Average ($\mu g/m^3$)	TSP* ($\mu g/m3$)	TSP Annual** ($\mu g/m3$)
1/04/2019	10.6	17.2	26.5	43.1
2/04/2019	11.0	17.2	27.5	43.0
3/04/2019	7.4	17.2	18.5	42.9
4/04/2019	11.7	17.2	29.3	42.9
5/04/2019	12.1	17.1	30.3	42.8
6/04/2019	11.5	17.1	28.8	42.8
7/04/2019	17.8	17.1	44.5	42.8
8/04/2019	22.3	17.1	55.8	42.8
9/04/2019	22.9	17.2	57.3	42.9
10/04/2019	15.4	17.2	38.5	42.9
11/04/2019	13.1	17.1	32.8	42.8
12/04/2019	14.1	17.1	35.3	42.8
13/04/2019	18.4	17.1	46.0	42.8
14/04/2019	20.1	17.1	50.3	42.9
15/04/2019	14.5	17.1	36.3	42.8
16/04/2019	11.3	17.1	28.3	42.8
17/04/2019	8.4	17.1	21.0	42.7
18/04/2019	10.4	17.1	26.0	42.6
19/04/2019	19.3	17.1	48.3	42.7
20/04/2019	12.3	17.0	30.8	42.6
21/04/2019	8.6	17.0	21.5	42.5
22/04/2019	11.9	17.0	29.8	42.5
23/04/2019	9.1	17.0	22.8	42.4
24/04/2019	6.9	16.9	17.3	42.3
25/04/2019	11.6	16.9	29.0	42.3
26/04/2019	18.0	16.9	45.0	42.3
27/04/2019	26.5	17.0	66.3	42.4
28/04/2019	15.2	16.9	38.0	42.4
29/04/2019	**66.7**	17.1	166.8	42.8
30/04/2019	21.4	17.1	53.5	42.8

*Calculated from PM10

**Calculated from PM10 Annual Average

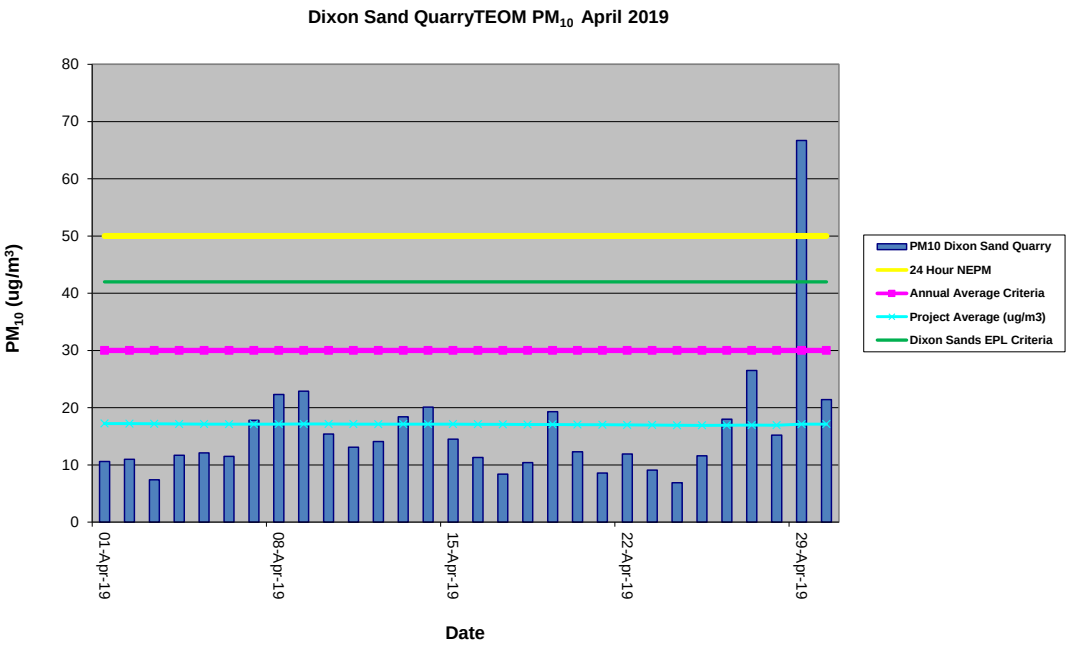


Figure 1: TEOM PM_{10} 24 hr, Annual Average and Criteria

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

The summary of results is presented in **Table 3. Figure 2 and 3** display the charts of meteorological parameters for the month. A windrose is provided in **Figure 4.** This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

Table 3: Meteorological Data Summary for April 2019

Date	Min Temp	Av Temp	Max Temp	RAIN mm	Min WS	Av WS	Max WS	Min Humidity	Av Humidity	Max Humidity	Min Pressure	Av pressure	Max Pressure
1/04/2019	10.5	15.0	21.0	0.0	0.0	2.2	14.0	54.3	72.7	98.9	998.1	1001.4	1004.7
2/04/2019	13.9	16.8	21.5	0.0	0.1	2.6	13.6	61.3	90.3	99.8	1003.8	1005.0	1007.0
3/04/2019	15.0	18.7	24.9	0.0	0.2	3.5	13.1	47.7	82.3	99.8	1002.9	1004.6	1006.0
4/04/2019	13.7	17.2	22.7	1.8	0.1	2.6	14.1	66.5	93.1	99.8	1004.4	1006.7	1008.4
5/04/2019	15.4	16.8	19.3	1.6	0.1	2.9	9.2	89.0	99.2	99.8	1003.5	1005.9	1008.5
6/04/2019	15.8	21.0	27.9	0.0	0.0	4.2	11.4	43.7	74.6	100.0	995.6	999.1	1003.4
7/04/2019	16.3	23.5	31.1	0.0	0.4	3.5	18.1	24.9	56.3	99.2	992.8	995.6	998.5
8/04/2019	19.1	25.3	32.0	0.0	0.2	4.1	18.9	15.5	34.8	57.2	990.8	992.9	995.3
9/04/2019	13.0	21.2	28.4	0.0	0.2	5.1	23.9	28.3	49.7	84.4	988.5	991.7	998.8
10/04/2019	11.0	14.2	20.1	0.0	0.0	3.2	11.5	44.8	70.8	90.7	998.4	1001.4	1003.7
11/04/2019	9.5	14.6	20.3	0.0	0.0	2.9	11.7	58.1	77.2	93.1	1002.1	1003.4	1004.8
12/04/2019	12.3	16.0	19.8	0.0	0.0	2.7	11.1	63.6	81.1	96.0	1001.1	1003.2	1005.1
13/04/2019	13.5	18.1	25.4	0.0	0.2	3.2	12.4	30.3	75.6	98.1	999.2	1001.5	1003.1
14/04/2019	13.6	16.6	22.0	0.8	0.1	2.3	10.1	55.8	80.8	98.7	1000.9	1002.1	1003.6
15/04/2019	12.4	16.4	22.7	0.2	0.1	2.9	9.5	46.1	82.5	99.8	1000.2	1001.8	1003.7
16/04/2019	13.0	17.1	23.5	0.0	0.0	3.4	11.5	53.7	84.5	99.6	1001.4	1002.8	1004.2
17/04/2019	13.9	17.8	23.6	0.0	0.1	2.7	13.5	55.4	85.0	99.8	1001.6	1003.1	1004.6
18/04/2019	14.3	19.2	26.3	0.0	0.1	3.2	13.6	39.3	80.0	99.8	1001.8	1003.4	1006.4
19/04/2019	15.9	18.8	23.6	0.0	0.0	2.1	8.6	58.5	87.2	99.9	1003.8	1005.5	1007.8
20/04/2019	14.3	19.1	24.1	0.0	0.0	3.4	15.8	63.8	89.8	99.9	1001.8	1003.6	1005.7
21/04/2019	15.5	19.7	25.1	0.0	0.1	3.1	13.0	56.8	88.1	99.9	999.7	1001.4	1003.5
22/04/2019	15.3	19.4	25.0	0.0	0.3	3.6	13.3	55.3	87.7	99.9	999.3	1000.9	1003.7
23/04/2019	14.9	18.7	23.9	0.0	0.0	3.6	16.7	62.9	92.1	99.9	1002.6	1004.2	1005.9
24/04/2019	15.1	18.9	24.3	0.0	0.1	2.4	11.9	52.5	83.8	99.9	999.4	1001.9	1004.2
25/04/2019	14.3	20.3	27.4	0.0	0.2	3.1	9.5	33.9	72.2	99.3	995.3	997.4	999.7
26/04/2019	14.9	20.8	27.5	0.0	0.0	4.0	20.2	25.4	51.7	85.6	989.7	993.3	997.1
27/04/2019	12.2	14.7	19.2	0.0	0.4	4.3	13.1	44.3	57.3	79.2	997.1	1000.1	1002.7
28/04/2019	9.1	15.2	22.8	0.0	0.1	2.9	10.4	26.0	55.5	90.1	997.2	999.1	1001.8
29/04/2019	9.8	15.2	20.5	0.0	0.0	2.7	12.8	57.4	76.7	99.2	1001.3	1002.6	1004.5
30/04/2019	13.9	17.7	23.2	0.0	0.1	2.5	12.5	54.0	81.1	99.7	997.3	999.5	1002.2
Monthly	9.1	18.1	32.0	4.4	0.0	3.2	23.9	15.5	76.5	100.0	988.5	1001.2	1008.5

Figure 2: Rainfall, Temperature and Humidity Charts

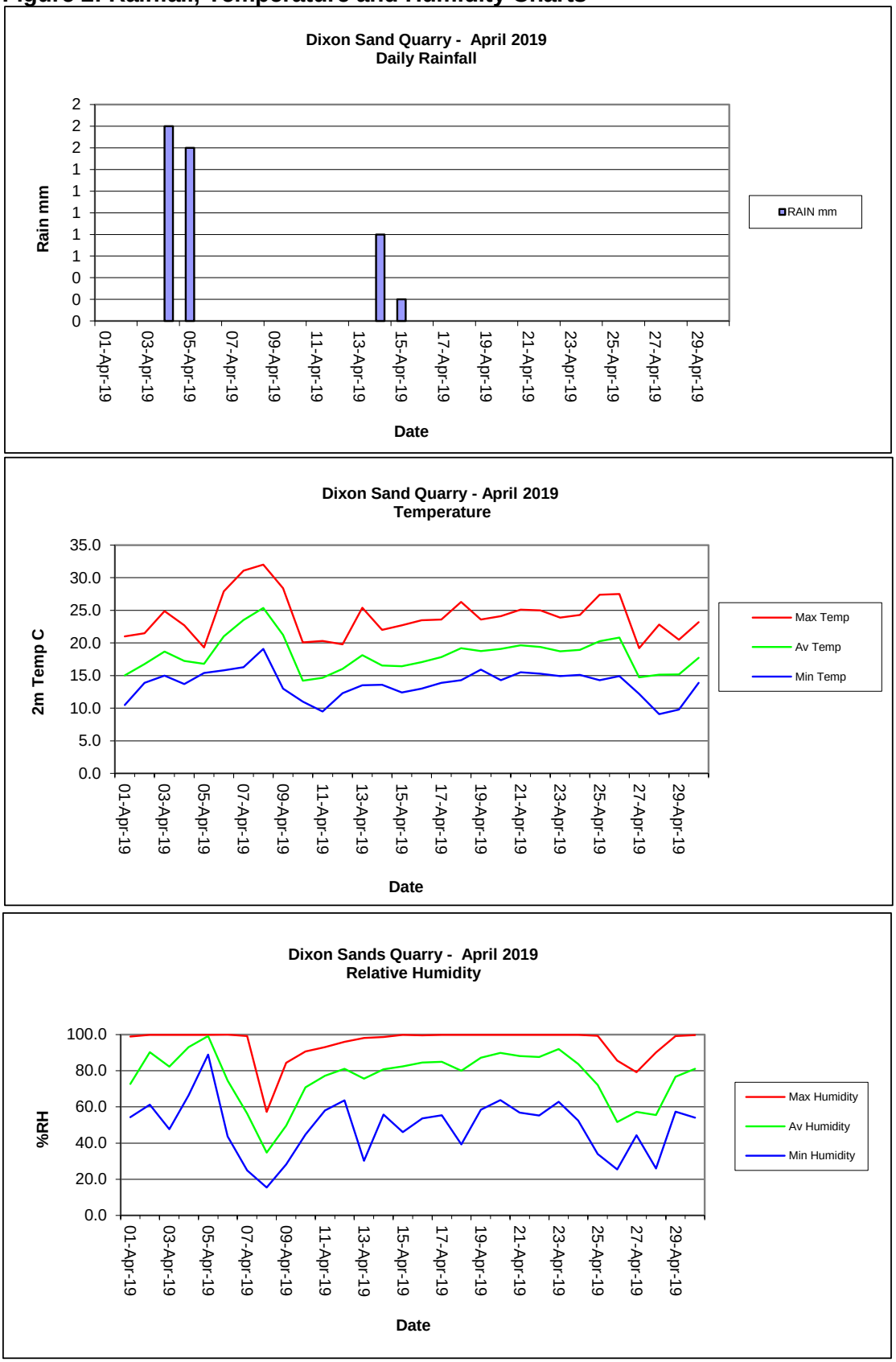


Figure 3: Wind Speed and Atmospheric Pressure Charts

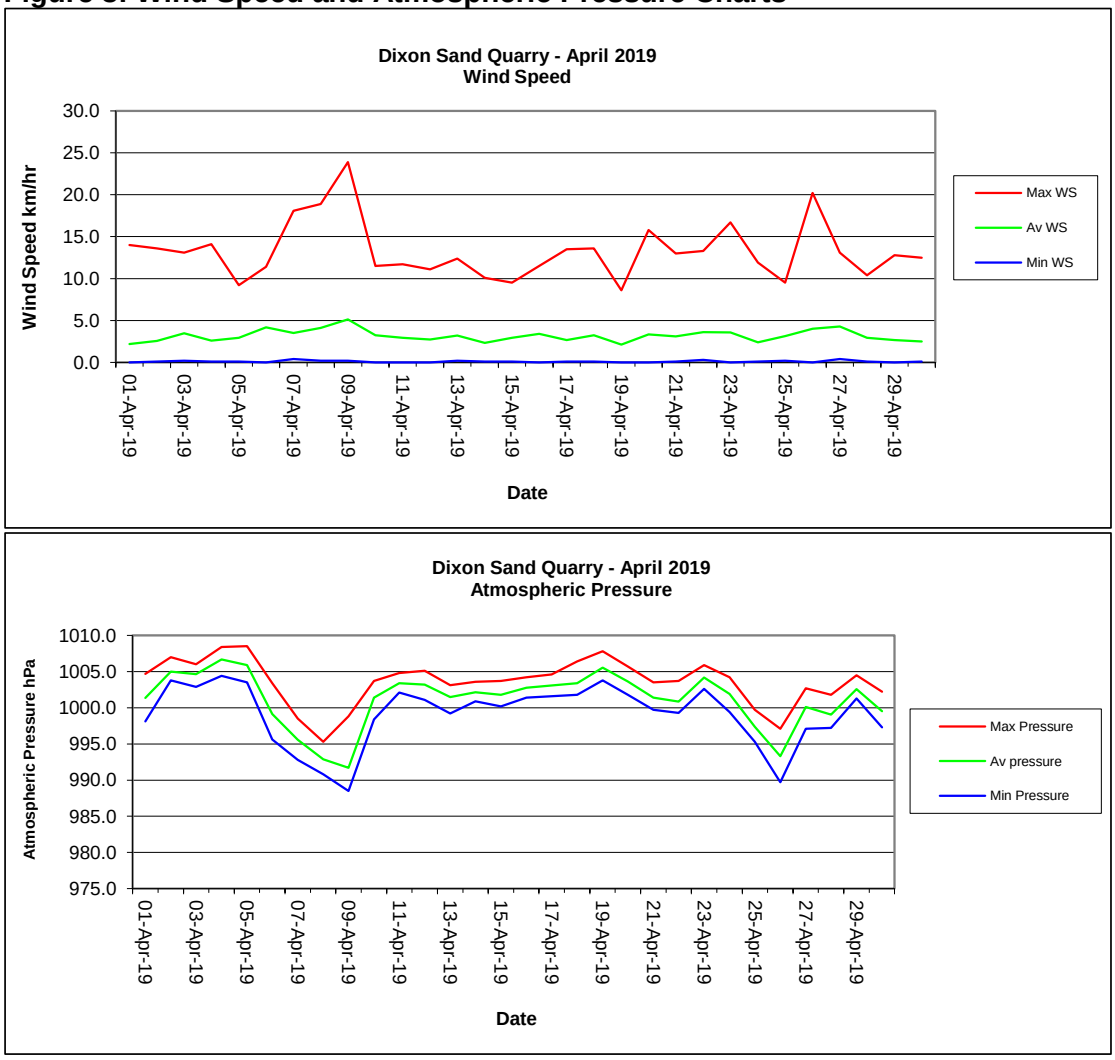
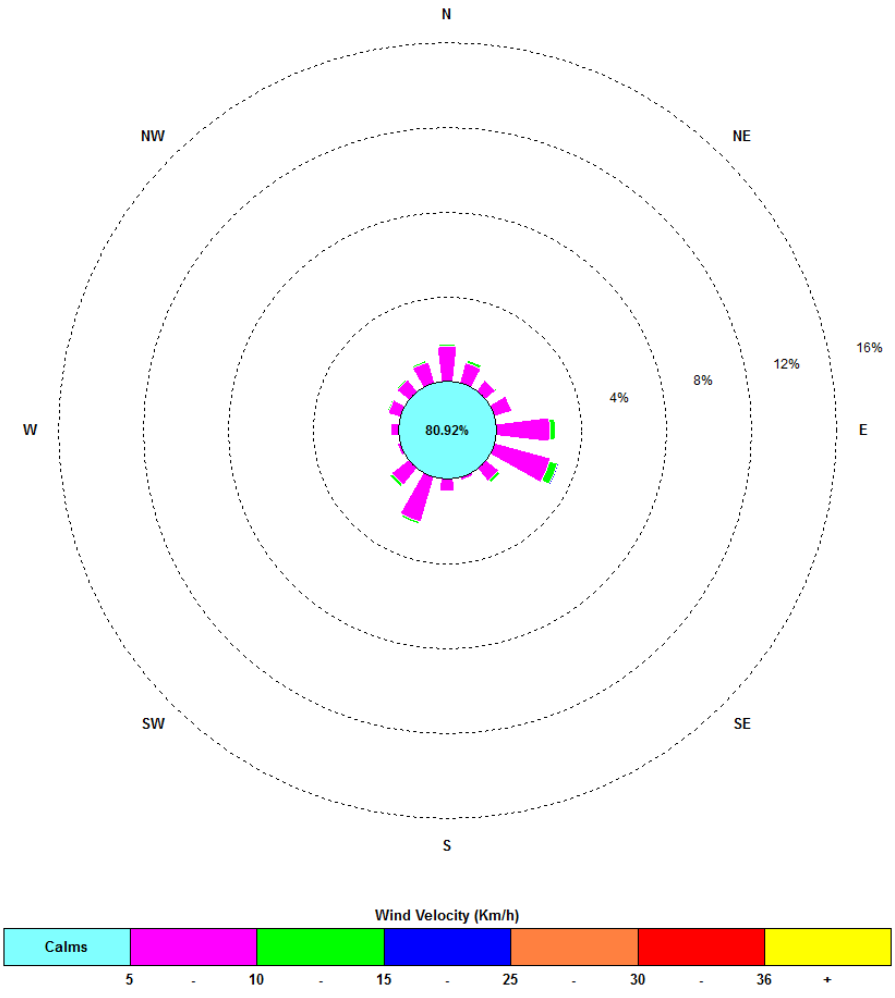


Figure 4: Windrose Plot (km/h)

00:00 1 April 2019 – 23:55 30 April 2019



Appendix 1

Calibration Documents (when required)

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

May 2019

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 27 June 2019

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited (CBE) is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for Fine Particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring program includes;

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report was prepared by CBased Environmental and includes the following;

- TEOM (PM_{10}) monitoring results for May 2019; and
- Meteorological results for May 2019.

Current year to date annual average for PM_{10} is calculated from the 1st July 2018 for TEOM's coinciding with the Dixon Sand project year.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- All TEOM PM_{10} 24-hour average result were below the short-term Dixon Sand Quarry consent, 24-hour impact criteria of 50ug/m^3;
- The current TEOM PM_{10} annual average is below the Dixon Sand Quarry consent, annual average criteria of 30ug/m3.
- Currently, calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.
- All TEOM PM_{10} 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Note that an annual amount of data has not yet been collected.

Approximately 100% of meteorological data was recovered for May 2019.
Approximately 100% of TEOM data was recovered for May 2019.

2.0 Sampling Program

The TEOM is operated to the applicable Australian Standard and OEH (EPA) approved method. All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

The following Australian Standards were used:

AS3580.9.8 (2001) "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*."

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

The location of the air quality monitoring equipment met the Australian Standard AS 3580.1.1 (2007) "*Methods for sampling and analysis of ambient air Part 1.1 Guide to siting air monitoring equipment*". Air Quality monitoring site descriptions and locations are provided in **Table 1**:

Table 1: Dixon Sands Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Reporting Period Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**. During the monitoring period individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m^3.

The current TEOM PM_{10} annual average runs from the 1st July 2018. At present it is below the Dixon Sand Quarry long term annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: an annual amount of data has not yet been collected.

A quarterly calibration was undertaken on 19 June 2019. Calibration certificates are provided in **Appendix 1** (when required).

Table 2: Average Daily 24 Hr TEOM PM_{10} and TSP for May 2019 from AQMS and Annual Average PM_{10} calculated from the 1 July 2018.

Date	TEOM PM_{10} ($\mu g/m^3$)	Annual PM_{10} Average ($\mu g/m^3$)	TSP* ($\mu g/m3$)	TSP Annual** ($\mu g/m3$)
1/05/2019	14.1	17.1	35.3	42.8
2/05/2019	15.5	17.1	38.8	42.8
3/05/2019	10.0	17.1	25.0	42.7
4/05/2019	5.5	17.1	13.8	42.6
5/05/2019	6.5	17.0	16.3	42.5
6/05/2019	6.2	17.0	15.5	42.5
7/05/2019	8.2	17.0	20.5	42.4
8/05/2019	11.5	16.9	28.8	42.3
9/05/2019	11.9	16.9	29.8	42.3
10/05/2019	13.8	16.9	34.5	42.3
11/05/2019	8.2	16.9	20.5	42.2
12/05/2019	8.1	16.9	20.3	42.1
13/05/2019	13.8	16.8	34.5	42.1
14/05/2019	11.9	16.8	29.8	42.1
15/05/2019	13.7	16.8	34.3	42.0
16/05/2019	15.5	16.8	38.8	42.0
17/05/2019	17.4	16.8	43.5	42.0
18/05/2019	19.0	16.8	47.5	42.0
19/05/2019	15.4	16.8	38.5	42.0
20/05/2019	12.7	16.8	31.8	42.0
21/05/2019	10.1	16.8	25.3	41.9
22/05/2019	19.7	16.8	49.3	42.0
23/05/2019	30.7	16.8	76.8	42.1
24/05/2019	15.1	16.8	37.8	42.1
25/05/2019	9.9	16.8	24.8	42.0
26/05/2019	7.8	16.8	19.5	41.9
27/05/2019	13.7	16.8	34.3	41.9
28/05/2019	11.6	16.8	29.0	41.9
29/05/2019	23.3	16.8	58.3	41.9
30/05/2019	10.2	16.8	25.5	41.9
31/05/2019	14.3	16.7	35.8	41.9

*Calculated from PM10

**Calculated from PM10 Annual Average

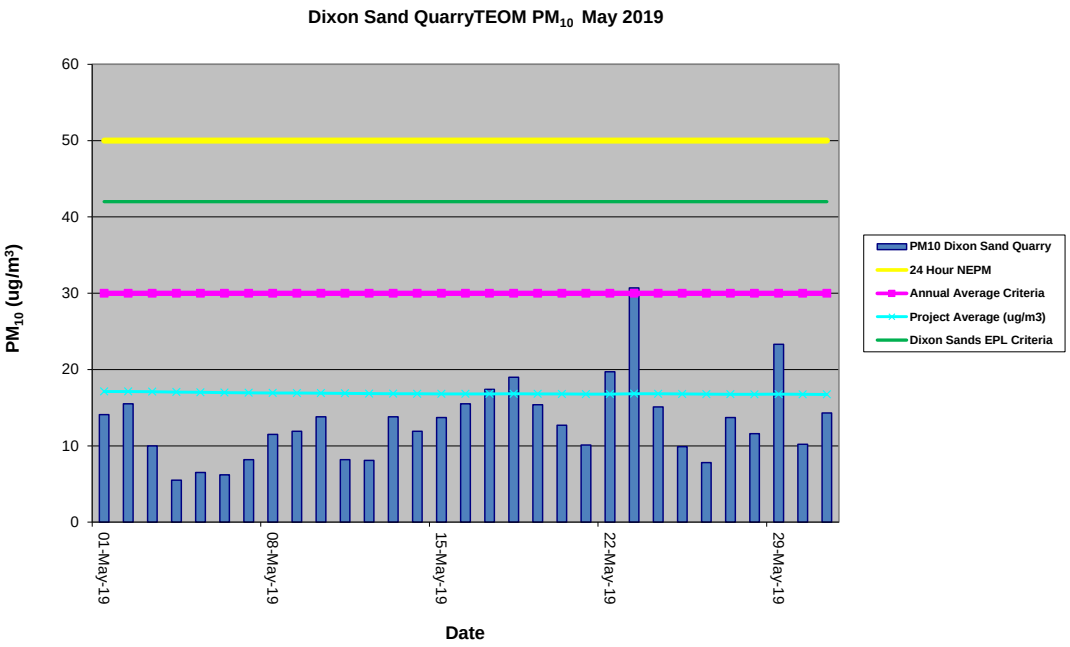


Figure 1: TEOM PM_{10} 24 hr, Annual Average and Criteria

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

The summary of results is presented in **Table 3. Figure 2 and 3** display the charts of meteorological parameters for the month. A windrose is provided in **Figure 4.** This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

Table 3: Meteorological Data Summary for May 2019

Date	Min Temp	Av Temp	Max Temp	RAIN mm	Min WS	Av WS	Max WS	Min Humidity	Av Humidity	Max Humidity	Min Pressure	Av pressure	Max Pressure
1/05/2019	14.8	18.3	22.9	0.0	0.1	2.9	10.9	60.8	82.1	99.2	997.6	999.8	1001.8
2/05/2019	16.1	19.5	23.5	0.0	0.2	2.9	10.4	63.5	83.7	99.2	999.7	1001.5	1004.2
3/05/2019	17.2	19.8	20.9	2.8	0.4	9.2	14.1	69.3	77.2	99.2	997.0	997.7	999.6
4/05/2019				0.2									
5/05/2019				0.2									
6/05/2019				0.0									
7/05/2019				0.0									
8/05/2019				0.0									
9/05/2019				0.0									
10/05/2019				0.0									
11/05/2019				0.0									
12/05/2019				0.0									
13/05/2019				0.0									
14/05/2019				0.0									
15/05/2019				0.0									
16/05/2019				0.0									
17/05/2019	14.4	19.4	20.8	0.0	0.2	8.5	11.7	61.9	73.4	96.0	997.7	1000.4	1006.6
18/05/2019	10.9	15.4	21.2	0.0	0.1	2.3	11.0	57.7	88.6	100.0	1005.9	1007.3	1009.0
19/05/2019	12.4	16.1	21.4	0.2	0.2	2.6	11.6	56.9	86.0	100.0	1006.1	1007.6	1009.8
20/05/2019	12.0	16.6	21.6	0.0	0.0	2.6	7.9	53.0	76.7	99.8	1001.9	1004.2	1006.3
21/05/2019	13.8	18.7	24.5	0.0	0.2	3.1	11.3	40.7	58.7	76.1	1001.3	1002.8	1004.3
22/05/2019	14.4	18.1	24.9	0.0	0.2	3.5	15.1	39.4	67.9	99.2	1003.4	1004.9	1006.3
23/05/2019	13.8	17.0	22.2	0.0	0.0	2.6	10.3	55.0	86.7	99.9	1002.8	1004.7	1006.8
24/05/2019	11.9	17.1	23.8	0.0	0.2	2.4	8.0	32.4	67.4	99.8	998.6	1000.6	1003.1
25/05/2019	11.8	17.8	24.6	0.0	0.1	3.8	10.0	23.1	40.7	56.7	994.1	996.6	999.3
26/05/2019	11.9	16.4	21.9	0.0	0.4	4.8	18.1	30.7	45.4	66.1	990.5	992.3	994.6
27/05/2019	9.4	11.9	17.7	0.2	0.6	6.4	28.6	33.3	47.4	61.4	984.9	988.9	993.0
28/05/2019	7.2	11.6	17.7	0.0	0.6	4.9	16.2	29.7	46.1	57.1	988.6	990.8	992.7
29/05/2019	9.4	13.2	16.8	0.0	1.0	8.5	32.5	34.2	46.1	54.7	982.5	985.9	990.1
30/05/2019	5.4	9.3	15.4	0.0	0.4	4.8	14.5	25.3	45.3	59.4	990.0	995.0	999.8
31/05/2019	5.1	11.1	18.7	0.0	0.2	3.6	13.1	35.5	53.1	66.2	998.4	1000.4	1003.7
Monthly	5.1	16.0	24.9	3.6	0.0	4.4	32.5	23.1	65.1	100.0	982.5	999.0	1009.8

