Dixon Sand

Old Northern Road Quarry, Maroota

Annual Review
2022 - 2023



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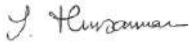
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Client: Dixon Sand Pty Ltd

Prepared by: Project Environmental Services Pty Ltd

Project Environmental Services

Document Control

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Name of Operator	Dixon Sand Pty Ltd
Development Consent / Project Approval #	DA250-09-01 (Mod 5) – Old Northern Road Quarry
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Name of Authorised reporting officer	Hunsamon Churcher
Title of Authorised reporting officer	Environmental Officer / Advisor
Signature of Authorised reporting officer	
Date	30/09/2023

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Report name	Dixon Sand Old Northern Road Quarry, Maroota - Annual Review 2022 - 2023		
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Prepared by:	Hunsamon Churcher	Date:	30/09/2023
Authorised by:	David Dixon	Date:	30/09/2023

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Appendix E – Monthly Site Inspection

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Appendix G – Bush Regeneration Report

Appendix H – Annual Biodiversity & Rehabilitation Management Report

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Appendix J – Community Engagement and CCC Meeting Minutes

Appendix K – Complaint Register

Appendix L – Waste Register

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
DRG	Department of Planning and Environment – Resources Regulator (now MEG)
DPE	Department of Planning and Environment
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
HRBOA	Biodiversity Offset Area, located at Haerses Road Quarry (for Old Northern Road DA250-09-01)
IEA	Independent Environmental Audit
MEDM	Maximum Extraction Depth Map
MEG	Mining, Exploration and Geoscience, within the Department of Regional NSW
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 <10µm
SCBGS	Sydney Central Basin Groundwater Source
TEOM	Tapered Element Oscillating Microbalance
TSP	Total suspended particulates
WAL	Water Access License

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
	WAL 24325	Yes
	WAL 24341	Yes
	WAL 43270	Yes

Table 2: Non-compliances

Relevant Approvals	Condition #	Condition description (summary)	Compliance Status	Section addressed in Annual Review
DA 250-09-01	Cond. 12 of Sch.5	Submission of Annual Review later than end of March 2022, however DPE approved an alternative date.	Non-compliant	Table 36, Section 11.1

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 at 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 at Old Northern Road quarry 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 Stages 1 and 2, and Cells 1A, 1B, 2A, 2B and 3B. Sand is being transferred to the Old Northern Road quarry for processing, product blending and sales. Products are also permitted to be sold directly to the market from Haerses Road quarry.

Environmental Monitoring locations for Old Northern Road Quarry are shown in Figure 2.

2.2 Scope of this document

The objective of this Annual Review is to report on the overall environmental performance, management of the operations and compliance of Old Northern Road Quarry with the consent conditions issued by the Secretary of NSW Department of Planning and Environment (DPE). The reporting period is from 01 July 2022 to 30 June 2023, 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 the surveys.

Development consent DA250-09-01 (Modification 5) is 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) states:

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 DPE for the submission deadline of the Annual Review to be adjusted to reflect the financial year reporting. Approval was granted by the DPE on 9 February 2018 to submit the Annual Review by the end of September each year.

This Annual Review will report on the environmental performance in relation to the requirements of DA250-09-01 (Modification 5), Environment Protection License (EPL) # 3916 and Water Access Licenses (WALs) 24325, 24341 and 43270. The Annual Review has been prepared in accordance with *Post-approval requirements for State Significant mining developments – Annual Review Guideline* (DP&E, October 2015).

2.3 Old Northern Road Quarry Approvals

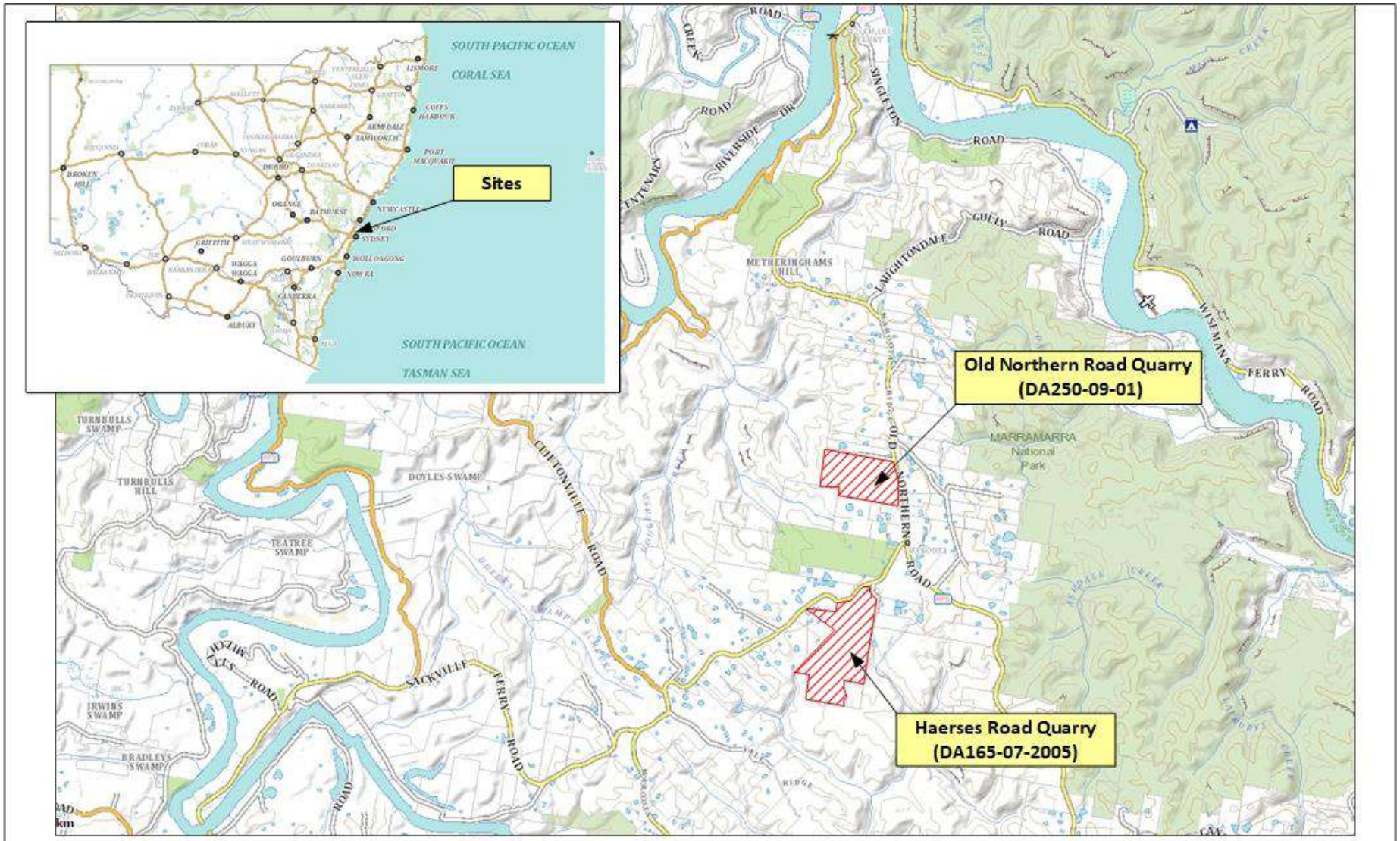
Development consents for the quarry on Lots 29 and 196 and extension into Lots 1 and 2 were issued by the Land and Environment Court on 7 July 2000 (796/00/HE) and 24 May 2004 (DA250-09-01), respectively. Consent No. 796/00/HE allowed for sand extraction, processing, and rehabilitation within Lots 29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

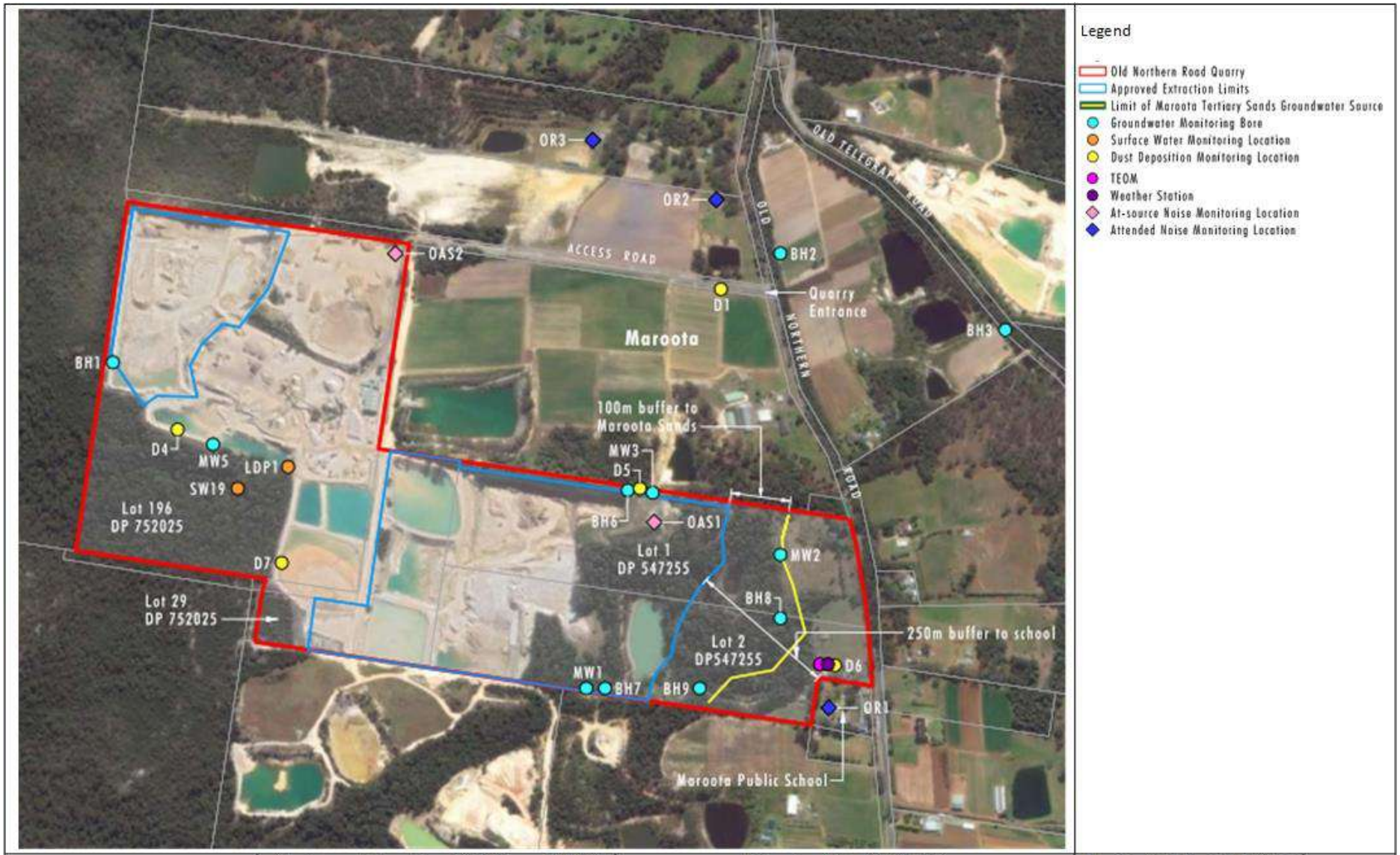
Five modifications to DA250-09-01 have been lodged and approved. Modification 5 is current and was approved on 14 November 2018. A summary of the development consents and modifications is provided in Table 3.

Table 3: Summary of Old Northern 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	Amended 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 extraction areas 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. Revision and update of the consent conditions in line with modern development consent format



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


Legend
Old Northern Road Quarry
Approved Extraction Limits
Limit of Maroota Tertiary Sands Groundwater Source
Groundwater Monitoring Bore
Surface Water Monitoring Location
Dust Deposition Monitoring Location
TEOM
Weather Station
At-source Noise Monitoring Location
Attended Noise Monitoring Location
OR3
OR2
OAS2
ACCESS ROAD
BH2
D1
Quarry Entrance
Maroota
BH3
BH1
100m buffer to Maroota Sands
MW3
D5
D4
MW5
LDP1
SW19
Lot 196 DP 752025
BH6
OAS1
Lot 1 DP 547255
MW2
D7
Lot 29 DP 752025
BH8
250m buffer to school
Lot 2 DP547255
D6
MW1
BH7
BH9
OR1
Maroota Public School
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 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. Direct sale of products from Haerses Road Quarry commenced in 2015 under a separate development consent DA165-7-2005.

A total of **357,066.28** tonnes of sand and sandstone products have been exported from the Old Northern Road quarry during the 2022 – 2023 reporting period. A total of **118,385** tonnes of materials have been extracted from Haerses Road and transferred to Old Northern Road for processing and blending.

An example of the morning truck movement record is contained in Appendix F.

Table 4 provides a summary of the annual production quantities, transfers and truck movements for Old Northern Road Quarry during the reporting period.

Table 4: Production Data, Transfers & Truck Movements at Old Northern Road Quarry.

Month	Total combined Production ONR from Lots 1, 2, 29 and 196 and HR (t)	Total Transfers from Haerses Rd to ONR (t)	Max Daily Truck Movements at ONR	Max No. Trucks 5:45 -7:00 am at ONR
Jul 2022	42,251.48	4,410	154	22
Aug 2022	47,570.75	6,048	180	40
Sep 2022	44,889.84	2,993	180	40
Oct 2022	37,761.75	3,087	180	32
Nov 2022	46,200.07	3,119	180	36
Dec 2022	32,109.52	1,481	180	34
Jan 2023	14,176.52	12,090	160	30
Feb 2023	21,967.82	16,865	178	24
Mar 2023	20,775.43	15,639	174	24
Apr 2023	14,434.72	12,338	142	20
May 2023	19,831.36	19,266	172	18
Jun 2023	15,097.02	21,049	150	20
Totals / Maximum	**357,066.28**	**118,385**	**180**	**40**
Annual Limit	**495,000**	**190,000**		
		Daily Max Criteria	**180**	**40**

3.2 Submission of Quarry Production Data to DRG

Condition 13 of Schedule 2 of DA 250-09-01 requires Dixon Sand to submit calendar year annual production data to the DRG (now MEG) using the standard form and include a copy of this data in the Annual Review.

The MEG Minerals Return forms require reporting of extractive materials for the financial year, and not for the calendar year as specified in the consent condition above.

The Minerals Return form for the financial year 2022 - 2023 will be submitted to DRG once the form is made available on the online Portal. The same production data contained in Table 4 will form the basis for calculations for MEG Minerals Return reporting.

4. Actions Required from Previous Annual Review

The proposed recommendations contained in the previous 2021-2022 Annual Review have been actioned by Dixon Sand, and are summarised in Table 5.

Table 5: Summary of Recommendations and Actions

Recommendation from the 2021 – 2022 Annual Review	Actions
Vegetation Clearing and Extraction	
• Vegetation clearing will be undertaken in accordance with the Pre-clearing procedures.	• Actioned - vegetation clearing during this 2022 – 2023 reporting period was undertaken in accordance with the Pre-clearing procedures.
Rehabilitation and bush regeneration	
Old Northern Road Quarry Native Vegetation Corridor Rehabilitation Area	
• Planting of the remaining *Melaleuca deanei* and local species when condition is suitable,	• Actioned – the remaining *Melaleuca deanei* have been planted together with additional locally propagated species.
• Continue with routine weed control and monitoring of regenerating native species.	• Actioned – ongoing routine weed management and monitoring undertaken
Old Northern Road Quarry Lots 1 and 2	
• Continue with management of *Lantana camera* and review techniques recommended in the Ecological Monitoring Report (South East Environmental, 2022)	• Actioned – ongoing management of Lantana camera and review of techniques
Old Northern Road Quarry other areas	
• Continue with routine weed management along the southern boundary of Cons Hill (Lot 196) and carry out	• Actioned – ongoing weed management undertaken. Exotic grasses slashed and brush matted enrichment nodes with Acacia

Recommendation from the 2021 – 2022 Annual Review	Actions
direct seeding or supplementary planting where suitable, and	seeds collected from nearby location. Supplementary planting of other native species planned for next reporting period.
• Continue with rehabilitation works along the western embankment at the Quarry entrance gate. Carry out direct seeding or supplementary planting where suitable.	• Actioned – ongoing routine weed management undertaken. Supplementary planting of trees, shrubs and groundcover species undertaken
Haerses Road Biodiversity Offset Area (HRBOA)	
• Continue with management of invasive grass and annual species along the North-western border of the HRBOA	• Actioned - continued weed management at the designated location

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 the Air Quality Management Plan.

The following potential sources of dust generated from Old Northern Road 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; • 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 requires 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 measure:

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

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

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

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,

These results are shown in Table 8.

Table 8: Monthly Total Rainfall and Averaged Temperatures.

Month	Jul 2022	Aug 2022	Sep 2022	Oct 2022	Nov 2022	Dec 2022	Jan 2023	Feb 2023	Mar 2023	Apr 2023	May 2023	Jun 2023
Ave Temp (ºC)	10.9	12.7	13.7	16.2	17.3	18.8	20.6	21.8	20.7	16.3	12.9	12.2
Total Rainfall (mm)	297.8	28.4	90.6	117.8*	20.8	41.8	168.8	114.8	52.6	68.6	18.2	13.0

*Note * Monthly rainfall was obtained from the Weather Station # 67105 located at Richmond RAAF due to the weather station at the Maroota Public School being offline for 5 days during storm events and therefore yielding inaccurate total monthly rainfall data.*

Data presented in Table 8 shows that the highest monthly rainfall of 297.8 mm was recorded in July 2022 and the lowest monthly rainfall of 13.0 mm was recorded in June 2023. The total annual rainfall recorded during this reporting period is 915.4 mm, in comparison to the previous two reporting periods which recorded 1527mm (2021 - 2022) and 1090.4mm (2020 - 2021).

From the recorded monthly temperature data, February 2023 experienced the highest average temperature at 21.8$^{\circ C}$ with July 2022 experiencing the lowest average temperature at 10.9$^{\circ C}$.

Fluctuations in temperatures and rainfalls are generally influenced largely by the El-Nino and La-Nina climatic cycle. A reduction in total rainfall has been observed during this reporting period which was directly influenced by the conclusion of the La-Nina climatic phenomenon.

Dust Deposition

Five dust deposition gauges are located on the Old Northern Road Quarry. Table 9 lists the locations of the 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

Dust deposition results are collected and analysed monthly by a NATA accredited laboratory. Table 10 presents the monthly dust deposition results between July 2022 and June 2023. Table 11 contains the calculated annual averages for the dust deposition gauges.

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

Table 10: Dust Deposition Results: 29 June **202**2 **–** 28 June **202**3**.**

Dust Gauge Location	29/06/22 - 27/07/22	27/07/22 - 24/08/22	24/08/22 - 21/09/22	21/09/22 - 19/10/22	19/10/22 - 16/11/22	16/11/22 - 14/12/22	14/12/22 - 11/01/23	11/01/23 - 08/02/23	08/02/23 - 08/03/23	08/03/23 - 05/04/23	05/04/23 - 31/05/23	31/05/23 - 28/06/23
DA1A Front Gate	1.5	2.9	0.8	2.2	2.0	2.3	0.7	0.8	1.5	2.1	**33.6**	2.6
D4 Rehab	0.4	0.6	0.0	0.5	0.7	1.1	0.7	0.6	0.9	0.4	0.4	0.3
D5 Bundwall	0.8	0.5	0.2	0.7	1.0	**4.1**	1.8	1.6	1.6	1.2	0.7	0.7
D6 School	**10.3**	0.5	**	1.0	0.7	1.3	0.4	0.5	1.1	1.1	0.4	0.4
D7 Mulloc Heap	0.2	0.7	0.6	0.3	0.3	0.5	0.4	0.4	0.4	0.2	0.7	**18.0**

Note:

x.x*	Vegetation / algae present in dust gauge
x.x*	Insects / Spider web present in dust gauge
x.x*	Bird dropping present in dust gauge
x.x*	Ash present in dust gauge
x.x*	Sand present in dust gauge
x.x*	Dust present in dust gauge
**	Bottle broken – no dust result

Table 11: Calculated Annual Averages of Dust Deposition: 29 June 2022 – 28 June 2023.

Dust Gauge Location	29/06/22 - 27/07/22	27/07/22 - 24/08/22	24/08/22 - 21/09/22	21/09/22 - 19/10/22	19/10/22 - 16/11/22	16/11/22 - 14/12/22	14/12/22 - 11/01/23	11/01/23 - 08/02/23	08/02/23 - 08/03/23	08/03/23 - 05/04/23	05/04/23 - 31/05/23	31/05/23 - 28/06/23
DA1A Front Gate	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.0	1.9	2.0	4.3	4.4
D4 Rehab	1.0	1.0	1.0	0.7	0.6	0.6	0.7	0.7	0.6	0.6	0.6	0.6
D5 Bundwall	1.6	1.6	1.6	1.5	1.4	1.4	1.6	1.1	1.1	1.2	1.2	1.2
D6 School	2.8	2.7	2.7	2.9	2.9	2.9	2.7	2.6	2.5	2.3	2.4	2.1
D7 Mulloc Heap	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0.4	0.4	0.4	0.4	1.9

Charts 1 to 4 illustrate the annual average dust deposition results for the reporting periods of 2019 - 2020, 2020 – 2021, 2021 – 2022 and 2022 - 2023 respectively.

TEOM PM_{10} and TSP

In accordance with Condition 8 of Schedule 3, DA250-09-01, 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 the 270º - 315º quadrat (westerly to north-westerly) indicate potential dust contributions from the Old Northern Road Quarry. Chart 8 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 2019 - 2020, 2020 – 2021, 2021 - 2022 and 2022 - 2023 respectively.

One elevated 24-hour average PM10 level was recorded on 7 March 2023 at 43.3 µg/m³. However, the rolling 24-hour average PM10 level did not exceed the EPL rolling 24-hour average PM10 of 42 µg/m³criteria or the NEPM criteria of 30 µg/m³ at the end of the day.

The annual average PM10 criteria of 30 µg/m³ and 24-hour average NEPM criteria of 50 µg/m³ have not been exceeded during this reporting period.

Reporting of TSP results commenced in December 2017 and are shown in Charts 9 to 12. No TSP exceedance occurred during this reporting 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.