Data flatline-needed power reset

Figure 2: Rainfall, Temperature and Humidity Charts

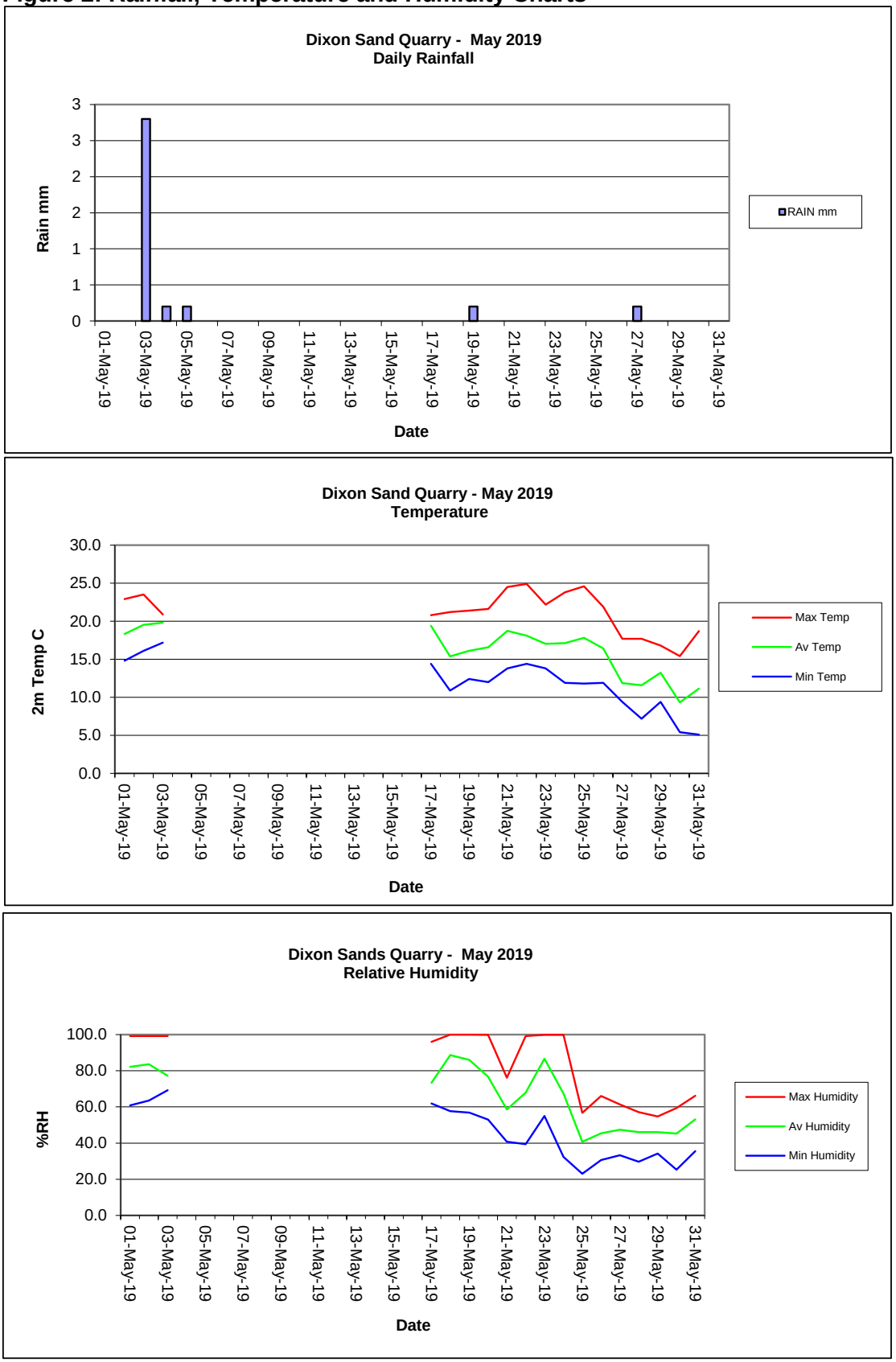


Figure 3: Wind Speed and Atmospheric Pressure Charts

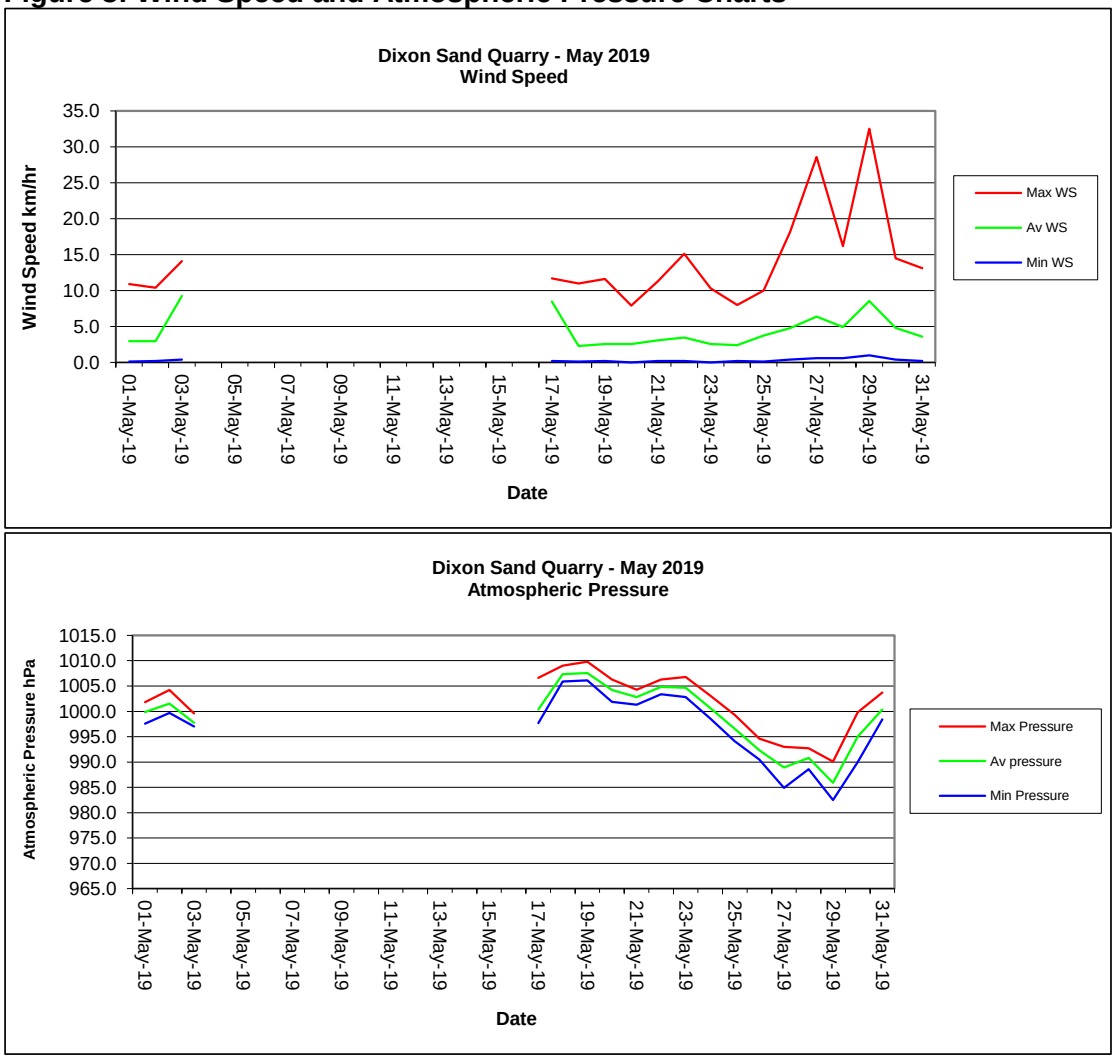
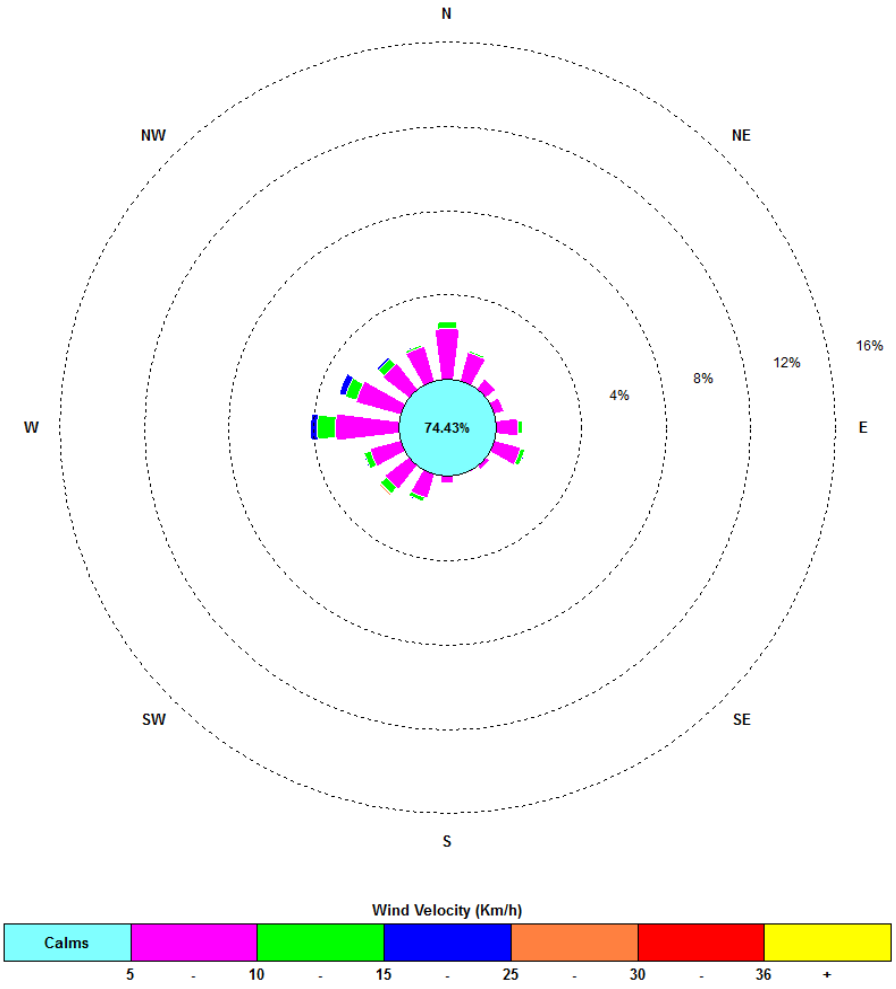


Figure 4: Windrose Plot (km/h)

00:00 1 May 2019 – 23:55 31 May 2019



Appendix 1

Calibration Documents (when required)

Continuous Air Quality
Monthly/Quarterly/Six Monthly/Annual
TEOM Maintenance and Calibration – 1400AB

TEOM Client/Site: Dixon Sands / TEOM 1 **Date:** 19.6.19

1. TEOM Data Screen **SERIAL No:** _____ **Firmware:** N/A.

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Operating Condition	OK ✓	Green - Normal	✓	
Date/time	TEOM: 19/6/19 9:39 Actual: 19/6/19 8:42	Current Date/time correct within 5 minutes	✓ DST	
PM-10 24hr av	6.1	Positive values	✓	
Filter loading PM10	76%	<80 %	✓	
Frequency PM-10	251.8230	200-300 Hz	✓	
Noise PM-10	0.048	<0.100ug	✓	

Comment: If filter load >80% but <90% and if flows Ok then data is OK

Comments: Adj time to EST

2. System Status

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Vacuum pump pressure		<0.50 atm	✓	
Warnings	NIL	No Warnings	✓	
If any warnings list:				

Comments:

Data Downloaded: YES/NO (circle)

Technician Name : COLIN DANIELS **Signed** _____

3. Instrument Conditions Ambient Conditions and Temperatures

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Ambient Temperature	12.9	-10 to 50 C	✓	
Ambient Dew Point	NA	-10 to 50 C	✓	
Ambient Pressure	0.979	0.9-1.1 atm	✓	
Ambient Relative Humidity	NA	10-100 %RH	✓	
Cap temperature	50.00	50.00 +/- 0.10 C	✓	
Case temperature	50.00	50.00 +/- 0.10 C	✓	
Main (PM-10) Air Tube temp	50.00	50.00 +/- 0.10 C	✓	

Comments:

4. Instrument Conditions – Flows

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Main (PM-10) Flow rate	3.00	2.82 – 3.18 lpm	✓	
Bypass Flow rate	13.68	12.95 – 14.39 lpm	✓	
Total Flow rate	16.68	15.67 – 17.67 lpm	✓	

Comments:

Results: (Tick box)

☑ **There were NO equipment faults found. No action required – (file report)**

☐ **There were faults found (Fails) – Were these fixed on site: YES/NO (circle)**
Any Fails that cannot be repaired on site must be reported to CBased:
Office: 65713334 or email cbased@bigpond.com
Date faults notified to CBased: _____

Comments/Action Required:

Calibration/Maintenance

1. 1405A: Were Filters replaced YES/NO
2. PM10 Inlet head cleaned YES/NO
3. If measurement filters were replaced, confirm stable results after change. Stable particulate results confirmed YES/NO

Channel	Filter Load %	Frequency Hz initial	Frequency check 1min	Frequency check 3min	Frequency check 5min
PM10	17.0	253.56369	253.56384	253.56395	253.56412

Frequency should not drift by more than 0.0010 between readings (if instrument is thermodynamically stable) Pass/Fail – if Fail – install new filter and redo stability test.

4. Instrument clock verified (Refer Section 1) YES/NO.
If Time changed – clock reset OK YES/NO or NA (not changed)
Comments: changed time to EST

5. Were TEOM in line and rear TEOM filters checked for cleanliness and replaced if necessary. YES/NO.
Comments if changed:

6. TEOM Cleaned and Air Conditioner checked YES/NO. Air Conditioner settings or operational status: 4 - lal cool

Tetracal Flow/Temp/Pressure Calibrator Serial No: 1009 Refer to calibration corrections for Temperature/Pressure and Flows and apply to all readings.

Quarterly or Six Monthly Calibration

1. Flow Verification – Conducted YES/NO

marginal but ok.

PM10 Flow verified Flow l/min 3.18 Error % 6 (allowed error <6%) PASS/FAIL

Bypass Flow verified Flow l/min 13.64 Error % 0.2 (allowed error <6%) PASS/FAIL

If fail then complete a full multipoint recalibration and review previous data from last good flow check. **Comments if Flows recalibrated:**

Final 3.01 l/m 13.65 l/m

2. Leak Check – Conducted YES/NO

PM10 actual 0.05 < Limit 0.15

Bypass actual 0.14 < Limit 0.60

Leak check PASS/FAIL – If fail then find leak and retest.
Comments: slight leak.

Main Fadj 1.005
bypass Fadj 1.000

Final
main Fadj : 0.83 up
bypass Fadj : 1.000
can only go to 0.8!

Annual Calibration/Maintenance

1. Temperature and Pressure Calibration – Conducted YES/NO
Reference Temperature: _____C TEOM Temperature_____C
if difference +/- 1 C recalibrate sensor. Sensor recalibrated YES/NO

Reference Pressure: _____atm TEOM Pressure_____atm
if difference +/- 0.010 atm recalibrate sensor. Sensor recalibrated YES/NO

Note: Tetracal measures Atmospheric Pressure in mm Hg or mb or hPa
For mb or hPa divide tetracal result by 1013.25 to change units to atm.
For mmHg divide tetracal result by 760 to change units to atm.

2. Flow Calibration – Conducted YES/NO
NA.
PM10
Set point 2.4 Actual:_____
Set point 3.6 Actual:_____
Set point 3.0 Actual:_____ After calibration Final:_____l/min

BYPASS
Set point 10.9 Actual:_____
Set point 16.4 Actual:_____
Set point 13.67 Actual:_____ After calibration Final:_____l/min

3. Mass calibration (K0) Verification – Conducted YES/NO
Actual measured K0 = _____TEOM stated K0_____ Error %:_____
Allowed Error +/- 2.5%. PASS/FAIL
If Error +/- 2.5% repeat. If confirmed consult manufacturer.
Second Error % =_____ PASS/FAIL. Comments:
If second test fails consult manufacturer.

4. Annual Noise check - Conducted YES/NO
Zero filter applied to TEOM and TEOM operated for at least 12 hours:
Start date/time: _____Finish date/time:_____
Standard deviation of all recorded data (min 30 min averages) = _____ug/m^3
Noise was less than $5ug/m^3$ YES/NO

5. Maintenance
Air Inlet system cleaned YES/NO
Pump Reconditioned YES/NO
Check Waterproofing YES/NO
Comments:

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

June 2019

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 23 July 2019

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited (CBE) is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for Fine Particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring program includes;

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report was prepared by CBased Environmental and includes the following;

- TEOM (PM_{10}) monitoring results for June 2019; and
- Meteorological results for June 2019.

Current year to date annual average for PM_{10} is calculated from the 1st July 2018 for TEOM's coinciding with the Dixon Sand project year.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- All TEOM PM_{10} 24-hour average result were below the short-term Dixon Sand Quarry consent, 24-hour impact criteria of 50ug/m^3;
- The current TEOM PM_{10} annual average is below the Dixon Sand Quarry consent, annual average criteria of 30ug/m3.
- Currently, calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.
- All TEOM PM_{10} 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Note that an annual amount of data has now been collected.

Approximately 100% of meteorological data was recovered for June 2019.
Approximately 100% of TEOM data was recovered for June 2019.

2.0 Sampling Program

The TEOM is operated to the applicable Australian Standard and OEH (EPA) approved method. All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

The following Australian Standards were used:

AS3580.9.8 (2001) "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*."

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

The location of the air quality monitoring equipment met the Australian Standard AS 3580.1.1 (2007) "*Methods for sampling and analysis of ambient air Part 1.1 Guide to siting air monitoring equipment*". Air Quality monitoring site descriptions and locations are provided in **Table 1**:

Table 1: Dixon Sands Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Reporting Period Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**. During the monitoring period individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m^3.

The current TEOM PM_{10} annual average runs from the 1st July 2018. At present it is below the Dixon Sand Quarry long term annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: an annual amount of data has been collected.

A quarterly calibration was undertaken on 19 June 2019. Calibration certificates are provided in **Appendix 1** (when required).

Table 2: Average Daily 24 Hr TEOM PM_{10} and TSP for June 2019 from AQMS and Annual Average PM_{10} calculated from the 1 July 2018.

Date	TEOM PM_{10} ($\mu g/m^3$)	Annual PM_{10} Average ($\mu g/m^3$)	TSP* ($\mu g/m3$)	TSP Annual** ($\mu g/m3$)
1/06/2019	21.0	16.8	52.5	41.9
2/06/2019	19.6	16.8	49.0	41.9
3/06/2019	12.1	16.8	30.3	41.9
4/06/2019	6.9	16.7	17.3	41.8
5/06/2019	6.3	16.7	15.8	41.7
6/06/2019	7.5	16.7	18.8	41.7
7/06/2019	11.8	16.6	29.5	41.6
8/06/2019	5.6	16.6	14.0	41.5
9/06/2019	7.4	16.6	18.5	41.5
10/06/2019	6.4	16.6	16.0	41.4
11/06/2019	8.1	16.5	20.3	41.3
12/06/2019	10.9	16.5	27.3	41.3
13/06/2019	8.8	16.5	22.0	41.2
14/06/2019	7.5	16.5	18.8	41.2
15/06/2019	9.5	16.4	23.8	41.1
16/06/2019	10.9	16.4	27.3	41.1
17/06/2019	5.4	16.4	13.5	41.0
18/06/2019	7.8	16.4	19.5	40.9
19/06/2019	0.6	16.3	1.5	40.8
20/06/2019	5.3	16.3	13.3	40.7
21/06/2019	6.2	16.3	15.5	40.6
22/06/2019	6.1	16.2	15.3	40.6
23/06/2019	6.1	16.2	15.3	40.5
24/06/2019	5.2	16.2	13.0	40.4
25/06/2019	5.1	16.1	12.8	40.3
26/06/2019	6.3	16.1	15.8	40.3
27/06/2019	6.0	16.1	15.0	40.2
28/06/2019	6.1	16.1	15.3	40.1
29/06/2019	4.4	16.0	11.0	40.0
30/06/2019	5.1	16.0	12.8	40.0

*Calculated from PM10

**Calculated from PM10 Annual Average

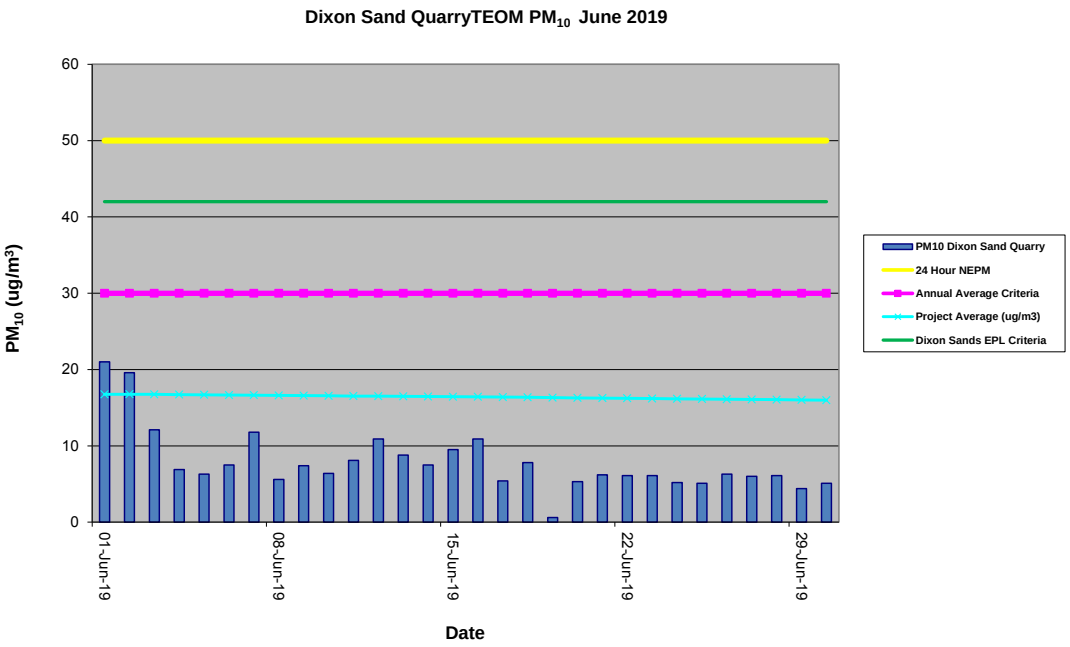


Figure 1: TEOM PM_{10} 24 hr, Annual Average and Criteria

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

The summary of results is presented in **Table 3. Figure 2 and 3** display the charts of meteorological parameters for the month. A windrose is provided in **Figure 4.** This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

Table 3: Meteorological Data Summary for June 2019

Date	Min Temp	Av Temp	Max Temp	RAIN mm	Min WS	Av WS	Max WS	Min Humidity	Av Humidity	Max Humidity	Min Pressure	Av pressure	Max Pressure
1/06/2019	8.1	12.2	17.6	0.0	0.2	4.6	12.9	54.2	67.6	83.0	1003.2	1004.9	1006.3
2/06/2019	8.2	12.5	16.5	0.0	0.2	3.1	13.0	63.7	78.2	90.2	998.3	1002.6	1005.7
3/06/2019	6.0	12.0	16.7	0.4	0.0	4.2	21.2	42.3	66.1	81.9	989.0	992.3	998.2
4/06/2019	5.0	9.0	12.8	5.6	0.2	11.1	35.7	58.0	74.1	99.8	987.9	992.9	999.6
5/06/2019	8.6	10.6	14.2	0.0	0.1	7.0	22.8	58.9	71.8	84.3	999.5	1003.3	1006.7
6/06/2019	6.7	11.2	16.9	0.0	0.2	2.4	11.1	28.8	59.8	80.9	1005.5	1007.9	1012.1
7/06/2019	8.2	11.9	15.4	0.4	0.2	2.9	9.3	61.2	80.9	99.9	1010.6	1012.2	1013.8
8/06/2019	9.4	11.7	13.5	0.0	0.0	2.8	9.0	78.3	94.8	100.0	1002.9	1007.7	1011.9
9/06/2019	11.5	15.2	20.4	0.0	0.1	3.6	13.3	46.3	69.1	90.6	999.0	1001.1	1003.1
10/06/2019	11.4	16.1	20.8	0.0	0.4	5.2	19.5	47.8	65.3	83.9	994.5	997.5	999.8
11/06/2019	13.8	16.7	22.5	0.0	0.1	3.8	12.7	44.7	66.7	81.4	997.9	1001.1	1003.6
12/06/2019	10.7	16.3	22.4	0.0	0.4	5.7	17.5	48.0	67.4	97.3	995.3	999.0	1002.6
13/06/2019	12.5	17.2	20.8	0.0	0.0	5.0	21.6	40.8	55.5	73.3	991.9	994.2	996.7
14/06/2019	8.9	12.4	18.0	0.0	0.1	2.2	8.6	39.0	58.7	75.9	995.6	997.1	998.8
15/06/2019	8.2	11.9	17.3	0.0	0.1	2.1	9.9	35.0	58.1	77.7	997.1	998.4	999.7
16/06/2019	8.6	10.9	13.2	0.0	0.4	4.1	13.1	66.6	96.1	100.0	996.7	998.3	999.6
17/06/2019	9.7	11.4	14.1	1.0	1.4	6.4	15.7	74.6	90.1	100.0	996.9	997.9	999.4
18/06/2019	9.4	12.7	16.9	0.0	0.1	3.6	11.8	64.9	85.3	99.2	995.0	997.1	998.4
19/06/2019	6.1	10.0	14.8	0.0	0.2	3.1	16.5	38.4	65.5	88.9	997.1	999.5	1002.1
20/06/2019	4.3	8.5	13.6	0.0	0.1	2.3	13.3	58.5	74.3	92.6	999.3	1001.0	1002.9
21/06/2019	4.5	8.0	12.5	0.0	0.2	4.2	15.5	37.5	67.5	97.8	999.1	1001.0	1003.2
22/06/2019	3.5	8.7	13.6	0.0	0.6	5.6	21.9	51.9	65.3	84.6	1002.4	1003.3	1004.5
23/06/2019	5.7	9.2	14.0	2.0	0.2	6.4	16.8	56.7	72.2	99.9	1003.0	1004.3	1006.4
24/06/2019	7.7	10.0	14.5	2.6	1.0	5.6	14.5	82.7	97.7	100.0	1006.1	1008.2	1010.2
25/06/2019	9.4	11.9	16.9	0.8	0.2	4.4	12.4	68.1	95.2	100.0	1009.6	1010.8	1012.0
26/06/2019	10.5	11.9	15.0	0.8	0.2	3.7	11.9	84.0	97.0	100.0	1011.5	1012.5	1014.1
27/06/2019	10.3	12.7	17.1	0.0	0.0	2.6	9.9	79.8	96.3	100.0	1010.5	1012.1	1013.7
28/06/2019	8.9	13.3	18.7	0.0	0.0	2.2	11.3	60.9	89.9	100.0	1006.6	1009.2	1011.6
29/06/2019	7.5	13.7	19.3	0.0	0.2	5.1	14.4	47.0	79.2	100.0	994.9	1001.8	1007.1
30/06/2019	9.0	12.9	16.7	0.0	0.1	4.0	16.6	39.3	72.9	100.0	994.4	998.9	1002.8
Monthly	3.5	12.1	22.5	13.6	0.0	4.3	35.7	28.8	76.0	100.0	987.9	1002.3	1014.1

Figure 2: Rainfall, Temperature and Humidity Charts

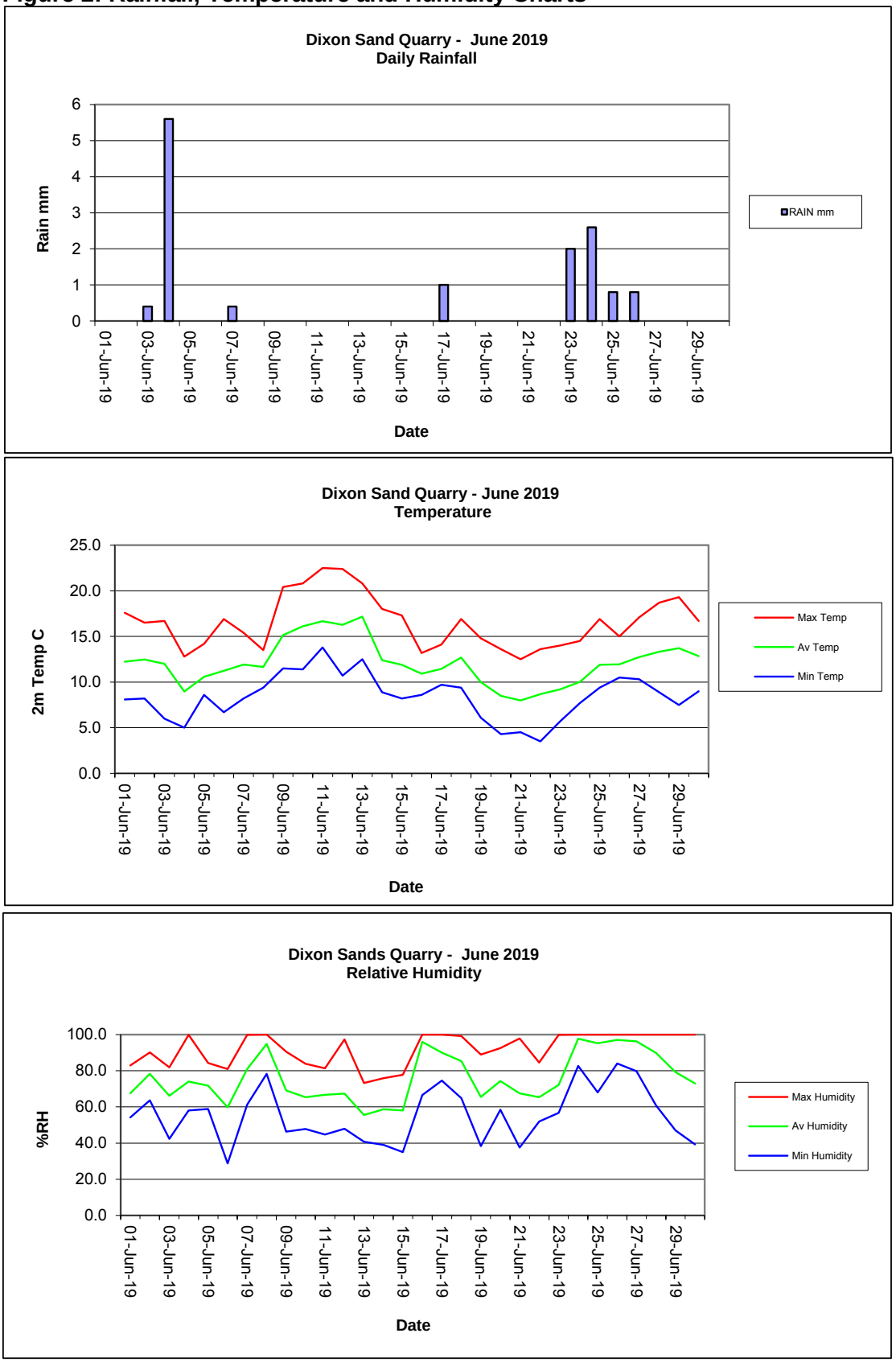


Figure 3: Wind Speed and Atmospheric Pressure Charts

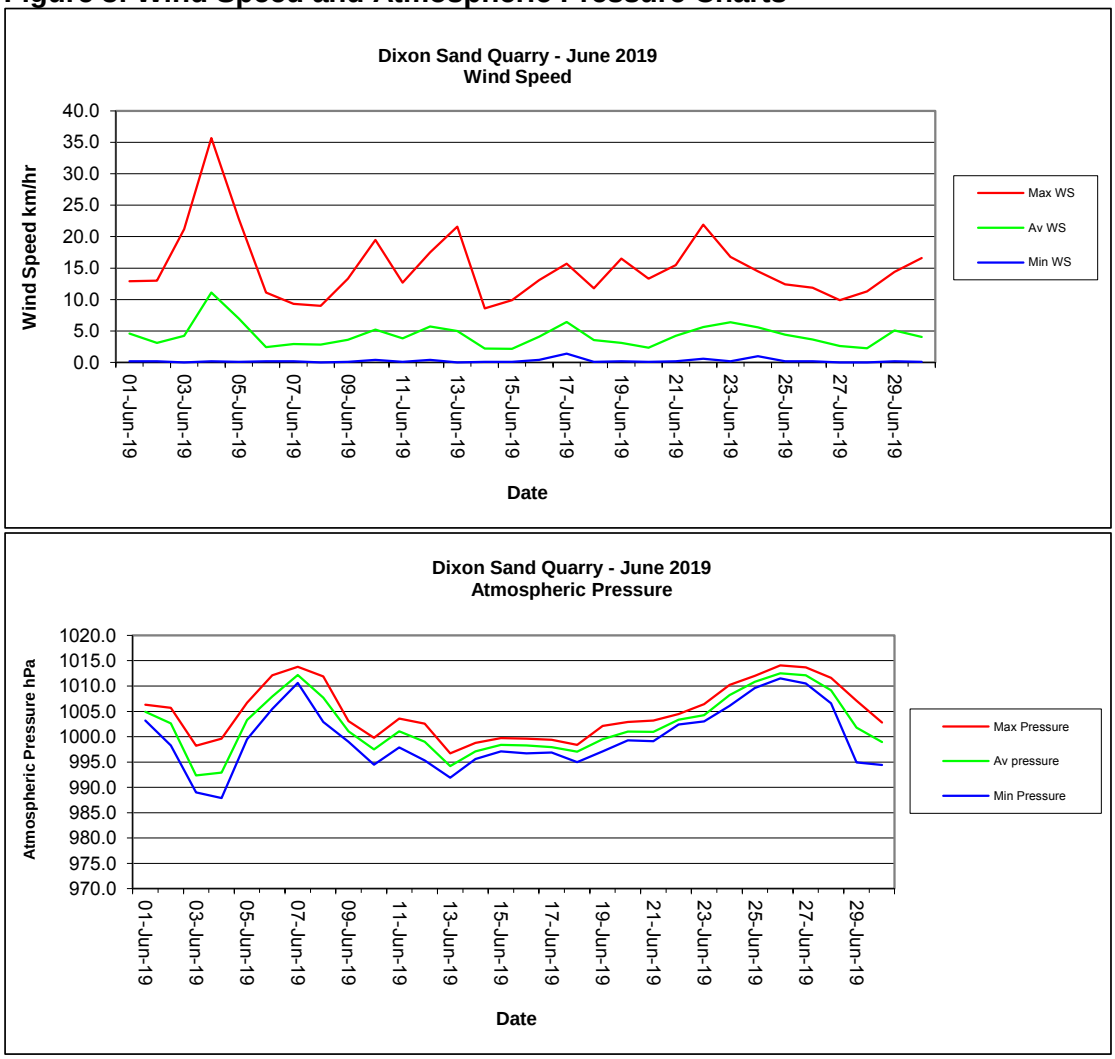
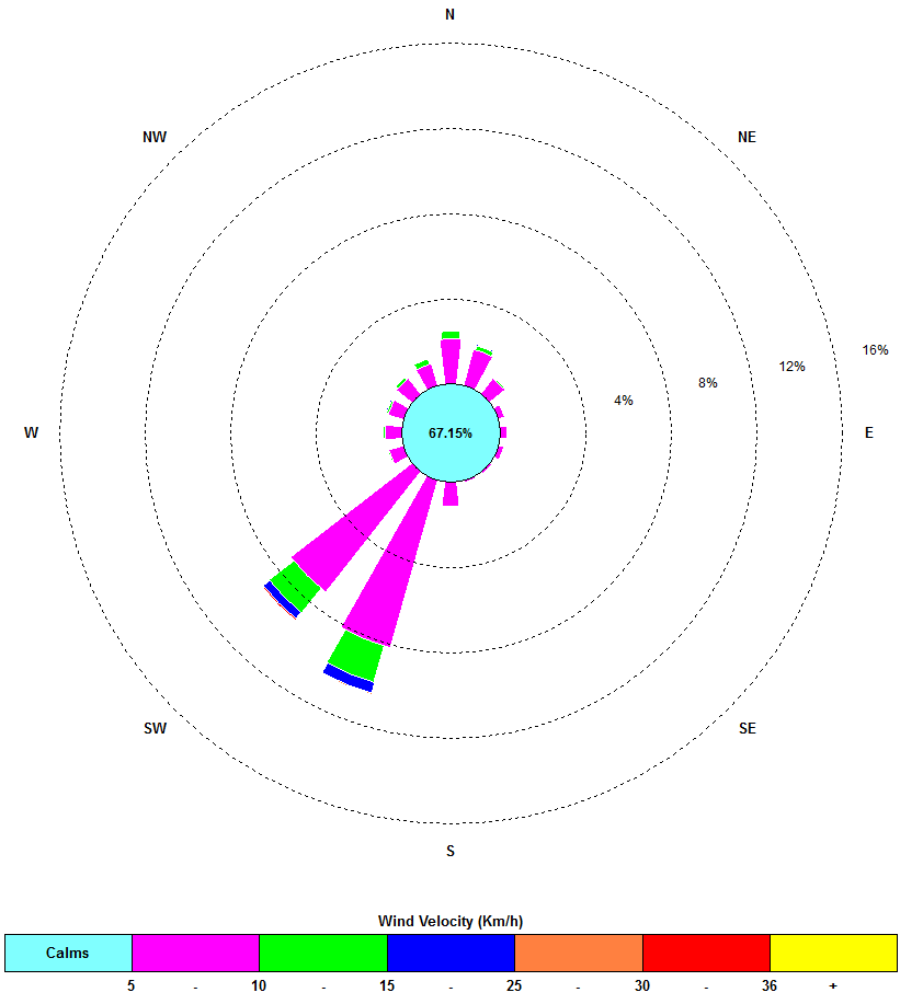


Figure 4: Windrose Plot (km/h)

00:00 1 June 2019 – 23:55 30 June 2019



Appendix 1

Calibration Documents (when required)

Continuous Air Quality
Monthly/Quarterly/Six Monthly/Annual
TEOM Maintenance and Calibration – 1400AB

TEOM Client/Site: Dixon Sands / TEOM 1 **Date:** 19.6.19

1. TEOM Data Screen **SERIAL No:** _____ **Firmware:** N/A.

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Operating Condition	OK 4 ✓	Green - Normal	✓	
Date/time	TEOM: 19/6/19 9.39 Actual: 19/6/19 8.42	Current Date/time correct within 5 minutes	✓ DST	
PM-10 24hr av	6.1	Positive values	✓	
Filter loading PM10	76%	<80 %	✓	
Frequency PM-10	251.8230	200-300 Hz	✓	
Noise PM-10	0.048	<0.100ug	✓	

Comment: If filter load >80% but <90% and if flows Ok then data is OK

Comments: Adj time to EST

2. System Status

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Vacuum pump pressure		<0.50 atm	✓	
Warnings	NIL	No Warnings	✓	
If any warnings list:				

Comments:

Data Downloaded: YES/NO (circle)

Technician Name : COLIN DANIELS **Signed** _____

3. Instrument Conditions Ambient Conditions and Temperatures

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Ambient Temperature	12.9	-10 to 50 C	✓	
Ambient Dew Point	NA	-10 to 50 C	✓	
Ambient Pressure	0.979	0.9-1.1 atm	✓	
Ambient Relative Humidity	NA	10-100 %RH	✓	
Cap temperature	50.00	50.00 +/- 0.10 C	✓	
Case temperature	50.00	50.00 +/- 0.10 C	✓	
Main (PM-10) Air Tube temp	50.00	50.00 +/- 0.10 C	✓	

Comments:

4. Instrument Conditions – Flows

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Main (PM-10) Flow rate	3.00	2.82 – 3.18 lpm	✓	
Bypass Flow rate	13.68	12.95 – 14.39 lpm	✓	
Total Flow rate	16.68	15.67 – 17.67 lpm	✓	

Comments:

Results: (Tick box)

☑ **There were NO equipment faults found. No action required – (file report)**

☐ **There were faults found (Fails) – Were these fixed on site: YES/NO (circle)**
Any Fails that cannot be repaired on site must be reported to CBased:
Office: 65713334 or email cbased@bigpond.com
Date faults notified to CBased: _____

Comments/Action Required:

Calibration/Maintenance

1. 1405A: Were Filters replaced YES/NO
2. PM10 Inlet head cleaned YES/NO
3. If measurement filters were replaced, confirm stable results after change. Stable particulate results confirmed YES/NO

Channel	Filter Load %	Frequency Hz initial	Frequency check 1min	Frequency check 3min	Frequency check 5min
PM10	17.0	253.56369	253.56384	253.56395	253.56412

✓ all ok

Frequency should not drift by more than 0.0010 between readings (if instrument is thermodynamically stable) Pass/Fail – if Fail – install new filter and redo stability test.

4. Instrument clock verified (Refer Section 1) YES/NO.
If Time changed – clock reset OK YES/NO or NA (not changed)
Comments: changed time to EST ✓

5. Were TEOM in line and rear TEOM filters checked for cleanliness and replaced if necessary. YES/NO.
Comments if changed:

6. TEOM Cleaned and Air Conditioner checked YES/NO. Air Conditioner settings or operational status: 4- low cool

Tetracal Flow/Temp/Pressure Calibrator Serial No: 1009 **Refer to calibration corrections for Temperature/Pressure and Flows and apply to all readings.**

Quarterly or Six Monthly Calibration

1. Flow Verification – Conducted YES/NO

PM10 Flow verified Flow l/min 3.18 Error % 6 (allowed error <6%) PASS/FAIL — marginal but ok. — Final 3.01 l/m

Bypass Flow verified Flow l/min 13.64 Error % 0.2 (allowed error <6%) PASS/FAIL — 13.65 l/m

If fail then complete a full multipoint recalibration and review previous data from last good flow check. **Comments if Flows recalibrated:**

2. Leak Check – Conducted YES/NO

PM10 actual 0.05 < Limit 0.15

Bypass actual 0.14 < Limit 0.60

Leak check PASS/FAIL – If fail then find leak and retest.
Comments: slight leak.

Main Fady 1.005
bypass Fady 1.000

Final
main Fady : 0.83 up
bypass Fady : 1.000
can only go to 0.8!

Annual Calibration/Maintenance

1. Temperature and Pressure Calibration – Conducted YES/NO
Reference Temperature: _____C TEOM Temperature_____C
if difference +/- 1 C recalibrate sensor. Sensor recalibrated YES/NO

Reference Pressure: _____atm TEOM Pressure_____atm
if difference +/- 0.010 atm recalibrate sensor. Sensor recalibrated YES/NO

Note: Tetracal measures Atmospheric Pressure in mm Hg or mb or hPa
For mb or hPa divide tetracal result by 1013.25 to change units to atm.
For mmHg divide tetracal result by 760 to change units to atm.

2. Flow Calibration – Conducted YES/NO
NA.
PM10
Set point 2.4 Actual:_____
Set point 3.6 Actual:_____
Set point 3.0 Actual:_____ After calibration Final:_____l/min

BYPASS
Set point 10.9 Actual:_____
Set point 16.4 Actual:_____
Set point 13.67 Actual:_____ After calibration Final:_____l/min

3. Mass calibration (K0) Verification – Conducted YES/NO
Actual measured KO = _____TEOM stated K0_____ Error %:_____
Allowed Error +/- 2.5%. PASS/FAIL
If Error +/- 2.5% repeat. If confirmed consult manufacturer.
Second Error % =_____ PASS/FAIL. Comments:
If second test fails consult manufacturer.

4. Annual Noise check - Conducted YES/NO
Zero filter applied to TEOM and TEOM operated for at least 12 hours:
Start date/time: _____Finish date/time:_____
Standard deviation of all recorded data (min 30 min averages) = _____ug/m^3
Noise was less than $5ug/m^3$ YES/NO

5. Maintenance
Air Inlet system cleaned YES/NO
Pump Reconditioned YES/NO
Check Waterproofing YES/NO
Comments:

Appendix C – Groundwater / Surface Water Monitoring Data and Maximum Extraction Depth Plans

Old Northern Road – Groundwater Quality

OLD NORTHERN RD QUARRY
DECEMBER 2018 GW QUALITY.

WATER SAMPLING FIELD SHEET

Project Environmental Services

Sampler Name	HUNNY CHURCHER	Project No.	J16-001	Project Name	DIXON SAND -
Date of Survey	11/12/2018	Weather	OVERCAST, NO WIND		OLD NORTHERN ROAD QUARRY

Data Collection

Sample ID	Water Body Type *	Time	Flow	Field Parameters & Observations			Comments **
				pH	EC	Turbidity	
MW5	BH	14:00	19.3°C	4.5	302		SLIGHTLY TURBID
BH1	BH	14:08	18.9°C	6.1	148		SLIGHTLY TURBID
BH7	BH	14:29	18.7°C	4.3	216		CLEAR
MW1	BH	14:37	18.4°C	3.9	232		SLIGHTLY TURBID
BH9	BH	14:47	19.3°C	5.5	307		TURBID
MW2	BH	14:59	17.3°C	3.8	629		CLEAR
MW3	BH	15:10	17.9°C	5.0	116		SLIGHTLY TURBID
BH6	BH	15:16	18.0°C	5.5	108		CLEAR
BH2	BH	15:33	COULD NOT SAMPLE - BH FULL OF SEDIMENT + GRAVEL → SEE PHOTO.				
BH3	BH	15:40	18.9°C	5.9	164		SLIGHTLY TURBID

Notes: * Borehole = BH, Stream = ST, Lake = LA, Sediment Basin = SB, Dam = DA
** Comments: Odour, Colour, Surface film, Obvious Contamination

Laboratory Details

Laboratory Name		Contact Name		Contact No.	
Sample Sent Date		Delivery Method		Result Due	
Analysis Suites	USED FIELD PH + EC METER NO LABORATORY ANALYSIS REQUIRED				

vgt
Laboratories Pty Ltd
PO Box 2335 Greenhills NSW 2323
P (02)4028 6412 E mail@vgt.com.au
www.vgt.com.au ABN 77 621 943 600

Report Number: 6837

Date Issued: 17/12/2018

Revision Number: 00

Site/Job: Old Northern Rd Quarry

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 2 sample(s) were received on 14/12/2018

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
SW19		13/12/2018 9:43 AM	6837/1	Water	
BH8		14/12/2018 8:48 AM	6837/2	Water	Tested in field By VGT (Terry Walker)

The samples have been tested and the following reports are included:

- Test Report: Results relate to sample(s) as received
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Report Number: 6837

Date Issued: 17/12/2018 Revision No: 00

vgt Laboratories Pty Ltd

Results

Field Tests	Units	Method	Limit of Report	6837/2 BH8 14/12/2018
Depth to Water	m	Depth	*0.01*	26.20
Temperature	℃	Temp	*0.1*	17.0
pH	pH Units	APHA 4500-H B	*0.1*	3.9
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	287

Physical Components	Units	Method	Limit of Report	6837/1 SW19 13/12/2018
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	178
Turbidity	NTU	APHA 2130 B	*0.1*	1.4
Total Suspended Solids	mg/L	AS3550.4	*2*	<2

COMMENTS:

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322

Note: # Where present, indicates the performance of this test is not covered under NATA accreditation

Holding times for some or all of the tests listed below are outside the period recommended in the method: pH (0.25 hrs), TSS, Turbidity (24 hrs).
This may be important to the interpretation of the results.

Results have been approved and report finalised on 17/12/2018

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Report Number: 7573

Date Issued: 12/06/2019 Revision Number: 00

Site/Job: Old Northern Rd 6 Mnth Ground Water

Client: Dixon Sand Pty Ltd
Address PO Box 4019
Pitt Town NSW 2756
Contact David Dixon

The following 11 samples were received on 3/06/2019

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
BH1		3/06/2019	7573/1	Water	
BH2		3/06/2019	7573/2	Water	Out of commission
BH3		3/06/2019	7573/3	Water	
BH6		3/06/2019	7573/4	Water	
BH7		3/06/2019	7573/5	Water	
BH8		3/06/2019	7573/6	Water	
BH9		3/06/2019	7573/7	Water	
MW1		3/06/2019	7573/8	Water	
MW2		3/06/2019	7573/9	Water	
MW3		3/06/2019	7573/10	Water	
MW5		3/06/2019	7573/11	Water	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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WORLD RECOGNISED ACCREDITATION

Test Report Number: 7573

Date Issued: 12/06/2019 Revision No: 00

vgt Laboratories Pty Ltd

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	7573/1 BH1 3/06/2019	7573/3 BH3 3/06/2019	7573/4 BH6 3/06/2019	7573/5 BH7 3/06/2019	7573/6 BH8 3/06/2019
Depth to Water	m	Depth	*0.01*	59.15	33.24	31.74	21.73	26.43
Temperature	℃	Temp	*0.1*	18.1	17.7	17.6	18.0	17.1
pH	pH Units	APHA 4500-H B	*0.1*	6.4	5.9	5.0	4.5	4.1
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	208	172	127	248	289

Water Sampling and Field Tests	Units	Method	Limit of Report	7573/7 BH9 3/06/2019	7573/8 MW1 3/06/2019	7573/9 MW2 3/06/2019	7573/10 MW3 3/06/2019	7573/11 MW5 3/06/2019
Depth to Water	m	Depth	*0.01*	35.18	8.87	20.85	22.59	8.51
Temperature	℃	Temp	*0.1*	17.5	18.4	16.5	17.7	18.2
pH	pH Units	APHA 4500-H B	*0.1*	5.6	4.0	3.9	4.8	5.1
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	269	260	750	137	152

Total Dissolved Solids	Units	Method	Limit of Report	7573/1 BH1 3/06/2019	7573/3 BH3 3/06/2019	7573/4 BH6 3/06/2019	7573/5 BH7 3/06/2019	7573/6 BH8 3/06/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	164	108	69	147	177

Total Dissolved Solids	Units	Method	Limit of Report	7573/7 BH9 3/06/2019	7573/8 MW1 3/06/2019	7573/9 MW2 3/06/2019	7573/10 MW3 3/06/2019	7573/11 MW5 3/06/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	151	131	449	87	86

COMMENTS:
Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates NATA accreditation does not cover the performance of this service.

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NATA WORLD RECOGNISED ACCREDITATION

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322

Results have been approved and report finalised on 12/06/2019

Sampling Report Number: 7573

Date Issued: 12/06/2019 Revision No: 00

Sampling Conditions: Cloudy, showers 14°-19°C

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
7573/1	BH1	3/06/2019 9:57 AM	T.Walker	AS5667.11, Bail		Only small quantity bailed
7573/2	BH2	3/06/2019 12:00 AM	T.Walker	AS5667.11, Bail		Out of commission
7573/3	BH3	3/06/2019 11:46 AM	T.Walker	AS5667.11, Pump		
7573/4	BH6	3/06/2019 10:59 AM	T.Walker	AS5667.11, Pump		
7573/5	BH7	3/06/2019 12:28 PM	T.Walker	AS5667.11, Pump		
7573/6	BH8	3/06/2019 1:07 PM	T.Walker	AS5667.11, Pump		Turbid, Roots at 27.52m. Very slow recharge
7573/7	BH9	3/06/2019 12:08 PM	T.Walker	AS5667.11, Pump		
7573/8	MW1	3/06/2019 12:47 PM	T.Walker	AS5667.11, Pump		Very sandy
7573/9	MW2	3/06/2019 1:41 PM	T.Walker	AS5667.11, Bail		Turbid. Bottom 24.40m
7573/10	MW3	3/06/2019 11:13 AM	T.Walker	AS5667.11, Pump		
7573/11	MW5	3/06/2019 10:30 AM	T.Walker	AS5667.11, Pump		Bottom 21.20m

Sampling procedures have been approved and report finalised on 12/06/2019
Where method is "unknown" sampling procedures are not endorsed

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Haerses Road – Groundwater Quality

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Report Number: 6749

Date Issued: 5/12/2018 Revision Number: 00

Site/Job: Haerses Road 6 Monthly Ground Water

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 9 samples were received on 3/12/2018

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
H6		3/12/2018	6749/1	Water	
H7		3/12/2018	6749/2	Water	
H9		3/12/2018	6749/3	Water	
H12		3/12/2018	6749/4	Water	
BH4		3/12/2018	6749/5	Water	
H14		3/12/2018	6749/6	Water	
BH5		3/12/2018	6749/7	Water	
H2		3/12/2018	6749/8	Water	
Duplicate (BH5)		3/12/2018	6749/9	Water	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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

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Test Report Number: 6749

Date Issued: 5/12/2018 Revision No: 00

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	6749/1 H6 3/12/2018	6749/2 H7 3/12/2018	6749/3 H9 3/12/2018	6749/4 H12 3/12/2018	6749/5 BH4 3/12/2018
Depth to Water	m	Depth	*0.01*	14.06	14.18	9.37	12.28	37.80
Temperature	℃	Temp	*0.1*	19.5	19.7	20.7	21.5	21.8
pH	pH Units	APHA 4500-H B	*0.1*	4.2	4.3	4.4	4.5	5.6
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	171	160	124	116	140

Water Sampling and Field Tests	Units	Method	Limit of Report	6749/6 H14 3/12/2018	6749/7 BH5 3/12/2018	6749/8 H2 3/12/2018	6749/9 Duplicate (BH5) 3/12/2018
Depth to Water	m	Depth	*0.01*	10.31	30.28	2.83	[NT]
Temperature	℃	Temp	*0.1*	19.8	20.8	20.6	20.9
pH	pH Units	APHA 4500-H B	*0.1*	4.3	5.1	4.4	5.2
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	94	201	68	200

COMMENTS:

Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates the performance of this test is not covered under NATA accreditation

Location Analysed : Tested On Site

Results have been approved and report finalised on 5/12/2018

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 6749

Date Issued: 5/12/2018
Sampling Conditions: Fine 21°-27°C

Revision No: 00

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6749/1	H6	3/12/2018 9:30 AM	T.Walker	AS5667.11, Bail		
6749/2	H7	3/12/2018 10:06 AM	T.Walker	AS5667.11, Bail		
6749/3	H9	3/12/2018 10:34 AM	T.Walker	AS5667.11, Pump		
6749/4	H12	3/12/2018 11:01 AM	T.Walker	AS5667.11, Pump		
6749/5	BH4	3/12/2018 11:36 AM	T.Walker	AS5667.11, Pump		
6749/6	H14	3/12/2018 12:08 PM	T.Walker	AS5667.11, Bail		
6749/7	BH5	3/12/2018 12:38 PM	T.Walker	AS5667.11, Pump		
6749/8	H2	3/12/2018 1:21 PM	T.Walker	AS5667.11, Bail		
6749/9	Duplicate (BH5)	3/12/2018 12:48 PM	T.Walker	AS5667.11, Pump		

Sampling procedures have been approved and report finalised on 5/12/2018
Where method is "unknown" sampling procedures are not endorsed

NATA Accredited Laboratory – 20375

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www.vgt.com.au ABN 77 621 943 800

Report Number: 7576

Date Issued: 12/06/2019 Revision Number: 00

Site/Job: Haerses Road 6 Mnth Ground Water

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 8 samples were received on 4/06/2019

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
H6		4/06/2019	7576/1	Water	
H7		4/06/2019	7576/2	Water	
H9		4/06/2019	7576/3	Water	
H12		4/06/2019	7576/4	Water	
BH4		4/06/2019	7576/5	Water	
H14		4/06/2019	7576/6	Water	
BH5		4/06/2019	7576/7	Water	
H2		4/06/2019	7576/8	Water	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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WORLD RECOGNISED ACCREDITATION

Test Report Number: 7576

Date Issued: 12/06/2019 Revision No: 00

vgt Laboratories Pty Ltd

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	7576/1 H6 4/06/2019	7576/2 H7 4/06/2019	7576/3 H9 4/06/2019	7576/4 H12 4/06/2019	7576/5 BH4 4/06/2019
Depth to Water	m	Depth	*0.01*	14.48	14.28	9.37	12.29	37.76
Temperature	℃	Temp	*0.1*	16.8	16.0	16.4	16.6	17.3
pH	pH Units	APHA 4500-H B	*0.1*	4.1	4.3	4.3	4.5	5.4
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	166	89	112	86	121

Water Sampling and Field Tests	Units	Method	Limit of Report	7576/6 H14 4/06/2019	7576/7 BH5 4/06/2019	7576/8 H2 4/06/2019
Depth to Water	m	Depth	*0.01*	10.43	30.31	3.45
Temperature	℃	Temp	*0.1*	17.2	17.6	18.5
pH	pH Units	APHA 4500-H B	*0.1*	4.4	5.0	4.4
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	89	199	69

Total Dissolved Solids	Units	Method	Limit of Report	7576/1 H6 4/06/2019	7576/2 H7 4/06/2019	7576/3 H9 4/06/2019	7576/4 H12 4/06/2019	7576/5 BH4 4/06/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	1,520	74	85	68	71

Total Dissolved Solids	Units	Method	Limit of Report	7576/6 H14 4/06/2019	7576/7 BH5 4/06/2019	7576/8 H2 4/06/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	51	113	37

COMMENTS:
Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates NATA accreditation does not cover the performance of this service.

NATA Accredited Laboratory – 20375

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NATA WORLD RECOGNISED ACCREDITATION

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322

Results have been approved and report finalised on 12/06/2019

Sampling Report Number: 7576

Date Issued: 12/06/2019 Revision No: 00
Sampling Conditions: Showers, Windy 8°-11°C

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
7576/1	H6	4/06/2019 9:41 AM	T.Walker	AS5667.11, Bail		Bottom 15.8m. High sediment load
7576/2	H7	4/06/2019 10:09 AM	T.Walker	AS5667.11, Pump		
7576/3	H9	4/06/2019 10:32 AM	T.Walker	AS5667.11, Pump		
7576/4	H12	4/06/2019 10:59 AM	T.Walker	AS5667.11, Pump		
7576/5	BH4	4/06/2019 11:31 AM	T.Walker	AS5667.11, Pump		Depth logger string was tangled ~ 1m out
7576/6	H14	4/06/2019 12:14 PM	T.Walker	AS5667.11, Pump		
7576/7	BH5	4/06/2019 1:02 PM	T.Walker	AS5667.11, Pump		
7576/8	H2	4/06/2019 1:31 PM	T.Walker	AS5667.11, Bail		

Sampling procedures have been approved and report finalised on 12/06/2019
Where method is "unknown" sampling procedures are not endorsed

NATA Accredited Laboratory – 20375

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

Haerses Road – Buffer Bores Groundwater Quality

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Report Number: 6291

Date Issued: 20/08/2018 Revision Number: 01

Site/Job: Haerses Road Monthly Ground Water

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 13 samples were received on 13/08/2018

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
BH01A		13/08/2018	6291/1	Water	BH Depth 70m/Top of Screen 64m (~114L)
BH01B		13/08/2018	6291/2	Water	BH Depth 40m/Top of Screen 34m (~52L)
BH01C		13/08/2018	6291/3	Water	BH Depth 10m/Top of Screen 2m (~6L)
BH02A		13/08/2018	6291/4	Water	BH Depth 80m/Top of Screen 74m (~104L)
BH02B		13/08/2018	6291/5	Water	BH Depth 42m/Top of Screen 36m (~28L)
BH02C		13/08/2018	6291/6	Water	BH Depth 15m/Top of Screen 12m (~<2L)
BH03A		13/08/2018	6291/7	Water	BH Depth 80m/Top of Screen 74m (~44L)
BH03B		13/08/2018	6291/8	Water	BH Depth 23m/Top of Screen 20m (~<2L)
BH03C		13/08/2018	6291/9	Water	BH Depth 15m/Top of Screen 12m (~4L)
BH05B		13/08/2018	6291/10	Water	BH Depth 35m/Top of Screen 29m (~30L)
BH06A		13/08/2018	6291/11	Water	BH Depth 70m/Top of Screen 64m (~48L)
BH06B		13/08/2018	6291/12	Water	BH Depth 38m/Top of Screen 32m (~6L)
BH06C		13/08/2018	6291/13	Water	BH Depth 15m/Top of Srceen 12m (~8L)

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Senior Chemist

NATA Accredited Laboratory – 20375

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

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Test Report Number: 6291

Date Issued: 20/08/2018 Revision No: 01

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	6291/1 BH01A 13/08/2018	6291/2 BH01B 13/08/2018	6291/3 BH01C 13/08/2018	6291/4 BH02A 13/08/2018	6291/5 BH02B 13/08/2018
Depth to Water	m	Depth	*0.01*	12.78	14.14	7.25	28.14	28.28
Temperature	℃	Temp	*0.1*	17.5	17.1	15.8	18.1	18.0
pH	pH Units	VGT-WI/01	*0.1*	5.3	4.9	4.8	5.6	5.5
Electrical Conductivity	µS/cm	VGT-WI/02	*50*	191	184	185	169	176

Water Sampling and Field Tests	Units	Method	Limit of Report	6291/6 BH02C 13/08/2018	6291/7 BH03A 13/08/2018	6291/8 BH03B 13/08/2018	6291/9 BH03C 13/08/2018	6291/10 BH05B 13/08/2018
Depth to Water	m	Depth	*0.01*	15.17	57.75	22.52	13.55	20.45
Temperature	℃	Temp	*0.1*	16.0	16.9	17.8	17.5	17.7
pH	pH Units	VGT-WI/01	*0.1*	6.5	6.7	5.4	4.7	4.5
Electrical Conductivity	µS/cm	VGT-WI/02	*50*	220	303	250	157	187

Water Sampling and Field Tests	Units	Method	Limit of Report	6291/11 BH06A 13/08/2018	6291/12 BH06B 13/08/2018	6291/13 BH06C 13/08/2018
Depth to Water	m	Depth	*0.01*	39.73	35.17	11.10
Temperature	℃	Temp	*0.1*	18.6	17.6	18.3
pH	pH Units	VGT-WI/01	*0.1*	12.6	5.8	7.2
Electrical Conductivity	µS/cm	VGT-WI/02	*50*	5,890	202	906

Total Dissolved Solids	Units	Method	Limit of Report	6291/1 BH01A 13/08/2018	6291/2 BH01B 13/08/2018	6291/3 BH01C 13/08/2018	6291/4 BH02A 13/08/2018	6291/5 BH02B 13/08/2018
Total Dissolved Solids	mg/L @105°C	VGT-WI/49 AS3550.4	*20*	92	67	79	71	64

Total Dissolved Solids	Units	Method	Limit of Report	6291/6 BH02C 13/08/2018	6291/7 BH03A 13/08/2018	6291/8 BH03B 13/08/2018	6291/9 BH03C 13/08/2018	6291/10 BH05B 13/08/2018
Total Dissolved Solids	mg/L @105°C	VGT-WI/49 AS3550.4	*20*	133	127	156	67	92

Total Dissolved Solids	Units	Method	Limit of Report	6291/11 BH06A 13/08/2018	6291/12 BH06B 13/08/2018	6291/13 BH06C 13/08/2018
Total Dissolved Solids	mg/L @105°C	VGT-WI/49 AS3550.4	*20*	1,190	84	493

Well Logging Data	Units	Method	Limit of Report	6291/1 BH01A 13/08/2018	6291/2 BH01B 13/08/2018	6291/3 BH01C 13/08/2018	6291/4 BH02A 13/08/2018	6291/5 BH02B 13/08/2018
Depth Logger Data	Date			13/08/2018	13/08/2018	13/08/2018	13/08/2018	13/08/2018

Well Logging Data	Units	Method	Limit of Report	6291/6 BH02C 13/08/2018	6291/7 BH03A 13/08/2018	6291/8 BH03B 13/08/2018	6291/9 BH03C 13/08/2018	6291/10 BH05B 13/08/2018
Depth Logger Data	Date			13/08/2018	13/08/2018	13/08/2018	13/08/2018	13/08/2018

Well Logging Data	Units	Method	Limit of Report	6291/11 BH06A 13/08/2018	6291/12 BH06B 13/08/2018	6291/13 BH06C 13/08/2018
Depth Logger Data	Date			13/08/2018	13/08/2018	13/08/2018

COMMENTS:

Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates the performance of this test is not covered under NATA accreditation

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322

Results have been approved and report finalised on 20/08/2018

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 6291

Date Issued: 20/08/2018
Sampling Conditions: Fine 15-22°C

Revision No: 01

vgt Laboratories Pty Ltd

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6291/1	BH01A	13/08/2018 1:38 PM	T.Walker	AS5667.11, Pump		Unable to get pump to bottom. Obstruction in well.
6291/2	BH01B	13/08/2018 2:10 PM	T.Walker	AS5667.11, Pump		Initially turbid, then clear.
6291/3	BH01C	13/08/2018 2:00 PM	T.Walker	AS5667.11, Bail		Clear
6291/4	BH02A	13/08/2018 4:30 PM	T.Walker	AS5667.11, Pump		Clear
6291/5	BH02B	13/08/2018 4:15 PM	T.Walker	AS5667.11, Pump		
6291/6	BH02C	13/08/2018 4:35 PM	T.Walker	AS5667.11, Bail		Insufficient water to pump
6291/7	BH03A	13/08/2018 2:40 PM	T.Walker	AS5667.11, Pump		
6291/8	BH03B	13/08/2018 3:20 PM	T.Walker	AS5667.11, Bail		Heavy sediment. Insufficient water to pump
6291/9	BH03C	13/08/2018 2:50 PM	T.Walker	AS5667.11, Bail		Insufficient water to pump
6291/10	BH05B	13/08/2018 3:55 PM	T.Walker	AS5667.11, Pump		
6291/11	BH06A	13/08/2018 12:30 PM	T.Walker	AS5667.11, Pump		Clear
6291/12	BH06B	13/08/2018 11:45 AM	T.Walker	AS5667.11, Pump		Turbid, sandy
6291/13	BH06C	13/08/2018 12:40 PM	T.Walker	AS5667.11, Bail		Insufficient water to pump

Sampling procedures have been approved and report finalised on 20/08/2018
Where method is "unknown" sampling procedures are not endorsed

NATA Accredited Laboratory – 20375

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NATA WORLD RECOGNISED ACCREDITATION

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www.vgt.com.au ABN 77 621 943 600

Report Number: 6360

Date Issued: 10/09/2018 Revision Number: 01

Site/Job: Haerses Road Monthly Ground Water

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 13 samples were received on 4/09/2018

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
BH01A		4/09/2018	6360/1	Water	BH Depth 70m/Top of Screen 64m (~114L)
BH01B		4/09/2018	6360/2	Water	BH Depth 40m/Top of Screen 34m (~52L)
BH01C		4/09/2018	6360/3	Water	BH Depth 10m/Top of Screen 2m (~6L)
BH02A		4/09/2018	6360/4	Water	BH Depth 80m/Top of Screen 74m (~104L)
BH02B		4/09/2018	6360/5	Water	BH Depth 42m/Top of Screen 36m (~107L)
BH02C		4/09/2018	6360/6	Water	BH Depth 15m/Top of Screen 12m (~<2L)
BH03A		4/09/2018	6360/7	Water	BH Depth 80m/Top of Screen 74m (~44L)
BH03B		4/09/2018	6360/8	Water	BH Depth 23m/Top of Screen 20m (~<2L)
BH03C		4/09/2018	6360/9	Water	BH Depth 15m/Top of Screen 12m (~4L)
BH05B		4/09/2018	6360/10	Water	BH Depth 35m/Top of Screen 29m (~30L)
BH06A		4/09/2018	6360/11	Water	BH Depth 70m/Top of Screen 64m (~48L)
BH06B		4/09/2018	6360/12	Water	BH Depth 38m/Top of Screen 32m (~6L)
BH06C		4/09/2018	6360/13	Water	BH Depth 15m/Top of Srceen 12m (~8L)

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Senior Chemist

NATA Accredited Laboratory – 20375

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Test Report Number: 6360

Date Issued: 10/09/2018 Revision No: 01

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	6360/1 BH01A 4/09/2018	6360/2 BH01B 4/09/2018	6360/3 BH01C 4/09/2018	6360/4 BH02A 4/09/2018	6360/5 BH02B 4/09/2018
Depth to Water	m	Depth	*0.01*	12.73	15.07	7.48	28.16	28.31
Temperature	℃	Temp	*0.1*	16.7	16.4	15.5	17.6	17.9
pH	pH Units	APHA 4500-H B	*0.1*	5.3	5.1	5.0	6.2	6.1
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	195	178	179	157	152

Water Sampling and Field Tests	Units	Method	Limit of Report	6360/6 BH02C 4/09/2018	6360/7 BH03A 4/09/2018	6360/8 BH03B 4/09/2018	6360/9 BH03C 4/09/2018	6360/10 BH05B 4/09/2018
Depth to Water	m	Depth	*0.01*	15.22	57.79	22.54	13.54	20.51
Temperature	℃	Temp	*0.1*	17.4	18.2	17.6	17.7	17.7
pH	pH Units	APHA 4500-H B	*0.1*	6.1	6.6	5.2	4.6	5.2
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	217	299	123	150	183

Water Sampling and Field Tests	Units	Method	Limit of Report	6360/11 BH06A 4/09/2018	6360/12 BH06B 4/09/2018	6360/13 BH06C 4/09/2018
Depth to Water	m	Depth	*0.01*	40.65	35.25	11.11
Temperature	℃	Temp	*0.1*	19.1	19.9	19.0
pH	pH Units	APHA 4500-H B	*0.1*	12.3	6.2	5.0
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	4,010	230	111

Well Logging Data	Units	Method	Limit of Report	6360/1 BH01A 4/09/2018	6360/2 BH01B 4/09/2018	6360/3 BH01C 4/09/2018	6360/4 BH02A 4/09/2018	6360/5 BH02B 4/09/2018
Depth Logger Data	Date			04/09/2018 15:55	04/09/2018 16:15	04/09/2018 16:35	04/09/2018 15:00	04/09/2018 15:20

Well Logging Data	Units	Method	Limit of Report	6360/6 BH02C 4/09/2018	6360/7 BH03A 4/09/2018	6360/8 BH03B 4/09/2018	6360/9 BH03C 4/09/2018	6360/10 BH05B 4/09/2018
Depth Logger Data	Date			04/09/2018 15:35	04/09/2018 12:40	04/09/2018 13:45	04/09/2018 14:20	04/09/2018 14:40

Well Logging Data	Units	Method	Limit of Report	6360/11 BH06A 4/09/2018	6360/12 BH06B 4/09/2018	6360/13 BH06C 4/09/2018
Depth Logger Data	Date			04/09/2018 09:35	04/09/2018 11:15	04/09/2018 11:50

Total Dissolved Solids	Units	Method	Limit of Report	6360/1 BH01A 4/09/2018	6360/2 BH01B 4/09/2018	6360/3 BH01C 4/09/2018	6360/4 BH02A 4/09/2018	6360/5 BH02B 4/09/2018
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	98	96	82	89	78

Total Dissolved Solids	Units	Method	Limit of Report	6360/6 BH02C 4/09/2018	6360/7 BH03A 4/09/2018	6360/8 BH03B 4/09/2018	6360/9 BH03C 4/09/2018	6360/10 BH05B 4/09/2018
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	109	149	83	83	120

Total Dissolved Solids	Units	Method	Limit of Report	6360/11 BH06A 4/09/2018	6360/12 BH06B 4/09/2018	6360/13 BH06C 4/09/2018
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	1,370	168	400

COMMENTS:

Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates the performance of this test is not covered under NATA accreditation

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322

Results have been approved and report finalised on 10/09/2018

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 6360

Date Issued: 10/09/2018 Revision No: 01
Sampling Conditions: Cloudy, showers 13°-17°C

vgt Laboratories Pty Ltd

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6360/1	BH01A	4/09/2018 3:55 PM	T.Walker	AS5667.11, Pump		
6360/2	BH01B	4/09/2018 4:15 PM	T.Walker	AS5667.11, Pump		
6360/3	BH01C	4/09/2018 4:35 PM	T.Walker	AS5667.11, Bail		
6360/4	BH02A	4/09/2018 3:00 PM	T.Walker	AS5667.11, Pump		
6360/5	BH02B	4/09/2018 3:20 PM	T.Walker	AS5667.11, Pump		
6360/6	BH02C	4/09/2018 3:35 PM	T.Walker	AS5667.11, Bail		
6360/7	BH03A	4/09/2018 12:40 PM	T.Walker	AS5667.11, Pump		
6360/8	BH03B	4/09/2018 1:45 PM	T.Walker	AS5667.11, Bail		
6360/9	BH03C	4/09/2018 2:20 PM	T.Walker	AS5667.11, Bail		
6360/10	BH05B	4/09/2018 2:40 PM	T.Walker	AS5667.11, Pump		
6360/11	BH06A	4/09/2018 9:35 AM	T.Walker	AS5667.11, Pump		Well pumped dry.
6360/12	BH06B	4/09/2018 11:15 AM	T.Walker	AS5667.11, Pump		
6360/13	BH06C	4/09/2018 11:50 AM	T.Walker	AS5667.11, Bail		

Sampling procedures have been approved and report finalised on 10/09/2018
Where method is "unknown" sampling procedures are not endorsed

NATA Accredited Laboratory – 20375

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NATA WORLD RECOGNISED ACCREDITATION

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Laboratories Pty Ltd
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www.vgt.com.au ABN 77 621 943 600

Report Number: 6433

Date Issued: 18/10/2018 Revision Number: 00

Site/Job: Haerses Road Monthly Ground Water

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 13 samples were received on 11/10/2018