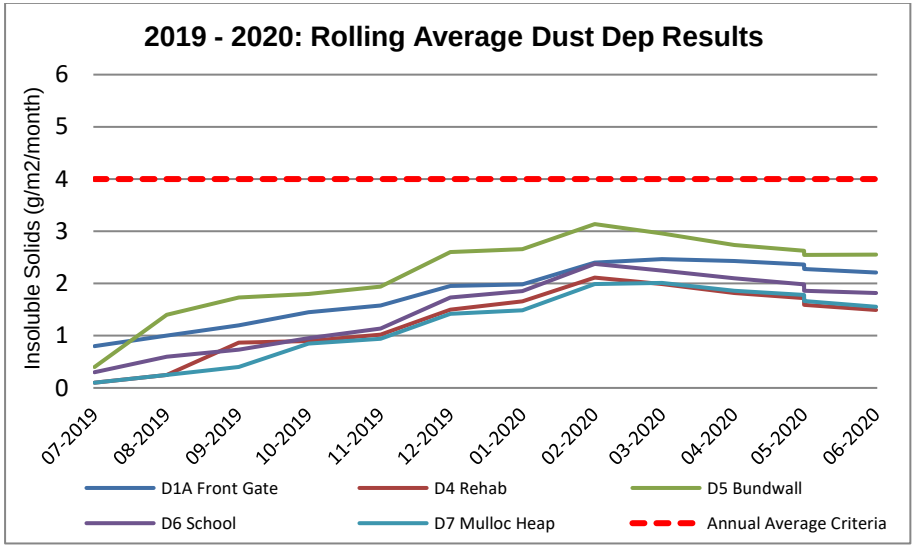


Chart 1: 2019 - 2020 Rolling Average of Dust Deposition Results

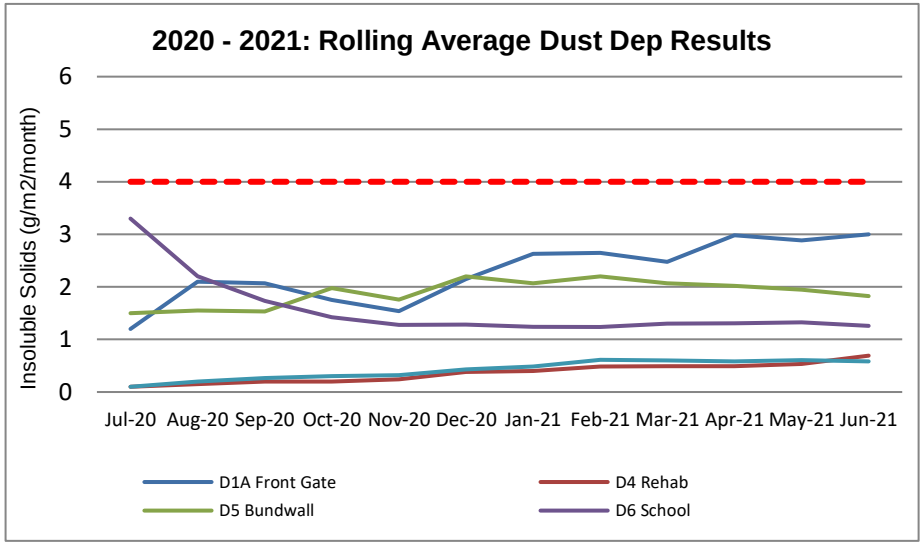


Chart 2: 2020 - 2021 Rolling Average of Dust Deposition Results

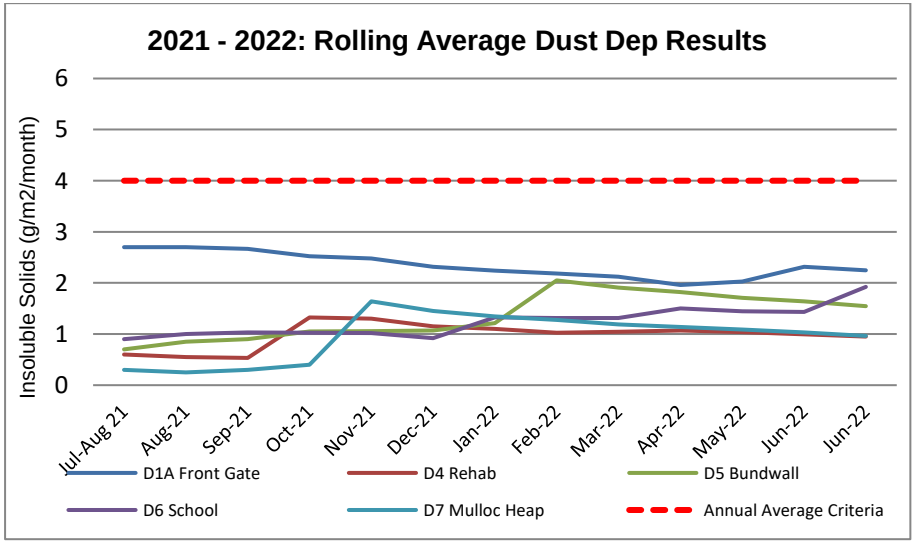


Chart 3: 2021 - 2022 Rolling Average of Dust Deposition Results

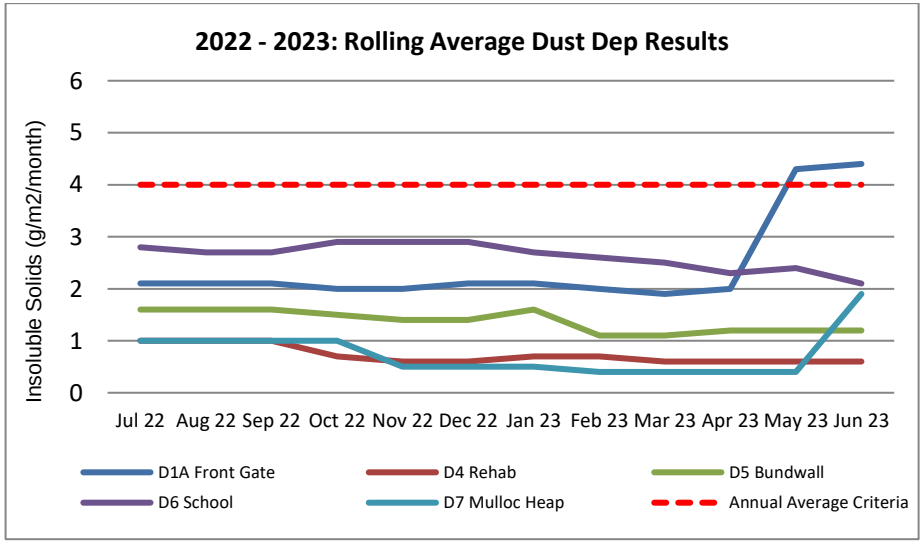


Chart 4: 2022 - 2023 Rolling Average of Dust Deposition Results

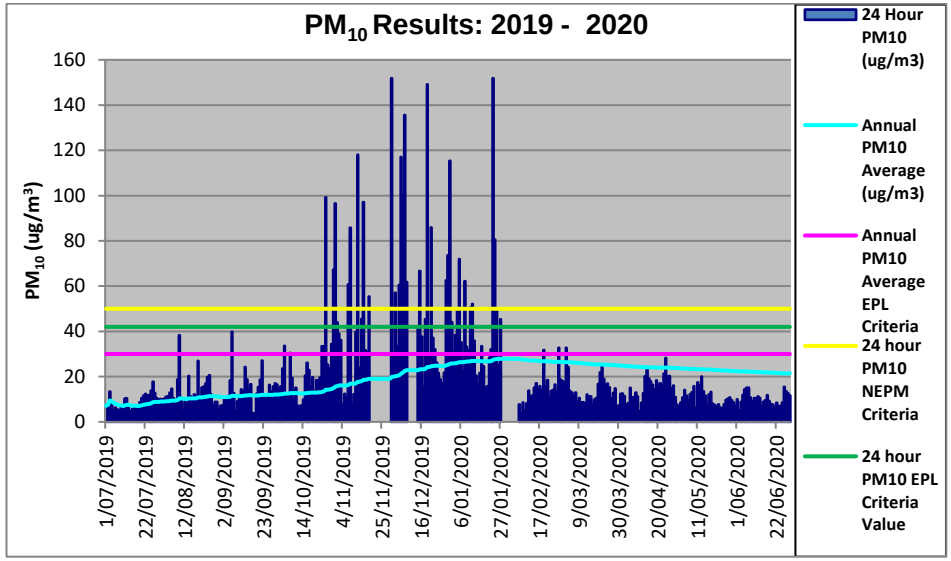


Chart 5: 2019 - 2020 PM10 Results and Criteria

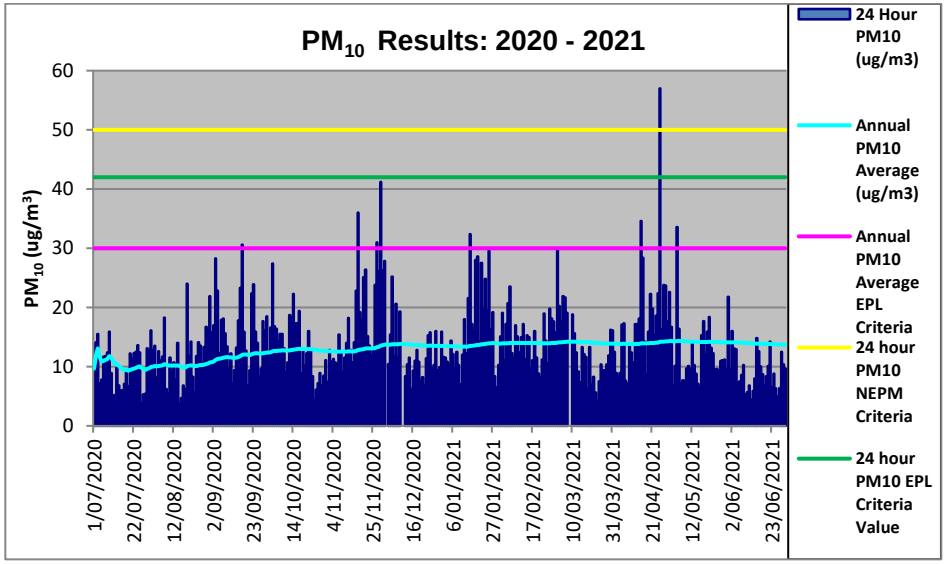


Chart 6: 2020 - 2021 PM10 Results and Criteria

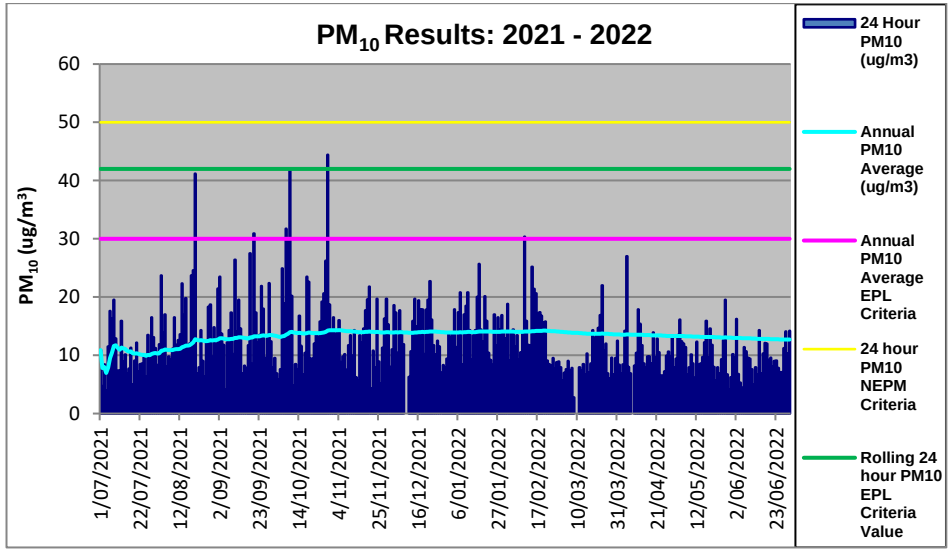


Chart 7: 2021 - 2022 PM10 Results and Criteria

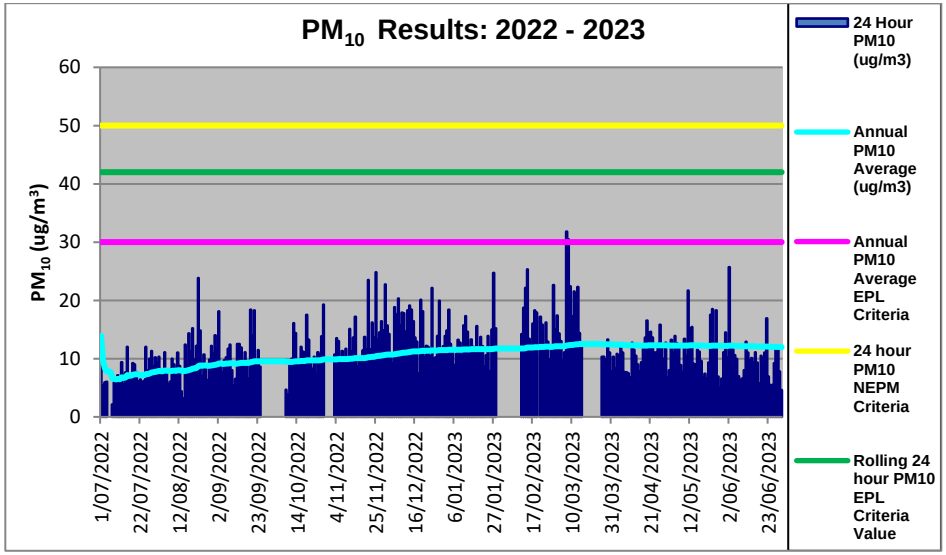


Chart 8: 2022 - 2023 PM10 Results and Criteria

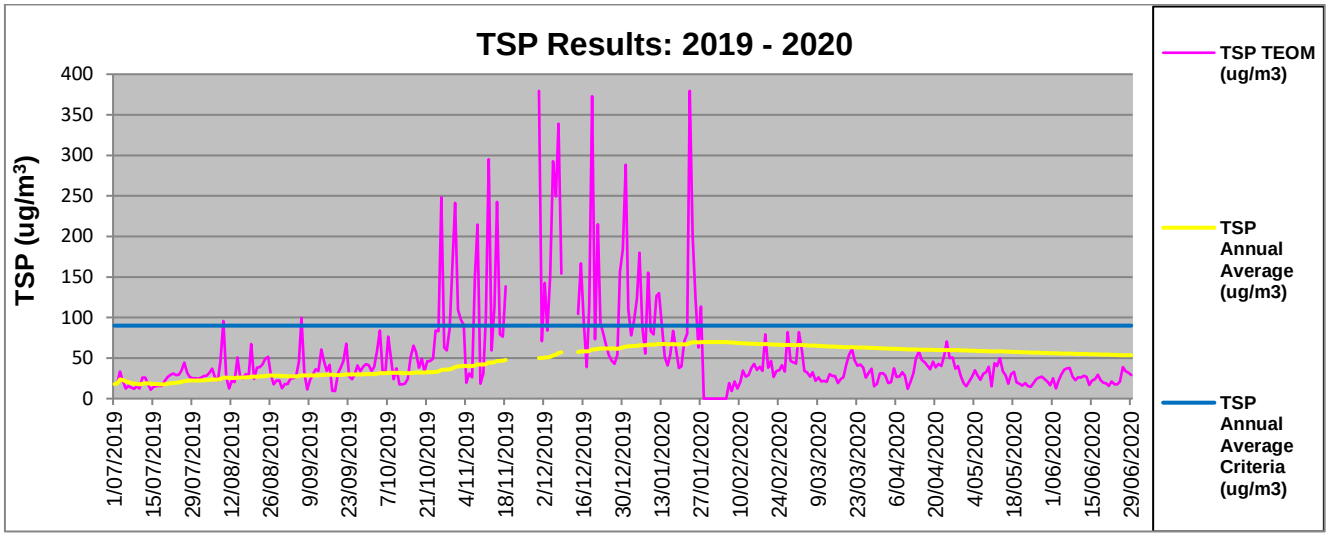


Chart 9: 2019 - 2020 TSP Results and Criteria

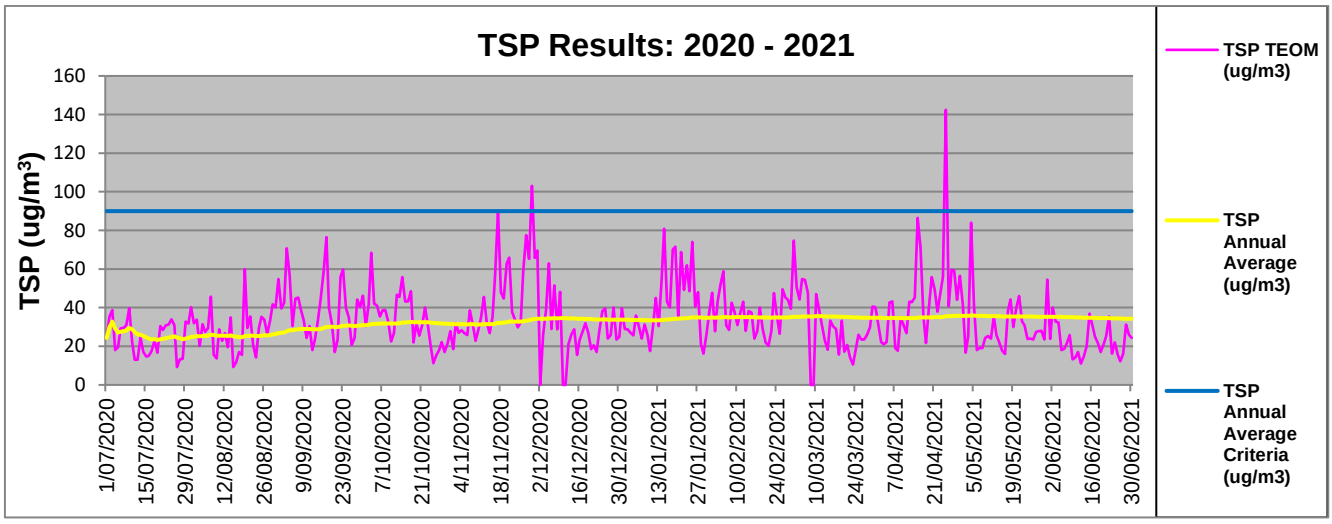


Chart 10: 2020 - 2021 TSP Results and Criteria

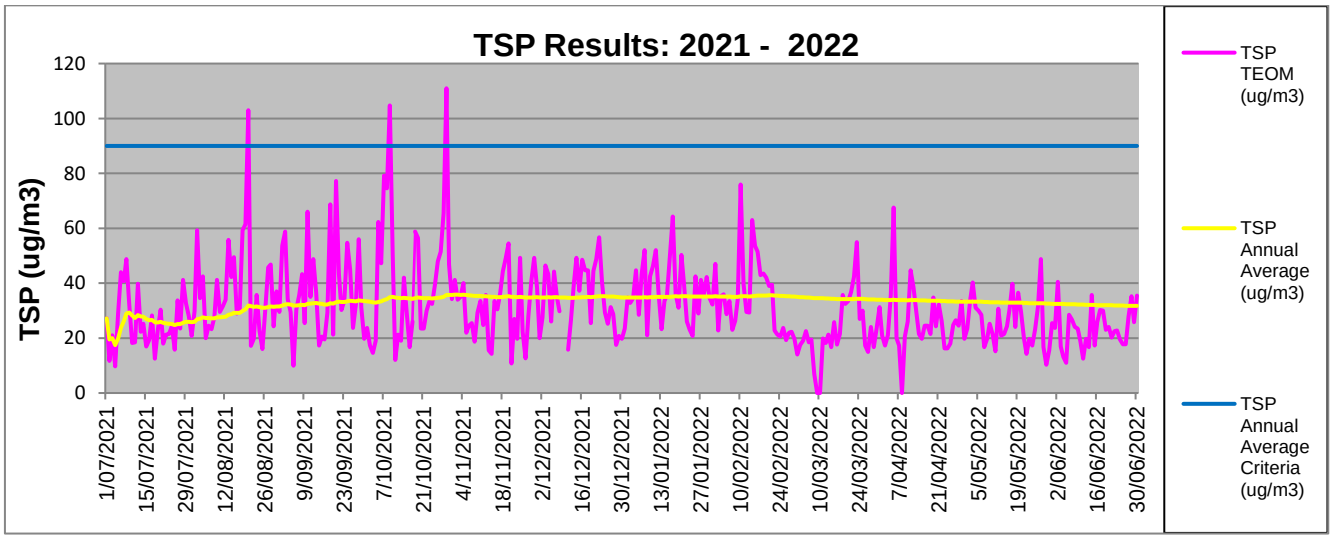


Chart 11: 2021 - 2022 TSP Results and Criteria

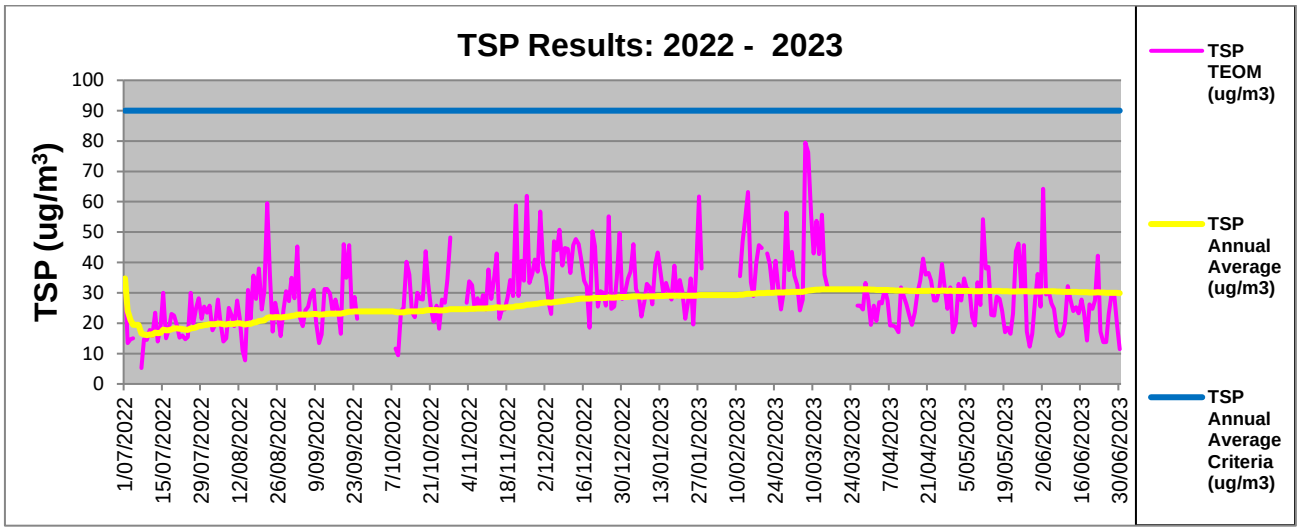


Chart 12: 2022 - 2023 TSP Results and Criteria

5.1.4 Analysis

Dust Deposition

Reporting Period 2022-2023

Five dust deposition gauges monitor potential 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 2022 to June 2023 period were mostly in compliant. All annual averages were in compliant with the 4 g/m2/month criteria, except for D01A where annual averages have been exceeded for May and June 2023. The exceeded annual averages were a result of the unusually high monthly reading of 33.6 g/m2/month in May 2023. It was identified that this unusually high monthly dust result can be considered an isolated anomaly and is attributed to neighbouring farming activities being undertaken directly adjacent to the dust gauge resulting in vast area of exposed ground. Other dust gauges in the entire air quality monitoring system did not return elevated results in the same monitoring period. The EPA (incident REF-NO-22144) and DPE (DA-250-09-01-PA-29) were notified of this annual dust deposition exceedance. DPE determined there was no breach of consent condition in this instance. It was noted that this significantly high monthly dust reading would have an influence over the calculation of the annual averages over the next several monitoring periods. EPA and DPE have requested that any future annual average exceedances associated with this anomaly monthly result be notified under normal incident notification procedures.

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 Old Northern Road quarry for the reporting period were within the EIS predicted range of dust levels, with the exception of the following:

- D1A (Front Gate) returned 33.6 g/m2/month in May 2023 which was attributed to adjacent farming activities,
- D5 (Bund Wall) returned a slightly elevated monthly dust result at 4.1 g/m2/month in December 2022,

- D6 (School) returned elevated monthly results of 10.3 g/m2/month in July 2022 which was likely caused by outdoor school grounds maintenance, and
- D7 (Mulloc Heap) returned 18.0 g/m2/month in June 2023 which was most likely due to dump trucks placing rehabilitation materials directly adjacent to the dust gauge.

Historical Data

It can be seen from Charts 1 to 4 that the majority of the dust deposition results are compliant over the previous 4 years of monitoring.

D01 (front gate) was relocated in September 2016 (renamed D01(A)). During 2019-2020, 2020-2021, 2021-2022 and 2022-2023 reporting periods, all monthly and annual average results were generally in compliant, except the anomaly monthly reading of 33.6 g/m2/month in May 2023 which was attributed to adjacent farming activities resulting in vast area of exposed ground. This high monthly reading led two rolling annual averages of 4.3 g/m2/month and 4.4 g/m2/month for May and June 2023.

Rolling annual averages for D04 (Rehab), D05 (Bundwall), D06 (School) and D07 (Mulloc Heap) have been consistently compliant over the last four reporting periods.