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
BH01A		2/10/2018	6433/1	Water	BH Depth 70m/Top of Screen 64m (~114L)
BH01B		2/10/2018	6433/2	Water	BH Depth 40m/Top of Screen 34m (~52L)
BH01C		2/10/2018	6433/3	Water	BH Depth 10m/Top of Screen 2m (~6L)
BH02A		2/10/2018	6433/4	Water	BH Depth 80m/Top of Screen 74m (~104L)
BH02B		2/10/2018	6433/5	Water	BH Depth 42m/Top of Screen 36m (~107L)
BH02C		2/10/2018	6433/6	Water	BH Depth 15m/Top of Screen 12m (~<2L)
BH03A		2/10/2018	6433/7	Water	BH Depth 80m/Top of Screen 74m (~44L)
BH03B		2/10/2018	6433/8	Water	BH Depth 23m/Top of Screen 20m (~<2L)
BH03C		2/10/2018	6433/9	Water	BH Depth 15m/Top of Screen 12m (~4L)
BH05B		2/10/2018	6433/10	Water	BH Depth 35m/Top of Screen 29m (~30L)
BH06A		2/10/2018	6433/11	Water	BH Depth 70m/Top of Screen 64m (~48L)
BH06B		2/10/2018	6433/12	Water	BH Depth 38m/Top of Screen 32m (~6L)
BH06C		2/10/2018	6433/13	Water	BH Depth 15m/Top of Srceen 12m (~8L)

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Senior Chemist

NATA Accredited Laboratory – 20375

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

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WORLD RECOGNISED ACCREDITATION

Test Report Number: 6433

Date Issued: 18/10/2018 Revision No: 00

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	6433/1 BH01A 2/10/2018	6433/2 BH01B 2/10/2018	6433/3 BH01C 2/10/2018	6433/4 BH02A 2/10/2018	6433/5 BH02B 2/10/2018
Depth to Water	m	Depth	*0.01*	12.88	15.08	7.52	28.10	28.25
Temperature	℃	Temp	*0.1*	17.1	17.0	15.1	18.2	18.0
pH	pH Units	APHA 4500-H B	*0.1*	5.1	4.6	4.9	5.9	5.1
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	177	173	172	212	156

Water Sampling and Field Tests	Units	Method	Limit of Report	6433/6 BH02C 2/10/2018	6433/7 BH03A 2/10/2018	6433/8 BH03B 2/10/2018	6433/9 BH03C 2/10/2018	6433/10 BH05B 2/10/2018
Depth to Water	m	Depth	*0.01*	15.26	57.69	22.41	13.66	20.48
Temperature	℃	Temp	*0.1*	17.3	17.1	17.2	17.1	17.2
pH	pH Units	APHA 4500-H B	*0.1*	5.9	6.2	5.0	4.5	4.5
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	217	239	140	140	171

Water Sampling and Field Tests	Units	Method	Limit of Report	6433/11 BH06A 2/10/2018	6433/12 BH06B 2/10/2018	6433/13 BH06C 2/10/2018
Depth to Water	m	Depth	*0.01*	40.69	35.24	11.41
Temperature	℃	Temp	*0.1*	18.2	18.1	18.0
pH	pH Units	APHA 4500-H B	*0.1*	12.1	5.7	5.3
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	2,780	183	107

Total Dissolved Solids	Units	Method	Limit of Report	6433/1 BH01A 2/10/2018	6433/2 BH01B 2/10/2018	6433/3 BH01C 2/10/2018	6433/4 BH02A 2/10/2018	6433/5 BH02B 2/10/2018
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	123	110	106	145	117

Total Dissolved Solids	Units	Method	Limit of Report	6433/6 BH02C 2/10/2018	6433/7 BH03A 2/10/2018	6433/8 BH03B 2/10/2018	6433/9 BH03C 2/10/2018	6433/10 BH05B 2/10/2018
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	148	176	104	87	105

Total Dissolved Solids	Units	Method	Limit of Report	6433/11 BH06A 2/10/2018	6433/12 BH06B 2/10/2018	6433/13 BH06C 2/10/2018
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	682	113	66

COMMENTS:

Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates the performance of this test is not covered under NATA accreditation

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322

Results have been approved and report finalised on 18/10/2018

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 6433

Date Issued: 18/10/2018 Revision No: 00
Sampling Conditions: Showers 11°-16°C

vgt Laboratories Pty Ltd

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6433/1	BH01A	2/10/2018 2:20 PM	T.Walker	AS5667.11, Pump		
6433/2	BH01B	2/10/2018 3:01 PM	T.Walker	AS5667.11, Pump		
6433/3	BH01C	2/10/2018 2:41 PM	T.Walker	AS5667.11, Bail		
6433/4	BH02A	2/10/2018 1:16 PM	T.Walker	AS5667.11, Pump		
6433/5	BH02B	2/10/2018 1:52 PM	T.Walker	AS5667.11, Pump		
6433/6	BH02C	2/10/2018 1:36 PM	T.Walker	AS5667.11, Bail		
6433/7	BH03A	2/10/2018 11:48 AM	T.Walker	AS5667.11, Bail		
6433/8	BH03B	2/10/2018 12:30 PM	T.Walker	AS5667.11, Bail		
6433/9	BH03C	2/10/2018 12:12 PM	T.Walker	AS5667.11, Bail		
6433/10	BH05B	2/10/2018 12:55 PM	T.Walker	AS5667.11, Pump		
6433/11	BH06A	2/10/2018 9:46 AM	T.Walker	AS5667.11, Pump		
6433/12	BH06B	2/10/2018 10:30 AM	T.Walker	AS5667.11, Pump		
6433/13	BH06C	2/10/2018 10:55 AM	T.Walker	AS5667.11, Bail		

Sampling procedures have been approved and report finalised on 18/10/2018
Where method is "unknown" sampling procedures are not endorsed

NATA Accredited Laboratory – 20375

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

NATA WORLD RECOGNISED ACCREDITATION

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Report Number: 6679

Date Issued: 27/11/2018 Revision Number: 00

Site/Job: Haerses Road Monthly Ground Water

Client: Dixon Sands
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 13 samples were received on 20/11/2018

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
BH01A		20/11/2018	6679/1	Water	BH Depth 70m/Top of Screen 64m (~114L)
BH01B		20/11/2018	6679/2	Water	BH Depth 40m/Top of Screen 34m (~52L)
BH01C		20/11/2018	6679/3	Water	BH Depth 10m/Top of Screen 2m (~6L)
BH02A		20/11/2018	6679/4	Water	BH Depth 80m/Top of Screen 74m (~104L)
BH02B		20/11/2018	6679/5	Water	BH Depth 42m/Top of Screen 36m (~107L)
BH02C		20/11/2018	6679/6	Water	BH Depth 15m/Top of Screen 12m (~<2L)
BH03A		20/11/2018	6679/7	Water	BH Depth 80m/Top of Screen 74m (~44L)
BH03B		20/11/2018	6679/8	Water	BH Depth 23m/Top of Screen 20m (~<2L)
BH03C		20/11/2018	6679/9	Water	BH Depth 15m/Top of Screen 12m (~4L)
BH05B		20/11/2018	6679/10	Water	BH Depth 35m/Top of Screen 29m (~30L)
BH06A		20/11/2018	6679/11	Water	BH Depth 70m/Top of Screen 64m (~48L)
BH06B		20/11/2018	6679/12	Water	BH Depth 38m/Top of Screen 32m (~6L)
BH06C		20/11/2018	6679/13	Water	BH Depth 15m/Top of Srceen 12m (~8L)

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Test Report Number: 6679

Date Issued: 27/11/2018 Revision No: 00

Laboratories Pty Ltd

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	6679/1 BH01A 20/11/2018	6679/2 BH01B 20/11/2018	6679/3 BH01C 20/11/2018	6679/4 BH02A 20/11/2018	6679/5 BH02B 20/11/2018
Depth to Water	m	Depth	*0.01*	12.71	14.95	7.24	27.95	28.14
Temperature	℃	Temp	*0.1*	17.8	18.4	16.4	19.0	19.2
pH	pH Units	APHA 4500-H B	*0.1*	4.9	4.4	4.5	5.5	4.8
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	177	176	174	183	157

Water Sampling and Field Tests	Units	Method	Limit of Report	6679/6 BH02C 20/11/2018	6679/7 BH03A 20/11/2018	6679/8 BH03B 20/11/2018	6679/9 BH03C 20/11/2018	6679/10 BH05B 20/11/2018
Depth to Water	m	Depth	*0.01*	15.15	57.60	22.40	13.50	20.31
Temperature	℃	Temp	*0.1*	19.2	18.2	17.8	17.7	19.9
pH	pH Units	APHA 4500-H B	*0.1*	5.7	6.7	4.9	4.3	4.7
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	216	362	140	148	182

Water Sampling and Field Tests	Units	Method	Limit of Report	6679/11 BH06A 20/11/2018	6679/12 BH06B 20/11/2018	6679/13 BH06C 20/11/2018
Depth to Water	m	Depth	*0.01*	40.20	35.17	11.60
Temperature	℃	Temp	*0.1*	18.9	18.5	18.2
pH	pH Units	APHA 4500-H B	*0.1*	12.0	5.6	5.0
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	2,020	172	104

Total Dissolved Solids	Units	Method	Limit of Report	6679/1 BH01A 20/11/2018	6679/2 BH01B 20/11/2018	6679/3 BH01C 20/11/2018	6679/4 BH02A 20/11/2018	6679/5 BH02B 20/11/2018
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	48	84	95	113	90

Total Dissolved Solids	Units	Method	Limit of Report	6679/6 BH02C 20/11/2018	6679/7 BH03A 20/11/2018	6679/8 BH03B 20/11/2018	6679/9 BH03C 20/11/2018	6679/10 BH05B 20/11/2018
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	131	286	78	96	114

Total Dissolved Solids	Units	Method	Limit of Report	6679/11 BH06A 20/11/2018	6679/12 BH06B 20/11/2018	6679/13 BH06C 20/11/2018
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	566	118	82

COMMENTS:

Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates the performance of this test is not covered under NATA accreditation

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322

Results have been approved and report finalised on 27/11/2018

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 6679

Date Issued: 27/11/2018
Sampling Conditions: Cloudy 19°-27°C

Revision No: 00

vgt Laboratories Pty Ltd

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6679/1	BH01A	20/11/2018 2:30 PM	T.Walker	AS5667.11, Pump		
6679/2	BH01B	20/11/2018 2:50 PM	T.Walker	AS5667.11, Pump		
6679/3	BH01C	20/11/2018 3:10 PM	T.Walker	AS5667.11, Bail		
6679/4	BH02A	20/11/2018 1:32 PM	T.Walker	AS5667.11, Pump		
6679/5	BH02B	20/11/2018 1:52 PM	T.Walker	AS5667.11, Pump		
6679/6	BH02C	20/11/2018 2:10 PM	T.Walker	AS5667.11, Bail		<1m water in well
6679/7	BH03A	20/11/2018 11:10 AM	T.Walker	AS5667.11, Bail		
6679/8	BH03B	20/11/2018 11:58 AM	T.Walker	AS5667.11, Bail		Not much water - very turbid
6679/9	BH03C	20/11/2018 12:20 PM	T.Walker	AS5667.11, Bail		
6679/10	BH05B	20/11/2018 12:44 PM	T.Walker	AS5667.11, Pump		
6679/11	BH06A	20/11/2018 8:58 AM	T.Walker	AS5667.11, Pump		
6679/12	BH06B	20/11/2018 9:52 AM	T.Walker	AS5667.11, Bail		Insufficient and dirty water for pumping
6679/13	BH06C	20/11/2018 10:40 AM	T.Walker	AS5667.11, Bail		

Sampling procedures have been approved and report finalised on 27/11/2018
Where method is "unknown" sampling procedures are not endorsed

NATA Accredited Laboratory – 20375

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

NATA WORLD RECOGNISED ACCREDITATION

Anthony Crane
Laboratory Manager

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Report Number: 6815

Date Issued: 20/12/2018 Revision Number: 00

Site/Job: Haerses Road Monthly Ground Water

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 13 samples were received on 14/12/2018

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
BH01A		14/12/2018	6815/1	Water	BH Depth 70m/Top of Screen 64m (~114L)
BH01B		14/12/2018	6815/2	Water	BH Depth 40m/Top of Screen 34m (~52L)
BH01C		14/12/2018	6815/3	Water	BH Depth 10m/Top of Screen 2m (~6L)
BH02A		14/12/2018	6815/4	Water	BH Depth 80m/Top of Screen 74m (~104L)
BH02B		14/12/2018	6815/5	Water	BH Depth 42m/Top of Screen 36m (~107L)
BH02C		14/12/2018	6815/6	Water	BH Depth 15m/Top of Screen 12m (~<2L)
BH03A		14/12/2018	6815/7	Water	BH Depth 80m/Top of Screen 74m (~44L)
BH03B		14/12/2018	6815/8	Water	BH Depth 23m/Top of Screen 20m (~<2L)
BH03C		14/12/2018	6815/9	Water	BH Depth 15m/Top of Screen 12m (~4L)
BH05B		14/12/2018	6815/10	Water	BH Depth 35m/Top of Screen 29m (~30L)
BH06A		14/12/2018	6815/11	Water	BH Depth 70m/Top of Screen 64m (~48L)
BH06B		14/12/2018	6815/12	Water	BH Depth 38m/Top of Screen 32m (~6L)
BH06C		14/12/2018	6815/13	Water	BH Depth 15m/Top of Srceen 12m (~8L)

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Test Report Number: 6815

Date Issued: 20/12/2018 Revision No: 00

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	6815/1 BH01A 14/12/2018	6815/2 BH01B 14/12/2018	6815/3 BH01C 14/12/2018	6815/4 BH02A 14/12/2018	6815/5 BH02B 14/12/2018
Depth to Water	m	Depth	*0.01*	13.16	15.10	7.25	27.86	28.02
Temperature	℃	Temp	*0.1*	17.5	17.5	16.6	18.3	18.3
pH	pH Units	APHA 4500-H B	*0.1*	5.0	4.5	4.6	5.6	5.1
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	178	175	178	181	158

Water Sampling and Field Tests	Units	Method	Limit of Report	6815/6 BH02C 14/12/2018	6815/7 BH03A 14/12/2018	6815/8 BH03B 14/12/2018	6815/9 BH03C 14/12/2018	6815/10 BH05B 14/12/2018
Depth to Water	m	Depth	*0.01*	15.19	57.53	22.17	13.48	20.27
Temperature	℃	Temp	*0.1*	17.8	17.9	17.6	17.4	18.0
pH	pH Units	APHA 4500-H B	*0.1*	5.9	6.1	4.6	4.2	4.7
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	219	225	139	148	175

Water Sampling and Field Tests	Units	Method	Limit of Report	6815/11 BH06A 14/12/2018	6815/12 BH06B 14/12/2018	6815/13 BH06C 14/12/2018
Depth to Water	m	Depth	*0.01*	39.24	35.05	10.97
Temperature	℃	Temp	*0.1*	18.7	18.2	18.0
pH	pH Units	APHA 4500-H B	*0.1*	11.6	5.3	4.6
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	1,330	160	101

Total Dissolved Solids	Units	Method	Limit of Report	6815/1 BH01A 14/12/2018	6815/2 BH01B 14/12/2018	6815/3 BH01C 14/12/2018	6815/4 BH02A 14/12/2018	6815/5 BH02B 14/12/2018
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	88	76	82	84	81

Total Dissolved Solids	Units	Method	Limit of Report	6815/6 BH02C 14/12/2018	6815/7 BH03A 14/12/2018	6815/8 BH03B 14/12/2018	6815/9 BH03C 14/12/2018	6815/10 BH05B 14/12/2018
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	122	165	80	66	70

Total Dissolved Solids	Units	Method	Limit of Report	6815/11 BH06A 14/12/2018	6815/12 BH06B 14/12/2018	6815/13 BH06C 14/12/2018
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	328	102	23

COMMENTS:

Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates the performance of this test is not covered under NATA accreditation

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322

Results have been approved and report finalised on 20/12/2018

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 6815

Date Issued: 20/12/2018
Sampling Conditions: Raining 20°-26°C

Revision No: 00

vgt Laboratories Pty Ltd

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6815/1	BH01A	14/12/2018 12:58 PM	T.Walker	AS5667.11, Pump		
6815/2	BH01B	14/12/2018 1:20 PM	T.Walker	AS5667.11, Pump		
6815/3	BH01C	14/12/2018 1:36 PM	T.Walker	AS5667.11, Bail		
6815/4	BH02A	14/12/2018 12:07 PM	T.Walker	AS5667.11, Pump		
6815/5	BH02B	14/12/2018 12:23 PM	T.Walker	AS5667.11, Pump		
6815/6	BH02C	14/12/2018 12:38 PM	T.Walker	AS5667.11, Bail		
6815/7	BH03A	14/12/2018 10:30 AM	T.Walker	AS5667.11, Bail		
6815/8	BH03B	14/12/2018 11:02 AM	T.Walker	AS5667.11, Bail		
6815/9	BH03C	14/12/2018 11:20 AM	T.Walker	AS5667.11, Bail		
6815/10	BH05B	14/12/2018 11:41 AM	T.Walker	AS5667.11, Pump		
6815/11	BH06A	14/12/2018 9:16 AM	T.Walker	AS5667.11, Pump		
6815/12	BH06B	14/12/2018 9:40 AM	T.Walker	AS5667.11, Bail		
6815/13	BH06C	14/12/2018 10:02 AM	T.Walker	AS5667.11, Bail		Depth to bottom 38.97

Sampling procedures have been approved and report finalised on 20/12/2018
Where method is "unknown" sampling procedures are not endorsed

NATA Accredited Laboratory – 20375

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

NATA WORLD RECOGNISED ACCREDITATION

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Report Number: 6899

Date Issued: 22/01/2019 Revision Number: 00

Site/Job: Haerses Road Monthly Ground Water

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 13 samples were received on 15/01/2019

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
BH01A		15/01/2019	6899/1	Water	BH Depth 70m/Top of Screen 64m (~114L)
BH01B		15/01/2019	6899/2	Water	BH Depth 40m/Top of Screen 34m (~52L)
BH01C		15/01/2019	6899/3	Water	BH Depth 10m/Top of Screen 2m (~6L)
BH02A		15/01/2019	6899/4	Water	BH Depth 80m/Top of Screen 74m (~104L)
BH02B		15/01/2019	6899/5	Water	BH Depth 42m/Top of Screen 36m (~107L)
BH02C		15/01/2019	6899/6	Water	BH Depth 15m/Top of Screen 12m (~<2L)
BH03A		15/01/2019	6899/7	Water	BH Depth 80m/Top of Screen 74m (~44L)
BH03B		15/01/2019	6899/8	Water	BH Depth 23m/Top of Screen 20m (~<2L)
BH03C		15/01/2019	6899/9	Water	BH Depth 15m/Top of Screen 12m (~4L)
BH05B		15/01/2019	6899/10	Water	BH Depth 35m/Top of Screen 29m (~30L)
BH06A		15/01/2019	6899/11	Water	BH Depth 70m/Top of Screen 64m (~48L)
BH06B		15/01/2019	6899/12	Water	BH Depth 38m/Top of Screen 32m (~6L)
BH06C		15/01/2019	6899/13	Water	BH Depth 15m/Top of Srceen 12m (~8L)

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Test Report Number: 6899

Date Issued: 22/01/2019 Revision No: 00

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	6899/1 BH01A 15/01/2019	6899/2 BH01B 15/01/2019	6899/3 BH01C 15/01/2019	6899/4 BH02A 15/01/2019	6899/5 BH02B 15/01/2019
Depth to Water	m	Depth	*0.01*	13.35	15.25	7.31	27.96	28.13
Temperature	℃	Temp	*0.1*	18.5	18.9	17.8	18.9	19.1
pH	pH Units	APHA 4500-H B	*0.1*	5.0	4.5	4.6	5.5	5.1
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	184	182	184	181	172

Water Sampling and Field Tests	Units	Method	Limit of Report	6899/6 BH02C 15/01/2019	6899/7 BH03A 15/01/2019	6899/8 BH03B 15/01/2019	6899/9 BH03C 15/01/2019	6899/10 BH05B 15/01/2019
Depth to Water	m	Depth	*0.01*	15.25	57.65	22.26	13.56	20.32
Temperature	℃	Temp	*0.1*	18.6	18.4	17.9	17.5	18.8
pH	pH Units	APHA 4500-H B	*0.1*	5.8	6.2	4.8	4.3	4.3
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	213	211	140	152	181

Water Sampling and Field Tests	Units	Method	Limit of Report	6899/11 BH06A 15/01/2019	6899/12 BH06B 15/01/2019	6899/13 BH06C 15/01/2019
Depth to Water	m	Depth	*0.01*	38.92	35.18	10.76
Temperature	℃	Temp	*0.1*	19.2	18.3	18.2
pH	pH Units	APHA 4500-H B	*0.1*	11.5	5.2	4.6
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	834	155	100

Total Dissolved Solids	Units	Method	Limit of Report	6899/1 BH01A 15/01/2019	6899/2 BH01B 15/01/2019	6899/3 BH01C 15/01/2019	6899/4 BH02A 15/01/2019	6899/5 BH02B 15/01/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	102	91	83	87	61

Total Dissolved Solids	Units	Method	Limit of Report	6899/6 BH02C 15/01/2019	6899/7 BH03A 15/01/2019	6899/8 BH03B 15/01/2019	6899/9 BH03C 15/01/2019	6899/10 BH05B 15/01/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	137	138	77	54	160

Total Dissolved Solids	Units	Method	Limit of Report	6899/11 BH06A 15/01/2019	6899/12 BH06B 15/01/2019	6899/13 BH06C 15/01/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	301	105	51

COMMENTS:

Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates the performance of this test is not covered under NATA accreditation

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322

Results have been approved and report finalised on 22/01/2019

NATA Accredited Laboratory – 20375

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

Sampling Report Number: 6899

Date Issued: 22/01/2019
Sampling Conditions: Fine 23°-34°C

Revision No: 00

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
6899/1	BH01A	15/01/2019 12:01 PM	T.Walker	AS5667.11, Pump		
6899/2	BH01B	15/01/2019 12:20 PM	T.Walker	AS5667.11, Pump		
6899/3	BH01C	15/01/2019 12:35 PM	T.Walker	AS5667.11, Bail		
6899/4	BH02A	15/01/2019 11:04 AM	T.Walker	AS5667.11, Pump		
6899/5	BH02B	15/01/2019 11:23 AM	T.Walker	AS5667.11, Pump		
6899/6	BH02C	15/01/2019 11:40 AM	T.Walker	AS5667.11, Bail		
6899/7	BH03A	15/01/2019 9:38 AM	T.Walker	AS5667.11, Bail		
6899/8	BH03B	15/01/2019 9:58 AM	T.Walker	AS5667.11, Bail		Vary sandy/turbid
6899/9	BH03C	15/01/2019 10:18 AM	T.Walker	AS5667.11, Bail		
6899/10	BH05B	15/01/2019 10:42 AM	T.Walker	AS5667.11, Pump		
6899/11	BH06A	15/01/2019 8:29 AM	T.Walker	AS5667.11, Pump		
6899/12	BH06B	15/01/2019 8:49 AM	T.Walker	AS5667.11, Bail		
6899/13	BH06C	15/01/2019 9:12 AM	T.Walker	AS5667.11, Bail		

Sampling procedures have been approved and report finalised on 22/01/2019
Where method is "unknown" sampling procedures are not endorsed

NATA Accredited Laboratory – 20375

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

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Report Number: 7023

Date Issued: 19/02/2019 Revision Number: 00

Site/Job: Haerses Road Monthly Ground Water

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 13 samples were received on 12/02/2019

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
BH01A		12/02/2019	7023/1	Water	BH Depth 70m/Top of Screen 64m (~114L)
BH01B		12/02/2019	7023/2	Water	BH Depth 40m/Top of Screen 34m (~52L)
BH01C		12/02/2019	7023/3	Water	BH Depth 10m/Top of Screen 2m (~6L)
BH02A		12/02/2019	7023/4	Water	BH Depth 80m/Top of Screen 74m (~104L)
BH02B		12/02/2019	7023/5	Water	BH Depth 42m/Top of Screen 36m (~107L)
BH02C		12/02/2019	7023/6	Water	BH Depth 15m/Top of Screen 12m (~<2L)
BH03A		12/02/2019	7023/7	Water	BH Depth 80m/Top of Screen 74m (~44L)
BH03B		12/02/2019	7023/8	Water	BH Depth 23m/Top of Screen 20m (~<2L)
BH03C		12/02/2019	7023/9	Water	BH Depth 15m/Top of Screen 12m (~4L)
BH05B		12/02/2019	7023/10	Water	BH Depth 35m/Top of Screen 29m (~30L)
BH06A		12/02/2019	7023/11	Water	BH Depth 70m/Top of Screen 64m (~48L)
BH06B		12/02/2019	7023/12	Water	BH Depth 38m/Top of Screen 32m (~6L)
BH06C		12/02/2019	7023/13	Water	BH Depth 15m/Top of Srceen 12m (~8L)

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Test Report Number: 7023

Date Issued: 19/02/2019 Revision No: 00

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	7023/1 BH01A 12/02/2019	7023/2 BH01B 12/02/2019	7023/3 BH01C 12/02/2019	7023/4 BH02A 12/02/2019	7023/5 BH02B 12/02/2019
Depth to Water	m	Depth	*0.01*	13.75	15.52	7.45	27.88	28.03
Temperature	℃	Temp	*0.1*	18.7	19.3	18.7	19.5	19.2
pH	pH Units	APHA 4500-H B	*0.1*	4.9	4.6	4.6	5.5	4.9
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	184	184	184	184	159

Water Sampling and Field Tests	Units	Method	Limit of Report	7023/6 BH02C 12/02/2019	7023/7 BH03A 12/02/2019	7023/8 BH03B 12/02/2019	7023/9 BH03C 12/02/2019	7023/10 BH05B 12/02/2019
Depth to Water	m	Depth	*0.01*	15.29	57.58	22.31	13.71	20.25
Temperature	℃	Temp	*0.1*	18.1	18.5	17.9	17.6	19.8
pH	pH Units	APHA 4500-H B	*0.1*	5.7	6.1	4.8	4.4	4.7
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	201	191	142	154	183

Water Sampling and Field Tests	Units	Method	Limit of Report	7023/11 BH06A 12/02/2019	7023/12 BH06B 12/02/2019	7023/13 BH06C 12/02/2019
Depth to Water	m	Depth	*0.01*	38.19	35.19	11.02
Temperature	℃	Temp	*0.1*	19.9	18.3	18.2
pH	pH Units	APHA 4500-H B	*0.1*	11.2	5.2	4.6
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	593	160	107

Total Dissolved Solids	Units	Method	Limit of Report	7023/1 BH01A 12/02/2019	7023/2 BH01B 12/02/2019	7023/3 BH01C 12/02/2019	7023/4 BH02A 12/02/2019	7023/5 BH02B 12/02/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	87	71	80	73	63

Total Dissolved Solids	Units	Method	Limit of Report	7023/6 BH02C 12/02/2019	7023/7 BH03A 12/02/2019	7023/8 BH03B 12/02/2019	7023/9 BH03C 12/02/2019	7023/10 BH05B 12/02/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	106	100	82	65	85

Total Dissolved Solids	Units	Method	Limit of Report	7023/11 BH06A 12/02/2019	7023/12 BH06B 12/02/2019	7023/13 BH06C 12/02/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	140	104	57

COMMENTS:

Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates the performance of this test is not covered under NATA accreditation

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322

Results have been approved and report finalised on 19/02/2019

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Sampling Report Number: 7023

Date Issued: 19/02/2019 Revision No: 00

Sampling Conditions:

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
7023/1	BH01A	12/02/2019 1:46 PM	T.Walker	AS5667.11, Pump		
7023/2	BH01B	12/02/2019 2:11 PM	T.Walker	AS5667.11, Pump		
7023/3	BH01C	12/02/2019 2:28 PM	T.Walker	AS5667.11, Bail		
7023/4	BH02A	12/02/2019 12:35 PM	T.Walker	AS5667.11, Pump		
7023/5	BH02B	12/02/2019 12:55 PM	T.Walker	AS5667.11, Pump		
7023/6	BH02C	12/02/2019 1:11 PM	T.Walker	AS5667.11, Bail		
7023/7	BH03A	12/02/2019 10:59 AM	T.Walker	AS5667.11, Bail		
7023/8	BH03B	12/02/2019 11:24 AM	T.Walker	AS5667.11, Bail		
7023/9	BH03C	12/02/2019 11:44 AM	T.Walker	AS5667.11, Bail		
7023/10	BH05B	12/02/2019 12:10 PM	T.Walker	AS5667.11, Pump		
7023/11	BH06A	12/02/2019 9:48 AM	T.Walker	AS5667.11, Pump		
7023/12	BH06B	12/02/2019 10:18 AM	T.Walker	AS5667.11, Bail		
7023/13	BH06C	12/02/2019 10:36 AM	T.Walker	AS5667.11, Bail		

Sampling procedures have been approved and report finalised on 19/02/2019
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 7122

Date Issued: 22/03/2019 Revision Number: 00

Site/Job: Haerses Road Monthly Ground Water

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 13 samples were received on 15/03/2019

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
BH01A		15/03/2019	7122/1	Water	BH Depth 70m/Top of Screen 64m (~114L)
BH01B		15/03/2019	7122/2	Water	BH Depth 40m/Top of Screen 34m (~52L)
BH01C		15/03/2019	7122/3	Water	BH Depth 10m/Top of Screen 2m (~6L)
BH02A		15/03/2019	7122/4	Water	BH Depth 80m/Top of Screen 74m (~104L)
BH02B		15/03/2019	7122/5	Water	BH Depth 42m/Top of Screen 36m (~107L)
BH02C		15/03/2019	7122/6	Water	BH Depth 15m/Top of Screen 12m (~<2L)
BH03A		15/03/2019	7122/7	Water	BH Depth 80m/Top of Screen 74m (~44L)
BH03B		15/03/2019	7122/8	Water	BH Depth 23m/Top of Screen 20m (~<2L)
BH03C		15/03/2019	7122/9	Water	BH Depth 15m/Top of Screen 12m (~4L)
BH05B		15/03/2019	7122/10	Water	BH Depth 35m/Top of Screen 29m (~30L)
BH06A		15/03/2019	7122/11	Water	BH Depth 70m/Top of Screen 64m (~48L)
BH06B		15/03/2019	7122/12	Water	BH Depth 38m/Top of Screen 32m (~6L)
BH06C		15/03/2019	7122/13	Water	BH Depth 15m/Top of Srceen 12m (~8L)

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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NATA
WORLD RECOGNISED ACCREDITATION

Test Report Number: 7122

Date Issued: 22/03/2019 Revision No: 00

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	7122/1 BH01A 15/03/2019	7122/2 BH01B 15/03/2019	7122/3 BH01C 15/03/2019	7122/4 BH02A 15/03/2019	7122/5 BH02B 15/03/2019
Depth to Water	m	Depth	*0.01*	13.33	15.31	7.51	27.90	28.07
Temperature	℃	Temp	*0.1*	17.5	17.4	18.9	18.2	18.3
pH	pH Units	APHA 4500-H B	*0.1*	4.8	4.4	4.6	5.4	4.9
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	177	175	188	181	157

Water Sampling and Field Tests	Units	Method	Limit of Report	7122/6 BH02C 15/03/2019	7122/7 BH03A 15/03/2019	7122/8 BH03B 15/03/2019	7122/9 BH03C 15/03/2019	7122/10 BH05B 15/03/2019
Depth to Water	m	Depth	*0.01*	15.42	57.75	22.25	13.64	20.35
Temperature	℃	Temp	*0.1*	17.8	18.3	17.8	17.5	18.1
pH	pH Units	APHA 4500-H B	*0.1*	5.6	6.2	4.7	4.2	4.5
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	191	199	137	149	174

Water Sampling and Field Tests	Units	Method	Limit of Report	7122/11 BH06A 15/03/2019	7122/12 BH06B 15/03/2019	7122/13 BH06C 15/03/2019
Depth to Water	m	Depth	*0.01*	37.95	35.35	10.88
Temperature	℃	Temp	*0.1*	18.9	18.2	18.4
pH	pH Units	APHA 4500-H B	*0.1*	11.0	5.1	4.5
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	413	143	103

Total Dissolved Solids	Units	Method	Limit of Report	7122/1 BH01A 15/03/2019	7122/2 BH01B 15/03/2019	7122/3 BH01C 15/03/2019	7122/4 BH02A 15/03/2019	7122/5 BH02B 15/03/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	102	91	95	116	94

Total Dissolved Solids	Units	Method	Limit of Report	7122/6 BH02C 15/03/2019	7122/7 BH03A 15/03/2019	7122/8 BH03B 15/03/2019	7122/9 BH03C 15/03/2019	7122/10 BH05B 15/03/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	128	135	78	102	99

Total Dissolved Solids	Units	Method	Limit of Report	7122/11 BH06A 15/03/2019	7122/12 BH06B 15/03/2019	7122/13 BH06C 15/03/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	191	110	70

COMMENTS:

Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates NATA accreditation does not cover the performance of this service.

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322

Results have been approved and report finalised on 22/03/2019

NATA Accredited Laboratory – 20375

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Sampling Report Number: 7122

Date Issued: 22/03/2019 Revision No: 00

Sampling Conditions: 100% Cloudcover, 19°-23°C

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
7122/1	BH01A	15/03/2019 12:33 PM	T.Walker	AS5667.11, Pump		
7122/2	BH01B	15/03/2019 12:49 PM	T.Walker	AS5667.11, Pump		
7122/3	BH01C	15/03/2019 1:06 PM	T.Walker	AS5667.11, Bail		
7122/4	BH02A	15/03/2019 11:44 AM	T.Walker	AS5667.11, Pump		
7122/5	BH02B	15/03/2019 12:01 PM	T.Walker	AS5667.11, Pump		
7122/6	BH02C	15/03/2019 12:15 PM	T.Walker	AS5667.11, Bail		
7122/7	BH03A	15/03/2019 10:36 AM	T.Walker	AS5667.11, Pump		
7122/8	BH03B	15/03/2019 10:52 AM	T.Walker	AS5667.11, Bail		
7122/9	BH03C	15/03/2019 11:08 AM	T.Walker	AS5667.11, Bail		
7122/10	BH05B	15/03/2019 11:26 AM	T.Walker	AS5667.11, Pump		
7122/11	BH06A	15/03/2019 9:24 AM	T.Walker	AS5667.11, Pump		
7122/12	BH06B	15/03/2019 9:56 AM	T.Walker	AS5667.11, Bail		
7122/13	BH06C	15/03/2019 10:15 AM	T.Walker	AS5667.11, Bail		

Sampling procedures have been approved and report finalised on 22/03/2019
Where method is "unknown" sampling procedures are not endorsed

NATA Accredited Laboratory – 20375

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Report Number: 7272

Date Issued: 23/04/2019 Revision Number: 00

Site/Job: Haerses Road Monthly Ground Water

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 13 samples were received on 12/04/2019

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
BH01A		12/04/2019	7272/1	Water	BH Depth 70m/Top of Screen 64m (~114L)
BH01B		12/04/2019	7272/2	Water	BH Depth 40m/Top of Screen 34m (~52L)
BH01C		12/04/2019	7272/3	Water	BH Depth 10m/Top of Screen 2m (~6L)
BH02A		12/04/2019	7272/4	Water	BH Depth 80m/Top of Screen 74m (~104L)
BH02B		12/04/2019	7272/5	Water	BH Depth 42m/Top of Screen 36m (~107L)
BH02C		12/04/2019	7272/6	Water	BH Depth 15m/Top of Screen 12m (~<2L)
BH03A		12/04/2019	7272/7	Water	BH Depth 80m/Top of Screen 74m (~44L)
BH03B		12/04/2019	7272/8	Water	BH Depth 23m/Top of Screen 20m (~<2L)
BH03C		12/04/2019	7272/9	Water	BH Depth 15m/Top of Screen 12m (~4L)
BH05B		12/04/2019	7272/10	Water	BH Depth 35m/Top of Screen 29m (~30L)
BH06A		12/04/2019	7272/11	Water	BH Depth 70m/Top of Screen 64m (~48L)
BH06B		12/04/2019	7272/12	Water	BH Depth 38m/Top of Screen 32m (~6L)
BH06C		12/04/2019	7272/13	Water	BH Depth 15m/Top of Srceen 12m (~8L)

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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Test Report Number: 7272

Date Issued: 23/04/2019 Revision No: 00

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	7272/1 BH01A 12/04/2019	7272/2 BH01B 12/04/2019	7272/3 BH01C 12/04/2019	7272/4 BH02A 12/04/2019	7272/5 BH02B 12/04/2019
Depth to Water	m	Depth	*0.01*	13.40	15.19	7.51	27.97	28.17
Temperature	℃	Temp	*0.1*	17.4	17.6	19.0	18.2	18.3
pH	pH Units	APHA 4500-H B	*0.1*	4.8	4.5	4.5	5.4	4.8
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	178	176	193	181	156

Water Sampling and Field Tests	Units	Method	Limit of Report	7272/6 BH02C 12/04/2019	7272/7 BH03A 12/04/2019	7272/8 BH03B 12/04/2019	7272/9 BH03C 12/04/2019	7272/10 BH05B 12/04/2019
Depth to Water	m	Depth	*0.01*	15.40	57.81	22.33	13.67	20.39
Temperature	℃	Temp	*0.1*	17.7	18.0	17.5	17.5	18.6
pH	pH Units	APHA 4500-H B	*0.1*	5.6	6.3	4.6	4.3	4.7
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	192	209	139	160	177

Water Sampling and Field Tests	Units	Method	Limit of Report	7272/11 BH06A 12/04/2019	7272/12 BH06B 12/04/2019	7272/13 BH06C 12/04/2019
Depth to Water	m	Depth	*0.01*	37.92	35.33	10.92
Temperature	℃	Temp	*0.1*	18.6	18.1	18.5
pH	pH Units	APHA 4500-H B	*0.1*	11.0	4.9	4.4
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	423	143	112

Total Dissolved Solids	Units	Method	Limit of Report	7272/1 BH01A 12/04/2019	7272/2 BH01B 12/04/2019	7272/3 BH01C 12/04/2019	7272/4 BH02A 12/04/2019	7272/5 BH02B 12/04/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	96	129	117	103	94

Total Dissolved Solids	Units	Method	Limit of Report	7272/6 BH02C 12/04/2019	7272/7 BH03A 12/04/2019	7272/8 BH03B 12/04/2019	7272/9 BH03C 12/04/2019	7272/10 BH05B 12/04/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	143	142	401	281	250

Total Dissolved Solids	Units	Method	Limit of Report	7272/11 BH06A 12/04/2019	7272/12 BH06B 12/04/2019	7272/13 BH06C 12/04/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	194	112	105

COMMENTS:
Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates NATA accreditation does not cover the performance of this service.

NATA Accredited Laboratory – 20375

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

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322

Results have been approved and report finalised on 23/04/2019

Sampling Report Number: 7272

Date Issued: 23/04/2019
Sampling Conditions: Cloudy 15°-22°C

Revision No: 00

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
7272/1	BH01A	12/04/2019 12:56 PM	T.Walker	AS5667.11, Pump		Logger failed to read
7272/2	BH01B	12/04/2019 1:22 PM	T.Walker	AS5667.11, Pump		Logger failed to read
7272/3	BH01C	12/04/2019 1:44 PM	T.Walker	AS5667.11, Bail		Logger failed to read
7272/4	BH02A	12/04/2019 11:55 AM	T.Walker	AS5667.11, Pump		
7272/5	BH02B	12/04/2019 12:12 PM	T.Walker	AS5667.11, Pump		
7272/6	BH02C	12/04/2019 12:26 PM	T.Walker	AS5667.11, Bail		
7272/7	BH03A	12/04/2019 10:43 AM	T.Walker	AS5667.11, Bail		
7272/8	BH03B	12/04/2019 11:21 AM	T.Walker	AS5667.11, Bail		
7272/9	BH03C	12/04/2019 11:04 AM	T.Walker	AS5667.11, Bail		
7272/10	BH05B	12/04/2019 11:35 AM	T.Walker	AS5667.11, Pump		
7272/11	BH06A	12/04/2019 9:36 AM	T.Walker	AS5667.11, Pump		
7272/12	BH06B	12/04/2019 9:58 AM	T.Walker	AS5667.11, Bail		
7272/13	BH06C	12/04/2019 10:15 AM	T.Walker	AS5667.11, Bail		

Sampling procedures have been approved and report finalised on 23/04/2019
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 7414

Date Issued: 17/05/2019 Revision Number: 00

Site/Job: Haerses Road Monthly Ground Water

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 13 samples were received on 9/05/2019

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
BH01A		10/05/2019	7414/1	Water	BH Depth 70m/Top of Screen 64m (~114L)
BH01B		10/05/2019	7414/2	Water	BH Depth 40m/Top of Screen 34m (~52L)
BH01C		10/05/2019	7414/3	Water	BH Depth 10m/Top of Screen 2m (~6L)
BH02A		10/05/2019	7414/4	Water	BH Depth 80m/Top of Screen 74m (~104L)
BH02B		10/05/2019	7414/5	Water	BH Depth 42m/Top of Screen 36m (~107L)
BH02C		10/05/2019	7414/6	Water	BH Depth 15m/Top of Screen 12m (~<2L)
BH03A		10/05/2019	7414/7	Water	BH Depth 80m/Top of Screen 74m (~44L)
BH03B		10/05/2019	7414/8	Water	BH Depth 23m/Top of Screen 20m (~<2L)
BH03C		10/05/2019	7414/9	Water	BH Depth 15m/Top of Screen 12m (~4L)
BH05B		10/05/2019	7414/10	Water	BH Depth 35m/Top of Screen 29m (~30L)
BH06A		10/05/2019	7414/11	Water	BH Depth 70m/Top of Screen 64m (~48L)
BH06B		10/05/2019	7414/12	Water	BH Depth 38m/Top of Screen 32m (~6L)
BH06C		10/05/2019	7414/13	Water	BH Depth 15m/Top of Srceen 12m (~8L)

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

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Test Report Number: 7414

Date Issued: 17/05/2019 Revision No: 00

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	7414/1 BH01A 10/05/2019	7414/2 BH01B 10/05/2019	7414/3 BH01C 10/05/2019	7414/4 BH02A 10/05/2019	7414/5 BH02B 10/05/2019
Depth to Water	m	Depth	*0.01*	13.56	15.39	7.43	27.89	28.06
Temperature	℃	Temp	*0.1*	17.4	17.0	18.3	18.3	18.0
pH	pH Units	APHA 4500-H B	*0.1*	4.8	4.5	4.7	5.5	4.9
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	181	174	190	186	159

Water Sampling and Field Tests	Units	Method	Limit of Report	7414/6 BH02C 10/05/2019	7414/7 BH03A 10/05/2019	7414/8 BH03B 10/05/2019	7414/9 BH03C 10/05/2019	7414/10 BH05B 10/05/2019
Depth to Water	m	Depth	*0.01*	15.29	57.77	22.34	13.77	20.29
Temperature	℃	Temp	*0.1*	17.5	17.5	17.1	17.3	17.8
pH	pH Units	APHA 4500-H B	*0.1*	5.5	6.6	4.6	4.3	4.4
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	183	228	138	149	178

Water Sampling and Field Tests	Units	Method	Limit of Report	7414/11 BH06A 10/05/2019	7414/12 BH06B 10/05/2019	7414/13 BH06C 10/05/2019
Depth to Water	m	Depth	*0.01*	37.71	35.33	11.17
Temperature	℃	Temp	*0.1*	18.2	17.5	18.0
pH	pH Units	APHA 4500-H B	*0.1*	10.8	5.3	4.4
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	326	174	107

Total Dissolved Solids	Units	Method	Limit of Report	7414/1 BH01A 10/05/2019	7414/2 BH01B 10/05/2019	7414/3 BH01C 10/05/2019	7414/4 BH02A 10/05/2019	7414/5 BH02B 10/05/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	128	126	133	136	98

Total Dissolved Solids	Units	Method	Limit of Report	7414/6 BH02C 10/05/2019	7414/7 BH03A 10/05/2019	7414/8 BH03B 10/05/2019	7414/9 BH03C 10/05/2019	7414/10 BH05B 10/05/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	131	172	127	122	122

Total Dissolved Solids	Units	Method	Limit of Report	7414/11 BH06A 10/05/2019	7414/12 BH06B 10/05/2019	7414/13 BH06C 10/05/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	220	113	45

COMMENTS:
Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates NATA accreditation does not cover the performance of this service.

NATA Accredited Laboratory – 20375

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

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322

Results have been approved and report finalised on 17/05/2019

Sampling Report Number: 7414

Date Issued: 17/05/2019
Sampling Conditions: Cloudy 12°-22°C

Revision No: 00

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
7414/1	BH01A	10/05/2019 1:43 PM	D.Walker	AS5667.11, Pump		
7414/2	BH01B	10/05/2019 2:00 PM	D.Walker	AS5667.11, Pump		
7414/3	BH01C	10/05/2019 2:13 PM	D.Walker	AS5667.11, Bail		
7414/4	BH02A	10/05/2019 12:24 PM	D.Walker	AS5667.11, Pump		
7414/5	BH02B	10/05/2019 12:41 PM	D.Walker	AS5667.11, Pump		
7414/6	BH02C	10/05/2019 12:57 PM	D.Walker	AS5667.11, Bail		
7414/7	BH03A	10/05/2019 10:52 AM	D.Walker	AS5667.11, Bail		
7414/8	BH03B	10/05/2019 11:53 AM	D.Walker	AS5667.11, Bail		
7414/9	BH03C	10/05/2019 11:44 PM	D.Walker	AS5667.11, Bail		
7414/10	BH05B	10/05/2019 1:13 PM	D.Walker	AS5667.11, Pump		
7414/11	BH06A	10/05/2019 8:40 AM	D.Walker	AS5667.11, Pump		
7414/12	BH06B	10/05/2019 9:20 AM	D.Walker	AS5667.11, Bail		
7414/13	BH06C	10/05/2019 10:00 AM	D.Walker	AS5667.11, Bail		

Sampling procedures have been approved and report finalised on 17/05/2019
Where method is "unknown" sampling procedures are not endorsed

NATA Accredited Laboratory – 20375

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

vgt
Laboratories Pty Ltd
PO Box 2335 Greenhills NSW 2323
P (02)4028 6412 E mail@vgt.com.au
www.vgt.com.au ABN 77 621 943 800

Report Number: 7569

Date Issued: 19/06/2019 Revision Number: 00

Site/Job: Haerses Road Monthly Ground Water

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 13 samples were received on 7/06/2019

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
BH01A		7/06/2019	7569/1	Water	
BH01B		7/06/2019	7569/2	Water	
BH01C		7/06/2019	7569/3	Water	
BH02A		7/06/2019	7569/4	Water	
BH02B		7/06/2019	7569/5	Water	
BH02C		7/06/2019	7569/6	Water	
BH03A		7/06/2019	7569/7	Water	
BH03B		7/06/2019	7569/8	Water	
BH03C		7/06/2019	7569/9	Water	
BH05B		7/06/2019	7569/10	Water	
BH06A		7/06/2019	7569/11	Water	
BH06B		7/06/2019	7569/12	Water	
BH06C		7/06/2019	7569/13	Water	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Test Report Number: 7569

Date Issued: 19/06/2019 Revision No: 00

Results

Water Sampling and Field Tests	Units	Method	Limit of Report	7569/1 BH01A 7/06/2019	7569/2 BH01B 7/06/2019	7569/3 BH01C 7/06/2019	7569/4 BH02A 7/06/2019	7569/5 BH02B 7/06/2019
Depth to Water	m	Depth	*0.01*	13.56	15.38	7.76	27.99	28.20
Temperature	℃	Temp	*0.1*	17.1	16.7	17.8	17.9	17.9
pH	pH Units	APHA 4500-H B	*0.1*	4.8	4.4	4.5	5.4	4.9
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	178	171	190	178	155

Water Sampling and Field Tests	Units	Method	Limit of Report	7569/6 BH02C 7/06/2019	7569/7 BH03A 7/06/2019	7569/8 BH03B 7/06/2019	7569/9 BH03C 7/06/2019	7569/10 BH05B 7/06/2019
Depth to Water	m	Depth	*0.01*	15.54	57.90	22.37	13.77	20.43
Temperature	℃	Temp	*0.1*	17.5	17.6	17.3	17.4	17.7
pH	pH Units	APHA 4500-H B	*0.1*	5.7	6.2	4.7	4.2	4.6
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	181	213	136	153	171

Water Sampling and Field Tests	Units	Method	Limit of Report	7569/11 BH06A 7/06/2019	7569/12 BH06B 7/06/2019	7569/13 BH06C 7/06/2019
Depth to Water	m	Depth	*0.01*	37.79	35.39	12.73
Temperature	℃	Temp	*0.1*	17.7	17.8	18.1
pH	pH Units	APHA 4500-H B	*0.1*	10.9	5.0	4.4
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	348	141	103

Total Dissolved Solids	Units	Method	Limit of Report	7569/1 BH01A 7/06/2019	7569/2 BH01B 7/06/2019	7569/3 BH01C 7/06/2019	7569/4 BH02A 7/06/2019	7569/5 BH02B 7/06/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	110	94	110	106	88

Total Dissolved Solids	Units	Method	Limit of Report	7569/6 BH02C 7/06/2019	7569/7 BH03A 7/06/2019	7569/8 BH03B 7/06/2019	7569/9 BH03C 7/06/2019	7569/10 BH05B 7/06/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	122	136	92	79	102

Total Dissolved Solids	Units	Method	Limit of Report	7569/11 BH06A 7/06/2019	7569/12 BH06B 7/06/2019	7569/13 BH06C 7/06/2019
Total Dissolved Solids	mg/L @105°C	AS3550.4	*20*	160	101	53

COMMENTS:
Depth measured to water from Top of bore PVC (m)

Note: # Where present, indicates NATA accreditation does not cover the performance of this service.

NATA Accredited Laboratory – 20375

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

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322

Results have been approved and report finalised on 19/06/2019

Sampling Report Number: 7569

Date Issued: 19/06/2019 Revision No: 00

Sampling Conditions: Intermittent Showers 11°-14°C

Sample #	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
7569/1	BH01A	7/06/2019 2:52 PM	T.Walker	AS5667.11, Pump		
7569/2	BH01B	7/06/2019 3:13 PM	T.Walker	AS5667.11, Pump		
7569/3	BH01C	7/06/2019 3:32 PM	T.Walker	AS5667.11, Bail		
7569/4	BH02A	7/06/2019 1:44 PM	T.Walker	AS5667.11, Pump		
7569/5	BH02B	7/06/2019 2:10 PM	T.Walker	AS5667.11, Pump		
7569/6	BH02C	7/06/2019 2:26 PM	T.Walker	AS5667.11, Bail		
7569/7	BH03A	7/06/2019 11:16 AM	T.Walker	AS5667.11, Bail		
7569/8	BH03B	7/06/2019 12:34 PM	T.Walker	AS5667.11, Bail		
7569/9	BH03C	7/06/2019 12:50 PM	T.Walker	AS5667.11, Bail		
7569/10	BH05B	7/06/2019 1:23 PM	T.Walker	AS5667.11, Pump		
7569/11	BH06A	7/06/2019 9:30 AM	T.Walker	AS5667.11, Pump		
7569/12	BH06B	7/06/2019 10:19 AM	T.Walker	AS5667.11, Bail		
7569/13	BH06C	7/06/2019 10:38 AM	T.Walker	AS5667.11, Bail		Depth dropped 1.8m compared to last few months

Sampling procedures have been approved and report finalised on 19/06/2019
Where method is "unknown" sampling procedures are not endorsed

NATA Accredited Laboratory – 20375

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

Old Northern Road – Surface Water SW19

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1827512**	Page	: 1 of 2
Client	: **DIXON SAND (PENRITH) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: HUNNY CHURCHER	Contact	: Customer Services ES
Address	:	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 4566 8348	Telephone	: +61-2-8784 8555
Project	: Old Northern Road Quarry	Date Samples Received	: 17-Sep-2018 16:30
Order number	:	Date Analysis Commenced	: 18-Sep-2018
C-O-C number	: ----	Issue Date	: 21-Sep-2018 12:41
Sampler	: Hunny Churcher		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Client sample ID	**SW19**	----	----	----	----
				Client sampling date / time	17-Sep-2018 09:58	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**ES1827512-001**	--------	--------	--------	--------
					Result	----	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**183**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	----	----	----	----
EA045: Turbidity									
Turbidity	----	0.1	NTU		**0.2**	----	----	----	----

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Laboratories Pty Ltd
PO Box 2335 Greenhills NSW 2323
P (02)4028 6412 E mail@vgt.com.au
www.vgt.com.au ABN 77 621 943 600

Report Number: 6837

Date Issued: 17/12/2018

Revision Number: 00

Site/Job: Old Northern Rd Quarry

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following 2 sample(s) were received on 14/12/2018

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
SW19		13/12/2018 9:43 AM	6837/1	Water	
BH8		14/12/2018 8:48 AM	6837/2	Water	Tested in field By VGT (Terry Walker)

The samples have been tested and the following reports are included:

- Test Report: Results relate to sample(s) as received
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Report Number: 6837

Date Issued: 17/12/2018 Revision No: 00

vgt Laboratories Pty Ltd

Results

Field Tests	Units	Method	Limit of Report	6837/2 BH8 14/12/2018
Depth to Water	m	Depth	*0.01*	26.20
Temperature	℃	Temp	*0.1*	17.0
pH	pH Units	APHA 4500-H B	*0.1*	3.9
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	287

Physical Components	Units	Method	Limit of Report	6837/1 SW19 13/12/2018
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	178
Turbidity	NTU	APHA 2130 B	*0.1*	1.4
Total Suspended Solids	mg/L	AS3550.4	*2*	<2

COMMENTS:

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322

Note: # Where present, indicates the performance of this test is not covered under NATA accreditation

Holding times for some or all of the tests listed below are outside the period recommended in the method: pH (0.25 hrs), TSS, Turbidity (24 hrs).
This may be important to the interpretation of the results.

Results have been approved and report finalised on 17/12/2018

NATA Accredited Laboratory – 20375

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

NATA WORLD RECOGNISED ACCREDITATION

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1908186**	Page	: 1 of 2
Client	: **DIXON SAND (PENRITH) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: HUNNY CHURCHER	Contact	: Customer Services ES
Address	:	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 4566 8348	Telephone	: +61-2-8784 8555
Project	: Old Northern Road Quarry	Date Samples Received	: 18-Mar-2019 15:30
Order number	: ----	Date Analysis Commenced	: 18-Mar-2019
C-O-C number	: ----	Issue Date	: 22-Mar-2019 11:32
Sampler	: HUNNY CHURCHER		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Client sample ID	**SW19**	----	----	----	----
				Client sampling date / time	18-Mar-2019 11:15	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**ES1908186-001**	--------	--------	--------	--------
					Result	----	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**412**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**9**	----	----	----	----
EA045: Turbidity									
Turbidity	----	0.1	NTU		**2.2**	----	----	----	----

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Laboratories Pty Ltd
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www.vgt.com.au ABN 77 621 943 800

Report Number: 7574

Date Issued: 5/06/2019 Revision Number: 00

Site/Job: Old Northern Rd Surface Water

Client: Dixon Sand Pty Ltd
Address PO Box 4019
Pitt Town NSW 2756
Contact

The following 1 sample(s) were received on 3/06/2019

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
SW19		3/06/2019 10:42 AM	7574/1	Water	

The samples have been tested and the following reports are included:

- Test Report: Results relate to sample(s) as received
- Chain of Custody (if available)

Anthony Crane
Laboratory Manager

NATA Accredited Laboratory – 20375

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

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WORLD RECOGNISED ACCREDITATION

Report Number: 7574

Date Issued: 5/06/2019

Revision No: 00

Laboratories Pty Ltd

Results

pH/EC/TSS/Turb	Units	Method	Limit of Report	7574/1 SW19 3/06/2019
Electrical Conductivity	µS/cm	APHA 2510 B	*50*	173
Turbidity	NTU	APHA 2130 B	*0.1*	0.10
Total Suspended Solids	mg/L	AS3550.4	*2*	3

COMMENTS:

Depth measured to water from Top of bore Casing (TOC) (m)

Note: # Where present, indicates NATA accreditation does not cover the performance of this service.

Location Analysed : Tested On Site

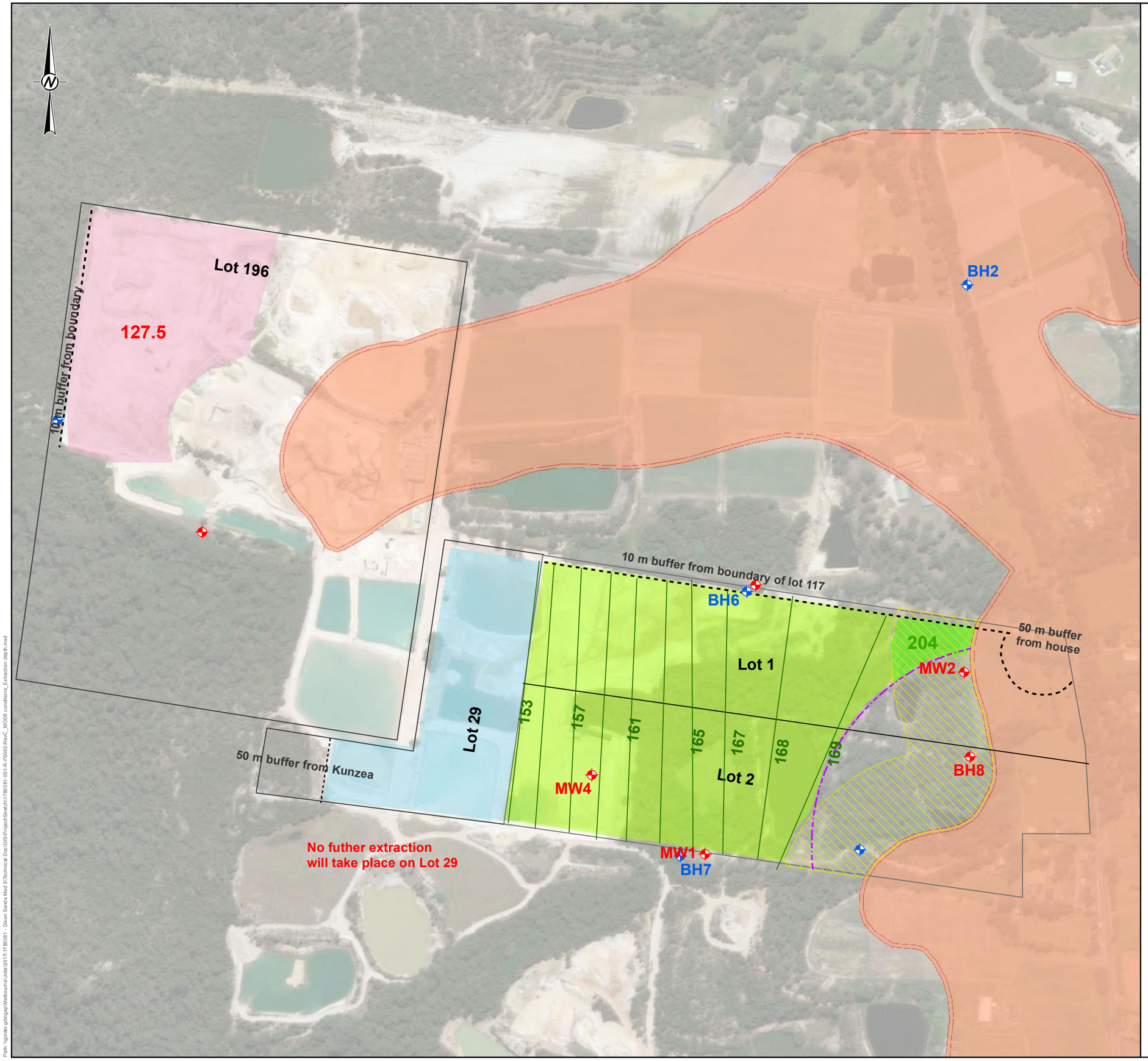
NATA Accredited Laboratory – 20375

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

NATA
WORLD RECOGNISED ACCREDITATION

Results have been approved and report finalised on 5/06/2019

Old Northern Road – Maximum Extraction Depth Plan



LOCATION MAP

Legend

- SBCGS Monitoring Bore
- Perched GW Monitoring Bore
- Boundary buffers
- Maroota public school buffer
- MTSGS Buffer Zone (100m)
- Property boundary
- Lot 1 and 2 Extraction area within MTSGS buffer
- Lot 1 and 2 Extraction area outside MTSGS buffer
- Lot 29 Extraction area
- NW Pit extaction area
- MTSGS (Etheridge 1980)

0 80 160 240 320 METRES

REFERENCE SCALE: 1:4,675 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

CLIENT
DIXON SAND (PENRITH) PTY LTD

PROJECT
GROUNDWATER ASSESSMENT:

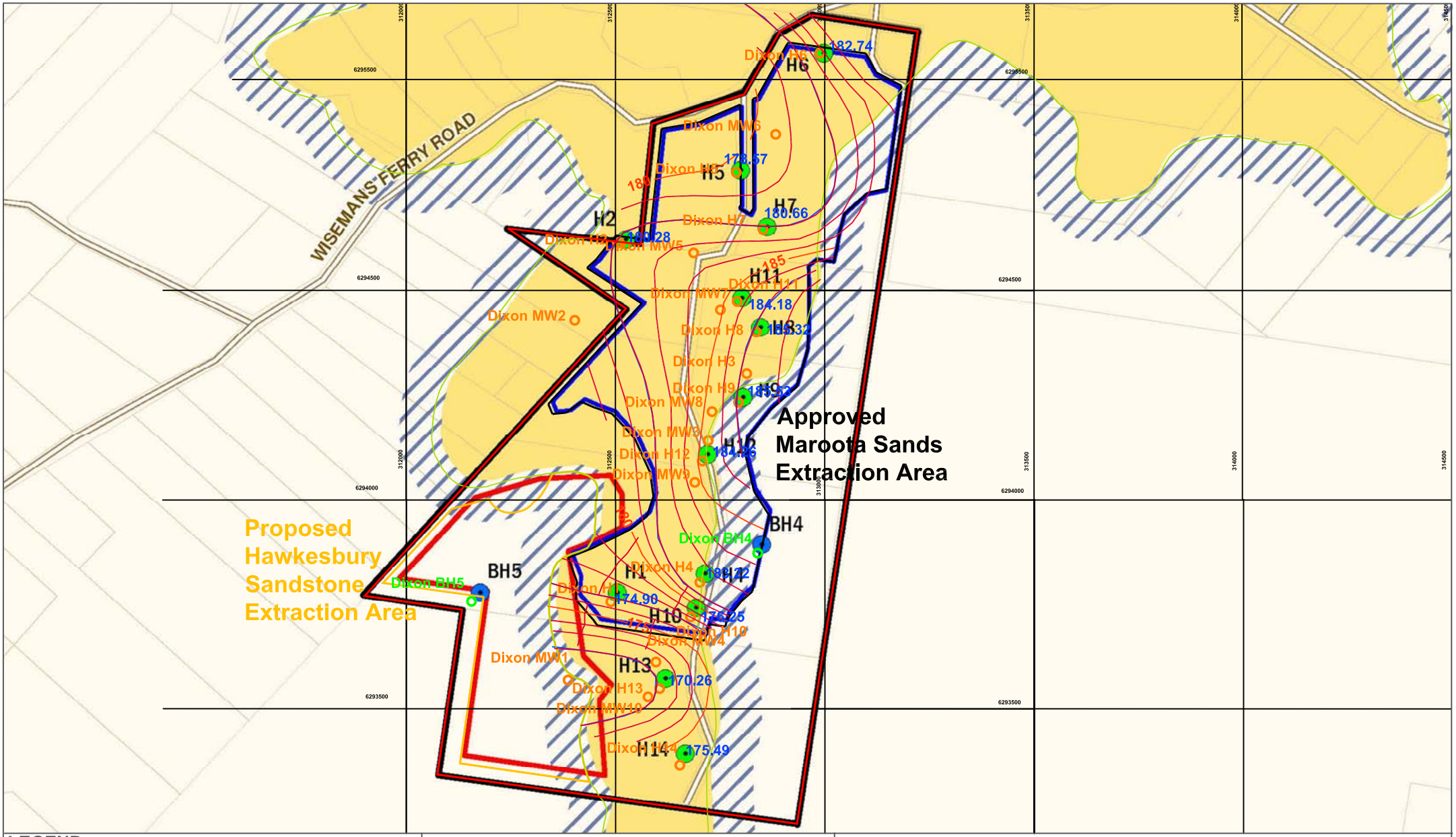
TITLE
MAXIMUM EXTRACTION DEPTH (MAHD)

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-04-24
PREPARED	GB
DESIGN	-
REVIEW	JA
APPROVED	JA

PROJECT No.	CONTROL	Rev.	FIGURE
1780381	001-R	A	3

Haerses Road – Maximum Extraction Depth Plan



LEGEND:

- Dixon Sands Site Boundary
- Dixon Sands HS Monitoring Bores
- Dixon Sands MS Monitoring Bores
- Wet weather high groundwater level (mAHD)
- Extraction depth - Maroota Sands (mAHD)
- Boundary of Maroota Sands (per WSP)

DATE: 30 April 2018	SCALE:
PROJECT NO: 07-0328	AUTHOR: PD
DRAWING NO: 0328-001d	REVISION: D

Dundon Consulting Pty Ltd

Dixon Sand (Penrith) Pty Ltd

HAERSES ROAD SAND QUARRY
Extraction Depth - April 2018 (based on wet weather high GW levels)

Figure 1

Appendix D – Noise Compliance Reports

Dixon Sand (No.1) Pty Ltd
Haerses Road Quarry, Maroota

Noise Monitoring Report
for DA165-7-2005 Modification 2

File Name:	J16-001-HR NMR 06_2019
Version:	1.0
Prepared by:	Project Environmental Services Pty Ltd
Client:	Dixon Sand (No. 1) Pty Ltd

Project Environmental Services

Document Control

File name	J16-001-HR NMR 06_2019		
Report name	Dixon Sand (No. 1) Pty Ltd - Haerses Road Noise Monitoring Report - June 2019		
Prepared by:	Hunsamon Churcher Environmental Consultant		
Authorised by:	Chris Churcher Senior Environmental Consultant / Director		
Document Version	VDraft	Issued:	21/06/2019 Draft for Internal Review
	V1.0		28/06/2019 Final report issued to Client

Table of Contents

Figures

Tables

Appendices

Abbreviations and Glossary

A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise
DA165-7-2005	Development Consent DA165-7-2005 Modification 2
dB(A)	An expression of the relative loudness of sound transmission in air as perceived by the human ear. Normalised/Weighted to the tone of "A".
Dixon Sand	Dixon Sand (No. 1) Pty Ltd
EPA	NSW Environment Protection Authority
LAeq(x minutes)	A-weighted, equivalent continuous noise level – the level of noise equivalent to the energy – average of noise levels occurring over a measured period.
LA90	The A-weighted sound pressure level that is exceeded for 90 percent of the time of which a given sound pressure is measured. This is considered to represent the background noise.
LAmax	Maximum sound pressure level, A-weighted
LAmin	Minimum sound pressure level, A-weighted
PES	Project Environmental Services Pty Ltd
Receiver	The noise-sensitive land use at which noise from a development can be heard
SLM	Sound Level Meter. An electronic measuring device recording instantaneous Sound Pressure Levels.

1. Introduction

1.1 Background

Dixon Sand (No. 1) Pty Ltd (Dixon Sand) operates the Haerses Road sand quarry in Maroota, located approximately 50 kilometres north-west of Sydney Central Business District. Dixon Sand began operation in 2006 and the site of approximately 71 Hectares comprises Lot 170 DP 664766, Lot 170 DP 664767, Lots A and B DP 407341, Lots 176 and 177 DP 752039 and Lot 216 DP 752039. Haerses Road quarry is located in the small rural community of Maroota, which supports a mixture of land uses including residential, sand extraction and agricultural businesses. The location of the quarry is shown in Figure 1.

Haerses Road quarry undertakes extraction of both sand and bulk sandstone materials, as well asprocessing and direct sales to the commercial market, with transfers of materials between licenced facilities. Materials from the quarry constitute a significant supply to the construction and maintenance industries of the Greater Sydney Region.