PM10

Reporting Period 2022-2023

The EIS predicted a 6th highest PM_{10} 24-hour average of 42 $\mu g/m^3$ and a PM_{10} annual average of 7 $\mu g/m^3$ (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 $\mu g/m^3$ at receptor 3. Consent DA250-09-01 and the Environment Protection Licence subsequently set a maximum rolling 24-hour average of 42 $\mu g/m^3$ for the site.

The rolling annual average PM_{10} values (light blue line on Chart 8) remained below the EPA long term criteria of 30$\mu g/m^3$ (pink line on Chart 8) for this reporting period.

The 24-hour average PM_{10} levels (dark blue columns on Chart 8) remained below the 24-hour EPL management level of 42 $\mu g/m^3$ (green line on Chart 8) and the 24-hour NEPM short term criteria level of 50 $\mu g/m^3$ (yellow line on Chart 8) for the whole duration of this reporting period. No exceedances were recorded during this reporting period.

One elevated 24hr average PM_{10} level was recorded on 7 March 2023 due to a number of bushfire events located north-west of the quarry. This elevated 24hr average PM_{10} level was reported to the EPA and no further action was required as no PM10 criteria had been exceeded. In addition, any exceedance associated with bushfire events are considered ‘extraordinary events’ in accordance with Notes to Table 3 of Condition 7, Schedule 3, DA 250-09-01 which therefore would not constitute a non-compliance or breach of consent condition.

Table 12: PM10 – EPL and NEPM Management Criteria Exceedance

Event No.	Exceedance Date	Exceeded PM10	Exceeded criteria (ug/m³)	Comment
No PM10 criteria have been exceeded during this reporting period.				

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 PM10 exceedances were recorded over the last four reporting periods with causes attributed to activities not related to quarry operations. Exceedances recorded during the 2019-2020 period were directly influenced by cumulative poor air quality associated with bushfires in the local, and regional and inter-state areas. Exceedances during the 2020-2021 period were attributed to forecast windy conditions and a number of hazard reduction burns across the region. Exceedance during the 2021-2022 period was associated with forecasted warm and windy conditions together with a local bushfire event occurring in Maroota.

The annual PM_{10} average for the 2022-2023 reporting period is 12.0 µg/m³, which is lower than the EPA criterion of 30µg/m³ but almost double of the predicted value of 7 µg/m³ in the EIS. In comparison, this annual average is lower than the recorded historical values of 12.7 µg/m³ (2021-2022), 13.7 µg/m³ (2020-2021) and 21.3 µg/m³ (2019-2020) and 16.0 µg/m³ (2018-2019). The cause of the lower annual average for this reporting period is likely caused by the return to average weather cycle and less frequent extraordinary events such as the number of bushfire and hazard reduction burn events.

Total Suspended Particles

Reporting Period 2022-2023

The Total Suspended Particles (TSP) results are reported in Charts 9 to 12 inclusive. The annual average TSP for this reporting period is 29.9 µg/m³ which is lower than the annual average TSP criteria of 90 µg/m³ set out by the consent and EPL. Elevated TSP values were a reflection of high PM10 values.

Historical Data

Reporting of TSP commenced in December 2017. Historical annual average TSP values were 38.3 µg/m³ (2017-2018), 40.0 µg/m³ (2018-2019), 53.4 µg/m³ (2019-2020), 34.3 µg/m³ (2020-2021) and 31.8 µg/m³ (2021-2022). The higher annual average TSP value recorded in 2019-2020 were attributed to cumulative effects of poor air quality associated with bushfires in the local, and regional and inter-state areas.

5.1.5 Changes to Environmental Procedures

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

In the event of significant amount of visible dust being observed at the premise, follow the steps outlined in the Air Quality Management Plan.

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 Plan.

The following potential sources of noise and mitigation measures at the Old Northern Road 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/ maintenance of bund walls • Water transfers using pumps	• 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 Old Northern Road quarry requires attended noise monitoring to be undertaken bi-annually.

5.2.2 Compliance Limits

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.

<table>
<tr><th>Consent Condition</th><th>Conditions</th></tr>
<tr><td>DA250-09-01, Condition 3 of Schedule 3 and</td><td>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)
<table>
<tr><th>Receiver</th><th>Averaging Period</th><th>Shoulder (6.00 am to 7.00 am)</th><th>Day (7.00 am to 6.00 pm)</th></tr>
<tr><td>Any residence on privately owned land</td><td>$L_{Aeq\ (15\ minute)}$</td><td>37</td><td>44</td></tr>
<tr><td>Any classroom at Maroota Public School</td><td>$L_{Aeq\ (1\ hour)}$</td><td>-</td><td>45</td></tr>
</table>
</td></tr>
</table>

Consent Condition	Conditions
	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.

<table>
<tr><th>Consent Condition</th><th>Condition</th></tr>
<tr><td>DA250-09-01, Condition 1 of Schedule 3</td><td>The Applicant must comply with the operating hours set out in Table 1.
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 (unladen)</td><td>5.45 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 loading
Truck dispatch
Truck arrival (laden)</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>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>DA250-09-01, 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.
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 were undertaken in December 2022 and June 2023. Attended noise monitoring was conducted at receivers (where permission to enter the property was granted) and at-source, in accordance with the requirements of the Noise Management Plan. In instances where extraneous noise such as road traffic and insects were found to be the dominant noise sources, noise levels were obtained at alternative locations closer to the quarry. Predicted noise levels are then extrapolated from the near-distance location to the sensitive receiver locations.

Quarry operations fell into four categories for main sources of noise during the monitoring period which were:

- sand processing and truck loading (main plant, front end loaders and trucks),
- extraction of sand (involving ripping by dozer and transporting via excavator loading a moxie)

- extraction of bulk sandstone by rock saw, and
- stockpile management with screen, front end loader, excavator and moxie.

Results for predicted noise impacts for Old Northern Road quarry undertaken in December 2022 and June 2023 are contained in Tables 16 and 17 respectively.

The full noise monitoring reports for December 2022 and June 2023 are contained in Appendix D.

Table 16: Extrapolated noise levels for Old Northern Road Quarry, December 2022.

Receiver	Noise Criteria (dBA)		Extrapolated noise level (dBA)	Comment
	Shoulder	Day		
OR1	-	45	39	Predicted levels correlate well with measured levels and all locations shown to meet noise limits during the day period.
OR2	37	44	40	
OR3			41	
R2			40	
R3			38	
R4/R5			40	

Table 17: Predicted Noise Impacts for Old Northern Road Quarry, June 2023.

Receiver	Noise Criteria (dBA)		Extrapolated noise level (dBA)	Comment
	Shoulder	Day		
OR1	-	45	37	Predicted levels correlate well with measured levels and all locations shown to meet noise limits during the day period.
OR2	37	44	38	
OR3			38 (+2) *	
R2			37	
R3			37	
R4/R5			37	

*Note * 2dB correct at OR3 for low frequency*

5.2.4 Analysis

Old Northern Road - Attended Noise Monitoring – December 2022

Attended noise monitoring and modelling results indicate that the Quarry was compliant with the noise criteria for shoulder and daytime operations at all receivers under the meteorological conditions at the time.

Old Northern Road - Attended Noise Monitoring – June 2023

Attended noise monitoring and modelling results indicate that the Quarry was compliant with the noise criteria for shoulder and daytime operations at all receivers under the meteorological conditions at the time.

5.2.5 Noise Exceedance and Non-Compliance

No noise exceedance or non-compliance have been recorded during this monitoring period.

5.2.6 Discrepancies between Predicted and Actual Noise Impacts

Table 18 compares the predicted noise levels contained in the EIS (ERM, 2001) during non-adverse weather with quarry operations in Strip 2 and 3 on Lots 1 and 2. The extrapolated noise levels from December 2022 and June 2023 assessment at the receivers are also presented here for comparison.

Modelled noise impacts contained in the EIS (ERM, 2001) show that a maximum external level of LAeq 36 dB(A) has been calculated for the Maroota Public School (the school) and assuming that internal noise levels are 10 dB less than external noise levels (with windows opened), the predicted internal noise level is approximately 26 dB(A).

Extrapolated December 2022 and June 2023 noise monitoring results at the school (external) yield noise levels of 39dB(A) and 37 dB(A) respectively. Extrapolated noise monitoring results for residences on Old Northern Road yielded levels between 37 and 41 dB(A) for the biannual monitoring events.

There are minor discrepancies between the predicted and actual noise impacts experienced at the school and residences with higher noise levels extrapolated during the attended noise monitoring. Despite of the higher extrapolated noise levels, all noise impacts comply with the daytime noise criteria. Dixon Sand is currently operating and extracting materials in Strip 3 which is east of Strip 2 which was the location used to model predicted impacts in the EIS (ERM, 2001). Therefore, current quarry operations are located closer to the school and receivers, which resulted in the recorded noise levels being higher than the predicted levels.

Table 18: Comparison of predicted and actual noise impacts, December 2022 and June 2023.

Receptor	EIS (ERM, 2001) Predicted Daytime Noise Levels LAeq (dB(A))	Daytime Noise Criteria LAeq (dB(A))	December 2022 Daytime Noise Levels	June 20223 Daytime Noise Levels	Compliance with Daytime Noise Criteria
R1	43	**44**	N/M	N/M	Yes
R2	40	**44**	40	37	Yes
R3	37	**44**	38	37	Yes
R4	35	**44**	40	37	Yes
R5	34	**44**	40	37	Yes
R6 (OR3)	N/A	**44**	41	40	Yes
School Building 1 (OR1)	36 (external) ~26 (internal)	**45**	39	37	Yes
School Building 2	35 (external) ~25 (internal)				

Note: N/A – R6 residential building constructed after the EIS (ERM, 2001)

N/M – R1 noise levels not measured due to existing Noise Agreement between Accurso and Dixon Sand.

5.2.7 Noise Trend

As quarry operations progress eastwards on Lots 1 and 2 towards Maroota Public School and other identified private residences, noise levels are expected to increase as a result of reduced proximity between machinery and noise receivers.

Charts 13 to 18 illustrate the long-term trend in noise monitoring levels for Maroota Public School and residences on Old Northern Road. Noise monitoring was undertaken during the period 2003 to 2007 however data has been omitted from this trending analysis due to the monitoring locations differing from the locations identified in the current Noise Management Plan.

It can be seen from Chart 13 that quarry noise level fluctuations occurred at Maroota Public School over the fourteen year period, with a general increasing trend with daytime noise level peaking in December 2019 at LAeq15 45 dB(A) and June 2021 at LAeq15 46 dB(A). Since 2021 there is a decreasing trend in measured noise levels with 37.0 dBA being recorded for June 2023.

Chart 14 provides long-term data for receiver OR2 at 4624 Old Northern Road. Fluctuations in daytime and shoulder noise levels can be observed with reduced daytime noise levels were recorded between December 2011 to May 2014, possibly a consequence of reduced quarry activities on Lots 29 and 196. From December 2014 to June 2021,

a general increasing daytime noise levels trend can be observed, with noise levels ranging from LAeq15min 34.1 to 45 dB(A). From June 2021 to June 2023 there is a slight decline in daytime noise levels.

Charts 16 and 17 display an increasing trend in quarry noise levels at receivers R2 and R3 from December 2018 to December 2020 (R2) and December 2021 (R3), peaking at LAeq15 44 dB(A). A declining trend in noise levels can be observed since the peak.

Chart 15 shows long term trend at receiver OR3 (R6) ranging between LAeq15 37 and 46 dB(A).

Chart 18 shows long term trend at receiver R4/5 with an increasing trend in noise levels from December 2018, peaking at LAeq15 45 dB(A) in June 2021. A declining trend in noise levels can be noted since June 2021.

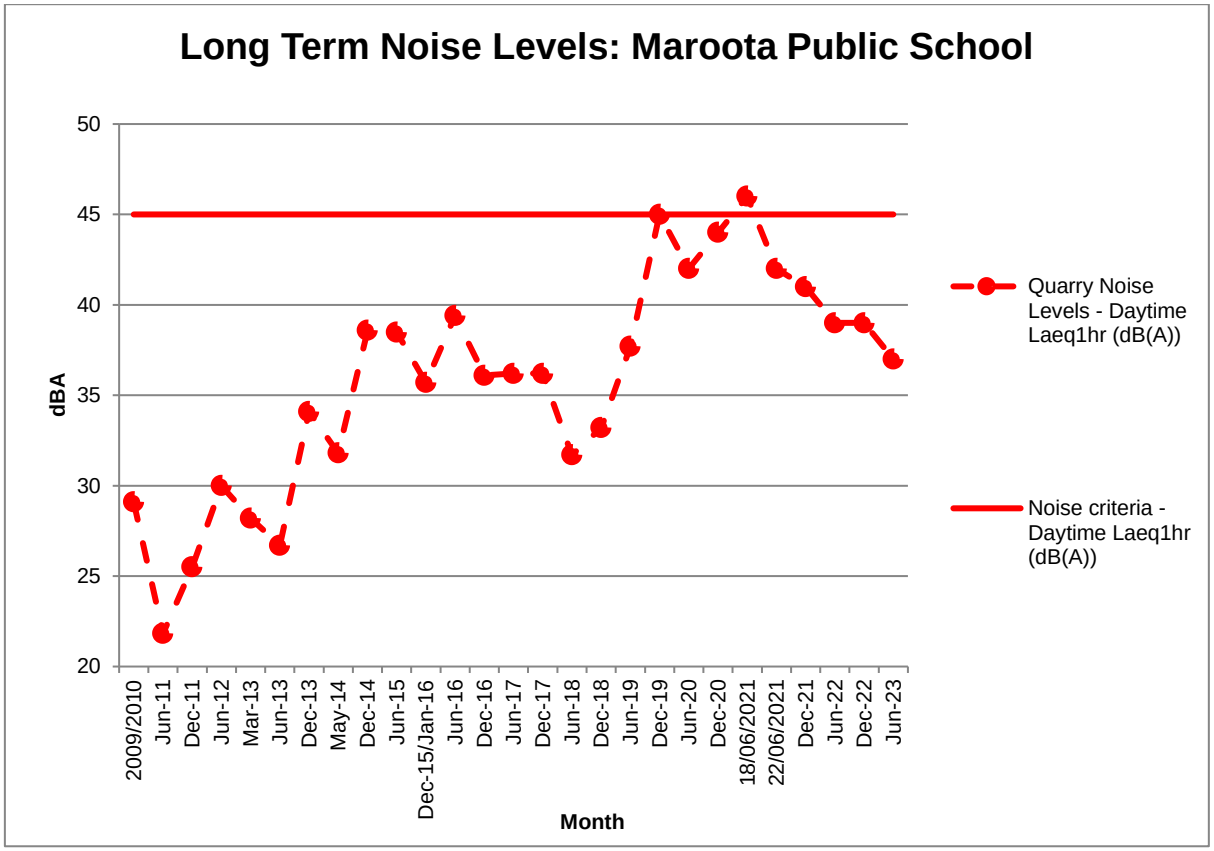


Chart 13: Long term noise trend – Maroota Public School

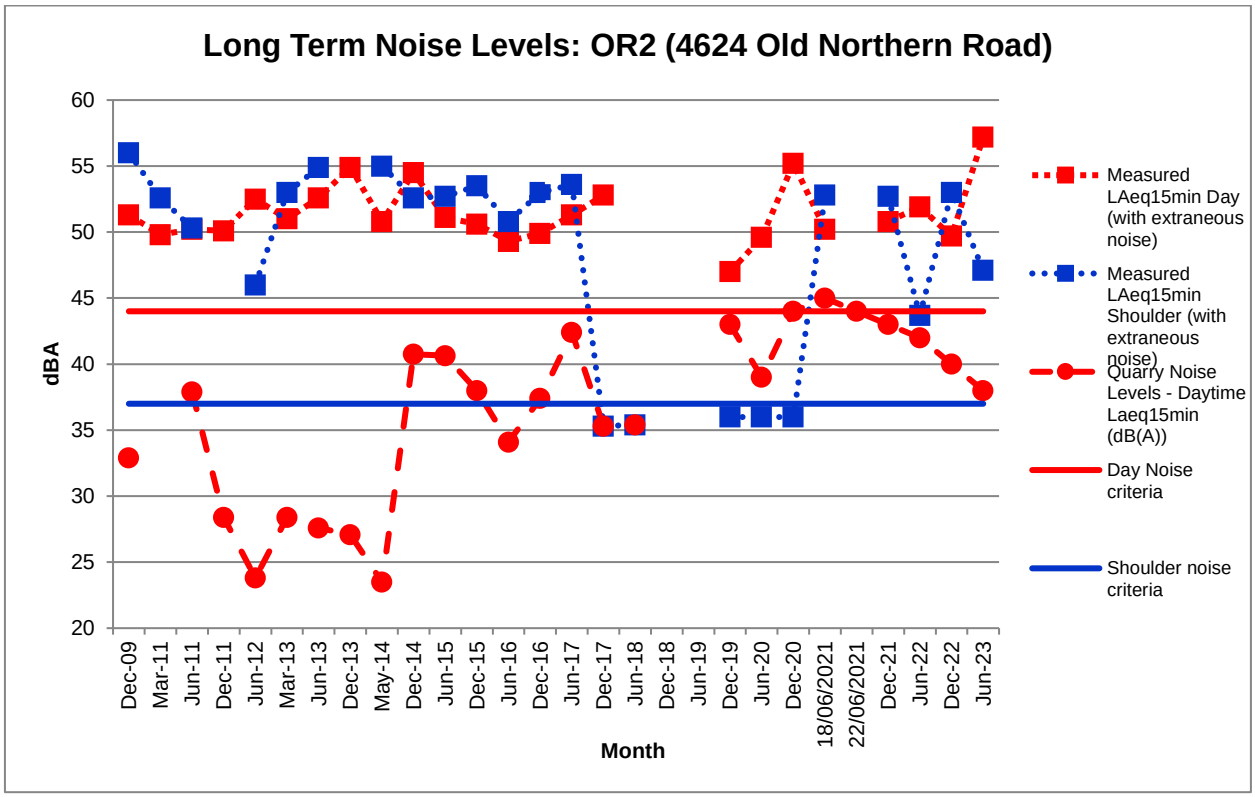


Chart 14: Long term noise trend – OR2 (No. 4624 Old Northern Road)

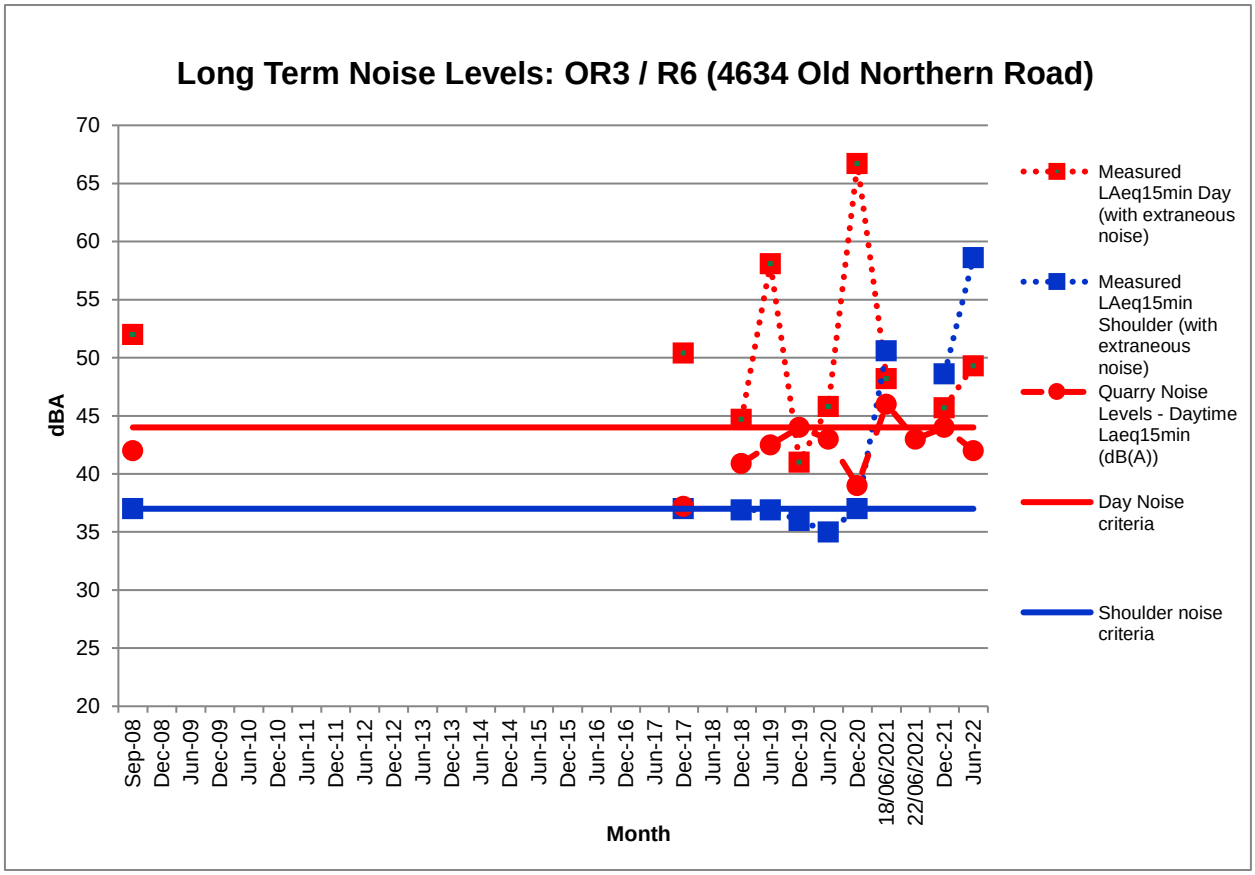


Chart 15: Long term noise trend – OR3/R6 (No. 4634 Old Northern Road)

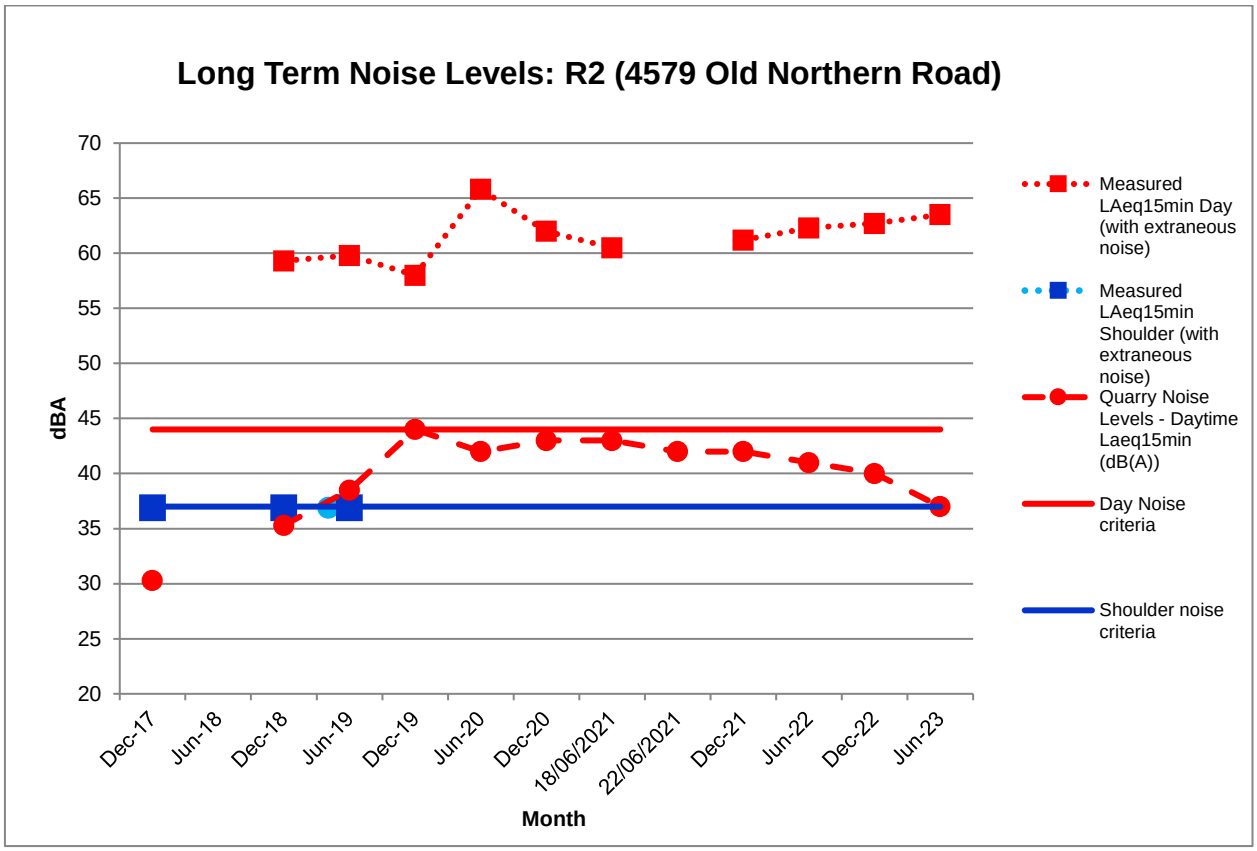


Chart 16: Long term noise trend – R2 (No. 4579 Old Northern Road)