1.2 Planning Consent

Haerses Road quarry operates in accordance with Development Consent DA165-7-2005. A modification to DA165-7-2005 under Section 4.55(1) of the Environmental Planning and Assessment Act 1979 (EP&A Act) was approved on 29th January 2019. DA165-7-2005 (Modification 2) permits Dixon Sand to undertake extraction and processing of 250,000 tonnes per annum and transport up to 190,000 tonnes per annum to the Old Northern Road Quarry for processing. Truck movements between Haerses Road and the Old Northern Road Quarries must not exceed 56 movements per day, with 20 movements allowed between 6:00am and 7:00am. DA165-7-2005 (Modification 2) also permits Dixon Sand to undertake extraction in the newly approved extraction area (Cells 1 to 5) located to the south-west of the original extraction footprint (Stages 1 to 5) pending the completion of the pre-commencement consent conditions.

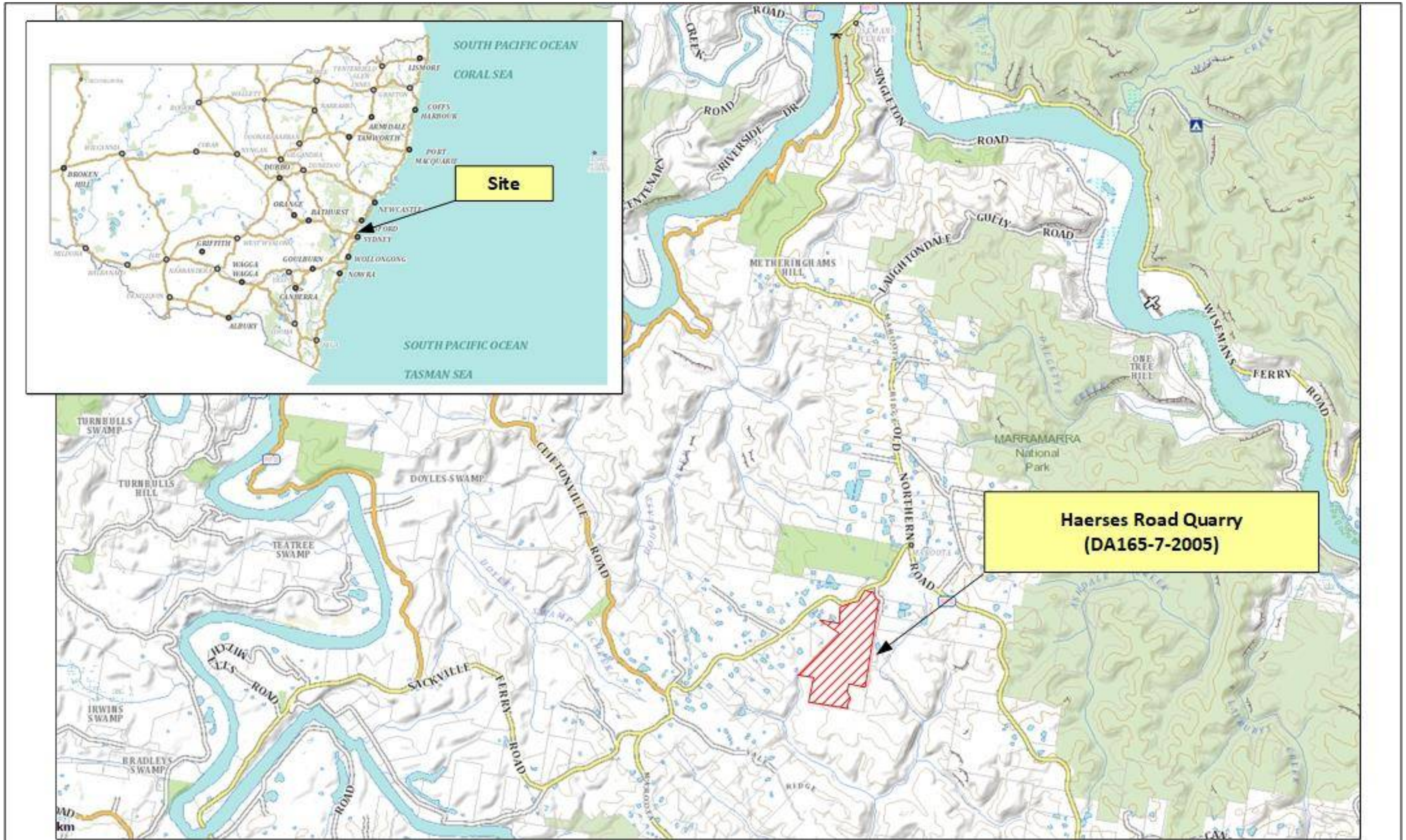
1.2 Scope of Assessment

Project Environmental Services Pty Ltd (PES) was commissioned by Dixon Sand to conduct attended noise monitoring and reporting in accordance with condition 7(d) of Schedule 3 of DA165-7-2005 and the requirements outlined in the Noise Management Plan (May 2019). Table 1 below outlines the consent conditions and assessment methodology to be adhered to when undertaking noise monitoring and reporting.

Table 1: Noise Compliance Assessment, Appendix 5 of DA165-7-2005 (Modification 1)

Consent Condition	Consent requirement
Condition 1 of Appendix 5	**Applicable Meteorological Conditions** The noise criteria in Table 2 are to apply under all meteorological conditions except the following: (a) Wind speeds greater than 3 m/s at 10m above ground level; or (b) Temperature inversion conditions between 1.5^{o}C and 3^{o}C/100m and wind speed greater than 2 m/s at 10m above ground level; or (c) Temperature inversion conditions greater than 3^{o}C/100m.
Condition 2 of Appendix 5	**Determination of Meteorological Conditions** Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station required under condition 13 of Schedule 3.

This noise assessment and report have been undertaken in accordance with the *Noise Policy for Industry* (EPA, 2017).



Project Environmental Services	Map Source: Sixmap (2016) Scale 0 120 200 400 (kilometres)	Dixon Sand (Penrith) Pty Ltd Figure 1 Locality Plan	Plan No: J16-001 HR NM06_19 Version 1.0 Date 18/06/2019 Drawn By HC	N

2. Noise Compliance Criteria

2.1 Approvals and Hours of Operation

The Quarry's hours of operation and activities permitted by the DA165-7-2005 are outlined in Table 2.

Table 2: Hours of Operation – Haerses Road Quarry.

Consent Condition	Activity	Permissible Hours
Condition 1 of Schedule 3 and Table 1	Quarrying operations (excluding truck arrival, loading and dispatch)	7.00 am to 6.00 pm Monday to Saturday
		At no time on Sundays and public holidays
	Truck arrival, loading and dispatch	6.00 am to 6.00 pm Monday to Saturday
		At no time on Sundays and public holidays
	Acoustic bund construction and road and intersection works on Haerses Road and Wisemans Ferry Road	8.00 am to 5.00 pm Monday to Friday
		At no time on Saturdays, Sundays and public holidays
	Maintenance	At any time, provided that these activities are not audible at any privately-owned residence outside the permissible hours of quarrying operations
Condition 2 of Schedule 3	The following activities may be carried out outside the hours specified in condition 1 above: (a) delivery or dispatch of materials as requested by the NSW Police Force or other public authorities; and (b) emergency work to avoid the loss of lives, property or to prevent environmental harm. In such circumstances, the Applicant must notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.	

2.2 Noise Criteria

Condition 3 of Schedule 3 of DA165-7-2005 requires Dixon Sand to comply with the following specific noise criteria presented in Table 3.

Table 3: Haerses Road – Operational Noise Criteria

<table>
<tr><th>DA165-7-2005 Consent Condition</th><th></th></tr>
<tr><td>Condition 3 of Schedule 3 and Table 2</td><td>
The Applicant must ensure that operational noise generated by the development (excluding acoustic bund construction) does not exceed the criteria in Table 2 at any residence on privately-owned land
.
Table 2: Operational noise criteria dB(A)
<table>
<tr><th>Receiver</th><th>Day</th><th colspan="2">Shoulder (6.00 am to 7.00 am)</th></tr>
<tr><th></th><th>$L_{Aeq\ (15\ minute)}$</th><th>$L_{Aeq\ (15\ minute)}$</th><th>$L_{A(max)}$</th></tr>
<tr><td>R1</td><td>37</td><td>37</td><td rowspan="6">45</td></tr>
<tr><td>R2</td><td>40</td><td>40</td></tr>
<tr><td>R3</td><td>38</td><td>38</td></tr>
<tr><td>R4</td><td>37</td><td>37</td></tr>
<tr><td>R6</td><td>37</td><td>35</td></tr>
<tr><td>R7</td><td>36</td><td>35</td></tr>
<tr><td>R8</td><td>36</td><td>35</td><td></td></tr>
<tr><td>All other receivers</td><td>35</td><td>35</td><td></td></tr>
</table>
Noise generated by the development is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy. Appendix 5 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 2 do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of agreement.
</td></tr>
</table>

A number of agreements between Dixon Sand and the adjacent private landowners are currently in place. PES is of the understanding that agreements regarding noise generation and quarry operations are in place between the residents of:

- Residential receiver identified as R2 in the planning consent and
- All identified residences to the east of Haerses Road quarry on Hitchcock Road.

The noise criteria contained in Condition 3 of Schedule 3, DA165-7-2005 do not apply to the above receivers while the agreement is in force.

3. Attended Noise Monitoring

3.1 Noise Compliance Assessment

In order to assess compliance with the above stated requirements, PES undertook noise monitoring in accordance with Australian Standard *AS1055-1997 Acoustics – Description and Measurement of Environmental Noise, Part 1 General Procedures*. Attended monitoring at noise sources and at receivers was undertaken on 12th June 2019.

3.2 Attended Noise Monitoring

Attended noise monitoring was conducted using a Rion NL- 42 CLASS 2 Sound Level Meter (SLM) set to A-weighted/Fast response. The SLM was calibrated prior to use with an NC-74 Tone Calibrator. The SLM and Tone Calibrator were calibrated by a NATA accredited acoustic laboratory (Calibration Certificate No. C18546 and C18547).

Attended noise monitoring was undertaken in order to measure:

- Instantaneous noise levels of background sources such as local traffic, aircraft, birds and surrounding agricultural and quarry activities;
- Instantaneous noise levels of audible quarry operations such as crushing, screening, ripping, quarry machinery (movements, reverse beepers) and truck haulage (loading & transport);
- Time, location, duration of sample; and
- L_{Aeq}, L_{Amin}, L_{Amax}, L_{A05}, L_{A10}, L_{A50} and L_{A90} parameters.

Wind speed was recorded during each of the attended monitoring periods using a hand-held anemometer which was positioned within 5 metres of the SLM microphone at an equal height above ground level. Weather data was obtained from the weather station located adjacent to the Maroota Public School as required by Environment Protection Licence #12513. The sigma-theta is used to estimate the Pasquill-Gifford stability category, based on the standard deviation of the wind direction across the hourly period. The shoulder period stability is determined in accordance with Fact Sheet D of the *Noise Policy for* Industry (EPA, 2017).

3.3 Setback Calculations

Due to high levels of background noise in the surrounding area from sources such as local road traffic, the operations of adjacent projects and development, birdcalls, insects and agricultural activities in the vicinity, additional calculations were undertaken to predict the 'quarry borne' noise contribution at receivers. Prediction of quarry borne noise impacts are determined using the setback noise calculation methodology outlined in Chapter 4 of the *Interim Construction Noise Guidelines* (DECC, 2009). These calculated impacts exclude the influence of background and extraneous noise sources, and are only

undertaken where quarry operations are not clearly audible or discernable from background noise sources at the receiver. Noise predictions require a 15 minute measurement to be taken within close proximity of quarry operations, with minimal influence from noise generated by other non-quarry activities. This methodology for the calculation of predicted noise impacts complies with the alternative modelling method in Section 7 of the *Noise Policy for Industry* (EPA, 2017).

3.4 Quarry Operations

The following activities and plant listed in Table 4 were in operation at the time of the attended noise monitoring.

Table 4: Quarry and plant operations.

Quarry Location	Quarry Operation	Plant
Stage 2 (west)	Sandstone cutting	Excavator with a double-blade saw attachment cutting sandstone
Cells 1 to 5 (DA165-5-2007 Modification 1)	Quarry operations not yet commenced in extraction cells 1 to 5	N/A

Quarry operations have not commenced in the recently approved extraction area (Cells 1 to 5). It is anticipated that operations in the recently approved extraction area will commence late 2019 following fulfilment of pre-commencement conditions.

3.5 Monitoring Locations

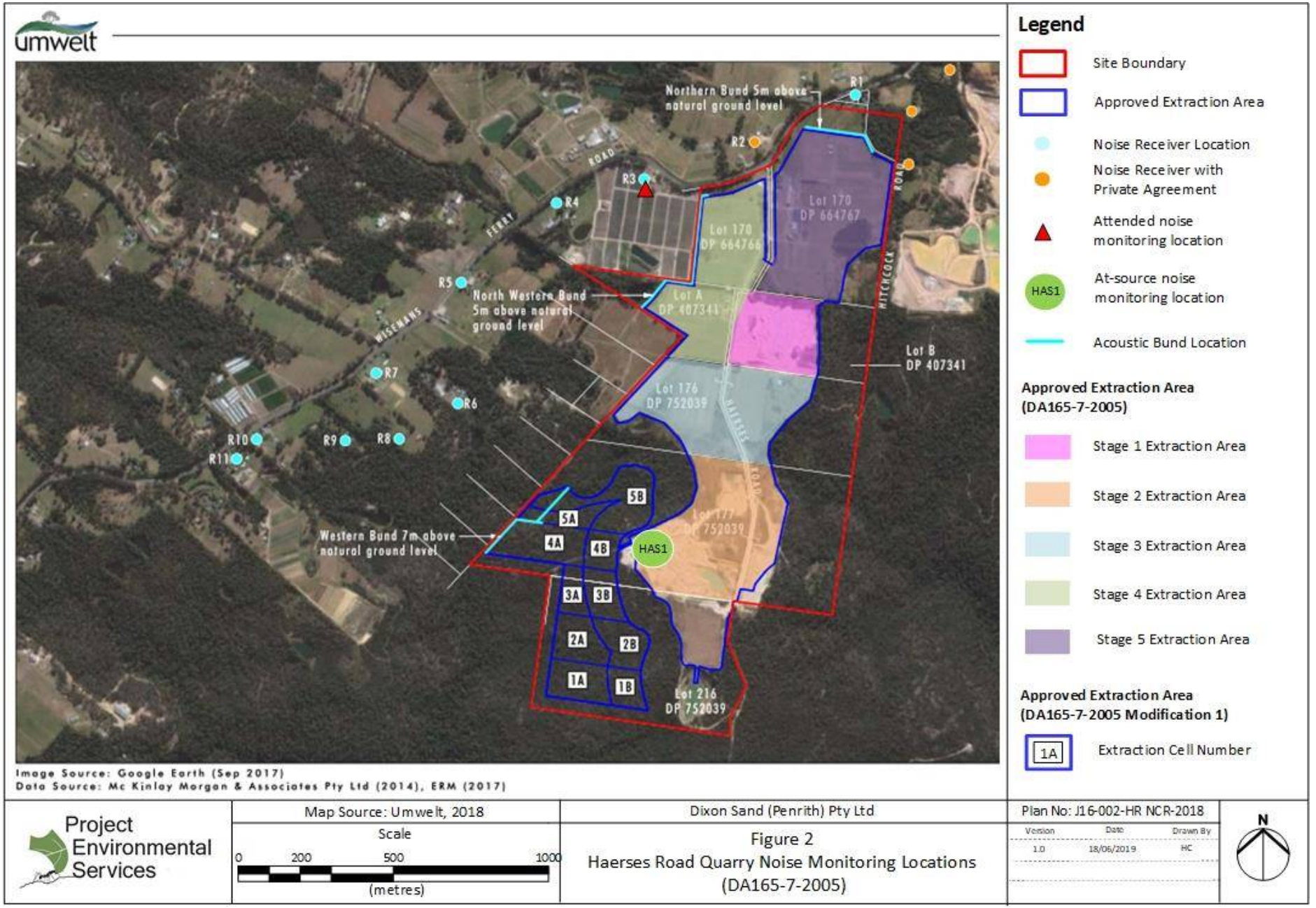
Table 6.1 of the Noise Management Plan (May 2019) reproduced as Table 5 below requires attended noise monitoring to undertaken at the receivers R3 and R4 during quarry extraction in Stage 2 for daytime (7am to 5pm) and shoulder (6am to 7am) periods. No permission was granted by the property owner at R4 therefore, attended noise monitoring was only undertaken at R3.

At-source noise monitoring was undertaken at Stage 2 (west) extraction area (HAS1) which is the only active extraction area at the time of the compliance assessment.

Table 4: Noise Monitoring Locations for Each stage and Extraction Cell, reproduced from Table 6.1 of the Noise Management Plan (May 2019).

Location	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Mod 1 Extraction cells 1A to 5B
R1	-	-	-	-	✓	-
R3	✓	✓	✓	✓	✓	-
R4	✓	✓	✓	✓	✓	-
R6	-	-	-	-	-	✓
R8	-	-	-	-	-	✓

Figures 2 shows the locations of the noise receivers and at-source monitoring in reference to the quarry.


umwelt
Northern Bund 5m above natural ground level
North Western Bund 5m above natural ground level
Western Bund 7m above natural ground level
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
HAS1
Lot 170 DP 664767
Lot 170 DP 664766
Lot A DP 407341
Lot B DP 407341
Lot 176 DP 752039
Lot 177 DP 752039
Lot 216 DP 752039
5B
5A
4A
4B
3A
3B
2A
2B
1A
1B
FERRY ROAD
WISEMANS
HAERSES ROAD
MITCHCOCK ROAD
Legend
Site Boundary
Approved Extraction Area
Noise Receiver Location
Noise Receiver with Private Agreement
Attended noise monitoring location
At-source noise monitoring location
Acoustic Bund Location
Approved Extraction Area (DA165-7-2005)
Stage 1 Extraction Area
Stage 2 Extraction Area
Stage 3 Extraction Area
Stage 4 Extraction Area
Stage 5 Extraction Area
Approved Extraction Area (DA165-7-2005 Modification 1)
1A
Extraction Cell Number
Image Source: Google Earth (Sep 2017)
Data Source: Mc Kinlay Morgan & Associates Pty Ltd (2014), ERM (2017)
Project Environmental Services
Map Source: Umwelt, 2018
Scale
0 200 500 1000
(metres)
Dixon Sand (Penrith) Pty Ltd
Figure 2
Haerses Road Quarry Noise Monitoring Locations
(DA165-7-2005)
Plan No: J16-002-HR NCR-2018
Version Date Drawn By
1.0 18/06/2019 HC
N

5. Noise Monitoring Results

5.1 Attended and At-Source Noise Monitoring Results

Table 6 presents the noise results obtained from at-source monitoring.

Table 7 contains the attended noise monitoring results which exhibit values greater than the noise management criteria values during the monitoring periods.

Where monitored levels were found to be in exceedance of noise criteria values or where attended noise monitoring could not be conducted, calculations of the quarry-borne noise contribution to the monitored noise receivers have been undertaken in accordance with Section 7 of the Noise Policy for Industry (EPA, 2017). Table 8 presents the predicted noise impacts at receivers which demonstrate quarry borne noise contribution below the noise management criteria.

Appendix A presents the weather data obtained from the weather station and the calculated Pasquill-Gifford stability classes during the four days of shoulder period attended noise monitoring. Temperature inversions are common characteristics of winter weather condition. The determined stability classes in Appendix A indicate the low probability temperature inversions occurring during the shoulder period noise monitoring. No temperature inversions occurred during daytime attended noise monitoring.

Table 5: At-source noise monitoring results

At-source monitoring location	Quarry Operation	Distance between SLM and Quarry operation	LAeq 15min (dBA)	LAmax (dBA)	LAmin (dBA)	LA10 (dBA)	LA90 (dBA)
HAS1	Stage 2 (west) Excavator with a double blade attachment cutting sandstone	20 m between SLM and HAS1	66.8	73.4	51.0	69.6	60.8

Table 6: Attended noise monitoring results.

Receiver Location	Monitoring Period	Date (Time)	Observations (dBA)	Measured Levels (dBA)					Noise Criteria (dBA)			Weather Observation at Monitoring Location
				LAeq 15min	LAmax	LAmin	LA10	LA90	Day (7am-6pm) Leq15min	Shoulder (6-7am) Leq15min	Shoulder (6-7am) LA(max)	
R3	Shoulder	12/06/2019 (6:35 - 6:50 am)	Haerses Road Quarry did not operate between 6 and 7am, Extraneous noise from Wisemans Ferry Road traffic, bird and rooster calls and dog barking	**43.6**	53.0	35.1	46.3	39.5		38	45	Clear sky, cool, sun rising, max. wind speed northerly 1.8 m/s, temp 11^{oC}
	Day	12/06/2019 (11:40 - 11:55 am)	• Quarry operations in Stage 2 **inaudible** at the receiver • Extraneous noise from Wisemans Ferry Road traffic, bird calls and intermittent frog calls.	**44.5**	60.1	29.3	47.7	32.0	38			Sunny, clear sky, cool, max. wind speed 3m/s N-NW, temp 18^{oC}
R4	Shoulder	No permission granted to enter the property to conduct attended noise monitoring								35	45	N/A
	Day								37			N/A

Table 7: Predicted Noise Levels using Setback Calculations.

Receiver Location	Distance between Receiver and SLM (m)	Monitoring Period	Comments	Predicted Noise Level at Receiver (setback calculation from at-source monitoring)	Noise Criteria (dBA)			Compliance
					Day (7am-6pm)	Shoulder (6-7am) Leq15min	Shoulder (6-7am) LA(max)	
R1	1,505	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**37**	45	Yes
		Day	Did not conduct attended noise monitoring	**29.3**	**37**			Yes
R2*	1,490	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**40**	45	Yes
		Day	Did not conduct attended noise monitoring	**29.4**	**40**			Yes
R3	1,142	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**38**	45	Yes
		Day	Quarry operation in Stage 2 inaudible at R3 during attended noise monitoring	**31.7**	**38**			Yes
R4	1,110	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**37**	45	Yes
		Day	Did not conduct attended noise monitoring	**31.9**	**37**			Yes
R5	1,006	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**32.8**	**35**			Yes
R6	768	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**35.1**	**37**			Yes
R7	1,030	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**32.6**	**36**			Yes
R8	846	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**34.3**	**36**			Yes
R9	997	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**32.8**	**35**			Yes
R10	1,250	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**30.9**	**35**			Yes
R11	1,295	Shoulder	No quary operation between 6 and 7 am	Not Applicable		**35**	45	Yes
		Day	Did not conduct attended noise monitoring	**30.6**	**35**			Yes

*Note: Dixon Sand has a noise agreement in place with receiver R2 and residents on Hitchcock Road.

5.2 Modifying Factor Adjustments

The requirement for modifying factor adjustments has been considered in accordance with Condition 4(c) and (d) of Appendix 5 of DA165-7-2005.

Where a noise source contains certain characteristics, such as tonality, impusiveness, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. Fact Sheet C of the Noise Policy for Industry (EPA, 2017) defines the requirements for applying modifying factor adjustments to be applied to the measured or predicted noise levels at the receiver locations, prior to making any comparison with the quarry operational noise criteria set out in Table 3 of this report.

“Table C1 Modifying factor corrections” contained in Fact Sheet C of the Noise Policy for Industry (EPA, 2017) is reproduced in Appendix B. At the time of monitoring, noise generated from quarry operations did not display factors that would require modifying factor adjustments prior to comparison with the specified noise levels in the consent.

6. Discussion

6.1 Attended Noise Monitoring – Shoulder Period

Dixon Sand is permitted to commence loading and dispatch from 6:00 am on Mondays to Fridays and Saturdays. However, at the time of monitoring, Haerses Road quarry did not operate between 6:00 and 7:00am. Attended noise monitoring during shoulder periods at receiver R3 therefore does not take in account any noise generated from Haerses Road Quarry operations. Results from attended noise monitoring during the shoulder periods indicate that the dominant noise sources are from Wisemans Ferry Road traffic and surrounding activities including birdcalls and domestic livestock.

Weather data contained in Appendix A indicates that temperature inversions were unlikely to have occurred during the shoulder period monitoring. However, as the quarry did not operate during the shoulder period, attended noise monitoring results suggest that receivers experience high noise levels from non-quarry borne noise sources.

6.2 Attended Noise Monitoring – Daytime Period

Attended noise monitoring during the daytime period indicates that quarry borne noises were inaudible at receiver R3. It was observed that noise from Wisemans Ferry Road traffic, birdcalls and rooster calls and frog calls contributed significantly to the measured noise levels.

Setback calculations contained in Table 8 indicate that the daytime predicted quarry borne noise contributions at receivers R1 to R11 (inclusive) are lower than the daytime noise management criteria contained in Table 3.

It must be noted that setback calculations represent the worst-case noise impact scenarios as no noise attenuation from topography or building material has been taken into account. It would be reasonable to state that the setback calculations for predicted noise impacts are likely to be higher than the actual noise levels experienced at identified receivers.

6 Statement of Compliance

The results of the attended noise monitoring and predicted noise impacts from setback calculations indicate that Dixon Sand's Haerses Road Quarry operations were in compliance with the noise assessment criteria at receivers R1 to R11 (inclusive) under the meteorological conditions at the time of monitoring.

An agreement between Dixon Sand and receivers on Hitchcock Road and R2 is in place and therefore, noise management levels defined by the development consent are not applicable.

7. References

Australian Standard *AS1055.1-1997. Acoustics – Description and measurement of environmental noise, General Procedures*.

Department of Environment & Climate Change NSW (2009), *Interim Construction Noise Guideline*.

Environment Protection Authority NSW (2017), *Noise Policy for Industry*

Appendix A

Meteorological Data

Meteorological Data and Pasquill-Gifford Stability Class for Shoulder Period, obtained from the Weather Station (Monitoring Point under EPL12513).

Date, Time	Temperature (°C)	Wind Speed (m/s)	Wind Direction (°)	Sigma Theta	Pasquill-Gifford Stability Class for Shoulder Period	Stability Classification
12/06/2019, 06:00 am	11.8	2.5	28	20.8	B	Moderately unstable
12/06/2019, 06:05 am	11.5	2.5	24	12.6	C	Slightly unstable
12/06/2019, 06:10 am	11.2	1.6	17	14.3	C	Slightly unstable
12/06/2019, 06:15 am	11.0	1.4	355	17.3	C	Slightly unstable
12/06/2019, 06:20 am	10.8	2.2	42	19.0	B	Moderately unstable
12/06/2019, 06:25 am	10.7	1.4	52	25.7	A	Extremely unstable
12/06/2019, 06:30 am	10.8	1.3	339	24.5	A	Extremely unstable
12/06/2019, 06:35 am	10.8	1.8	15	23.1	A	Extremely unstable
12/06/2019, 06:40 am	10.9	0.4	340	19.0	B	Moderately unstable
12/06/2019, 06:45 am	11.0	1.6	36	36.5	A	Extremely unstable
12/06/2019, 06:50 am	11.3	1.9	37	22.3	B	Moderately unstable
12/06/2019, 06:55 am	11.5	2.4	36	20.7	B	Moderately unstable
12/06/2019, 07:00 am	11.5	1.9	359	20.8	B	Moderately unstable

Appendix B

Table 4.1: Modifying Factor Corrections

Table C1: Modifying factor corrections

Factor	Assessment / measurement	When to apply	Corection[1]	Comments
Tonal noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method (ISO1996.2-2007 – Annex D).	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: • 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz • 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz • 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.	5 dB[2,3]	Third octave measurements should be undertaken using unweighted or Z-weighted measurements. Note: Narrow-band analysis using the reference method in ISO1996-2:2007, Annex C may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified, e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands.
Low-frequency noise	Measurement of source contribution Cweighted and Aweighted level and one-third octave measurements in the range 10– 160 Hz	Measure/assess source contribution C- and A-weighted Leq,T levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: • where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2-dB(A) positive adjustment to measured/predicted Aweighted levels applies for the evening/night period • where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted Aweighted levels applies for the evening/night period and a 2- dB(A) positive adjustment applies for the daytime period.	2 or 5 dB[2]	A difference of 15 dB or more between C and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.
Intermittent noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level.	The source noise heard at the receiver varies by more than 5 dB(A) and the intermittent nature of the noise is clearly audible.	5 dB	Adjustment to be applied for nighttime only.
Duration	Single-event noise duration may range from 1.5 min to 2.5 h.	One event in any assessment period.	0 to 20 dB(A)	The project noise trigger level may be increased by an adjustment depending on duration of noise (see Table C3).
Maximum adjustment	Refer to individual modifying factors.	Where two or more modifying factors are indicated.	Maximum correction of 10 dB(A)2 (excluding duration correction).	

Notes:

1. Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.
2. Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.
3. Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.

Dixon Sand Pty Ltd
Old Northern Road Quarry, Maroota

Noise Monitoring Report
for DA250-09-01 Modification 5

File Name:	J16-001-ONR NM 06_2019
Version:	1.0
Prepared by:	Project Environmental Services Pty Ltd
Client:	Dixon Sand Pty Ltd

Project Environmental Services

Document Control

File name	J16-001-ONR NM 06_2019		
Report name	Dixon Sand Pty Ltd - Old Northern Road Noise Monitoring Report – June 2019		
Prepared by:	Hunsamon Churcher Environmental Consultant		
Authorised by:	Chris Churcher Senior Environmental Consultant / Director		
Document Version	VDraft	Issued:	25/06/2019 Draft for Internal Review
	V1.0		28/06/2019 Final Report issued to Client

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Figures

Tables

Appendix

Abbreviations and Glossary

A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise
DA250-09-01	Development Consent DA250-09-01 Modification 5
dB(A)	An expression of the relative loudness of sound transmission in air as perceived by the human ear. Normalised/Weighted to the tone of "A".
Dixon Sand	Dixon Sand Pty Ltd
EPA	NSW Environment Protection Authority
LAeq(x minutes)	A-weighted, equivalent continuous noise level – the level of noise equivalent to the energy – average of noise levels occurring over a measured period.
LA90	The A-weighted sound pressure level that is exceeded for 90 percent of the time of which a given sound pressure is measured. This is considered to represent the background noise.
LAmax	Maximum sound pressure level, A-weighted
LAmin	Minimum sound pressure level, A-weighted
ONR	Old Northern Road
PES	Project Environmental Services Pty Ltd
Receiver	The noise-sensitive land use at which noise from a development can be heard
SLM	Sound Level Meter. An electronic measuring device recording instantaneous Sound Pressure Levels.

1. Introduction

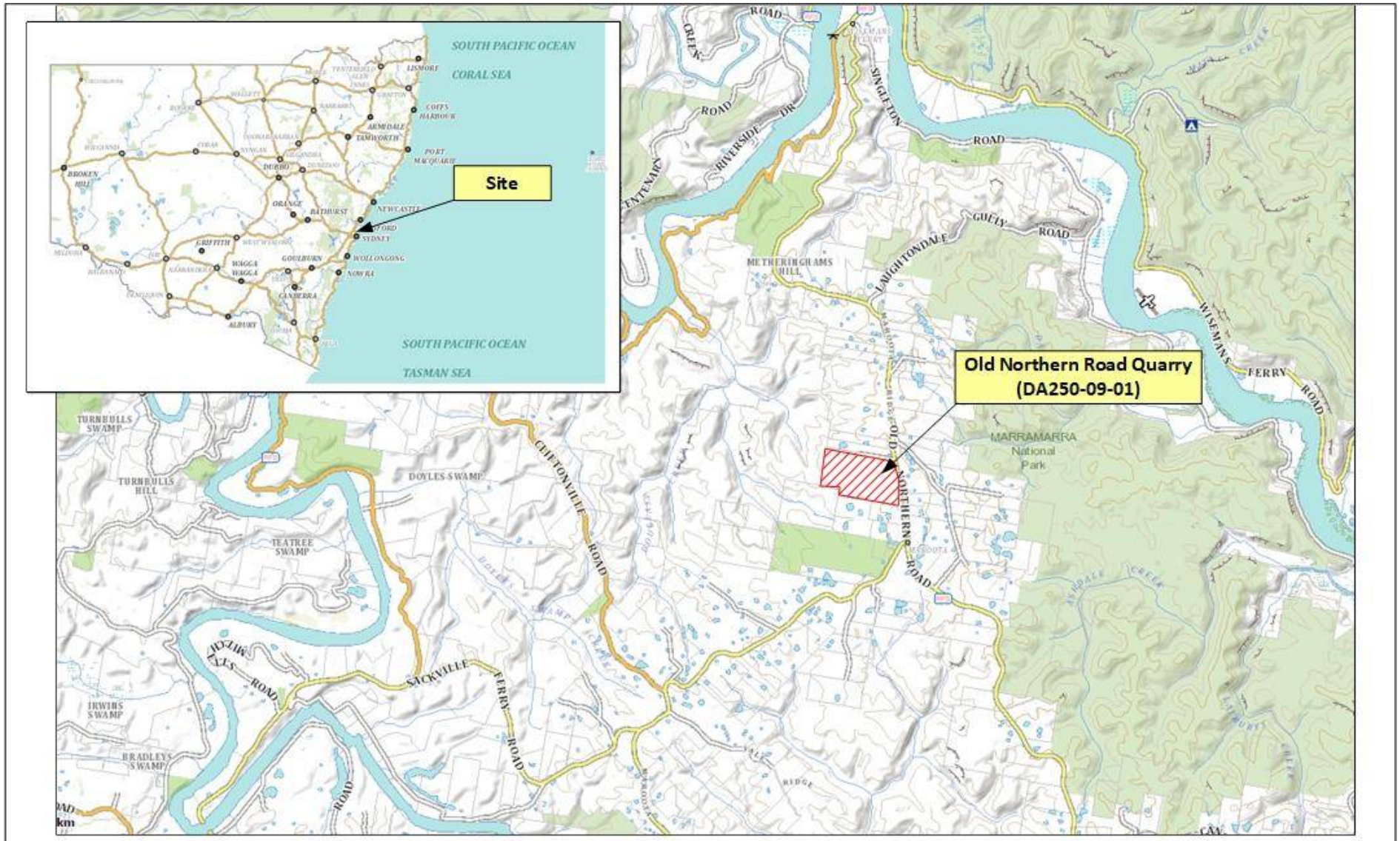
1.1 Background

Dixon Sand Pty Ltd (Dixon Sand) operates the Old Northern Road sand quarry (Lots 29 and 196 DP 752025 and Lots 1 and 2 DP 547255) in Maroota. The quarry is located approximately 50 kilometres north-west of Sydney Central Business District. The location of the quarry is shown in Figure 1.

Dixon Sand undertakes sand and bulk sandstone extraction, processing and direct sales to the commercial market with transfers of materials between licenced facilities. Materials provide a significant supply to the construction and maintenance industries.

1.2 Scope of Assessment

Project Environmental Services Pty Ltd (PES) was commissioned by Dixon Sand to undertake the 6-monthly attended noise monitoring and reporting in accordance with conditions outlined in the development consent DA 250-09-01, Environment Protection Licence # 3916 and the approved Noise Management Plan (Umwelt, April 2018).



Project Environmental Services	Map Source: Sixmap (2016) Scale 0 120 200 400 (kilometres)	Dixon Sand (Penrith) Pty Ltd Figure 1 Locality Plan	Plan No: J16-001-ONR NM P1 Version: 1.0 Date: 20/06/2019 Drawn By: HC N

2. Noise Compliance Criteria

2.1 Approvals and Hours of Operation

The Old Northern Road Quarry (ONR) operates under the development consent DA250-09-01 (Modification 5), issued by the Department of Planning and Environment on 17th November 2017. Quarry operation hours and activities permitted by the development consent are outlined in Table 2.

Table 1: Hours of Operation – Old Northern Road Quarry.

Consent Condition	Activity	Permissible Hours
DA250-09-01, Condition 1 of Schedule 3	Quarrying operations (excluding truck arrival, loading and dispatch)	7.00 am 6.00 pm Monday to Saturday
		At no time on Sundays and Public Holiday
	Truck arrival (unladen)	5.45 am 6.00 pm Monday to Saturday
		At no time on Sundays and Public Holiday
	Truck loading Truck dispatch Truck arrival (laden)	6.00 am 6.00 pm Monday to Saturday
		At no time on Sundays and Public Holiday
	Bund construction or rehabilitation works within 250m of Maroota Public School	7.00 am to 6.00 pm Monday to Friday during school holiday periods unless otherwise approved in writing by the EPA
	Maintenance	May be conducted at any time, provided that these activities are not audible at any privately-owned residence.
DA250-09-01, Condition 2 of Schedule 3	The following activities may be carried out outside the hours specified in condition 1 above: (a) Delivery or dispatch of materials as requested by the NSW Police Force or other public authorities; and (b) Emergency work to avoid the loss of lives, property or to prevent environmental harm. In such circumstances, the Applicant must notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.	

2.2 Noise Criteria

Condition 3 of Schedule 3 of DA250-09-01 requires Dixon Sand to comply with the following specific noise criteria outlined in Table 3.

Table 2: Old Northern Road – Noise Management Criteria

DA250-09-01 Consent Condition	Receiver	Averaging Period	Shoulder (6:00am to 7:00am)	Day (7:00 am to 6:00 pm)
Condition 3 of Schedule 3	Any residence on privately owned land	$L_{Aeq(15\ minutes)}$	37	44
	Any classroom at Maroota Public School	$L_{Aeq(1\ hour)}$	-	45
Note: the noise criteria in Table 2 of Condition 3 of Schedule 3 of DA250-09-01 do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement				

A noise agreement between Dixon Sand and G&M Acurso is in place therefore, the noise criteria contained in Condition 3 of Schedule 3, DA250-09-01 do not apply to the Acurso residence on Lot 117 DP 752025 (noise Receiver R1) while the agreement is in force in accordance with the development consent.

4. Attended Noise Monitoring

4.1 Noise Compliance Assessment

In order to assess compliance with the above requirements, PES conducted attended noise monitoring in accordance with Australian Standard *AS1055-1989 Acoustics – Description and Measurement of Environmental Noise, Part 1 General Procedures* and the *Noise Policy for Industry* (EPA, 2017).

Attended noise monitoring at noise sources and at identified receivers was undertaken on 3rd and 6th June 2019 during shoulder and daytime periods.

4.2 Attended Noise Monitoring

Attended noise monitoring was conducted using a Rion NL- 42 CLASS 2 Sound Level Meter (SLM) set to A-weighted/Fast response. The SLM was calibrated prior to use with an NC-74 Tone Calibrator. The SLM and Tone Calibrator were calibrated by a NATA accredited acoustic laboratory (Calibration Certificate No. C18546 and C18547).

Attended noise monitoring was undertaken in order to measure:

- Instantaneous noise levels of background sources such as local traffic, aircraft, birdcalls and surrounding agricultural and quarry activities;
- Instantaneous noise levels of audible quarry operations such as crushing, screening, ripping, quarry machinery (movements, reverse beepers) and truck haulage (loading & transport);
- Time, location, duration of sample; and
- L_{Aeq}, L_{Amin}, L_{Amax}, L_{A05}, L_{A10}, L_{A50} and L_{A90} parameters.

Wind speed was recorded during each of the attended monitoring periods using a hand-held anemometer which was positioned within 5 metres of the SLM microphone at an equal height above ground level. Weather data was obtained from the weather station located adjacent to the Maroota Public School as required by Environment Protection Licence #3916. The sigma-theta is used to estimate the Pasquill-Gifford stability category, based on the standard deviation of the wind direction across the hourly period. The shoulder period stability is determined in accordance with Fact Sheet D of the *Noise Policy for Industry* (EPA, 2017).

4.3 Setback Calculations

Due to high levels of background noise in the surrounding area from sources such as local traffic, other quarry operations, birdcalls, insects and agricultural activities in the vicinity, additional calculations were undertaken to predict the 'quarry-borne' noise contribution at the receivers. Prediction of quarry borne noise impacts are determined using the setback noise calculation methodology outlined in Chapter 4 of the *Interim Construction Noise Guidelines* (DECC, 2009). These calculated predicted impacts exclude the influence of background and extraneous noise sources, and are only undertaken where quarry operations are not clearly

audible above background noise at the receiver. Noise predictions require a 15 minute measurement to be taken within close proximity of quarry operations, with minimal influence from noise generated by other non-quarry activities. This methodology of calculating predicted noise impacts complies with Section 7 of the *Noise Policy for Industry* (EPA, 2017).

4.4 Quarry Operations

The following activities and plant listed in Table 4, were in operation at the time of the attended noise compliance monitoring.

Table 3: Quarry and plant operations.

Quarry Location	Quarry Operation	Plant
Lot 196	Main processing plant, material stockpiling, haulage truck loading	2 x Front end loaders, Multiple haulage trucks
Lot 196 (north-east near front gate)	Sand screening, stockpiling and loading of haulage truck	2 x Front end loaders loading dump truck and stockpiling material 1 x Haulage truck transferring from Haerses Road
Lot 1 & 2	Sand screening, stockpiling and loading of dump truck	1 x Excavator loading screen 1 x Excavator loading dump truck 1 x Front end loader stockpiling 1 x Telehandler moving equipment

4.5 Monitoring Locations

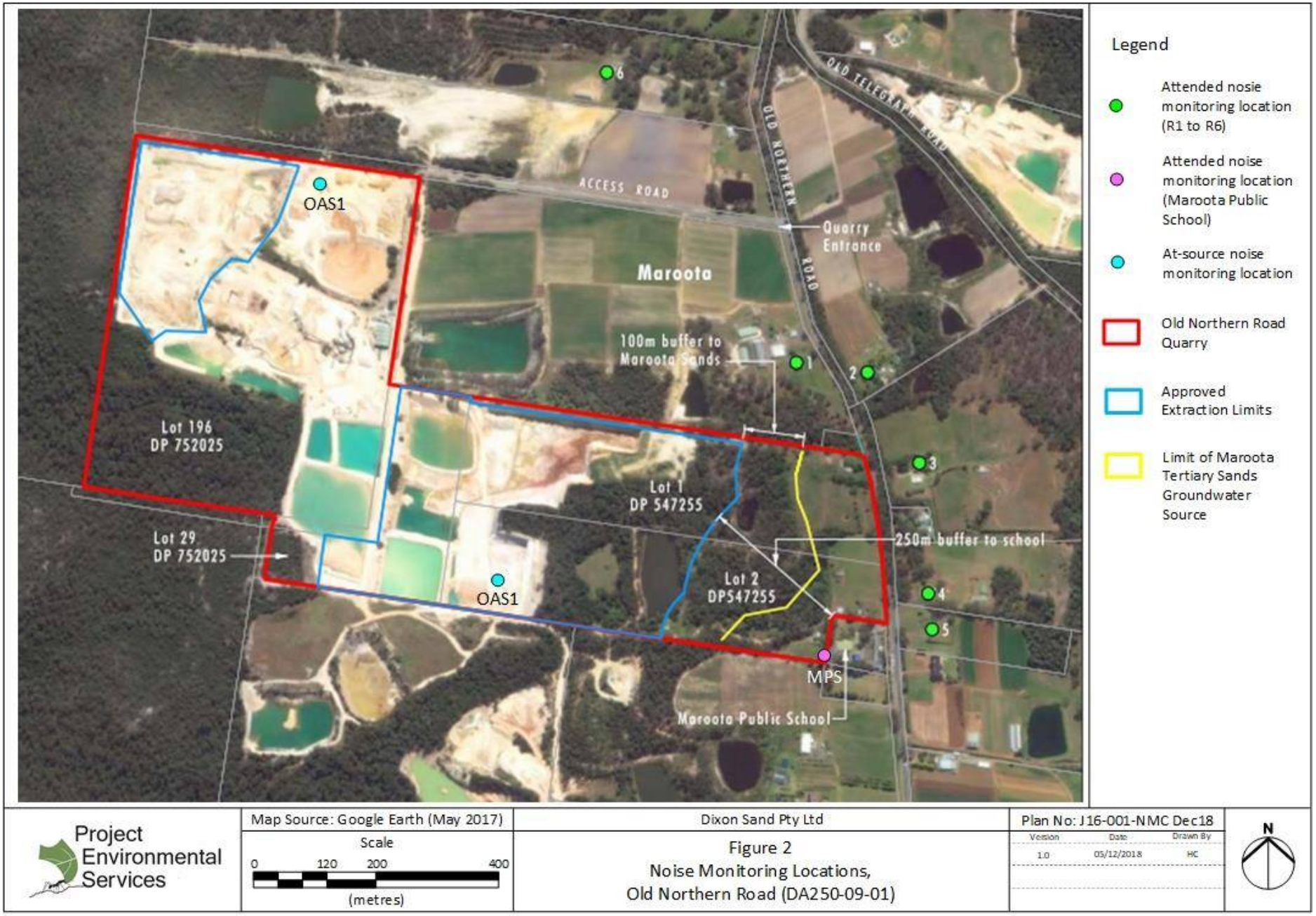
Attended noise monitoring was undertaken at the receivers outlined in Table 5 for daytime (between 7:00am and 5:00pm) and shoulder (between 5:45am and 7:00am) periods. At-source noise monitoring was undertaken at OAS1 and OAS2.

Table 4: Receiver and at-source noise monitoring locations.

Noise Receiver for Attended Noise Monitoring	Noise Source Location for At-Source Noise Monitoring
MPS (Maroota Public School)	OAS1 (Lots 1 and 2 operation)
R1*	Attended noise monitoring not conducted
R2	OAS1 (Lots 1 and 2 operation) OAS2 (Lot 196 operation)
R3	OAS1 (Lots 1 and 2 operation) OAS2 (Lot 196 operation)
R4	OAS1 (Lots 1 and 2 operation) OAS2 (Lots 1 and 2 operations)
R5	OAS1 (Lots 1 and 2 operation) OAS2 (Lots 1 and 2 operations)
R6	OAS2 (Lot 196 operation)

Note: Receiver R1 and Dixon Sand currently has a noise agreement in place.*

Figures 2 shows the locations of the identified noise receivers, attended noise monitoring and at-source monitoring in reference to the quarry.


Legend
Attended nosie monitoring location (R1 to R6)
Attended noise monitoring location (Maroota Public School)
At-source noise monitoring location
Old Northern Road Quarry
Approved Extraction Limits
Limit of Maroota Tertiary Sands Groundwater Source
ACCESS ROAD
OLD NORTHERN ROAD
OLD TELEGRAPH ROAD
Quarry Entrance
Maroota
100m buffer to Maroota Sands
250m buffer to school
OAS1
OAS1
Lot 196 DP 752025
Lot 29 DP 752025
Lot 1 DP 547255
Lot 2 DP547255
MPS
Maroota Public School
1
2
3
4
5
6
Project Environmental Services
Map Source: Google Earth (May 2017)
Scale
0 120 200 400
(metres)
Dixon Sand Pty Ltd
Figure 2
Noise Monitoring Locations,
Old Northern Road (DA250-09-01)
Plan No: J16-001-NMC Dec18
Version Date Drawn By
1.0 05/12/2018 HC
N

5. Noise Monitoring Results

5.1 Attended and At-Source Noise Monitoring Results

Table 6 presents the results obtained from at-source monitoring.

Table 7 contains the attended noise monitoring results at receivers which exhibit values greater than the noise management criteria values during the monitoring periods.

Where monitored levels were found to be in exceedance of noise criteria values or where attended noise monitoring could not be conducted, calculations of the quarry-borne noise contribution to the monitored noise receivers have been undertaken in accordance with Section 7 of the *Noise Policy for Industry* (EPA, 2017). Table 8 presents the predicted noise impacts at receivers which demonstrate quarry borne noise contribution below the noise management criteria.

Appendix A presents the weather data obtained from the weather station and the calculated Pasquill-Gifford stability classes during the two days of shoulder period attended noise monitoring. The determined stability classes indicate that temperature inversion was unlikely to have been present for during the attended noise monitoring for the shoulder periods. No temperature inversions occurred during daytime attended noise monitoring.

Table 5: At-source noise monitoring results, June 2019.

At-source monitoring location	Quarry Operation	Distance between SLM and Quarry operation	LAeq 15min (dBA)	LAmax (dBA)	LAmin (dBA)	L10 (dBA)	L90 (dBA)
OAS1	Lots 1 and 2	85m between SLM and OAS1	53.6	68.7	46.8	55.9	49.9
OAS2	Lot 196 Front Gate	30m between SLM and OAS2	66.4	70.6	59.0	68.6	64.4

Table 6: Attended noise monitoring results, June 2019.

Noise Receiver	Monitoring Period	Date, Time	Observations (dBA)	Measured Levels (dBA)					Noise Criteria (dBA)			Weather Observation
				LAeq 15min	LAmax	LAmin	L10	L90	Day (7am-6pm) Leq1hour	Day (7am-6pm) Leq15min	Shoulder (6-7am) Leq15min	
Maroota Public School	Shoulder	Did not conduct attended noise monitoring during shoulder period – no criteria required										
	Day	06/06/2019, 10:03 - 10:18 am	• ONR traffic intermittently audible: 41.4 – 51.3 • Bird calls constant throughout monitoring: 37.8 – 62.0 • Operations on Lots 1&2 slightly audible	**43.4**	65.5	34.3	46.4	38.0	**45**	-	-	Sunny, clear sky, temp 12.4^{oC}, wind speed 0.6m/s SW at mic
R1	Shoulder	Did not conduct attended noise monitoring due to a noise agreement in place between Dixon Sand and receiver R1										
	Day											
R2	Shoulder	03/06/2019, 6:24 - 6:39 am	• Quarry ops – loading of haulage trucks – inaudible • Dominant noise from ONR traffic: 46 – 82.3 • Bird calls: 35.3 - 58 • Rooster call: 44.3 – 49.2	**63.3**	82.9	31.7	66.9	39.1	-	**-**	**37**	Clear sky, temp 7^{oC}, wind speed 0.7m/s NW at mic
	Day	06/06/2019, 11:12 - 11:27 am	• ONR traffic: 62.0 – 78.4 • Bird calls constant: 35.8 – 41.7 • Aeroplane slightly audible • Quarry operation inaudible, intermittent at 5:15 and 6:10 min) • Dominant noise sources from ONR traffic and bird calls	**59.8**	82.2	33.0	61.4	35.6	-	**44**	-	Sunny, clear sky, temp 13^{oC}, wind speed 1.3m/s W-NW at mic
R3	Shoulder	03/06/2019, 6:06 - 6:21 am	• Quarry ops – loading of haulage trucks – slightly audible • Dominant noise from ONR traffic: 64.2 – 80.5 • Bird calls: 38.2 • Rooster call: 33.5-39.1	**60.8**	80.7	28.6	61.3	34.5	-	-	**37**	Clear sky, temp 6.8^{oC}, wind speed 0.6m/s N at mic

Noise Receiver	Monitoring Period	Date, Time	Observations (dBA)	Measured Levels (dBA)					Noise Criteria (dBA)			Weather Observation
				LAeq 15min	LAmax	LAmin	L10	L90	Day (7am-6pm) Leq1hour	Day (7am-6pm) Leq15min	Shoulder (6-7am) Leq15min	
	Day (1)	03/06/2019, 10:32 – 10:47 am	• Quarry operation on Lot 196 slightly audible. • Dominant noise source from ONR traffic: 62.4 – 85.8 • Birdcalls constant: 44.9 – 52.7 • Aeroplane audible at a distance	**60.6**	86.1	39.2	61.9	43.8	-	**44**	-	Sunny, clear sky, wind speed 2.9m/s at mic
	Day (2)	06/06/2019, 10:52 - 11:07 am	• Dominant noise source from ONR traffic: 62.6 – 81.6 • Birdcalls constant: 35.8 – 46.8 • Aeroplane audible at a distance • School students in playground slightly audible after 8:20 mins: 43.4 – 50.3 • Quarry operation on Lots 1&2 intermittently audible (inaudible after 5th minute)	**60.7**	81.6	32.4	62.6	36.2	-	**44**	-	Sunny, clear sky, temp 12.4^{oC}, wind speed 0.6m/s SW at mic
R4	Shoulder	03/06/2019, 5:45 - 6:00 am	• Combined Shoulder Period monitoring between R4 and R5 • Quarry operation – only truck movement into quarry. • Dominant noise sources from ONR traffic: 50.5 – 83.9 • Bird calls: 39.0 • Resident R4 generated noise near their vehicle: 43.0 • WFR traffic intermittently audible	**66.4**	86.1	33.3	65.9	39.4	-	-	**37**	Clear sky, temp 7.2^{oC}, wind speed 0.8m/s W at mic
	Day	06/06/2019, 11:31 - 11:46 am	• Dominant noise sources from ONR traffic: 60.3 – 87.0 • Bird calls: 44 – 63.5 • Resident contributed to noise measurement, start up car: 41.1 • Quarry operation intermittently audible during 0-5, 8:40, 9:41, 10:45, 11:49 and 12:12:30 min: 39 - 40	**67.4**	87.5	36.0	70.1	39.6	-	**44**	-	Sunny, clear sky, wind speed 1.5m/s SW-W at mic

Noise Receiver	Monitoring Period	Date, Time	Observations (dBA)	Measured Levels (dBA)					Noise Criteria (dBA)			Weather Observation
				LAeq 15min	LAmax	LAmin	L10	L90	Day (7am-6pm) Leq1hour	Day (7am-6pm) Leq15min	Shoulder (6-7am) Leq15min	
R5	Shoulder	03/06/2019, 5:45 - 6:00 am	• Combined Shoulder Period monitoring between R4 and R5 • Quarry operation – only truck movement into quarry. • Dominant noise sources from ONR traffic: 50.5 – 83.9 • Bird calls: 39.0 • Resident R4 generated noise near their vehicle: 43.0 • WFR traffic intermittently audible	**66.4**	86.1	33.3	65.9	39.4	-	-	**37**	Clear sky, temp 7.2^{oC}, wind speed 0.8m/s W at mic
	Day	06/06/2019, 11:50 am - 12:05 pm	• Dominant noise source from ONR traffic: 67.5 – 83.8 • Birdcalls constant: 41.6 – 65.9 • School students outside of classroom: 44.4 – 47.5 • Quarry operation on Lots 1&2 intermittently audible	**66.4**	84.4	34.9	69.3	38.8	-	**44**	-	Sunny, clear sky, temp 15^{oC}, wind speed 1.7m/s SW-W at mic
R6	Shoulder	06/06/2019, 6:45 - 7:00 am	• Quarry operation - truck loading intermittlently audible • Dominant noise sources from ONR traffic: 37.4 – 57.4 • Quarry access road: 45.9 – 49.2 • Constant Bird calls: 35.1 – 57.1 • Receiver R1 goat: 42.8 • Dog barking – intermittently audible	**43.1**	64.6	31.7	46.6	35.5	-	-	**37**	Clear sky, sun rising, temp 7.4^{oC}, wind speed 1.4m/s N-NW at mic
	Day	03/06/2019, 11:55 am - 12:10 pm	• ONR traffic: 46.9 – 55.1 • Birdcalls: 45.1 – 53.0 • Quarry access road: 48.1 – 50.9 • Quarry operation on Lot 196 audible	**47.2**	58.1	40.0	49.8	43.2	-	**44**	-	Sunny, clear sky, wind speed 2.5m/s at mic

Table 7: Predicted Noise Levels using Setback Calculations for Quarry operations at OAS1, June 2019.

Receiver Location	Distance between Receiver and SLM (m)	Monitoring Period	Comments	Predicted Noise Level at Receiver (setback calculation from at-source monitoring) (dBA)	Noise Criteria (dBA)			Compliance
					Shoulder (6-7am) Leq15min	Day (7am-6pm) Leq15min	Day (7am-6pm) Leq1hour	
MPS	530	Shoulder	School not operating – no criteria set for Shoulder period	Not Applicable	-	-	-	N/A
		Day	Quarry ops slightly audible	**37.7**			45	Yes
R1*	380	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day	No attended noise monitoring conducted	**40.6**		**44**		Yes
R2	485	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day	Quarry inaudible	**38.5**		**44**		Yes
R3	551	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day	Quarry intermittently audible	**37.4**		**44**		Yes
R4	612	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day	Quarry intermittently audible	**36.5**		**44**		Yes
R5	641	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day	Quarry intermittently audible	**36.1**		**44**		Yes
R6	640	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day		**36.1**		**44**		Yes

*Note: A noise agreement between Dixon Sand and receiver R1 is in place and therefore the noise criteria do not apply.

Table 8: Predicted Noise Levels using Setback Calculations for Quarry operations at OAS2, June 2019.

Receiver Location	Distance between Receiver and SLM (m)	Monitoring Period	Comments	Predicted Noise Level at Receiver (setback calculation from at-source monitoring) (dBA)	Noise Criteria (dBA)			Compliance
					Shoulder (6-7am) Leq15min	Day (7am-6pm) Leq15min	Day (7am-6pm) Leq1hour	
Maroota Public School	1100	Shoulder	School not operating – no criteria set for Shoulder period	Not Applicable	-	-	-	N/A
		Day		**35.0**			45	Yes
R1*	787	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day	No attended noise monitoring conducted	**38.0**		**44**		Yes
R2	900	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day		**36.9**		**44**		Yes
R3	1038	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day	Quarry operations slightly audible	**35.6**		**44**		Yes
R4	1160	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day		**34.7**		**44**		Yes
R5	1200	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day		**34.4**		**44**		Yes
R6	472	Shoulder	Quarry operations – truck loading, no extraction	**<37**	**37**			Yes
		Day	Quarry operations audible	**42.5**		**44**		Yes

*Note: A noise agreement between Dixon Sand and receiver R1 is in place and therefore the noise criteria do not apply.

5.2 Modifying Factor Adjustments

The requirement for modifying factor adjustments has been considered in accordance with Condition 4(c) and (d) of Appendix 6 of DA250-09-01 (Modification 5).

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. Fact Sheet C of the *Noise Policy for Industry* (EPA, 2017) defines the requirements for applying modifying factor adjustments to be applied to the measured or predicted noise levels at the receiver locations, prior to making any comparison with the quarry operational noise criteria set out in Table 3 of this report.

"Table C1 Modifying factor corrections" contained in *Noise Policy for Industry* (EPA, 2017) is reproduced in Appendix B. Noise generated from quarry operations do not display factors that would require modifying factor adjustments prior to comparison with the specified noise levels in the consent. Noise generated from quarry operations is not considered tonal, impulsive or of low frequency at the time of monitoring.

6. Discussion

No measured noise levels are considered to have been enhanced by meteorological conditions as outlined in Appendix 6 of the development consent and Section 1.2 of this report. Meteorological conditions recorded at the weather station installed by the Dixon Sand adjacent to the Maroota Public School, as required by the Environment Protection Licence No. 3916, do not include corrections for the meteorological condition. During attended noise monitoring at receivers, ambient and extraneous noise from sources such as insects, birdcalls and local traffic dominated the acoustic environment.

At the Maroota Public School, setback calculations indicate that the daytime predicted quarry borne noise levels experienced at the receiver are L_{Aeq} 37.7 dBA and L_{Aeq} 35.0 dBA for quarry operations on Lots 1 and 2 and Lot 196, respectively. The predicted quarry borne noise levels are lower than the daytime noise criteria of 45 dBA defined by the development consent. Attended noise monitoring on the western perimeter of the school indicated that the environment is highly influenced by external noise sources from the Old Northern road local traffic and birdcalls. Quarry operations were intermittently audible during the attended noise monitoring. The development consent does not stipulate noise criteria during shoulder period as the school is not in operation.

No attended noise monitoring was undertaken at receiver R1 due to a noise agreement currently in place between Dixon Sand and the receiver.

Setback calculations utilising at-source noise monitoring results have been undertaken to determine the predicted noise impacts at receivers R1 to R6 (inclusive). Tables 8 and 9 demonstrate that the predicted noise impact levels at all receivers are below the daytime noise management criteria contained in the DA250-09-01. Predicted noise impact levels during shoulder period can assumed to be less than those calculated for daytime due to restricted quarry operations.

It must be noted that setback calculations represent the worst-case noise impact scenarios as no topographical or building material noise attenuation has been taken into account. It would be reasonable to state that the setback calculations for predicted noise impacts are likely to be higher than the actual noise levels experienced at the receivers.

7. Statement of Compliance

The results of the attended noise monitoring and predicted noise impacts from setback calculations indicate that Dixon Sand's Old Northern Road quarry operations were in compliance with the noise assessment criteria at receivers R1 to R6 (inclusive) and the MPS (Maroota Public School) under the meteorological conditions at the time of monitoring.

An agreement between Dixon Sand and receiver R1 is in place and therefore, noise management levels defined by the development consent are not applicable.

8. References

Australian Standard *AS1055.1-1997. Acoustics – Description and measurement of environmental noise, General Procedures*.

Department of Environment & Climate Change NSW (2009), *Interim Construction Noise Guideline*.

Environment Protection Authority NSW (2017), *New South Wales Noise Policy for Industry.*

Appendix A

Meteorological Data

Meteorological Data obtained from the Meteorological Station (Monitoring Point 3 of EPL 3916)

Date, Time	Temperature (°C)	Wind Speed (m/s)	Wind Direction (°)	Sigma Theta	Pasquill-Gifford Stability Class for Shoulder Period	Stability Classification
03/06/2019, 05:40 am	12.4	0.7	320	30.8	A	Extremely unstable
03/06/2019, 05:45 am	12.5	1.1	307	40.3	A	Extremely unstable
03/06/2019, 05:50 am	12.5	0.6	323	60.4	A	Extremely unstable
03/06/2019, 05:55 am	12.5	0.4	343	67.1	A	Extremely unstable
03/06/2019, 06:00 am	12.6	0.5	329	44.9	A	Extremely unstable
03/06/2019, 06:05 am	12.6	0.4	3	51.7	A	Extremely unstable
03/06/2019, 06:10 am	12.5	0.2	34	59.0	A	Extremely unstable
03/06/2019, 06:15 am	12.5	0.2	268	59.2	A	Extremely unstable
03/06/2019, 06:20 am	12.4	0.6	282	46.4	A	Extremely unstable
03/06/2019, 06:25 am	12.4	1.3	308	35.0	A	Extremely unstable
03/06/2019, 06:30 am	12.5	0.9	325	33.2	A	Extremely unstable
03/06/2019, 06:35 am	12.4	0.7	278	41.6	A	Extremely unstable
03/06/2019, 06:40 am	12.4	1.6	335	47.3	A	Extremely unstable
03/06/2019, 06:45 am	12.3	0.6	262	45.0	A	Extremely unstable
03/06/2019, 06:50 am	12.2	1.4	334	40.4	A	Extremely unstable
03/06/2019, 06:55 am	12.4	1.7	267	34.2	A	Extremely unstable
03/06/2019, 07:00 am	12.4	0.5	37	43.9	A	Extremely unstable

Date, Time	Temperature (°C)	Wind Speed (m/s)	Wind Direction (°)	Sigma Theta	Pasquill-Gifford Stability Class for Shoulder Period	Stability Classification
06/06/2019, 05:40 am	7.1	0.4	291	43.8	A	Extremely unstable
06/06/2019, 05:45 am	7.2	0.9	268	15.6	C	Slightly unstable
06/06/2019, 05:50 am	6.9	0.6	326	15.6	C	Slightly unstable
06/06/2019, 05:55 am	6.8	0.6	252	43.7	A	Extremely unstable
06/06/2019, 06:00 am	6.7	0.3	272	54.2	A	Extremely unstable
06/06/2019, 06:05 am	6.8	0.6	10	36.1	A	Extremely unstable
06/06/2019, 06:10 am	6.8	0.3	22	48.0	A	Extremely unstable
06/06/2019, 06:15 am	6.8	0.4	345	32.4	A	Extremely unstable
06/06/2019, 06:20 am	6.9	0.7	330	35.8	A	Extremely unstable
06/06/2019, 06:25 am	7.1	0.1	337	50.9	A	Extremely unstable
06/06/2019, 06:30 am	7.0	1.3	357	49.3	A	Extremely unstable
06/06/2019, 06:35 am	7.2	0.3	315	48.1	A	Extremely unstable
06/06/2019, 06:40 am	7.1	0.5	20	72.2	A	Extremely unstable
06/06/2019, 06:45 am	7.2	0.8	12	92.5	A	Extremely unstable
06/06/2019, 06:50 am	7.2	0.2	32	40.8	A	Extremely unstable
06/06/2019, 06:55 am	7.4	1.4	312	26.7	A	Extremely unstable
06/06/2019, 07:00 am	7.5	0.6	303	13.7	C	Slightly unstable

Appendix B

Table C1: Modifying Factor Corrections

Table C1: Modifying factor corrections

Factor	Assessment / measurement	When to apply	Corection[1]	Comments
Tonal noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method (ISO1996.2-2007 – Annex D).	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: • 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz • 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz • 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.	5 dB[2,3]	Third octave measurements should be undertaken using unweighted or Z-weighted measurements. Note: Narrow-band analysis using the reference method in ISO1996-2:2007, Annex C may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified, e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands.
Low-frequency noise	Measurement of source contribution Cweighted and Aweighted level and one-third octave measurements in the range 10– 160 Hz	Measure/assess source contribution C- and A-weighted Leq,T levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: • where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2-dB(A) positive adjustment to measured/predicted Aweighted levels applies for the evening/night period • where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted Aweighted levels applies for the evening/night period and a 2- dB(A) positive adjustment applies for the daytime period.	2 or 5 dB[2]	A difference of 15 dB or more between C and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.
Intermittent noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level.	The source noise heard at the receiver varies by more than 5 dB(A) and the intermittent nature of the noise is clearly audible.	5 dB	Adjustment to be applied for nighttime only.
Duration	Single-event noise duration may range from 1.5 min to 2.5 h.	One event in any assessment period.	0 to 20 dB(A)	The project noise trigger level may be increased by an adjustment depending on duration of noise (see Table C3).
Maximum adjustment	Refer to individual modifying factors.	Where two or more modifying factors are indicated.	Maximum correction of 10 dB(A)2 (excluding duration correction).	

Notes:

1. Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.
2. Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.
3. Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.

Dixon Sand Pty Ltd
Old Northern Road Quarry, Maroota

Noise Monitoring Report
for DA250-09-01 Modification 5

File Name:	J16-001 ONR Noise Mon 12_2018 v1.0
Version:	1.0
Prepared by:	Project Environmental Services Pty Ltd
Client:	Dixon Sand Pty Ltd

Project Environmental Services

Document Control

File name	J16-001 ONR Noise Mon 12_2018 v1.0		
Report name	Dixon Sand Pty Ltd - Old Northern Road Noise Monitoring Report - December 2018		
Prepared by:	Hunsamon Churcher Environmental Consultant		
Authorised by:	Chris Churcher Senior Environmental Consultant / Director		
Document Version	VDraft	Issued:	10/12/2018 Draft for Internal Review
	V1.0		15/12/2018 Final report issued to client

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Tables

Appendix

Abbreviations and Glossary

A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise
DA250-09-01	Development Consent DA250-09-01 Modification 5
dB(A)	An expression of the relative loudness of sound transmission in air as perceived by the human ear. Normalised/Weighted to the tone of “A”.
Dixon Sand	Dixon Sand (Penrith) Pty Ltd
EPA	NSW Environment Protection Authority
LAeq(x minutes)	A-weighted, equivalent continuous noise level – the level of noise equivalent to the energy – average of noise levels occurring over a measured period.
LA90	The A-weighted sound pressure level that is exceeded for 90 percent of the time of which a given sound pressure is measured. This is considered to represent the background noise.
LAmax	Maximum sound pressure level, A-weighted
LAmin	Minimum sound pressure level, A-weighted
ONR	Old Northern Road
PES	Project Environmental Services Pty Ltd
Receiver	The noise-sensitive land use at which noise from a development can be heard
SLM	Sound Level Meter. An electronic measuring device recording instantaneous Sound Pressure Levels.