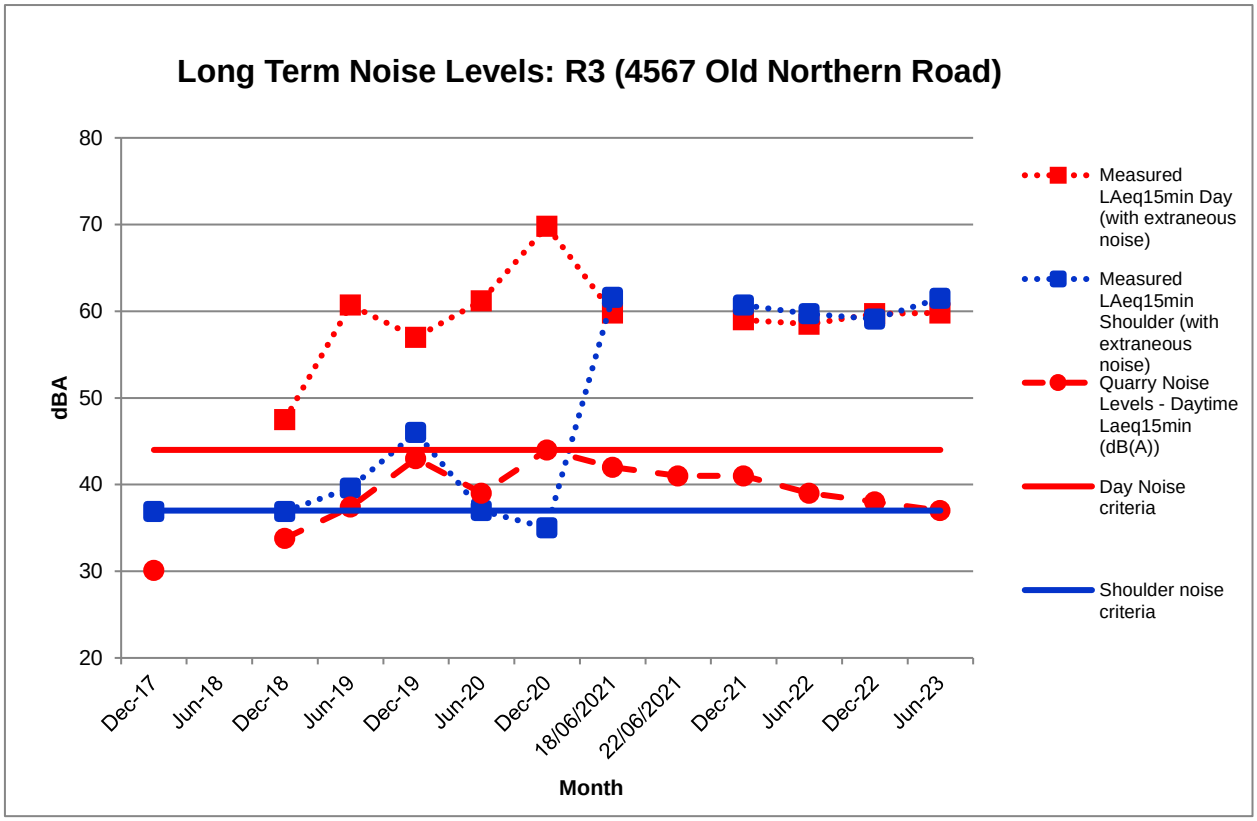


Chart 17: Long term noise trend – R3 (No. 4567 Old Northern Road)

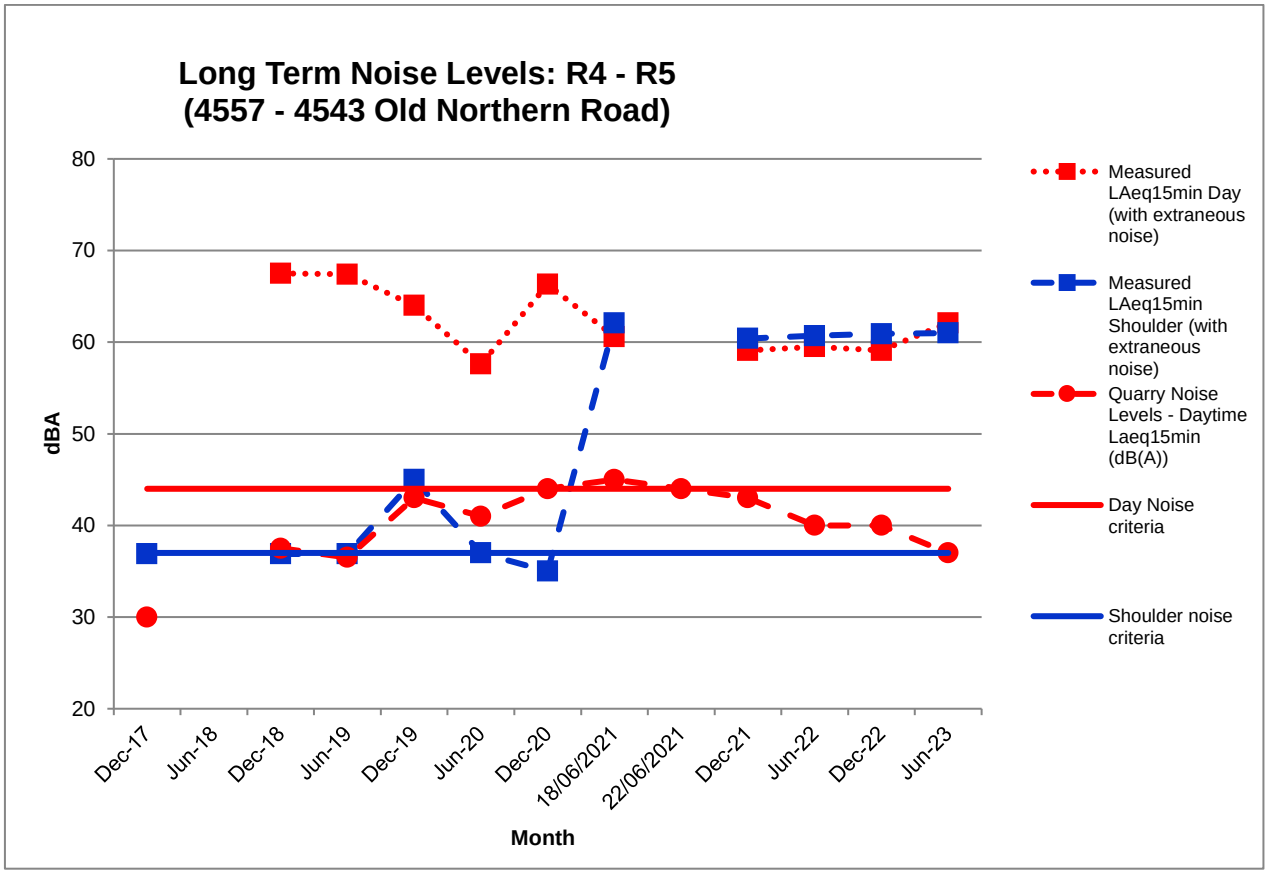


Chart 18: Long term noise trend – R4/R5 (No. 4634 Old Northern Road)

5.2.8 Changes to Environmental Procedures

There are no proposed changes to the noise procedures as a result of noise compliance during this reporting period.

Dixon Sand is required to construct a noise bund within the 250m buffer to the Maroota Public School prior to commencing extraction in Strip 4 on Lots 1 and 2. Any construction or maintenance of noise bund walls are to be carried out in accordance with the strategies outlined in the Old Northern Road Noise Management Plan. Should vegetation clearing be required for the bund construction, undertake vegetation clearing in accordance with the pre-clearing procedures. Construction of the noise bund for the 250m buffer to the Maroota Public School is anticipated to be undertaken during the next reporting period.

Continue to undertake attended noise monitoring in accordance with the Noise Management Plan.

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

No traffic related complaint was received for Old Northern Road Quarry during the 2022-2023 reporting period.

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 TfNSW and the EPA. Dixon Sand is restricted by its legal jurisdiction in prohibiting the use of the trucks' safety features such as engine braking. Dixon Sand however is committed to assisting in the education campaign through induction, traffic management policies and inter-pit agreement.

A copy of the complaints register containing the complaints summary during the reporting period is attached in Appendix K.

Table 19: Traffic Complaints, recommended action(s) and outcome

Old Northern Road Quarry Complaint Details
Dixon Sand did not receive any traffic related complaints during this reporting period.

5.3.3 Compliance

Assessment of compliance against the relevant conditions is summarised in Table 20.

Table 20: Road and Traffic Compliance.

<table>
<tr><th>DA250-09-01 (Mod 5)</th><th>Condition</th><th>Compliance</th><th>Comments</th></tr>
<tr><td>Condition 5(b) of Schedule 2</td><td>continue to receive and process extractive material from Haerses Road Sand Quarry, and dispatch quarry products from the site, until 14 February 2046.</td><td>Yes</td><td>Material transported from Haerses Road to Old Northern Road during this reporting period.</td></tr>
<tr><td>Condition 7 of Schedule 2</td><td>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.</td><td>Yes</td><td>Maximum recorded daily truck movements were 180 in and out bound.
Maximum number of morning trucks was 40 in and out bound</td></tr>
<tr><td>Condition 12 of Schedule 2</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 S.94 contribution (example)</td></tr>
<tr><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 records</td></tr>
<tr><td colspan="4">
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>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)	Condition	Compliance	Comments
Condition 21 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 records on its website every 6 months.	Yes	Refer to Summary Truck Record on Dixon Sand's website: http://www.dixonsand.com.au/environment
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

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 2022-2023 reporting period. In addition, the Quarry did not receive any traffic related complaints during this reporting period.

5.3.5 Findings and Effectiveness of Traffic Management

Current traffic management and mitigation measures are being implemented through Old Northern Road Quarry Traffic Management Plan (TMP). The mitigation measures listed in Table 5.1 in the TMP are categorised into three main categories: (1) truck movement measures, (2) site operational control measures and (3) transport related consultation measures.

During the period of this Annual Review, the adopted mitigation measures have been effective in managing traffic on the quarry premise. Restrictions on number of truck movements to and from site during morning and daytime period have been complied with. All haulage truck operators have been inducted onto site and a record maintained.

During induction, the haulage truck operators were provided with a copy of the following documents:

- Site Traffic Management Plan - outlining specific requirements the responsibilities and requirements,
- Quarry Premise Map - showing traffic flow directions,
- Maroota Local Traffic Management Policy - outlining the inter-pit agreement between the three signatories of local quarries, and
- Site Induction Declaration – declaration to be made and signed by haulage truck operators confirming induction requirements.

The implemented mitigation measures and educational campaign increases awareness and emphasises the importance of traffic related compliance. This has proven to be effective as there is a decreasing trend in the number of traffic related complaints over the last three reporting years, as discussed in later Section 8.3.

5.3.6 Additional Management Controls

The Maroota Local Traffic Management Policy (MLTMP) was reviewed, updated and signed by the local quarry signatories on 17 January 2020. This MLTMP (2020) supersedes the original MLTMP.

Dixon Sand continues to show its support towards the CCC's recommendation to extend the school zone time outside Maroota Public School in the afternoon from 16:00 to 16:30 due to safety concerns for students waiting for school bus pickup within that period. The matter has been raised by the CCC Chairperson with the member of the Hawkesbury Electorate in correspondence with The Hills Shire Council, noting that the original contact was made 3 years ago. Future correspondences will be dealt with in the CCC meetings. The outcome of this proposal is yet to be resolved.

No additional management controls identified.

5.3.7 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, Disposal and Recycling

During the reporting period, waste oil and grease were removed from the quarry by a licensed contractor for processing and disposal. 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 the 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 for disposal, recycled and processed during the monitoring period is contained in Tables 21. The waste tracking register is contained in Appendix L.

Table 21: Old Northern Road – Total waste generated on site, July 2022 to June 2023.

Waste Type	Disposal / Recycling / Processing	Amount of Waste Generated
General Solid Waste - Putrescible	The Hills Shire Council Waste Contractor weekly bin collection (3 x 240L Red bin)	Approx. 78 m^3
General Solid Waste - Recyclables	The Hills Shire Council Waste Contractor fortnightly bin collection (2 x 240L Yellow bin)	Approx. 52 m^3
Scrap Metals	Recycled by Westland Metals	42.3 tonnes
Non-putrescible waste from workshop	Skip Bins provided and picked up by Asquith Mini Skips	50m^3
Grease	Collected and transported by Grease Eater	4,425 litres
Waste Oil	Collected and transported by: • ABC Waste Oil Collection	3,000 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

5.4.2 Waste Importation

DA 250-09-01 does not permit any importation of waste onto the quarry premise.

5.4.3 Changes to Environmental Procedures

No changes to the waste management procedure are proposed for the next 2023-2024 reporting period.

Continued 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. Installation and commencement of monitoring of these two additional bores occurred in September 2015.

6.1.1 Groundwater Levels and Criteria / Trigger Levels

Groundwater levels for the Old Northern Road Quarry have been measured on a monthly basis. The groundwater monitoring system comprised initially of five boreholes in 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 (Modification 4). Borehole BH2 was damaged in December 2019 due to vehicle strike and therefore monitoring has been suspended until the monitoring well is rectified.

Borehole locations are listed in Table 22.

Table 22: 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	Localised perched aquifer
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.*

The baseline groundwater level statistics with the 20th and 80th percentile results are listed in Table 23.

Table 23: Baseline Groundwater Level Statistics and Trigger Values (2003 – 2020)

Monitoring Bore	Minimum	20th Percentile	50th Percentile	80th Percentile	Maximum
MW1	173.1	176.0	177.5	178.3	180.0
MW2	191.2	194.3	199.0	200.3	202.1
MW3	173.6	175.1	177.4	178.4	180.3
MW5	158.4	162.1	162.6	162.9	164.0
BH1	106.1	106.2	106.2	107.1	107.5
BH2	162.1	165.0	165.0	166.7	167.9
BH3	158.1	160.5	161.0	161.7	162.1
BH6	161.7	164.1	164.7	165.5	166.2
BH7	157.0	160.0	160.4	161.2	162.1
BH8	189.2	189.5	189.8	189.9	190.3
BH9	157.8	161.3	163.0	163.8	164.4

6.1.2 Groundwater Quality and Criteria / Trigger Levels

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 2022 and June 2023. 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. Table 24 contains that baseline groundwater quality statistics and trigger values.

Table 24: Baseline Groundwater Quality Statistics and Trigger Values (2010 – 2020)

Monitoring Bore	pH			Electrical Conductivity (µS/c)		
	20th Percentile	50th Percentile	80th Percentile	20th Percentile	50th Percentile	80th Percentile
MW1	4.0	4.1	4.6	206	249	271
MW2	3.7	3.9	4.5	239	560	618
MW3	5.2	5.6	6.1	129	141	160
MW5	4.4	5.1	5.4	135	151	213
BH1	6.0	6.1	6.6	161	185	214
BH2	4.9	5.7	7.1	262	293	325
BH3	5.9	6.0	6.9	176	186	269
BH6	5.2	5.5	5.8	120	127	156
BH7	4.4	4.8	5.8	242	252	258
BH8	3.9	4.0	4.1	267	278	291
BH9	5.4	5.5	5.6	262	269	275

6.1.3 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 25. Water discharged at the main storage dam weir must meet these criteria outlined in the EPL 3916. Water sampling at the EPA licensed discharge point is to be obtained and analysed against the criteria in Condition L2.4 of EPL 3916 prior to being discharged from the main water storage dam, as listed Table 26.

Table 25: EPL 3916 Surface water sampling requirement at LDP01.

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

Table 26: EPL 3916 Surface water discharge criteria.

Pollutant	Units of Measure	100th Percentile concentration limit
pH	pH	4.5 – 6.5
Total Suspended Solids	milligrams per litre	50

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 27 below.

Table 27: 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.

Notwithstanding Condition 17 of Schedule 2 of DA250-09-01, Licence 627635 was granted by Department of Planning, Industry and Environment (Crown Lands) and commenced on 4th June 2021 permitting Dixon Sand to undertake extraction of the area hatched on Lot 196 (Appendix 2 of DA 250-09-01) beyond the depth of 15.24 m below original ground level.

6.3 Results

6.3.1 Groundwater Levels

Chart 19 depicts the long term recorded groundwater levels, with monitoring commencing in June 2003. Charts 20 to 30 (inclusive) illustrate the groundwater levels for all monitoring bores for this reporting period.

6.3.2 Groundwater Quality

Chart 31 displays the long-term pH results for all monitoring bores from June 2010 to June 2023. Charts 32 to 42 (inclusive) show the pH results and trigger values for each bore for this reporting period.

Chart 43 presents the long-term electrical conductivity results for all monitoring bores from June 2010 to June 2023. Charts 44 to 54 (inclusive) show the electrical conductivity results and trigger values for each bore for this reporting period.

Note that there was insufficient water in Borehole BH8 during the sampling event and therefore no water quality could be tested.

6.3.3 Surface Water Monitoring

Charts 55 to 58 (inclusive) illustrate the pH, electrical conductivity, turbidity and total suspended solids of the water samples obtained from the surface monitoring location SW19.

6.3.4 Water Discharge Events

There was no water being discharged at LDP01 during this reporting period.

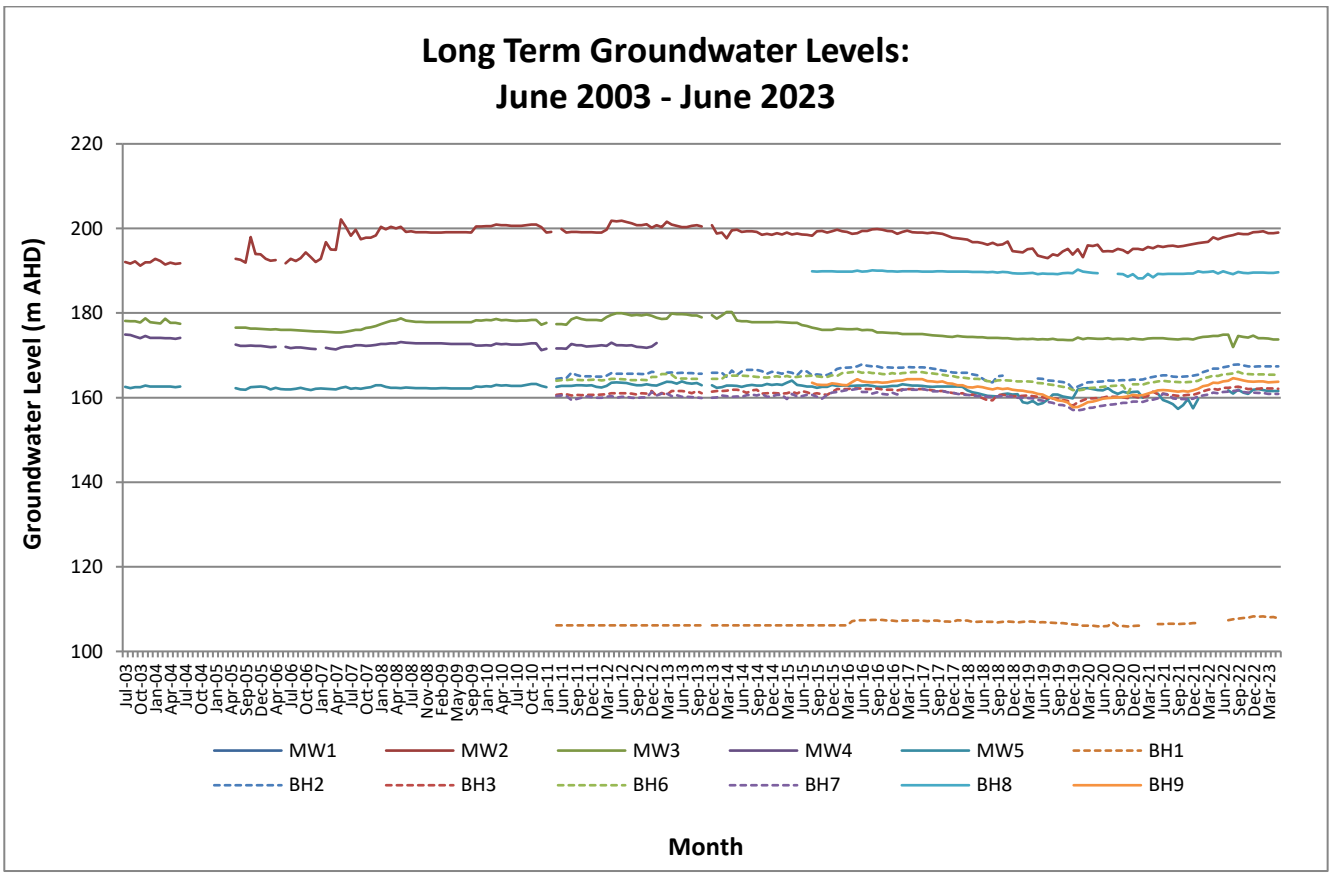


Chart 19: Long Term Groundwater Levels – all Boreholes.

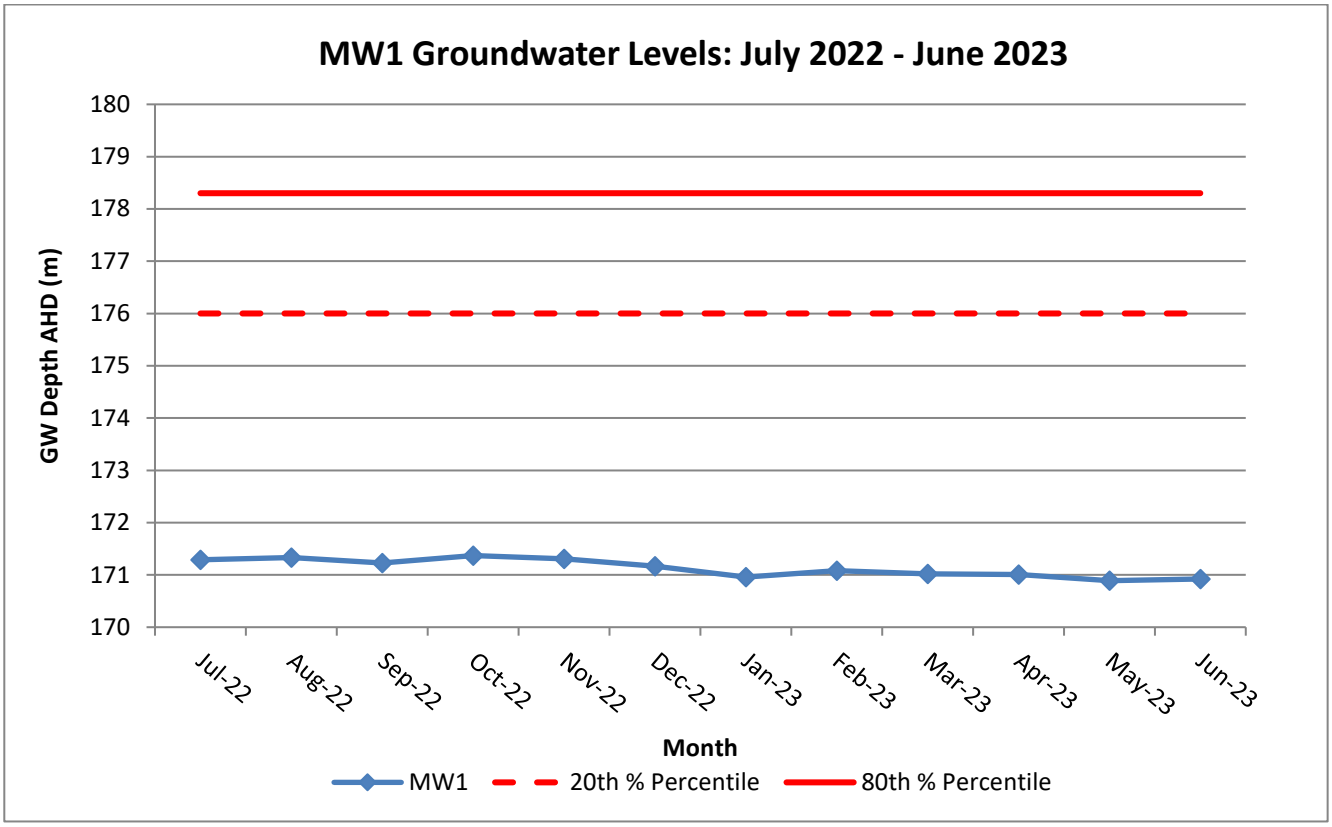


Chart 20: MW1 Groundwater Levels for July 2022 – June 2023.

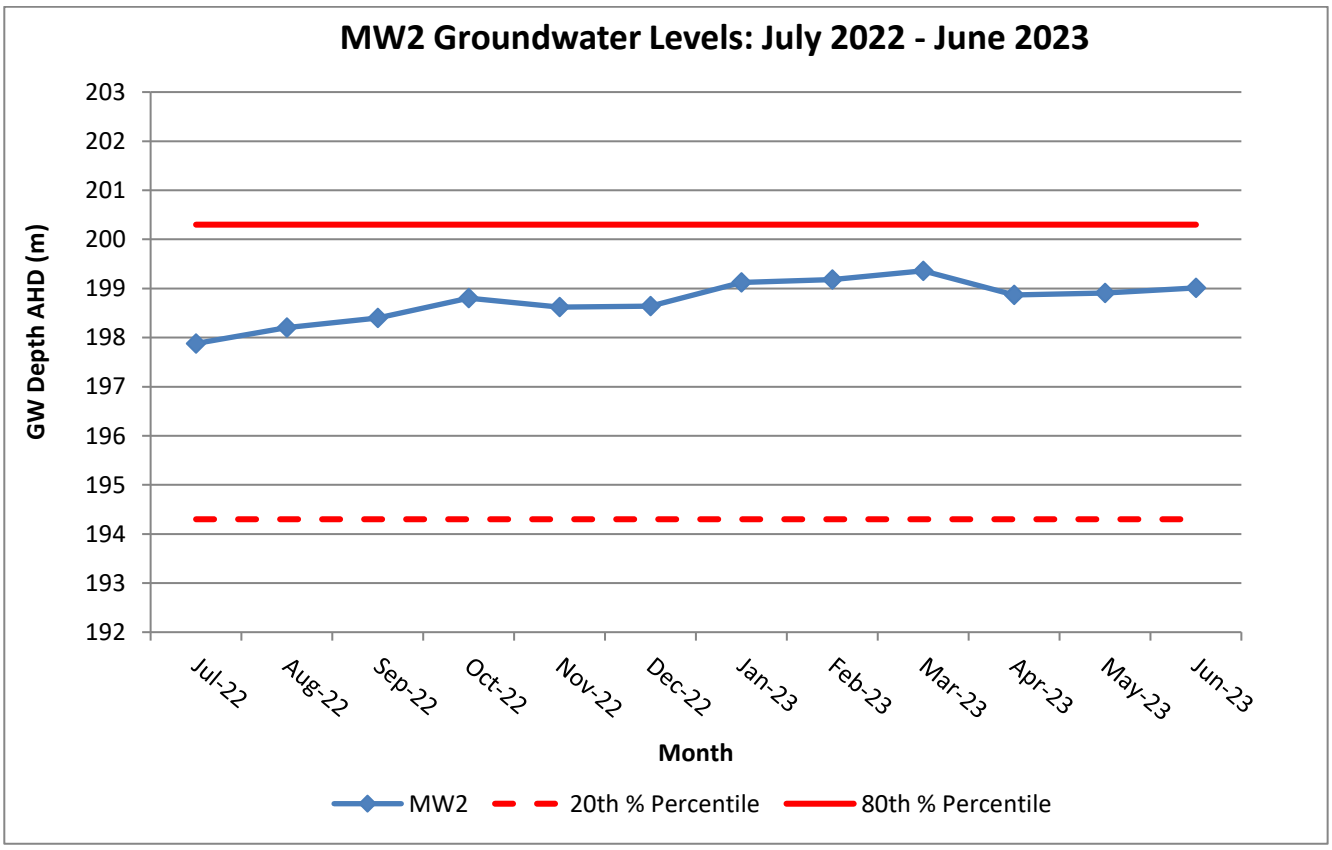


Chart 21: MW2 Groundwater Levels for July 2022 – June 2023.

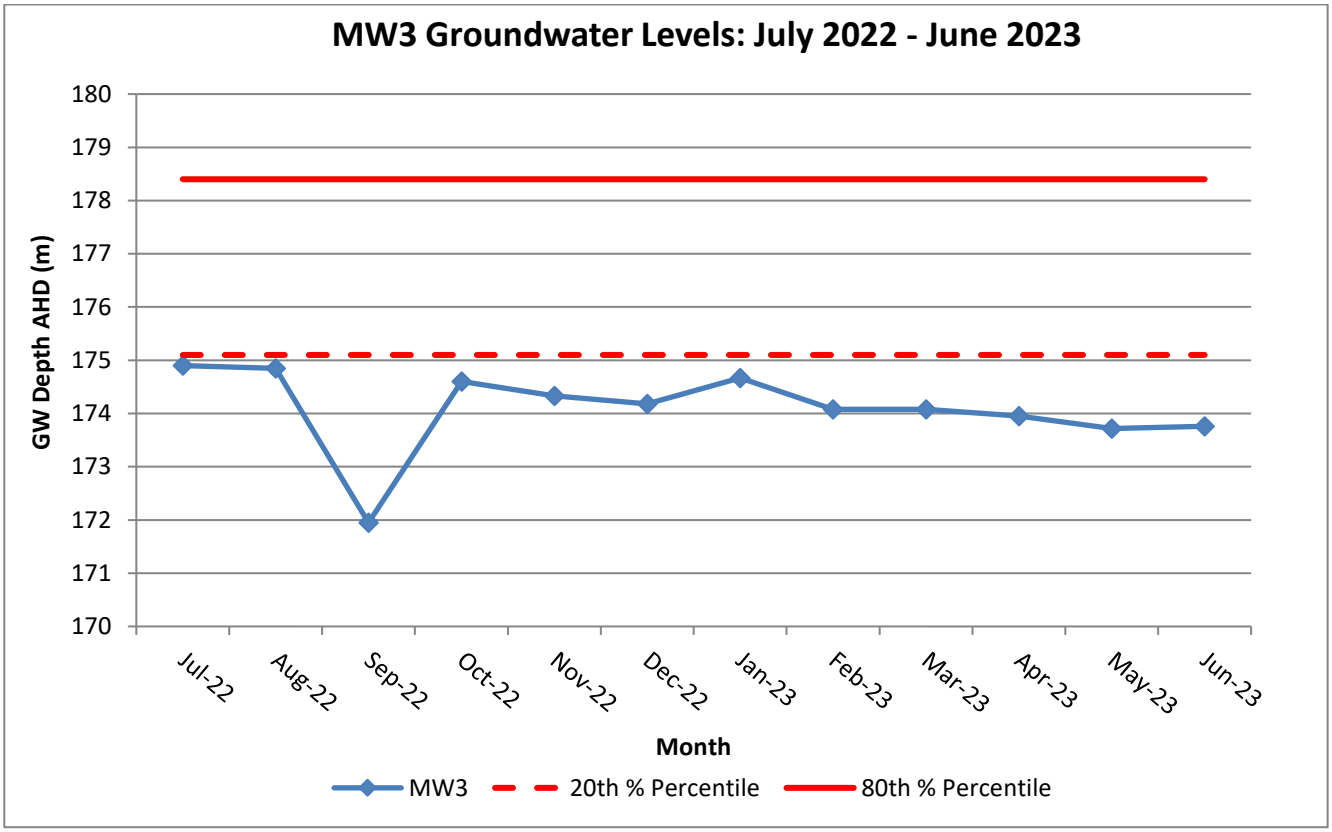


Chart 22: MW3 Groundwater Levels for July 2022 – June 2023.

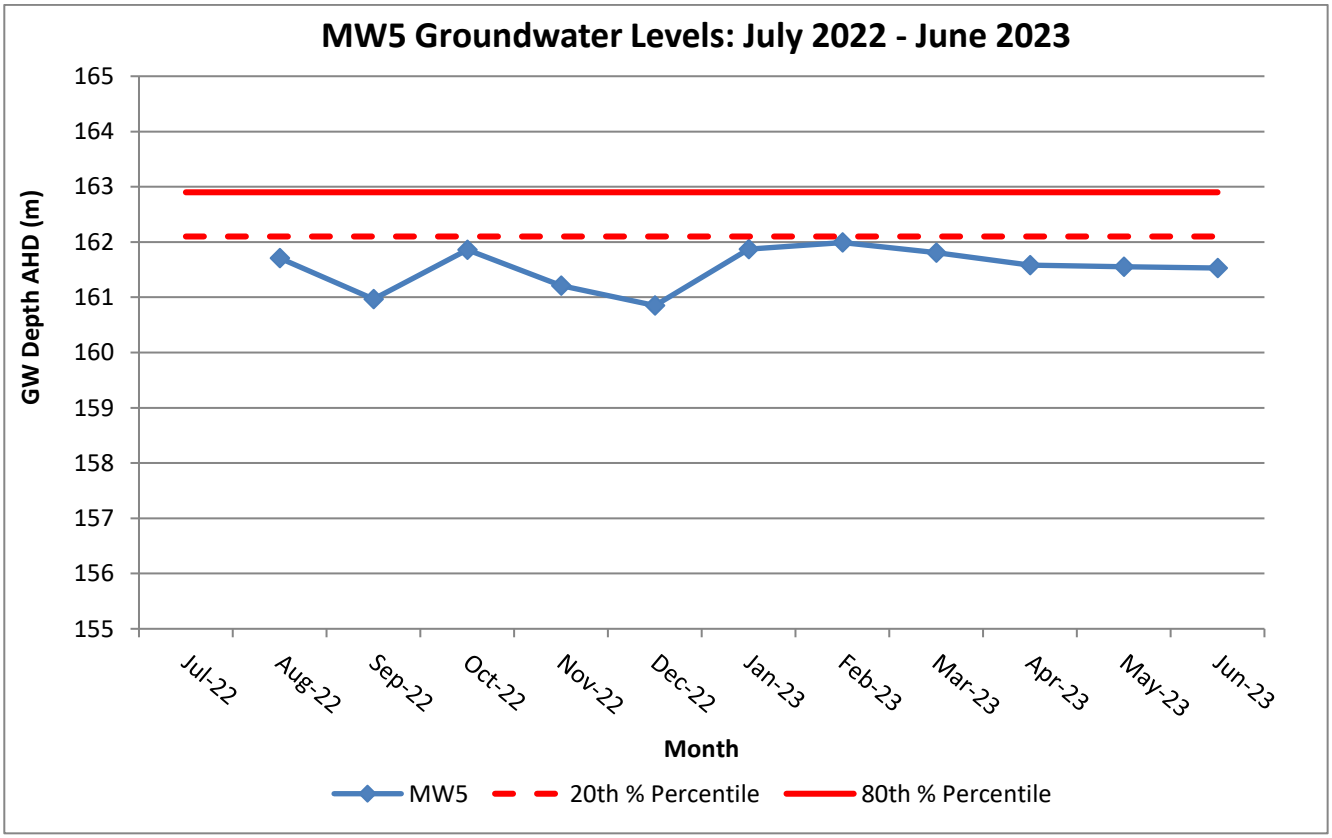


Chart 23: MW5 Groundwater Levels for July 2022 – June 2023.

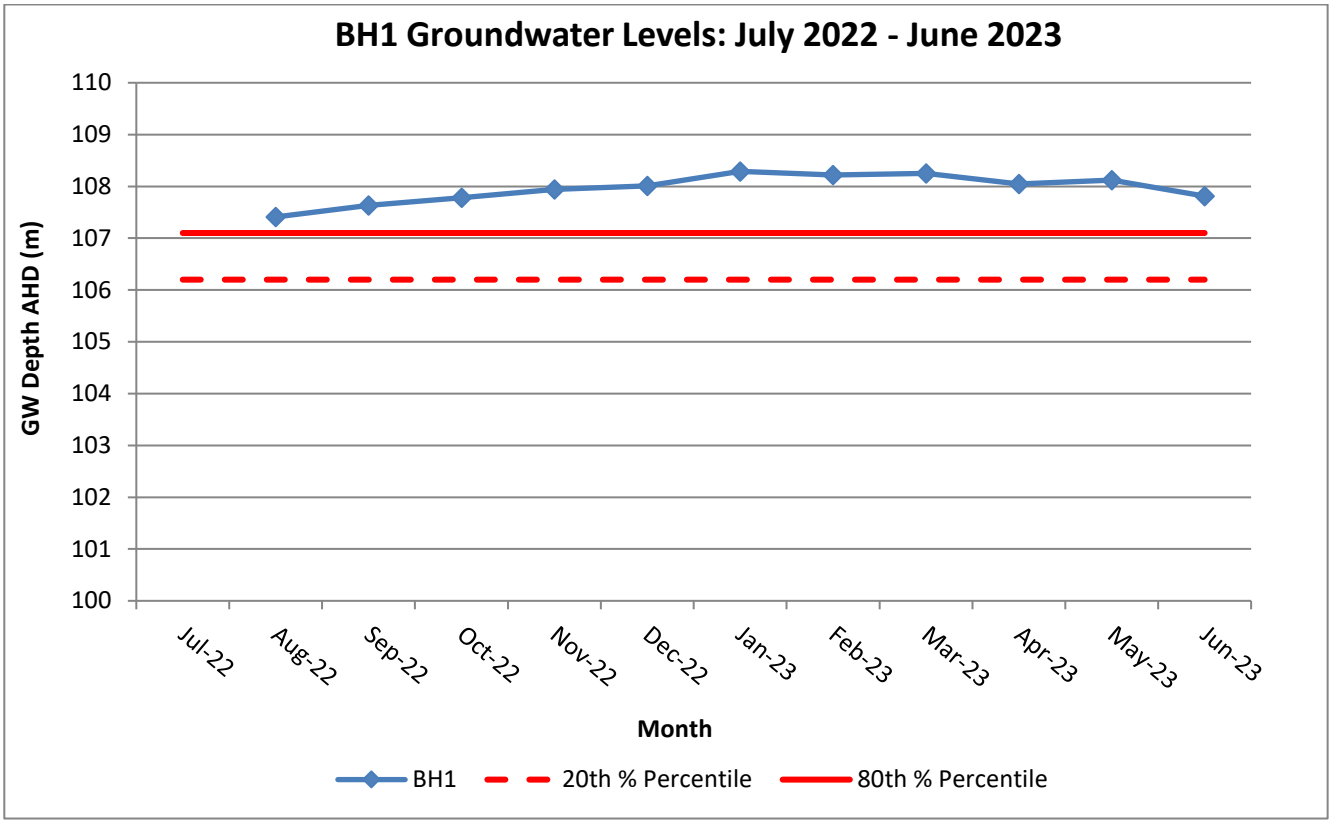


Chart 24: BH1 Groundwater Levels for July 2022 – June 2023.

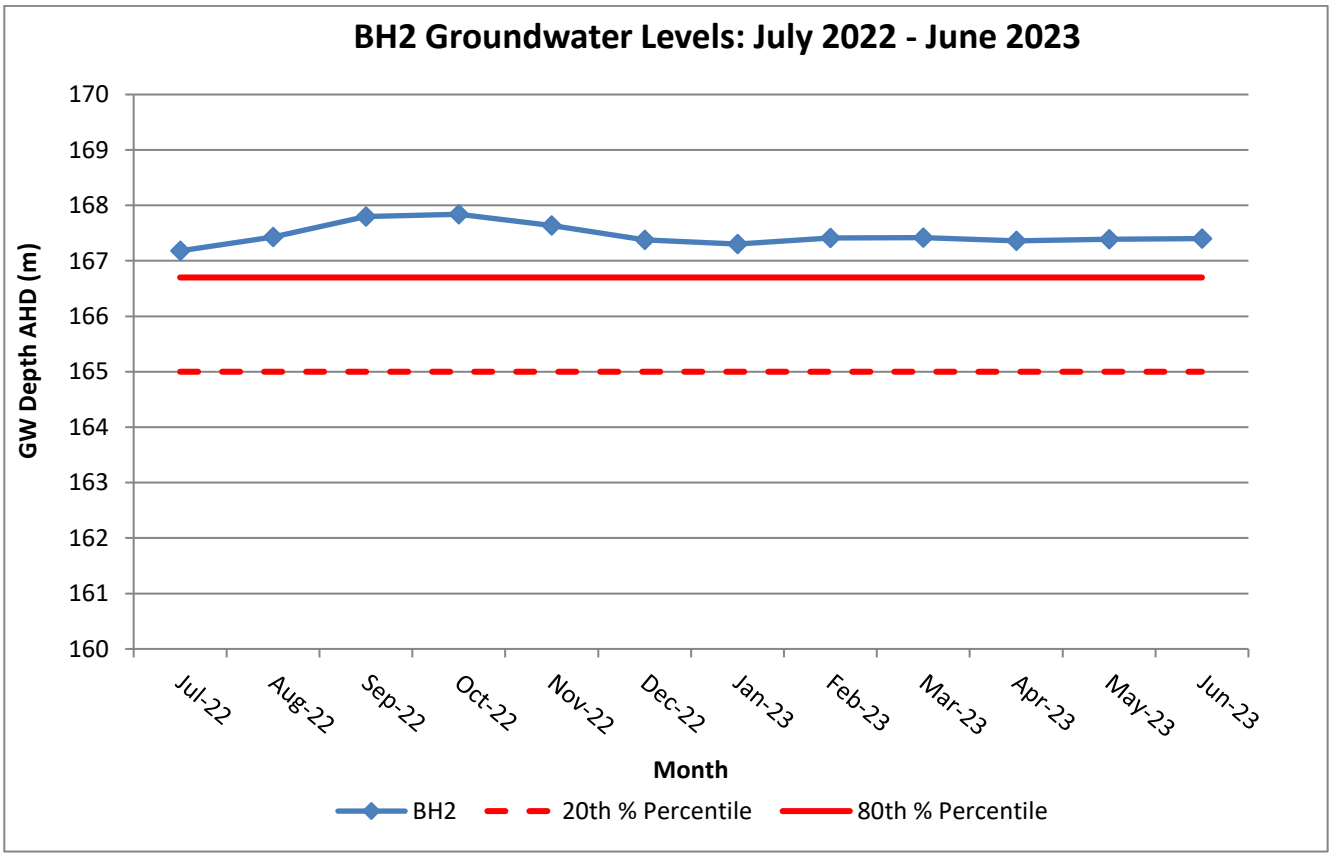


Chart 25: BH2 Groundwater Levels for July 2022 – June 2023..

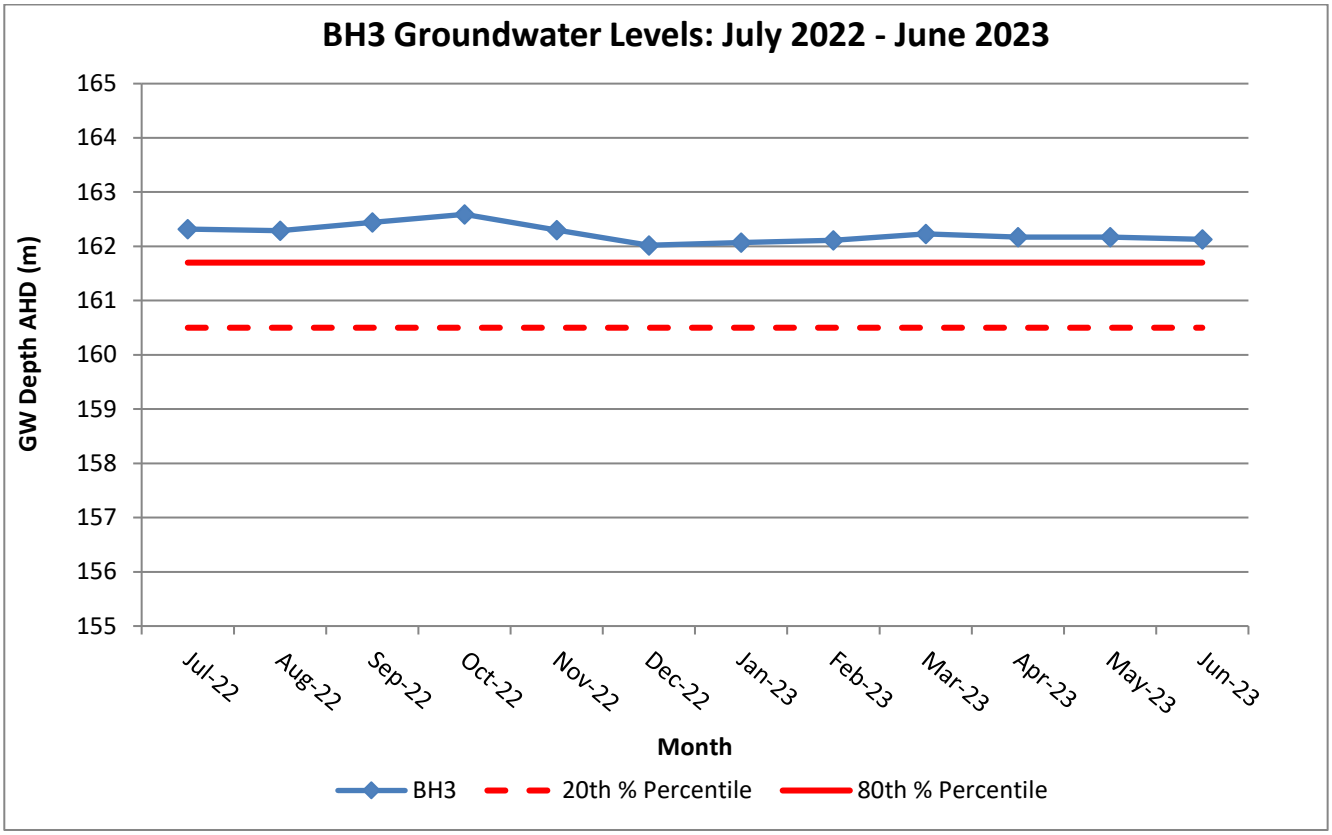


Chart 26: BH3 Groundwater Levels for July 2022 – June 2023.