1. Introduction

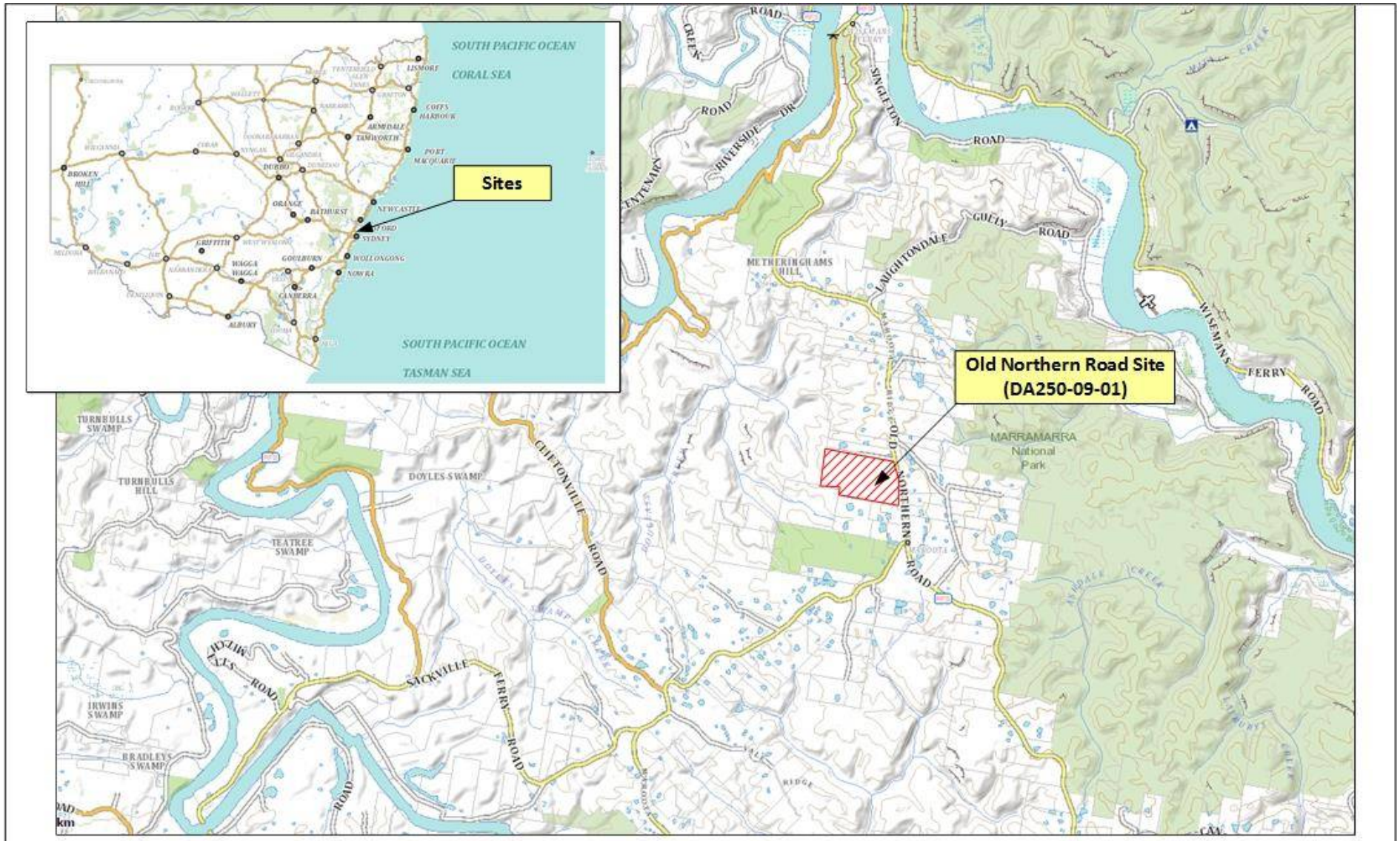
1.1 Background

Dixon Sand Pty Ltd (Dixon Sand) operates the Old Northern Road sand quarry (Lots 29 and 196 DP 752025 and Lots 1 and 2 DP 547255) in Maroota. The quarry is located approximately 50 kilometres north-west of Sydney Central Business District. The location of the quarry is shown in Figure 1.

Dixon Sand undertakes sand and bulk sandstone extraction, processing and direct sales to the commercial market with transfers of materials between licenced facilities. Materials provide a significant supply to the construction and maintenance industries.

1.2 Scope of Assessment

Project Environmental Services Pty Ltd (PES) was commissioned by Dixon Sand to undertake the 6-monthly attended noise monitoring and reporting in accordance with conditions outlined in the development consent DA 250-09-01, Environment Protection Licence # 3916 and the approved Noise Management Plan (Umwelt, April 2018).



Project Environmental Services	Map Source: Sixmap (2016) Scale 0 120 200 400 (kilometres)	Dixon Sand (Penrith) Pty Ltd Figure 1 Locality Plan	Plan No: J16-001-AR2015/16-1 Version: 1.0 Date: 12/09/2016 Drawn By: HC N

2. Noise Compliance Criteria

2.1 Approvals and Hours of Operation

The Old Northern Road Quarry (ONR) operates under the development consent DA250-09-01 (Modification 5), issued by the Department of Planning and Environment on 17th November 2017. Quarry operation hours and activities permitted by the development consent are outlined in Table 1.

Table 1: Hours of Operation – Old Northern Road Quarry.

Consent Condition	Activity	Permissible Hours
DA250-09-01, Condition 1 of Schedule 3	Quarrying operations (excluding truck arrival, loading and dispatch)	7.00 am 6.00 pm Monday to Saturday
		At no time on Sundays and Public Holiday
	Truck arrival (unladen)	5.45 am 6.00 pm Monday to Saturday
		At no time on Sundays and Public Holiday
	Truck loading Truck dispatch Truck arrival (laden)	6.00 am 6.00 pm Monday to Saturday
		At no time on Sundays and Public Holiday
	Bund construction or rehabilitation works within 250m of Maroota Public School	7.00 am to 6.00 pm Monday to Friday during school holiday periods unless otherwise approved in writing by the EPA
	Maintenance	May be conducted at any time, provided that these activities are not audible at any privately-owned residence.
DA250-09-01, Condition 2 of Schedule 3	The following activities may be carried out outside the hours specified in condition 1 above: (a) Delivery or dispatch of materials as requested by the NSW Police Force or other public authorities; and (b) Emergency work to avoid the loss of lives, property or to prevent environmental harm. In such circumstances, the Applicant must notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.	

2.2 Noise Criteria

Condition 3 of Schedule 3 of DA250-09-01 requires Dixon Sand to comply with the following specific noise criteria outlined in Table 2.

Table 2: Old Northern Road – Noise Management Criteria

DA250-09-01 Consent Condition	Receiver	Averaging Period	Shoulder (6:00am to 7:00am)	Day (7:00 am to 6:00 pm)
Condition 3 of Schedule 3	Any residence on privately owned land	$L_{Aeq(15\ minutes)}$	37	44
	Any classroom at Maroota Public School	$L_{Aeq(1\ hour)}$	-	45
Note: the noise criteria in Table 2 of Condition 3 of Schedule 3 of DA250-09-01 do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement				

A noise agreement between Dixon Sand and G&M Acurso is in place therefore, the noise criteria contained in Condition 3 of Schedule 3, DA250-09-01 do not apply to the Acurso residence on Lot 117 (noise Receiver R1), DP 752025 while the agreement is in force in accordance with the development consent.

Attended Noise Monitoring

3.1 Noise Compliance Assessment

In order to assess compliance with the above requirements, PES conducted attended noise monitoring in accordance with Australian Standard *AS1055-1989 Acoustics – Description and Measurement of Environmental Noise, Part 1 General Procedures* and the *Noise Policy for Industry* (EPA, 2017).

Attended noise monitoring at noise sources and at identified receivers was undertaken on 3rd, 4th and 5th December 2018.

3.2 Attended Noise Monitoring

Attended noise monitoring was conducted using a Rion NL- 42 CLASS 2 Sound Level Meter (SLM) set to A-weighted/Fast response. The SLM was calibrated prior to use with an NC-74 Tone Calibrator. The SLM and Tone Calibrator were calibrated by a NATA accredited acoustic laboratory (Calibration Certificate No. C18546 and C18547).

Attended noise monitoring was undertaken in order to measure:

- Instantaneous noise levels of background sources such as local traffic, aircraft, birds and surrounding agricultural and quarry activities;
- Instantaneous noise levels of audible quarry operations such as crushing, screening, ripping, quarry machinery (movements, reverse beepers) and truck haulage (loading & transport);
- Time, location, duration of sample; and
- L_{Aeq}, L_{Amin}, L_{Amax}, L_{A05}, L_{A10}, L_{A50} and L_{A90} parameters.

Wind speed was recorded during each of the attended monitoring periods using a hand-held anemometer which was positioned within 5 metres of the SLM microphone at an equal height above ground level. Weather data was obtained from the weather station located adjacent to the Maroota Public School as required by Environment Protection Licence #3916. The sigma-theta is used to estimate the Pasquill-Gifford stability category, based on the standard deviation of the wind direction across the hourly period. The shoulder period stability is determined in accordance with Fact Sheet D of the *Noise Policy for Industry* (EPA, 2017).

3.3 Setback Calculations

Due to high levels of background noise in the surrounding area from sources such as local traffic, other quarry operations, birdcalls, insects and agricultural activities in the vicinity, additional calculations were undertaken to predict the 'quarry-borne' noise contribution at the receivers. Prediction of quarry borne noise impacts are determined using the setback noise calculation methodology outlined in Chapter 4 of the *Interim Construction Noise Guidelines* (DECC, 2009). These calculated predicted impacts exclude the influence of background and extraneous noise sources, and are only undertaken where quarry operations are not clearly

audible above background noise at the receiver. Noise predictions require a 15 minute measurement to be taken within close proximity of quarry operations, with minimal influence from noise generated by other non-quarry activities. This methodology of calculating predicted noise impacts complies with Section 7 of the *Noise Policy for Industry* (EPA, 2017).

3.4 Quarry Operations

The following activities and plant listed in Table 3, were in operation at the time of the attended noise compliance monitoring.

Table 3: Quarry and plant operations.

Quarry Location	Quarry Operation	Plant
Lot 196	Main processing plant, material stockpiling, haulage truck loading	2 x Front end loaders, 1 x dump trucks, and Multiple haulage trucks
Lot 196 (north-east near front gate)	Sand screening, stockpiling and loading of haulage truck	2 x Front end loaders and 1 x haulage truck
Lot 1 & 2	Loading of Dumptruck	1 x Excavator (50 tonne) and 1 x Dump truck

3.5 Monitoring Locations

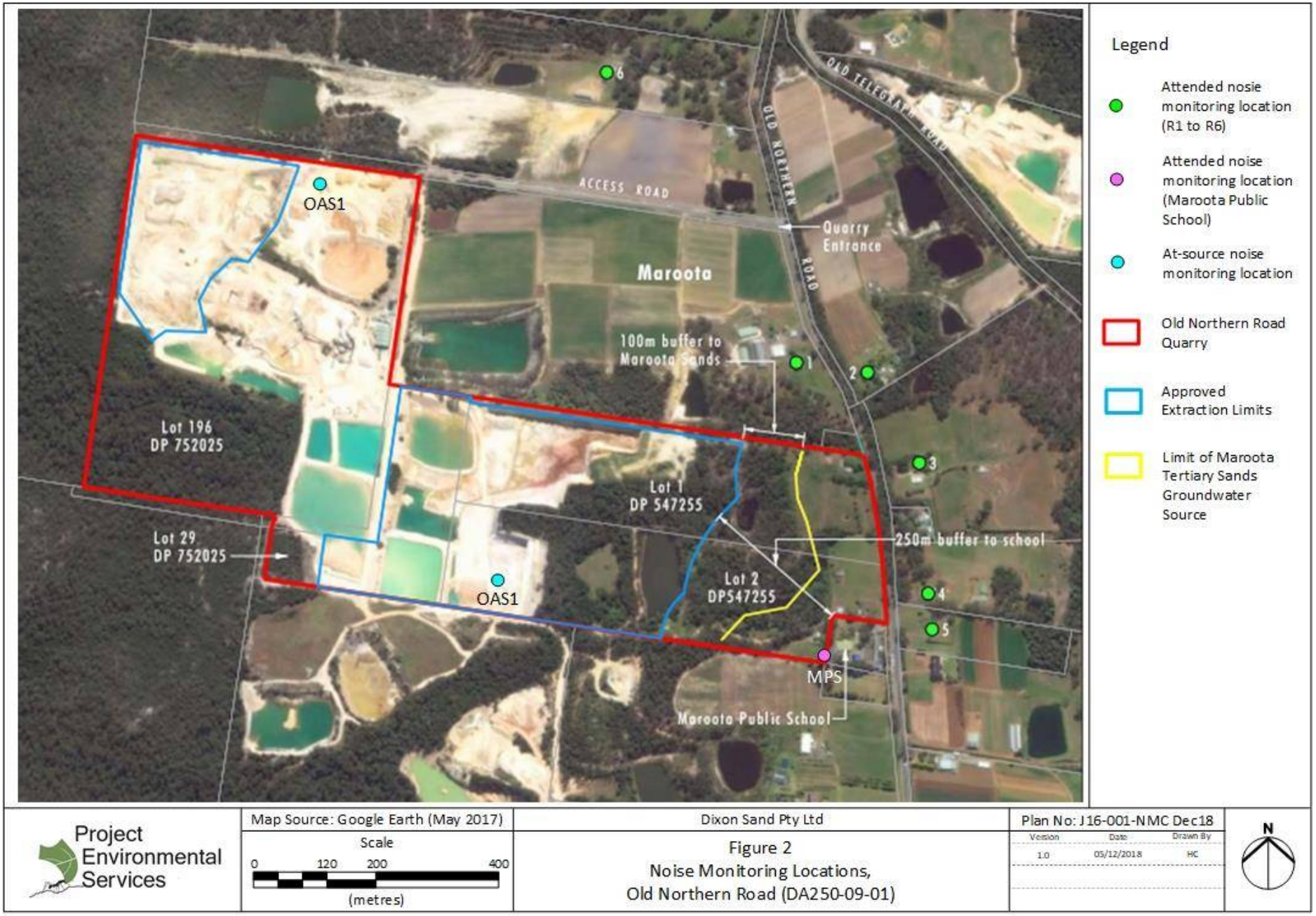
Attended noise monitoring was undertaken at the receivers outlined in Table 4 for daytime (between 7am and 5pm) and shoulder (between 6am and 7am) periods. At-source noise monitoring was undertaken at OAS1 (Lots 1 and 2 operation) and OAS2 (Lot 196 operation).

Table 4: Receiver and at-source noise monitoring locations.

Noise Receiver for Attended Noise Monitoring	Noise Source Location for At-Source Noise Monitoring
MPS (Maroota Public School)	OAS1 (Lots 1 and 2 operation)
R1*	Attended noise monitoring not conducted
R2	OAS1 (Lots 1 and 2 operation) OAS2 (Lot 196 operation)
R3	OAS1 (Lots 1 and 2 operation) OAS2 (Lot 196 operation)
R4	OAS1 (Lots 1 and 2 operation) OAS2 (Lot 196 operation)
R5	OAS1 (Lots 1 and 2 operation) OAS2 (Lot 196 operation)
R6	OAS1 (Lots 1 and 2 operation) OAS2 (Lot 196 operation)

Note: Receiver R1 and Dixon Sand currently has a noise agreement in place.*

Figures 2 shows the locations of the identified noise receivers, attended noise monitoring and at-source monitoring in reference to the quarry.


Legend
Attended nosie monitoring location (R1 to R6)
Attended noise monitoring location (Maroota Public School)
At-source noise monitoring location
Old Northern Road Quarry
Approved Extraction Limits
Limit of Maroota Tertiary Sands Groundwater Source
OAS1
ACCESS ROAD
Quarry Entrance
Maroota
OLD NORTHERN ROAD
OLD TELEGRAPH ROAD
100m buffer to Maroota Sands
Lot 196 DP 752025
Lot 1 DP 547255
Lot 29 DP 752025
Lot 2 DP547255
250m buffer to school
MPS
Maroota Public School
1
2
3
4
5
6
Project Environmental Services
Map Source: Google Earth (May 2017)
Scale
0 120 200 400
(metres)
Dixon Sand Pty Ltd
Figure 2
Noise Monitoring Locations,
Old Northern Road (DA250-09-01)
Plan No: J16-001-NMC Dec18
Version Date Drawn By
1.0 05/12/2018 HC
N

4. Noise Monitoring Results

4.1 Attended and At-Source Noise Monitoring Results

Table 5 presents the results obtained from at-source monitoring.

The attended noise monitoring results exhibit values greater than the noise management criteria values during the monitoring periods.

Where monitored levels were found to be in exceedance of noise criteria values or where attended noise monitoring could not be conducted, calculations of the quarry-borne noise contribution to the monitored noise receivers have been undertaken in accordance with Section 7 of the *Noise Policy for Industry* (EPA, 2017). Table 6 presents the predicted noise impacts at receivers which demonstrate quarry borne noise contribution below the noise management criteria.

Appendix A presents the weather data obtained from the weather station and the calculated Pasquill-Gifford stability classes during the four days of shoulder period attended noise monitoring. The determined stability classes indicate that temperature inversion may have been present for the duration of attended noise monitoring during shoulder periods. Temperature inversions are common characteristics of winter weather condition and may occur in summer months. During the shoulder period, neutral to moderately stable classes were present.

Table 5: At-source noise monitoring results, December 2018.

At-source monitoring location	Quarry Operation	Distance between SLM and Quarry operation	LAeq 15min (dBA)	LAmax (dBA)	LAmin (dBA)	LA90 (dBA)
OAS1	Lots 1 and 2: 50T Excavator loading a dump truck	20m between SLM and OAS1	64.8	79.8	52.7	44.6
OAS2	Lot 196: 2 x Front end loaders loading the screen and haulage truck (for material transfer)	15m between SLM and OAS2	70.9	80.4	68.2	69.6

Table 6: Predicted Noise Levels using Setback Calculations for Quarry operations, December 2018.

Receiver Location	Distance betw. Receiver and At source mon (m)	Monitoring Period	Comments	Predicted Noise Level at Receiver (setback calculation from at-source monitoring) (dBA)	Noise Criteria (dBA)			Compliance
					Shoulder (6-7am) Leq15min	Day (7am-6pm) Leq15min	Day (7am-6pm) Leq1hour	
Maroota Public School	1150 (to Lot 196)	Shoulder	School not operating – no criteria set for Shoulder period	Not Applicable	-	-	-	N/A
		Day	Quarry operations intermittently audible	33.2			45	Yes
	605 (to Lots 1&2)	Shoulder	School not operating – no criteria set for Shoulder period	Not Applicable	-	-	-	N/A
		Day	No attended noise monitoring conducted	35.2			45	Yes
R1*	795 (to Lot 196)	Shoulder	No extraction during shoulder period	< 37	37			Yes
		Day	No attended noise monitoring conducted	36.5		44		Yes
	615 (to Lots 1&2)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	No attended noise monitoring conducted	35.0		44		Yes
R2	908 (to Lot 196)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	Quarry operations intermittently audible	35.3		44		Yes
	710 (to Lots 1&2)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	No attended noise monitoring conducted	33.8		44		Yes
R3	1075 (to Lot 196)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	Quarry operations slightly audible	33.8		44		Yes
	712 (to Lots 1&2)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	No attended noise monitoring conducted	33.8		44		Yes
R4	1170 (to Lot 196)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	No attended noise monitoring conducted	37.5		44		Yes
	733 (to Lots 1&2)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	Quarry operations inaudible	33.5		44		Yes
R5	1210 (to Lot 196)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	No attended noise monitoring conducted	32.8		44		Yes
	733 (to Lots 1&2)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	Quarry operations inaudible	33.3		44		Yes
R6	472 (to Lot 196)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	Quarry operations audible	40.9		44		Yes
	845 (to Lots 1&2)	Shoulder	No extraction during shoulder period	<37	37			Yes
		Day	No attended noise monitoring conducted	32.3		44		Yes

*Note: A noise agreement between Dixon Sand and receiver R1 is in place and therefore the noise criteria do not apply.

4.2 Modifying Factor Adjustments

The requirement for modifying factor adjustments has been considered in accordance with Condition 4(c) and (d) of Appendix 6 of DA250-09-01 (Modification 5).

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. Fact Sheet C of the *Noise Policy for Industry* (EPA, 2017) defines the requirements for applying modifying factor adjustments to be applied to the measured or predicted noise levels at the receiver locations, prior to making any comparison with the quarry operational noise criteria set out in Table 2 of this report.

"Table C1 Modifying factor corrections" contained in *Noise Policy for Industry* (EPA, 2017) is reproduced in Appendix B. Noise generated from quarry operations do not display factors that would require modifying factor adjustments prior to comparison with the specified noise levels in the consent. Noise generated from quarry operations is not considered tonal, impulsive or of low frequency.

5. Discussion

No measured noise levels are considered to have been enhanced by meteorological conditions as outlined in Appendix 6 of the development consent. Meteorological conditions recorded at the weather station installed by the Dixon Sand adjacent to the Maroota Public School, as required by the Environment Protection Licence No. 3916, do not include corrections for the meteorological condition. During attended noise monitoring at receivers, ambient and extraneous noise from sources such as insects, birdcalls and local traffic dominated the acoustic environment.

Setback calculations utilising at-source noise monitoring results have been undertaken to determine the predicted noise impacts at receivers R1 to R6 (inclusive) and the Maroota Public School. Table 8 demonstrates that the predicted noise impact levels at all receivers are below the daytime noise management criteria contained in the DA250-09-01. Predicted noise impact levels during shoulder period can assumed to be less than those calculated for daytime due to restricted quarry operations.

At the Maroota Public School, setback calculations indicate that the daytime predicted quarry borne noise level experienced at the receiver are L_{Aeq} 33.2 dBA and L_{Aeq} 35.2 dBA for operations on Lot 196 and Lots 1&2 respectively. These predicted noise levels are lower than the daytime noise criteria of 45 dBA defined by the development consent. Day time attended noise monitoring for quarry operations on Lots 1&2 at the Maroota Public School recorded an L_{Aeq15} of 50.8 dBA which was highly influenced by external noise

sources from the Old Northern road local traffic, birdcalls and cicadas. Quarry operations were intermittently audible during the attended noise monitoring. The development consent does not stipulate noise criteria during shoulder period as the school is not in operation during these times.

The results of the attended noise monitoring and predicted noise impacts from setback calculations indicate that Dixon Sand's Old Northern Road quarry operations were in compliance with the noise assessment criteria at receivers R1 to R6 (inclusive) and at the Maroota Public School under the meteorological conditions at the time of monitoring.

An agreement between Dixon Sand and receiver R1 is in place and therefore, noise management levels defined by the development consent are not applicable.

Setback calculations utilising at-source noise monitoring results have been undertaken to determine the predicted noise impacts at receivers R1 to R6 (inclusive) and Maroota Public School. Table 6 demonstrates that the predicted noise impact levels at all receivers are below the daytime noise management criteria contained in the DA250-09-01. Predicted noise impact levels during shoulder period can assumed to be less than those calculated for daytime due to restricted quarry operations.

It must be noted that setback calculations represent the worst-case noise impact scenarios as no topographical or building material noise attenuation has been taken into account. It would be reasonable to state that the setback calculations for predicted noise impacts are likely to be higher than the actual noise levels experienced at the receivers.

6. Statement of Compliance

The results of the attended noise monitoring and predicted noise impacts from setback calculations indicate that Dixon Sand's Old Northern Road quarry operations were in compliance with the noise assessment criteria at receivers R1 to R6 (inclusive) and the MPS (Maroota Public School) under the meteorological conditions at the time of monitoring.

An agreement between Dixon Sand and receiver R1 is in place and therefore, noise management levels defined by the development consent are not applicable.

7. References

Australian Standard *AS1055.1-1997. Acoustics – Description and measurement of environmental noise, General Procedures*.

Department of Environment & Climate Change NSW (2009), *Interim Construction Noise Guideline*.

Environment Protection Authority NSW (2017), *New South Wales Noise Policy for Industry.*

Appendix A

Meteorological Data

Meteorological Data

Date & Time	Temperature (ºC)	Wind Speed (m/s)	Wind Direction (degrees)	Sigma Theta	Pasquill-Gifford Stability Class
01/12/17 06:00	18.3	0.78	87	13.3	E
01/12/17 06:05	18.2	0.78	95	8.8	D
01/12/17 06:10	18.2	0.64	79	11.1	D
01/12/17 06:15	18.3	0.56	60	12.0	D
01/12/17 06:20	18.4	0.83	74	13.2	E
01/12/17 06:25	18.4	0.92	62	15.1	E
01/12/17 06:30	18.5	0.36	68	42.1	F
01/12/17 06:35	18.7	0.61	39	14.5	E

Appendix B

Table C1: Modifying Factor Corrections

Table C1: Modifying factor corrections

Factor	Assessment / measurement	When to apply	Corection[1]	Comments
Tonal noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method (ISO1996.2-2007 – Annex D).	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: • 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz • 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz • 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.	5 dB[2,3]	Third octave measurements should be undertaken using unweighted or Z-weighted measurements. Note: Narrow-band analysis using the reference method in ISO1996-2:2007, Annex C may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified, e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands.
Low-frequency noise	Measurement of source contribution Cweighted and Aweighted level and one-third octave measurements in the range 10– 160 Hz	Measure/assess source contribution C- and A-weighted Leq,T levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: • where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2-dB(A) positive adjustment to measured/predicted Aweighted levels applies for the evening/night period • where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted Aweighted levels applies for the evening/night period and a 2- dB(A) positive adjustment applies for the daytime period.	2 or 5 dB[2]	A difference of 15 dB or more between C and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.
Intermittent noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level.	The source noise heard at the receiver varies by more than 5 dB(A) and the intermittent nature of the noise is clearly audible.	5 dB	Adjustment to be applied for nighttime only.
Duration	Single-event noise duration may range from 1.5 min to 2.5 h.	One event in any assessment period.	0 to 20 dB(A)	The project noise trigger level may be increased by an adjustment depending on duration of noise (see Table C3).
Maximum adjustment	Refer to individual modifying factors.	Where two or more modifying factors are indicated.	Maximum correction of 10 dB(A)2 (excluding duration correction).	

Notes:

1. Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.
2. Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.
3. Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.

Appendix E – Monthly Site Inspections

DIXON SAND MAROOTA OLD NORTHERN RD QUARRY

MONTHLY SITE CONDITION CHECKLIST

This checklist is to be completed monthly by the Environmental Officer.

Completed checklists are to be retained and included in the Annual Review.

Date of inspection:	26/06/19
Inspection by:	Hunny Churcher
Measured monthly rainfall (mm)	28/05/19 – 26/06/19: Rainfall = 13.6 mm

	Yes (✓) No (X) NA	Comments	Actions	Actions Complete (Date/Sign)
SEDIMENT CONTROLS				
Site checked for potential erosion issues or transport of sediment from batters, vehicle access points, excavations, haul roads, vegetation clearing etc.	✓			
Effectiveness and capacity of Erosion and Sediment controls checked (drains, basins, filters etc.)	✓			
Stockpiles located and maintained correctly	✓			
Tree clearance restricted to required area	N/A	No veg clearing this period		
WATER QUALITY AND QUANTITY				
Water sample taken daily for quality testing prior to discharge of water. Water quality tested and EPL#3916 criteria for pH, TSS and turbidity complied prior to discharge.	N/A	No discharge this period therefore no sampling is required		
Weir: Daily volume of water discharged recorded.	N/A			
4 monthly monitoring of surface water quality at SW19.	✓	SW19 sampled on 03/06/19	Next sampling in Sept 2019.	HC
6 monthly monitoring of groundwater quality at six bores on Lots 1&2 and two bores on Lots 196.	✓	samples taken on 03/06/19	Next sampling in Dec 2019	HC
Monthly depth measurement of all groundwater bores and comparison with rainfall	✓	depths measured on 26/06/19		
Monthly inspection of drainage & sediment controls including water storages, pumps, pipes and dams' walls	✓			
Any Fuel or oil spills reported and maintained	✓			
Fuels/chemicals stored in bunded areas	✓	EPA approved bunding		
AIR QUALITY				
Continuous static dust (collected for analysis monthly)	✓	VGT reports		
On site dust suppression	✓	Watercart regularly in use		
Loads covered entering and leaving site	✓	Refer to requirements in TMP		
No burning of vegetation	✓	-		
Wind speed, direction and rainfall recorded	✓	Weather station located at TEOM, managed by CBased.		

NOISE				
Operation only during hours of operation	✓	Hours in accordance with the DA & TMP + NMP.		
No complaints received from school, residences or local community members.	✓			
6 monthly monitoring at Maroota PS	✓	Noise monitoring undertaken on 6/6/19.		
Bulldozer not being used concurrently with any other plant on strips 4, 5 and 6 of Lots 1 and 2 DP547255 at depths between EGL and 6 metres below EGL	N/A	Current extraction on Lots 1 & 2 are in strips 1-2-3. Condition not yet triggered.		
Bulldozer being used for clearing, topsoil stripping and bund construction on Lots 1 and 2 DP547255 only during calm wind conditions	N/A	No topsoil stripping or bund construction.		
Between 0-6 metres depth below EGL, dozer-dump truck combination replaced by excavator-dump truck combination to strip overburden on Strips 2-6 inclusive	N/A	No quarrying at this level.		
Quarrying at ground level on Lot 196 not occurring during southwest to northwest winds	N/A	No quarrying at ground level.		
Construction and rehabilitation of eastern highwall of quarry within 250 metres of Maroota Public School occurring in school holiday periods only	N/A	Condition not yet triggered.		
FLORA & FAUNA/ REHABILITATION				
Sightings of threatened species reported	✓	Refer to the Ecologists Annual Report		
No disturbance of buffer/conservation areas	✓			
All buffer/conservation area fencing/marking intact	✓			
Rehabilitation undertaken to schedule	✓			
Success of rehabilitation of buffers, conservation areas & rehabilitation areas	✓			
Rehabilitation near school during holidays	N/A	Condition not yet triggered.		
Flora and fauna monitoring program undertaken to schedule	✓			
ARCHAEOLOGY				
Stop work if sites located – OEH notified	✓	No finds this period		
WASTE AND SITE CONDITION				
No rubbish visible or buried on site	✓	waste segregation implemented		
Recyclables removed by licensed Contractors	✓	Council & Private contractors		
Putrescible waste covered and regularly removed	✓	Council contractors		
ROADS AND TRANSPORT				

Weekly inspection of Old Northern Rd/Crown Rd intersection and sand/clay removed as necessary.	✓	Routine maintenance		QM + operators.
Crown Road, Old Northern Road near site, intersection & haul roads in good state of repair.	✓	"		"
Truck movements have not exceeded 180/day, or 40 between 6-7am.	✓	Truck Records		
Weighbridge/log book records forwarded to Council monthly	✓			
EXTRACTION PROGRAM				
Extraction depths from monthly checked control points in accordance with extraction program.	✓	Quantity survey by surveyor in June 2019		
REPORTING				
Complaints register maintained	✓			
Environmental incidents reported to EPA	✓	No enviro incident this period		

Signed: ..... (Environmental Officer)

HAERSES ROAD QUARRY

DIXON SAND MAROOTA
MONTHLY SITE CONDITION CHECKLIST

This checklist is to be completed monthly by the Environmental Officer.
Completed checklists are to be retained and included in the Annual Review.

Date of inspection:	26/06/19
Inspection by:	Hunny Churcher
Measured monthly rainfall (mm)	28/05/19 – 26/06/19: Rainfall = 13.6 mm

	Yes (✓) No (X) N/A	Comments	Actions	Actions Complete (Date/Sign)
SEDIMENT CONTROLS				
Site checked for potential erosion issues or transport of sediment from batters, vehicle access points, excavations, haul roads, vegetation clearing etc.	✓			
Effectiveness and capacity of Erosion and Sediment controls checked (drains, basins, filters etc.)	✓			
Stockpiles located and maintained correctly	✓			
Tree clearance restricted to required area	N/A	No vegetation clearing this period.		
WATER QUALITY AND QUANTITY				
Monthly water quality samples collected from monitoring bores. Samples tested for pH and electrical conductivity	✓	Samples + depths for Buffer Bores taken by VGT ~~refer to~~ GW reports		
Monthly surface water monitoring of the in-pit sump	N/A	No inpit sump		
6 monthly monitoring of groundwater quality at 13 bores	✓			
Monthly depth measurement of all groundwater bores and comparison with rainfall	✓	Depths recorded by data loggers continuously		
Monthly inspection of drainage & sediment controls including water storages, pumps, pipes and dams' walls	✓			
Any Fuel or oil spills reported and maintained	✓	No spills this period.		
Fuels/chemicals stored in bunded areas	✓			

AIR QUALITY				
Monitoring station (TEOM) and continuous automatic meteorological station are maintained and operating in the vicinity of the Maroota Public School	✓	Managed by CBased.		
On site dust suppression	✓			
Loads covered entering and leaving site	✓			
Drop height of material minimised during truck loading and unloading	✓			
Active extraction areas minimised within the project area through progressive clearing and rehabilitation	✓			
Cessation or restriction of dust generating activities during period of high winds		No high winds this period		
NOISE				
Compliance with approved hours of operation	✓	Refer to TMP + NMP		
No complaints received from surrounding residences	✓	On going complaints related to truck exhaust brakes for HR Mod 3.		HC + DD
Annual attended and unattended monitoring	✓	Noise monitoring done in June 2019.	Next monitoring in June 2020.	HC
Either one of a dozer or front end loader (not both) operating in Cell 4 and Cell 5 during early extraction, clearing or construction of bund walls, to minimise noise	N/A	Condition not yet triggerd		
The use of noisy equipment scheduled at the least sensitive time of day	✓			
t switched off when not in use	✓			
In the wet processing plant area, stockpiles are located along to western boundary of the area to shield loading and unloading activities	N/A	Condition not yet triggered.		
Additional noise monitoring at the potentially most affected locations near the south-western end of the site, such as Location R6 and R8, when extraction operations are being conducted in the additional extraction area	N/A			

Flora & Fauna / Rehabilitation				
Sightings of threatened species reported	✓	Refer to Ecologist Annual Report.		
No disturbance of buffer/conservation areas	✓			
All buffer/conservation area fencing/marking intact	✓			
Rehabilitation undertaken to schedule	✓			
Success of rehabilitation of buffers, conservation areas & rehabilitation areas	✓			
Flora and fauna monitoring program undertaken to schedule	✓			
ARCHAEOLOGY				
Stop work if sites located – OEH notified	✓	No finds this period.		
WASTE & SITE CONDITION				
Rubbish visible or buried on site	✓			
Recyclables removed by licensed Contractors	✓	Council + Private contractors		
Putrescible waste covered and regularly removed	✓	council + Private contractors		
ROAD & TRAFFIC				
Monthly inspection of haul roads, site access road and Haerses Road/site access road intersection	✓			
Weekly inspection of Haerses Road/site access road intersection and sand/clay removed as necessary	✓			
Continuous recording of the amount of quarry products transported from site and total truck movements	✓	Refer to Truck Record		
Truck movements have not exceeded 56 per day, or 20 between 6:00 am and 7:00 am	✓	"		
Weighbridge/log book records retained and recorded	✓	Refer to records by Pacific Quarrying		
REPORTING				
Complaints register maintained	✓			
Environmental incidents reported to EPA and DPE	✓			
Monitoring results and statements of compliance with Development Consent and EPL conditions provided in the Annual Review and EPL Annual Return	✓			

Signed: S. Hussain ..... (Environmental Officer)