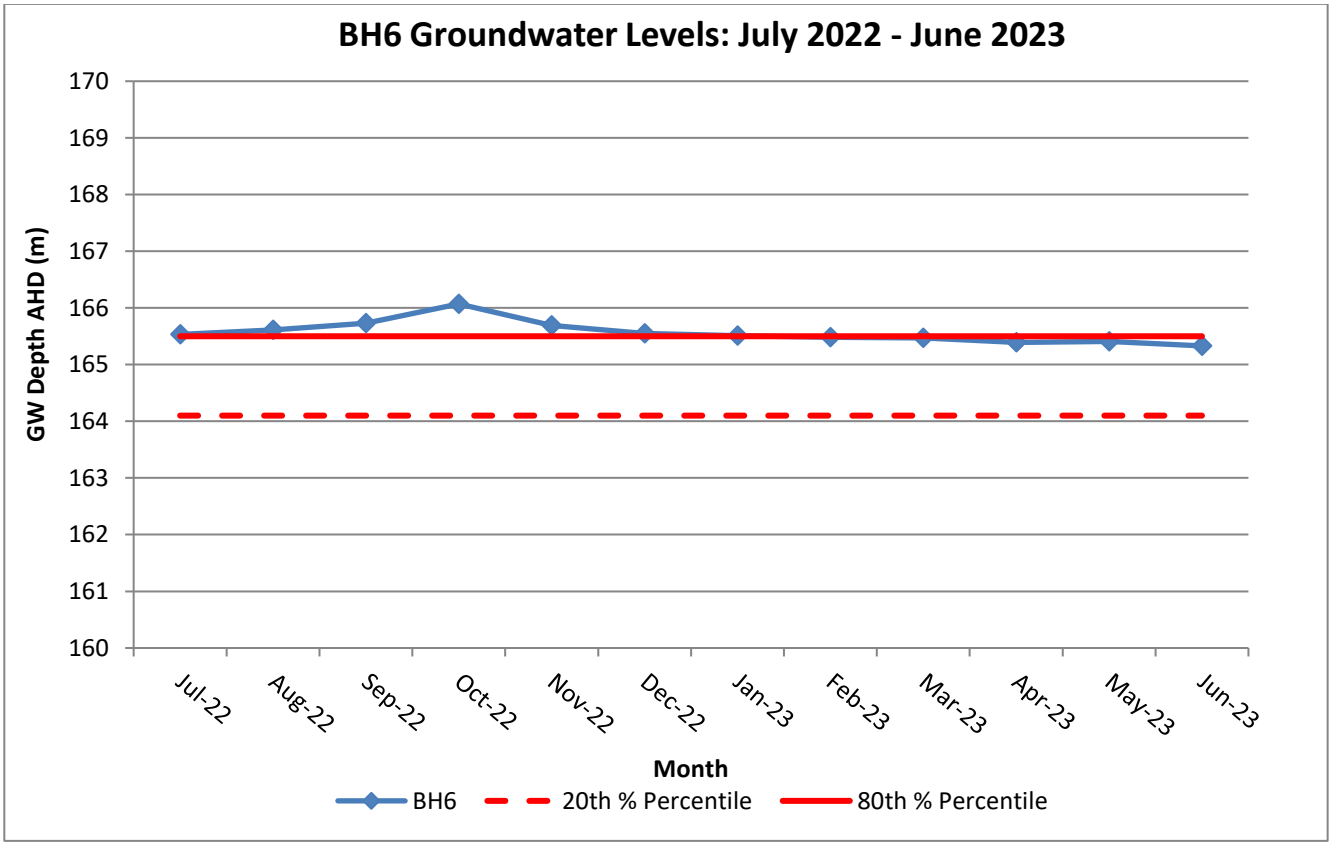


Chart 27: BH6 Groundwater Levels for July 2022 – June 2023.

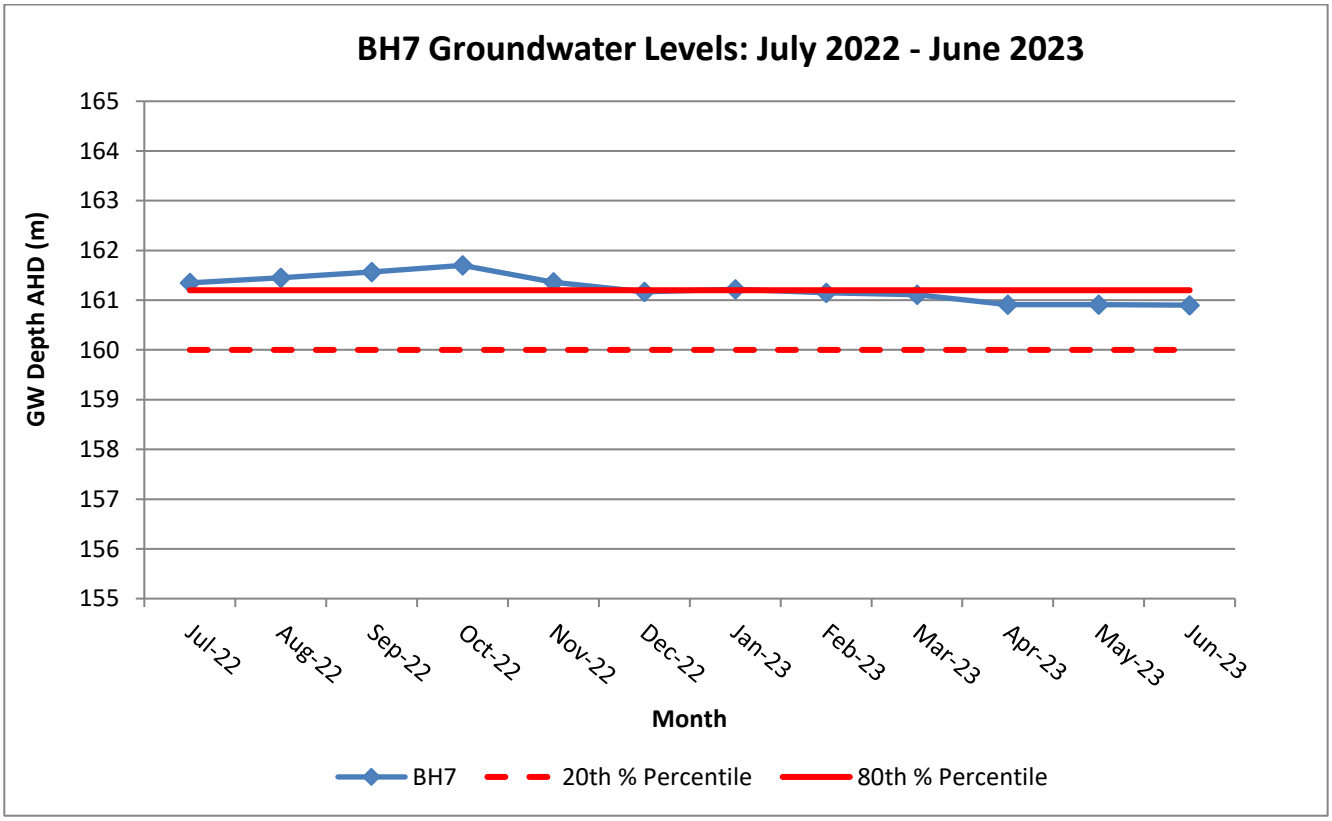


Chart 28: BH7 Groundwater Levels for July 2022 – June 2023.

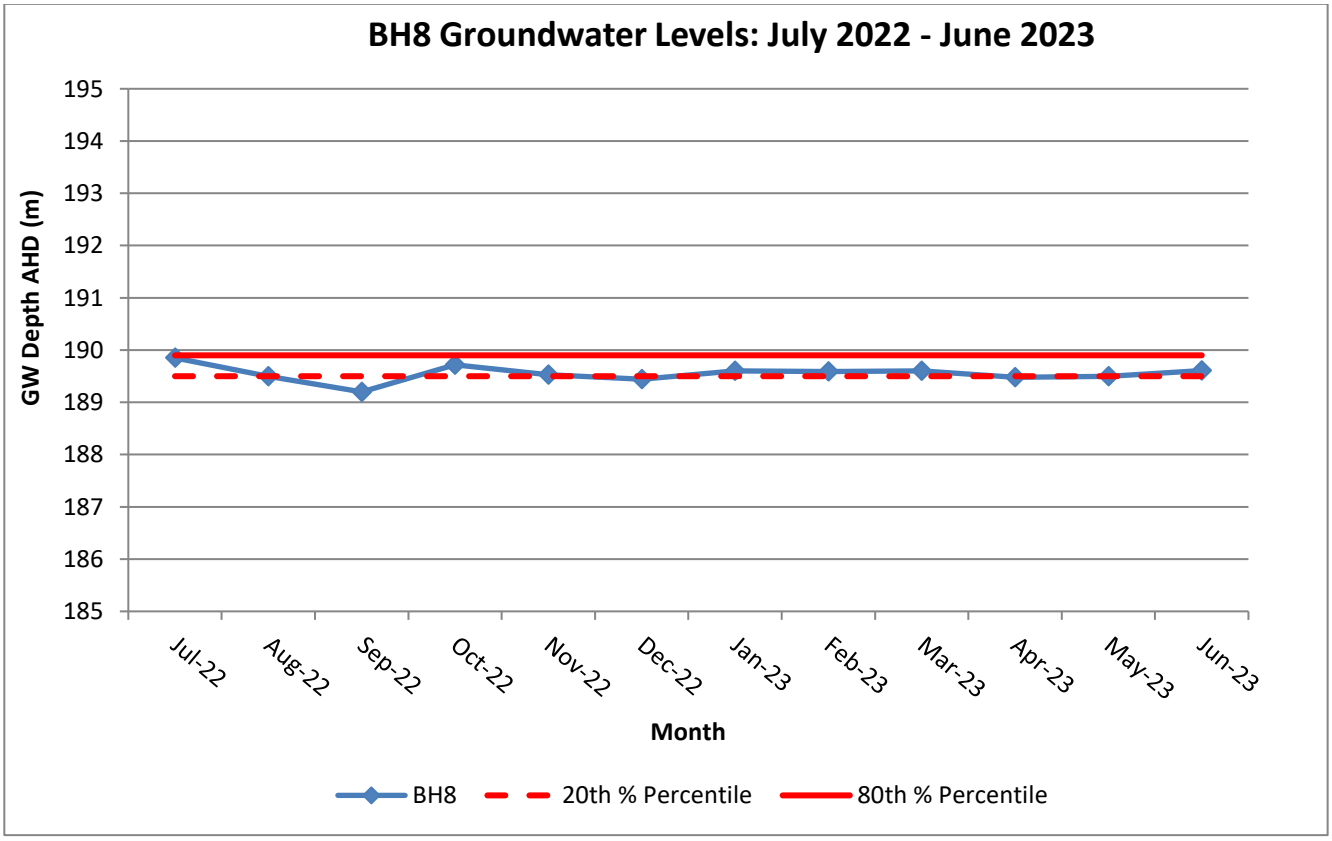


Chart 29: BH8 Groundwater Levels for July 2022 – June 2023.

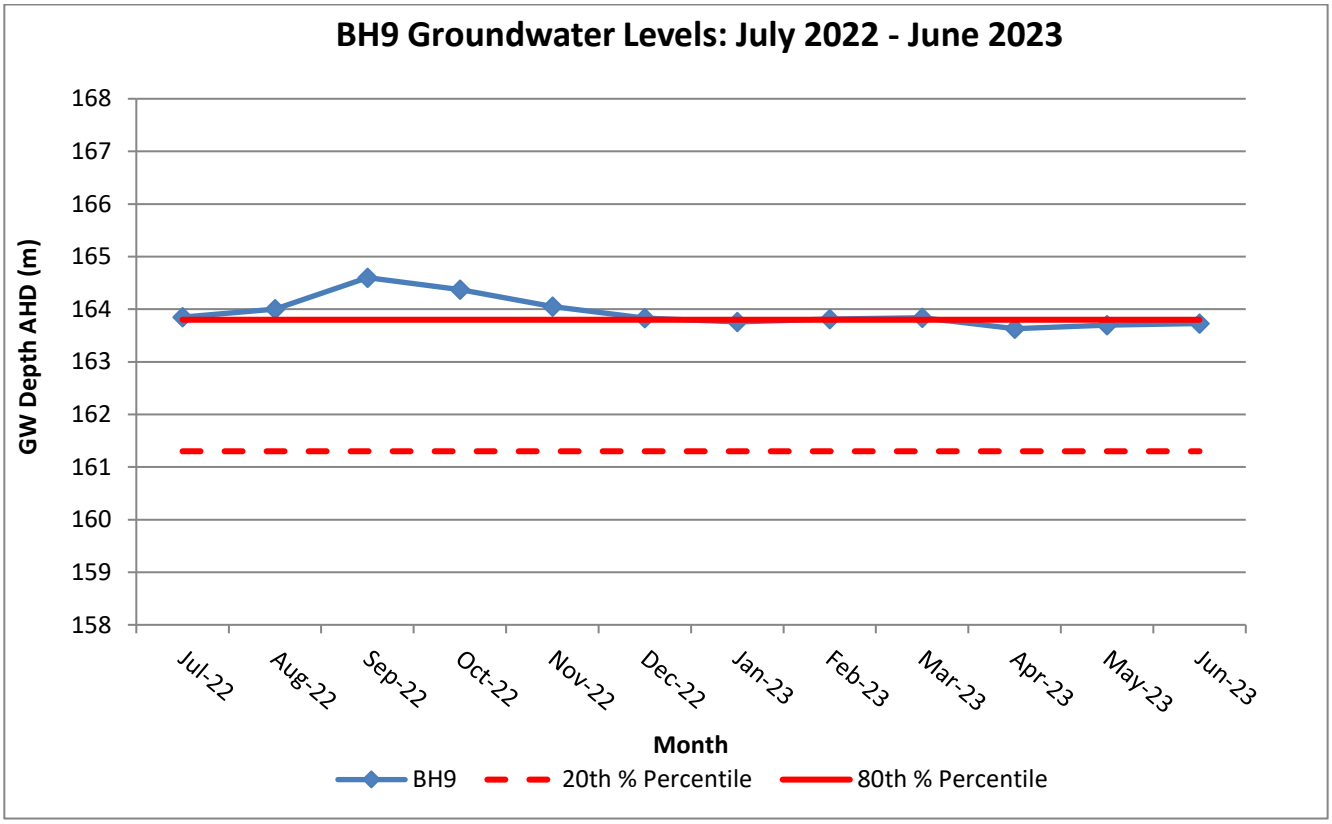


Chart 30: BH9 Groundwater Levels for July 2022 – June 2023.

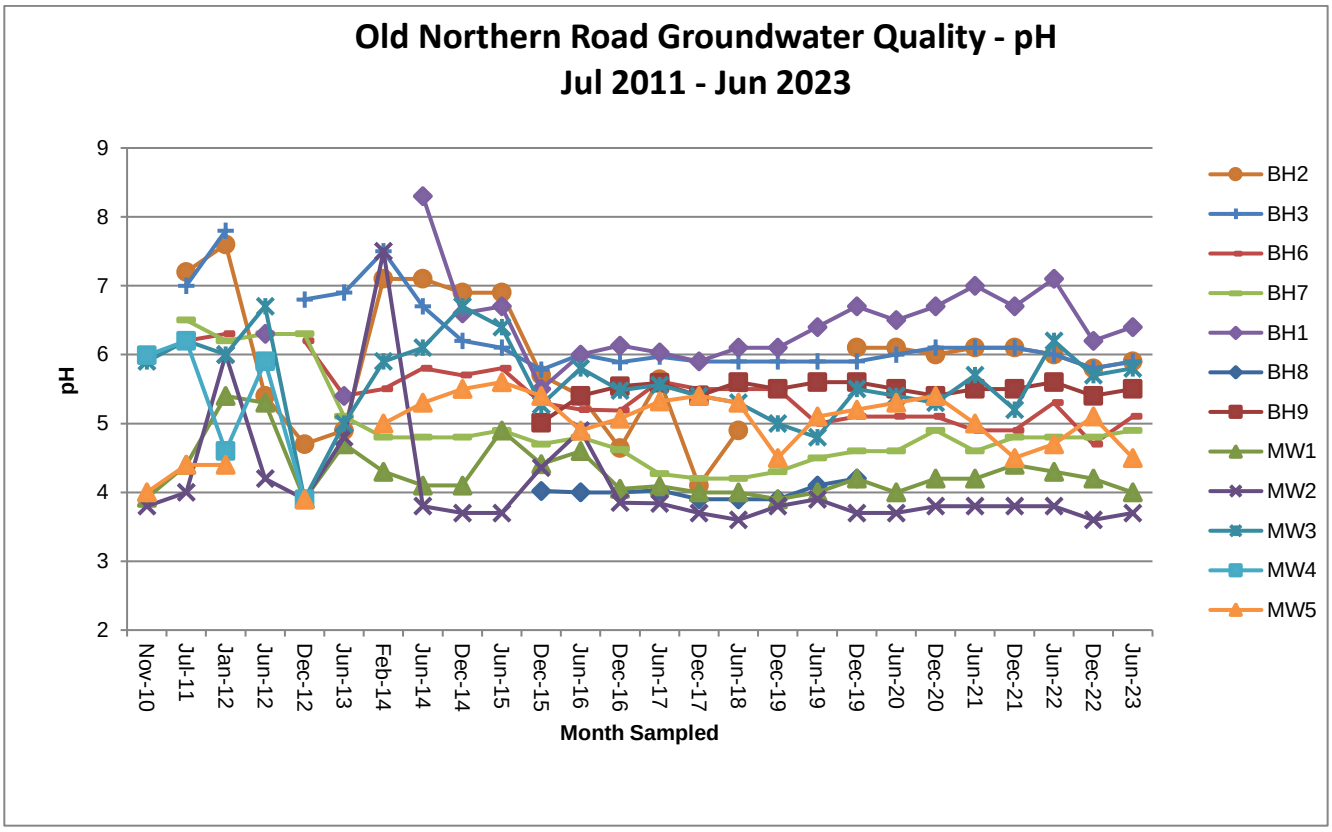


Chart 31: Long term pH results.

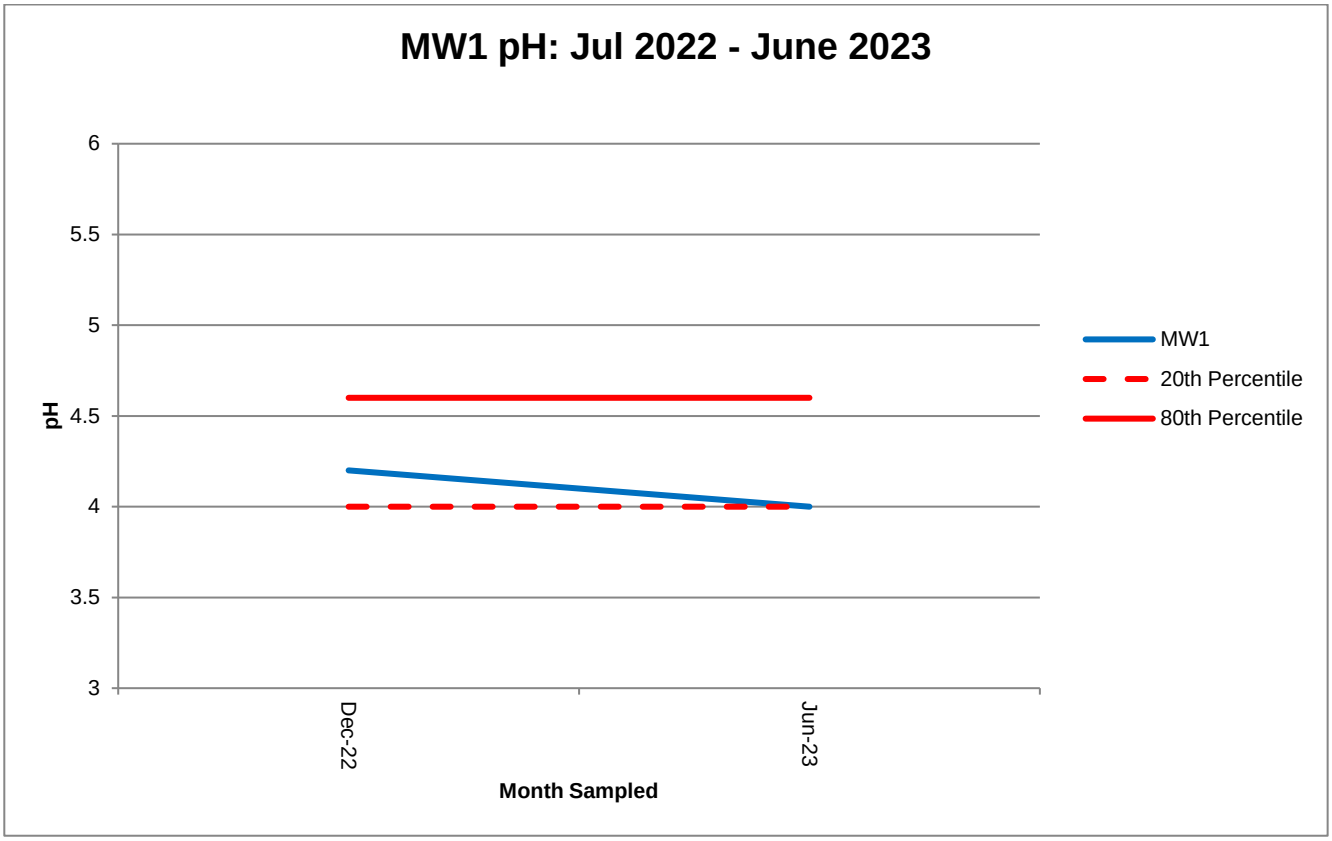


Chart 32: MW1 pH Results July 2022 – June 2023.

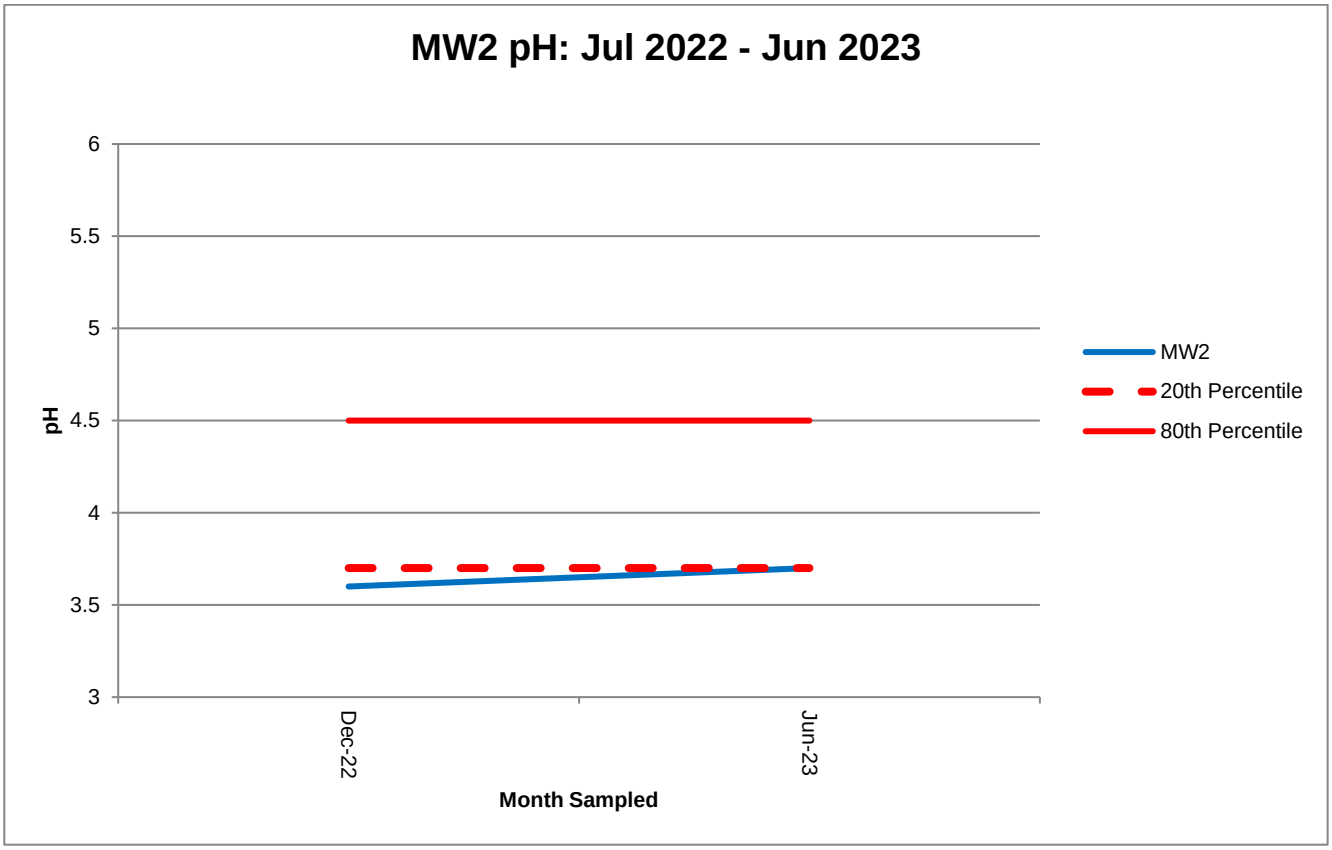


Chart 33: MW2 pH Results July 2022 – June 2023.

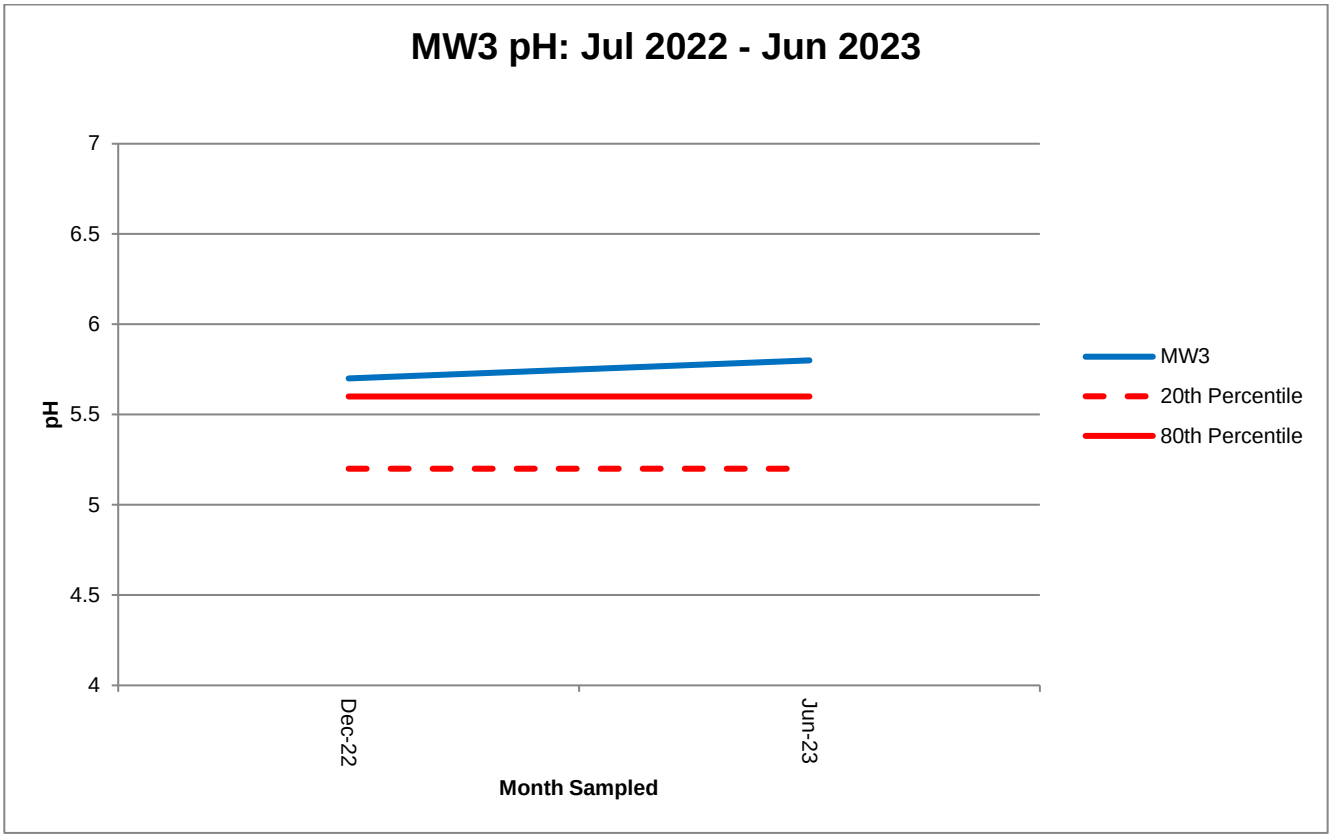


Chart 34: MW3 pH Results July 2022 – June 2023.

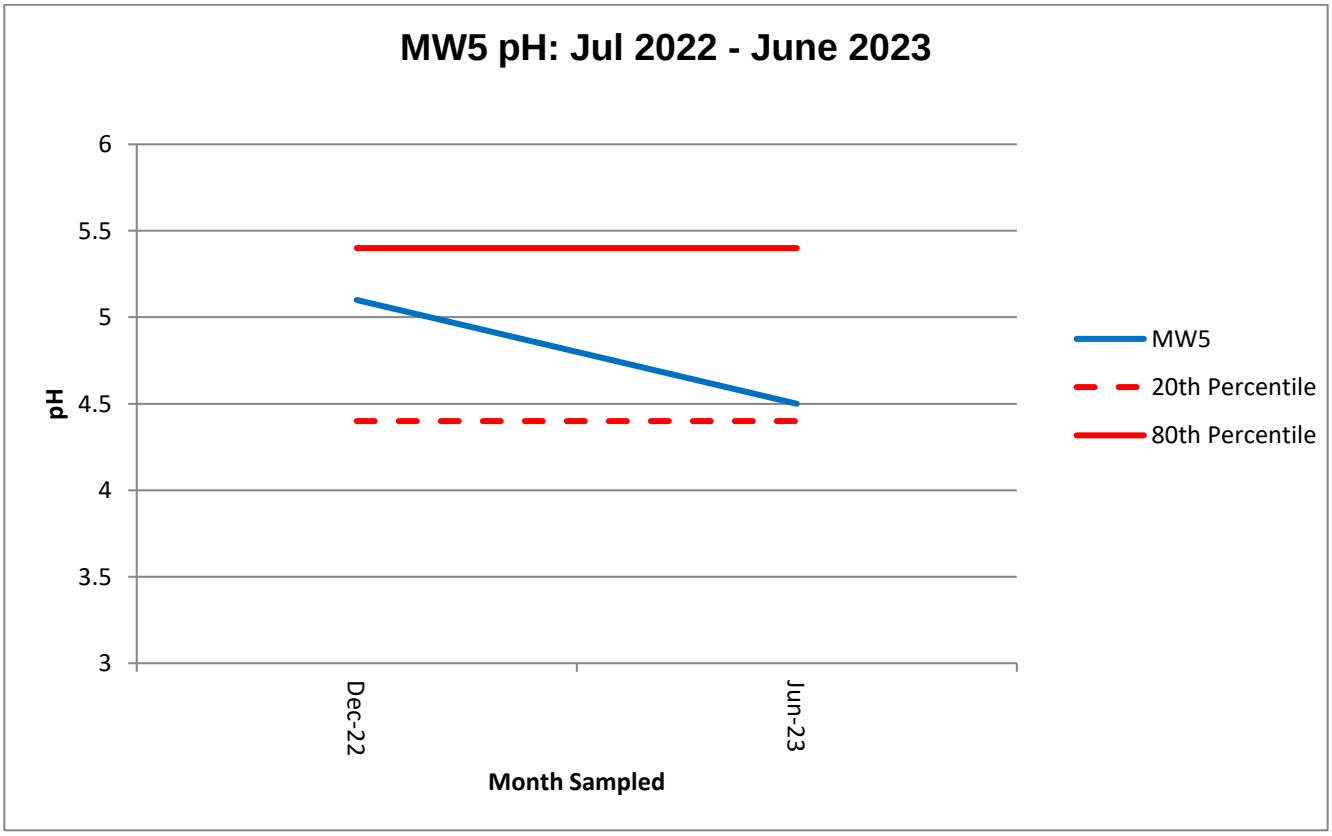


Chart 35: MW5 pH Results July 2022 – June 2023.

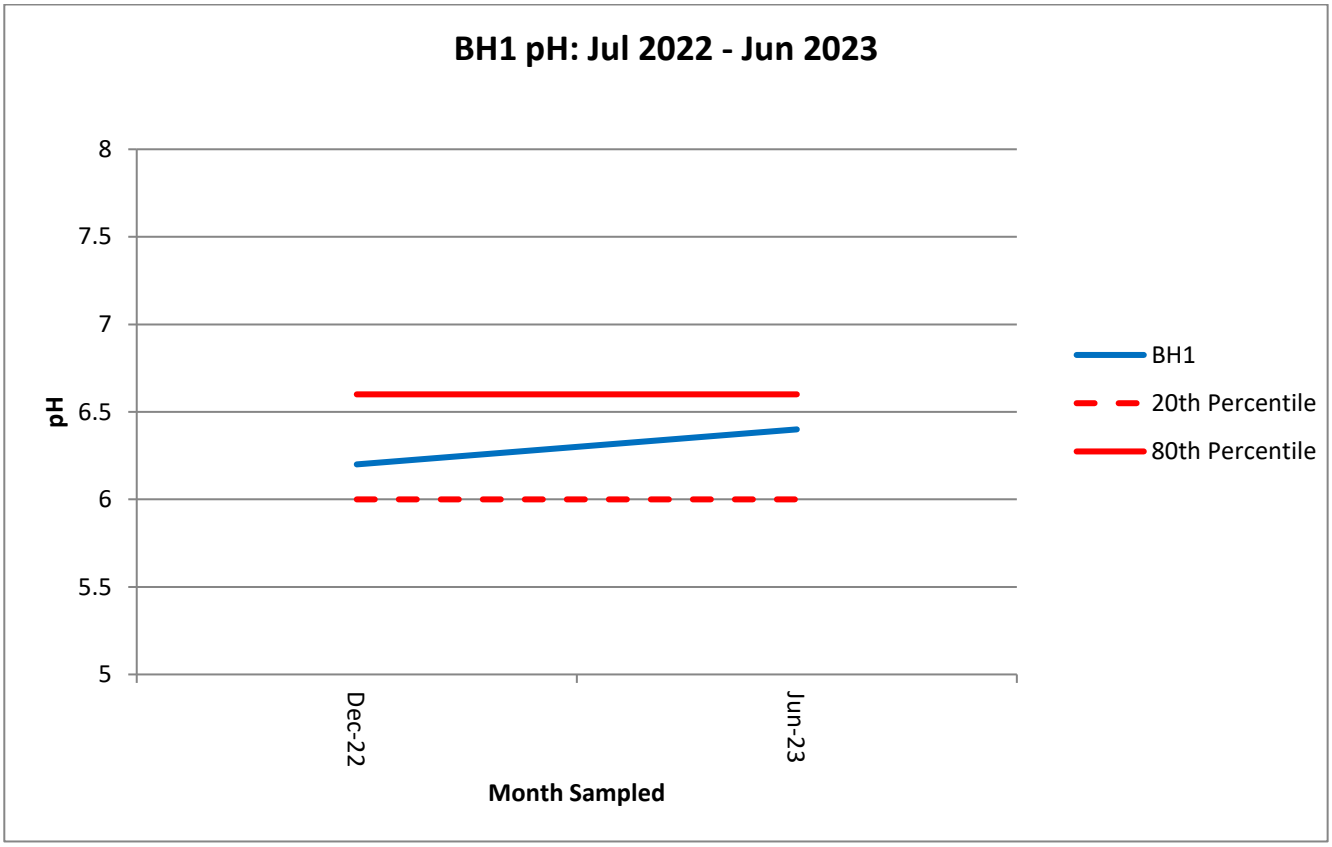


Chart 36: BH1 pH Results July 2022 – June 2023.

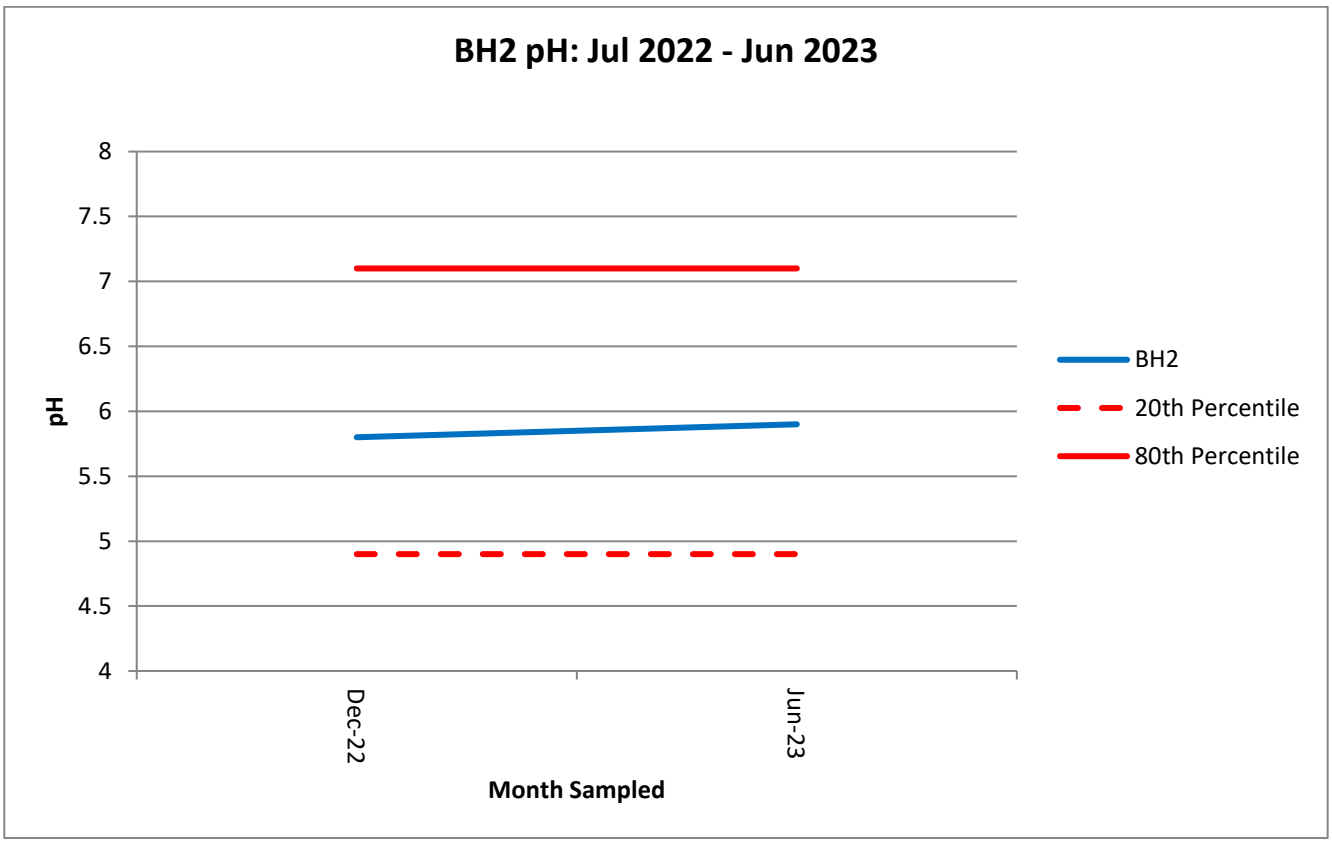


Chart 37: BH2 pH Results July 2022 – June 2023.

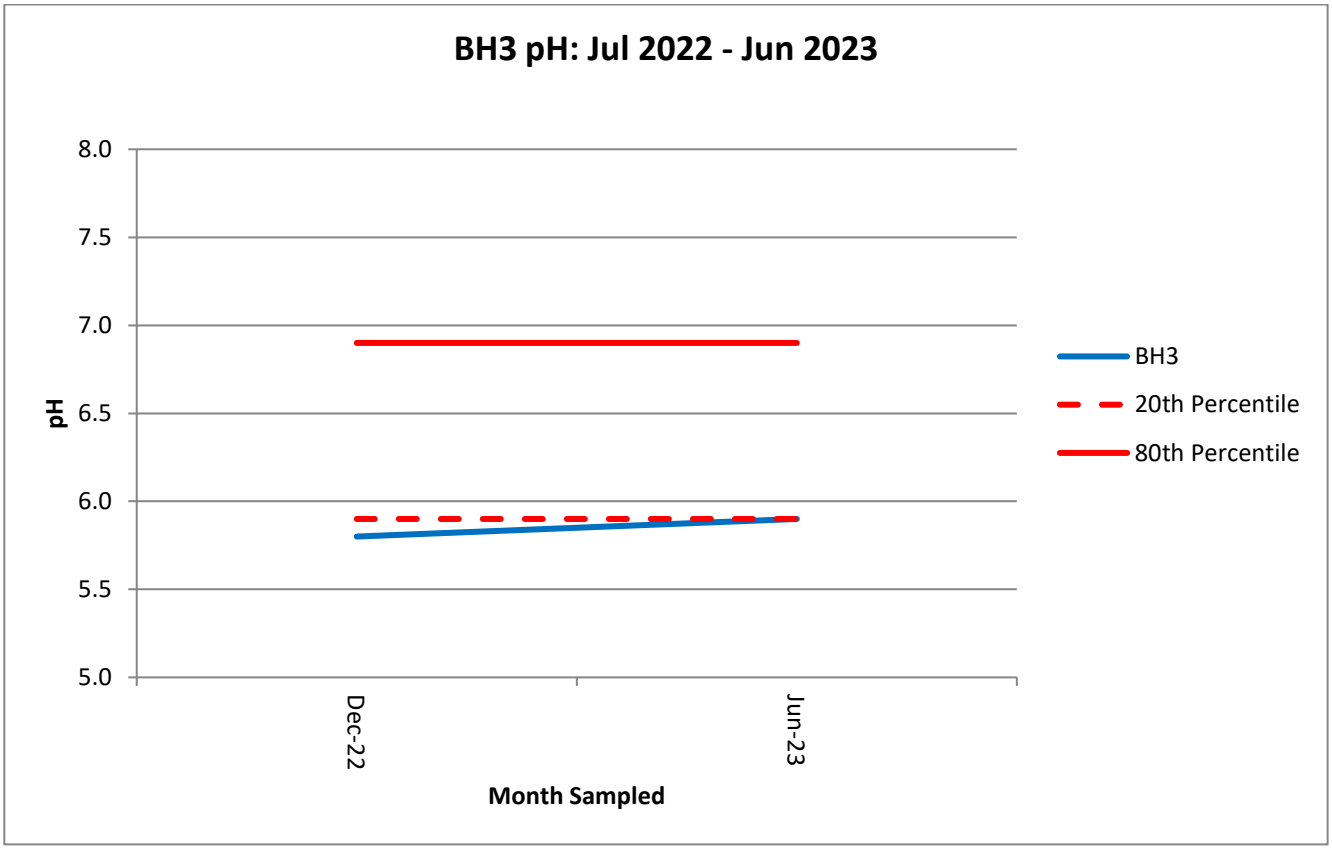


Chart 38: BH3 pH Results July 2022 – June 2023.

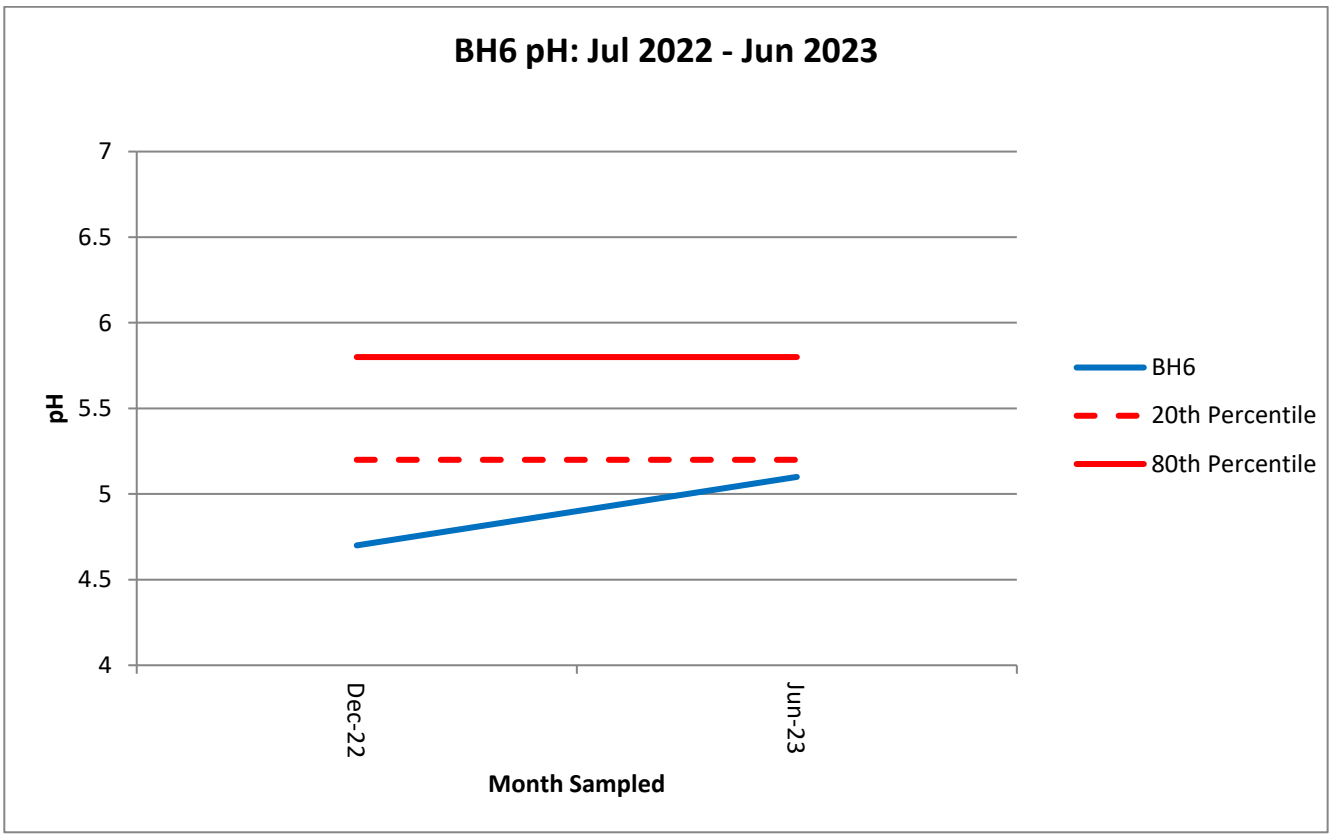


Chart 39: BH6 pH Results July 2022 – June 2023.

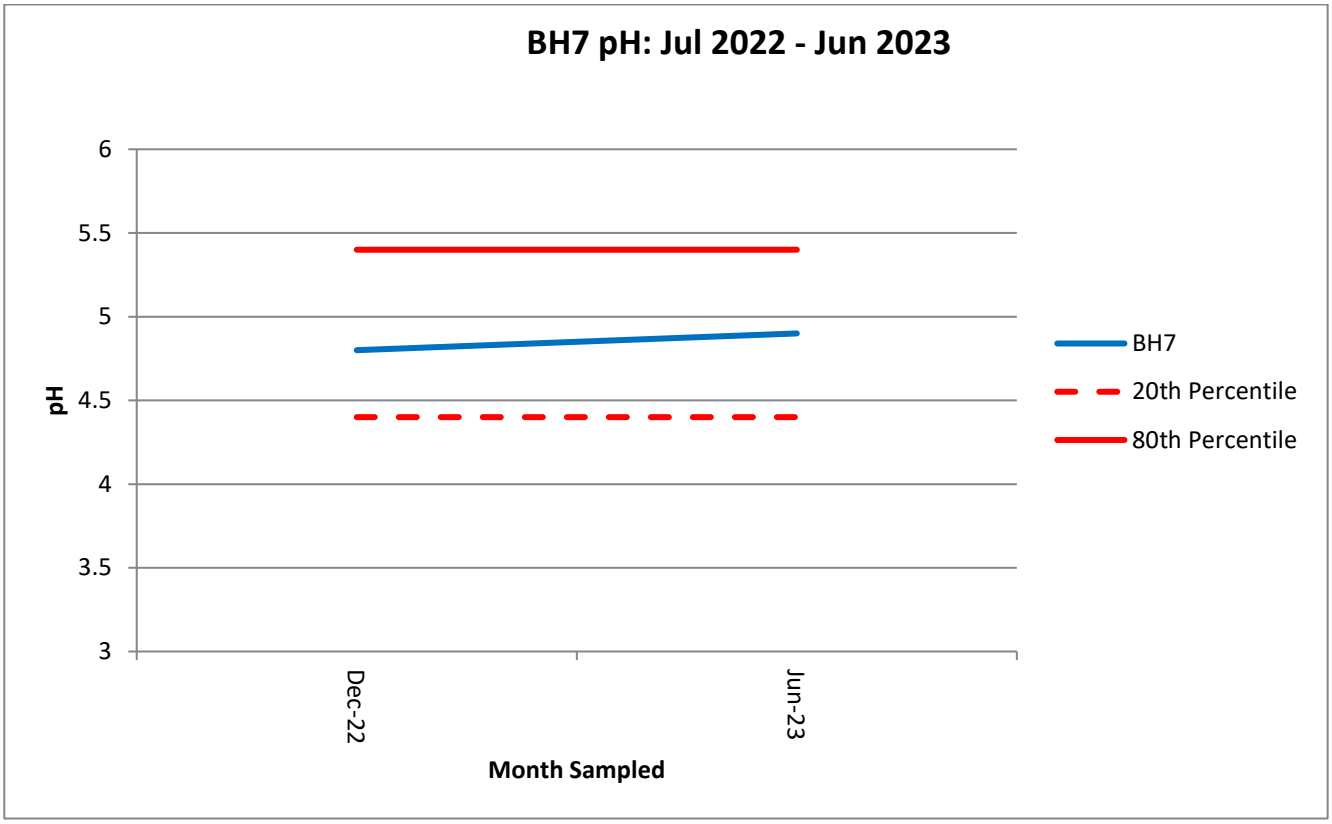


Chart 40: BH7 pH Results July 2022 – June 2023.

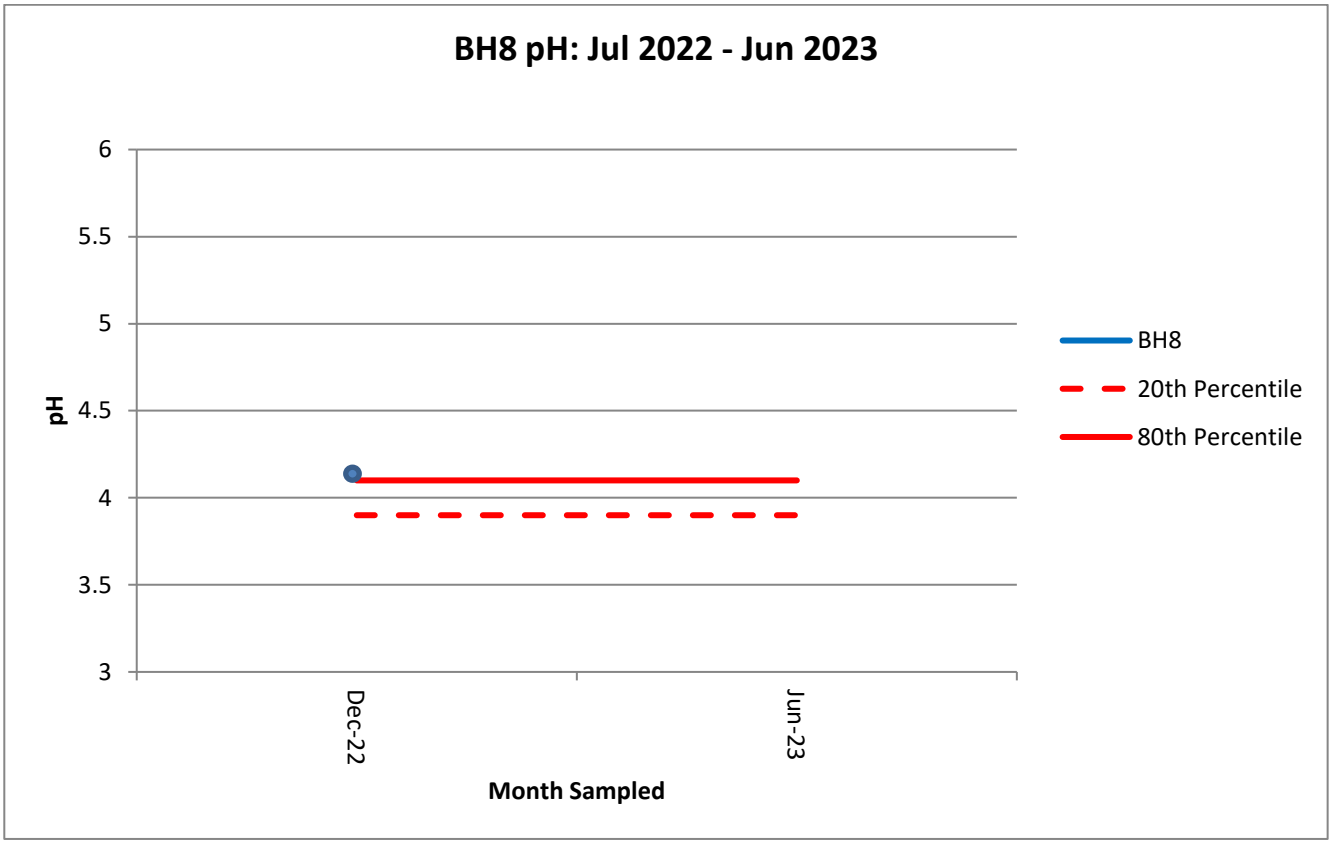


Chart 41: BH8 pH Results July 2022 – June 2023.

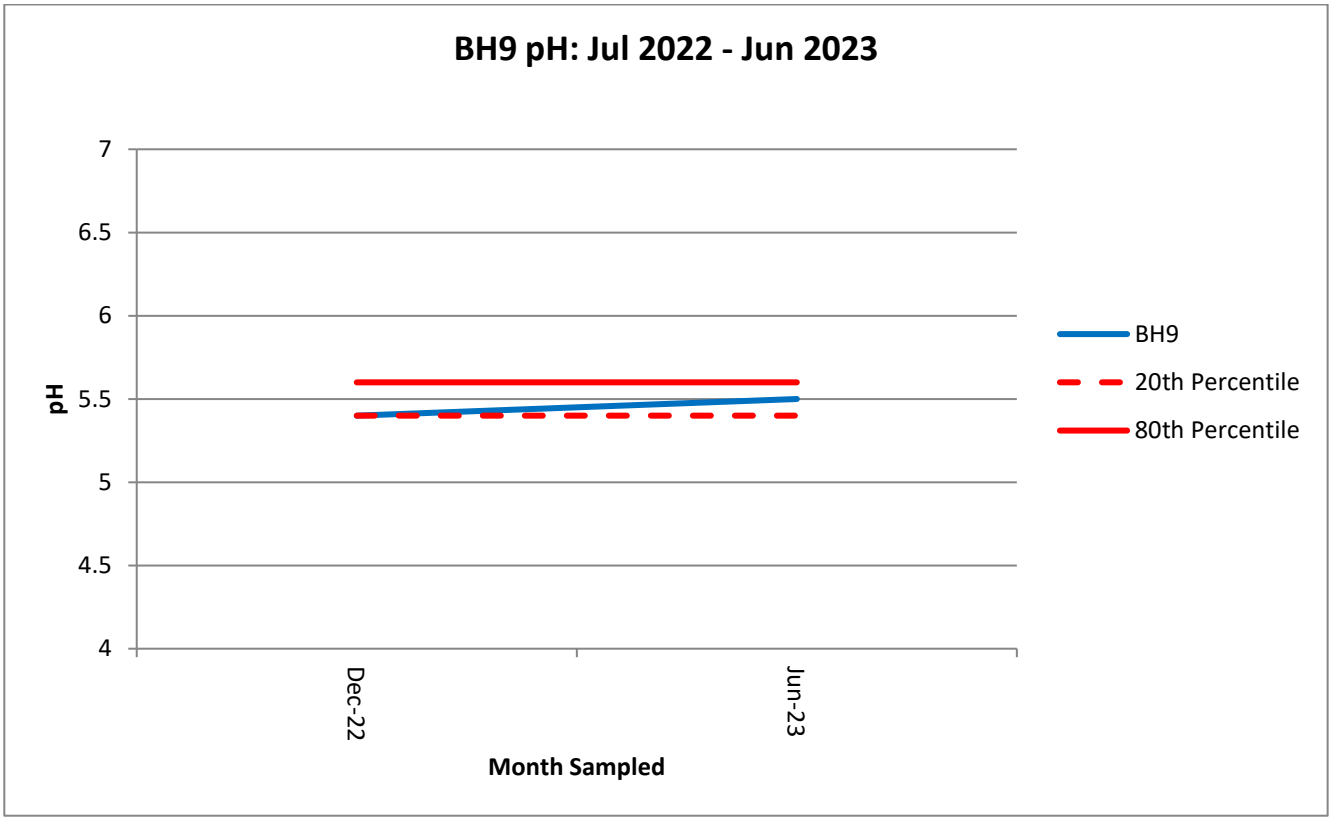


Chart 42: BH9 pH Results July 2022 – June 2023.

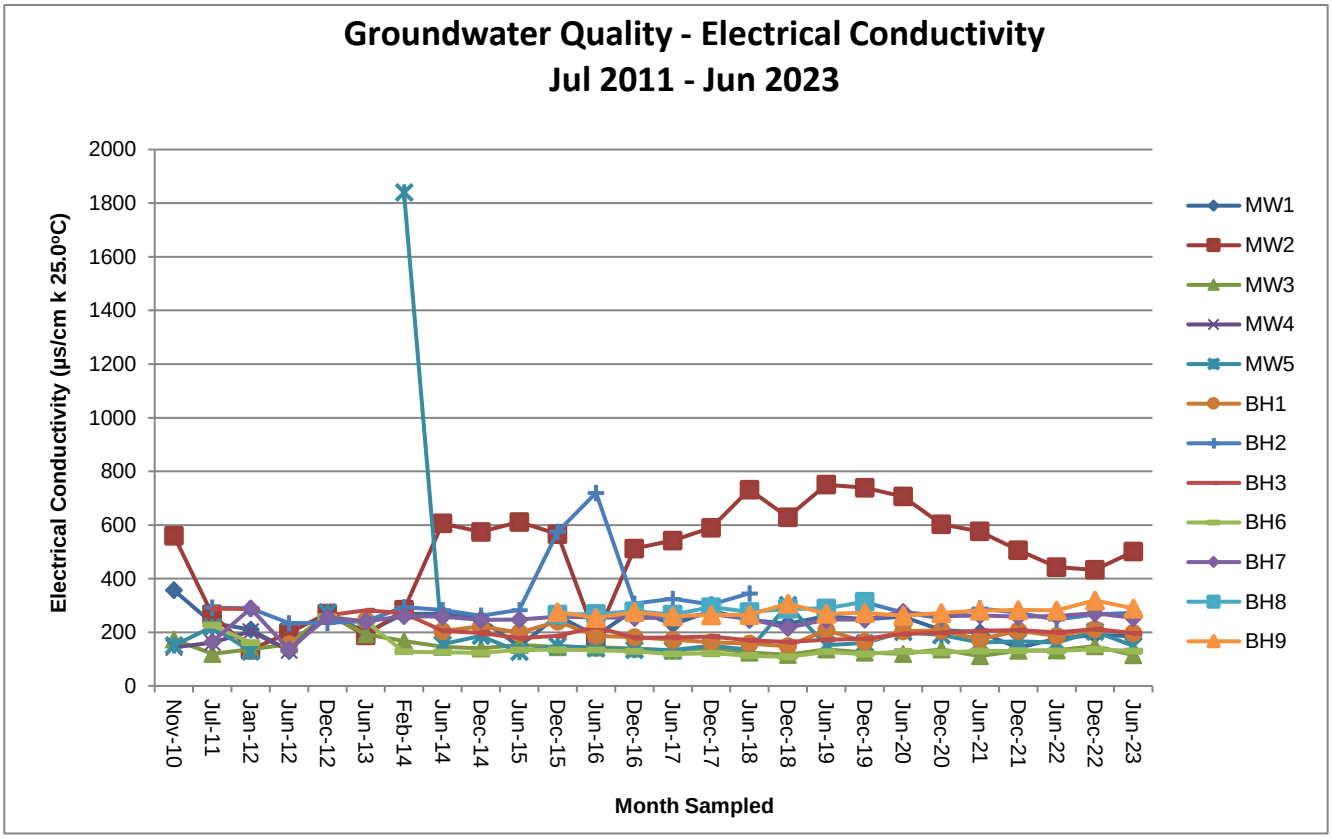


Chart 43: Long term Electrical Conductivity Results.

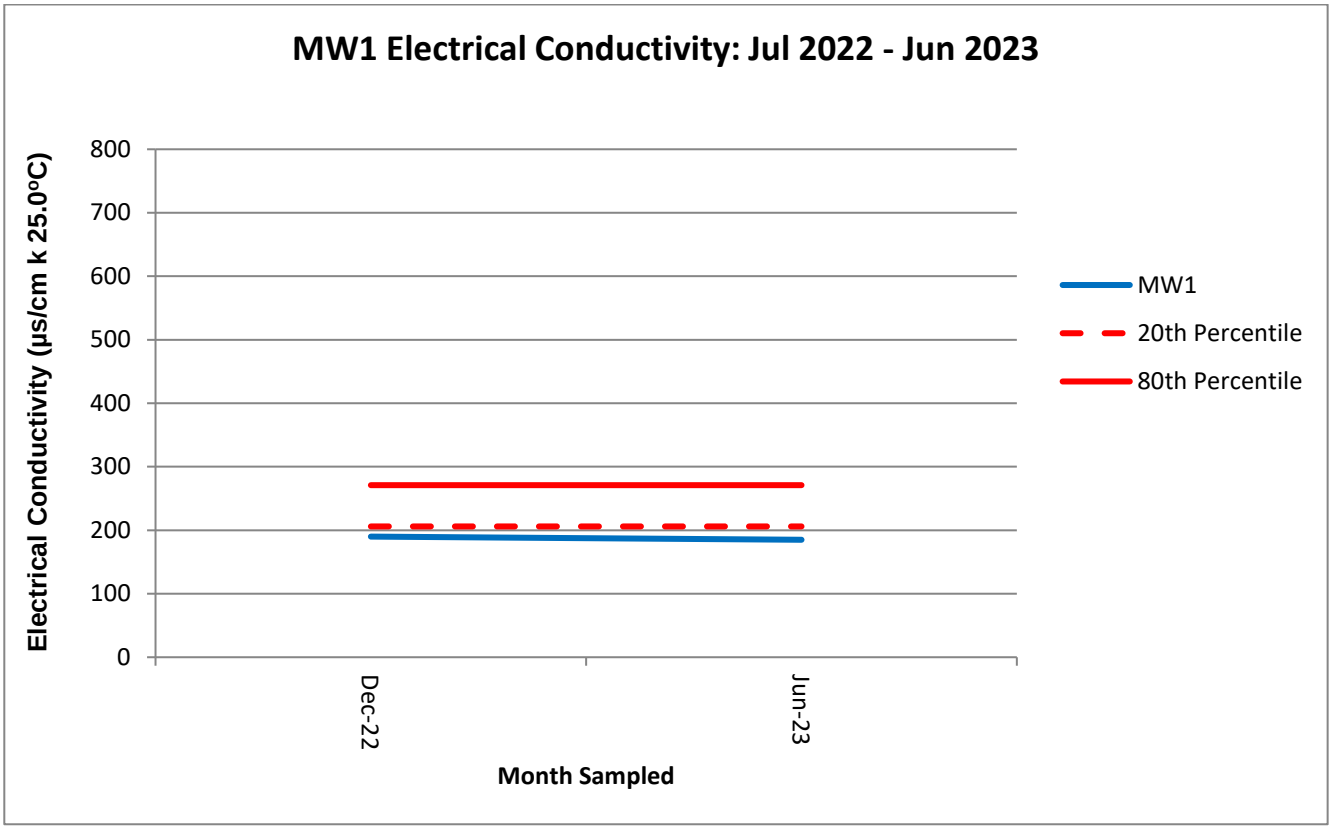


Chart 44: MW1 Electrical Conductivity Results July 2022 – June 2023.

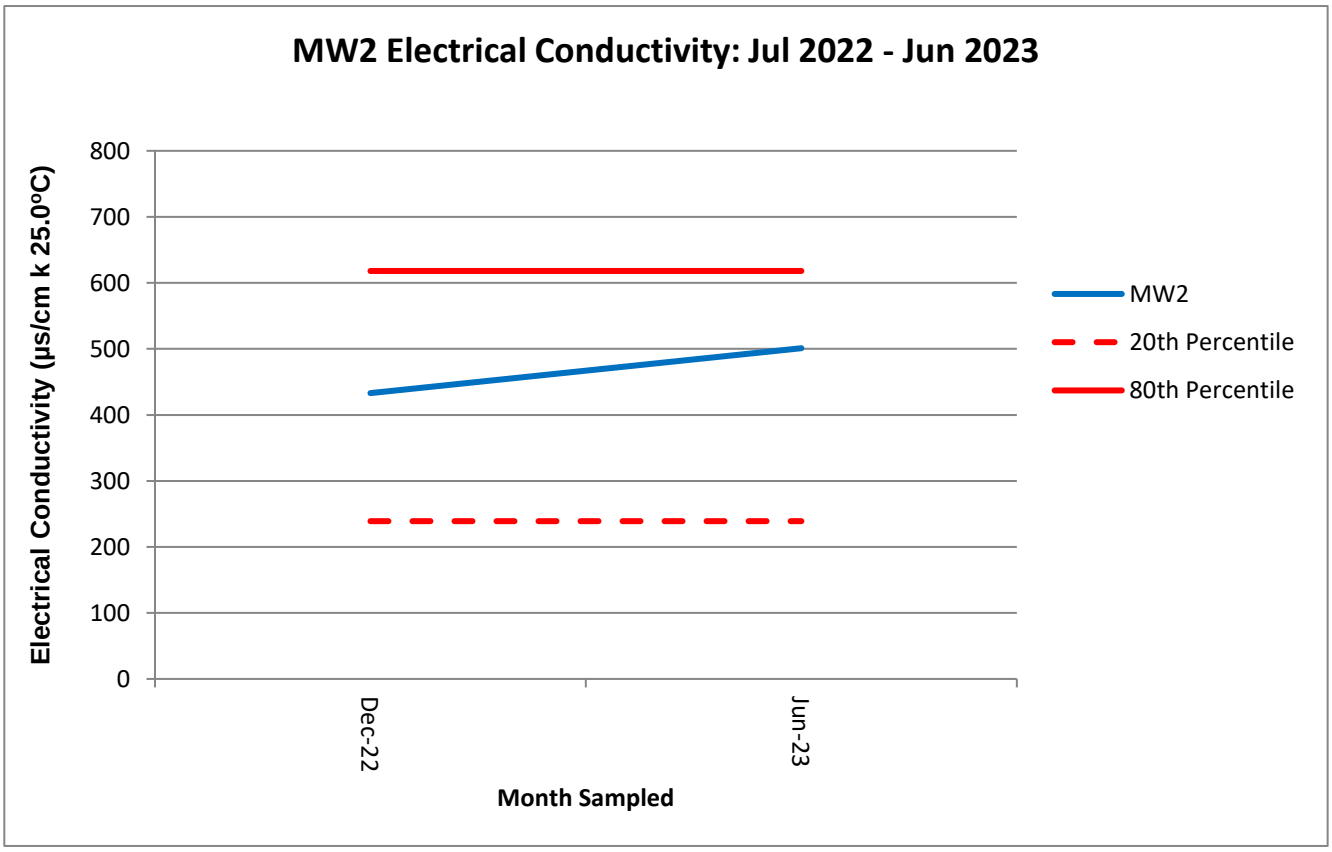


Chart 45: MW2 Electrical Conductivity Results July 2022 – June 2023.

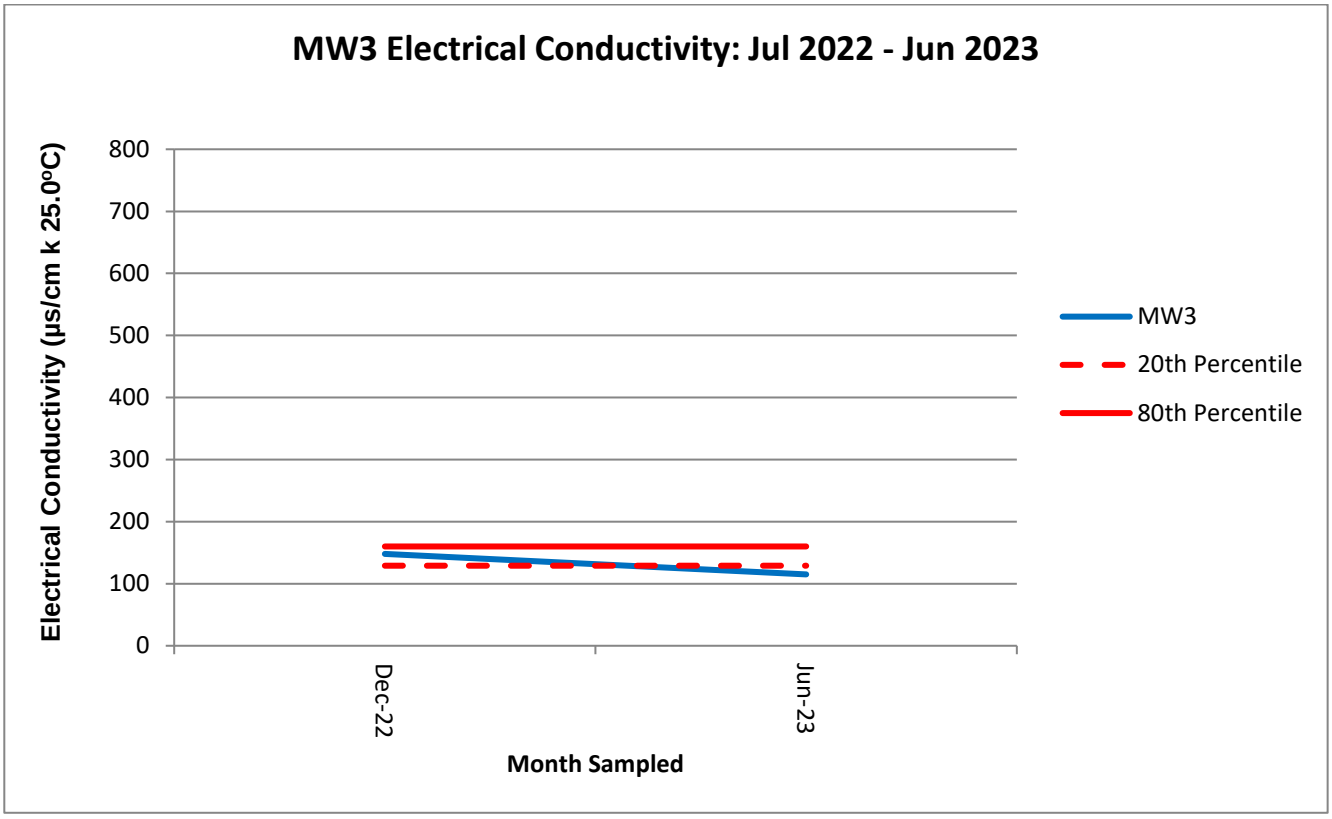


Chart 46: MW3 Electrical Conductivity Results July 2022 – June 2023.

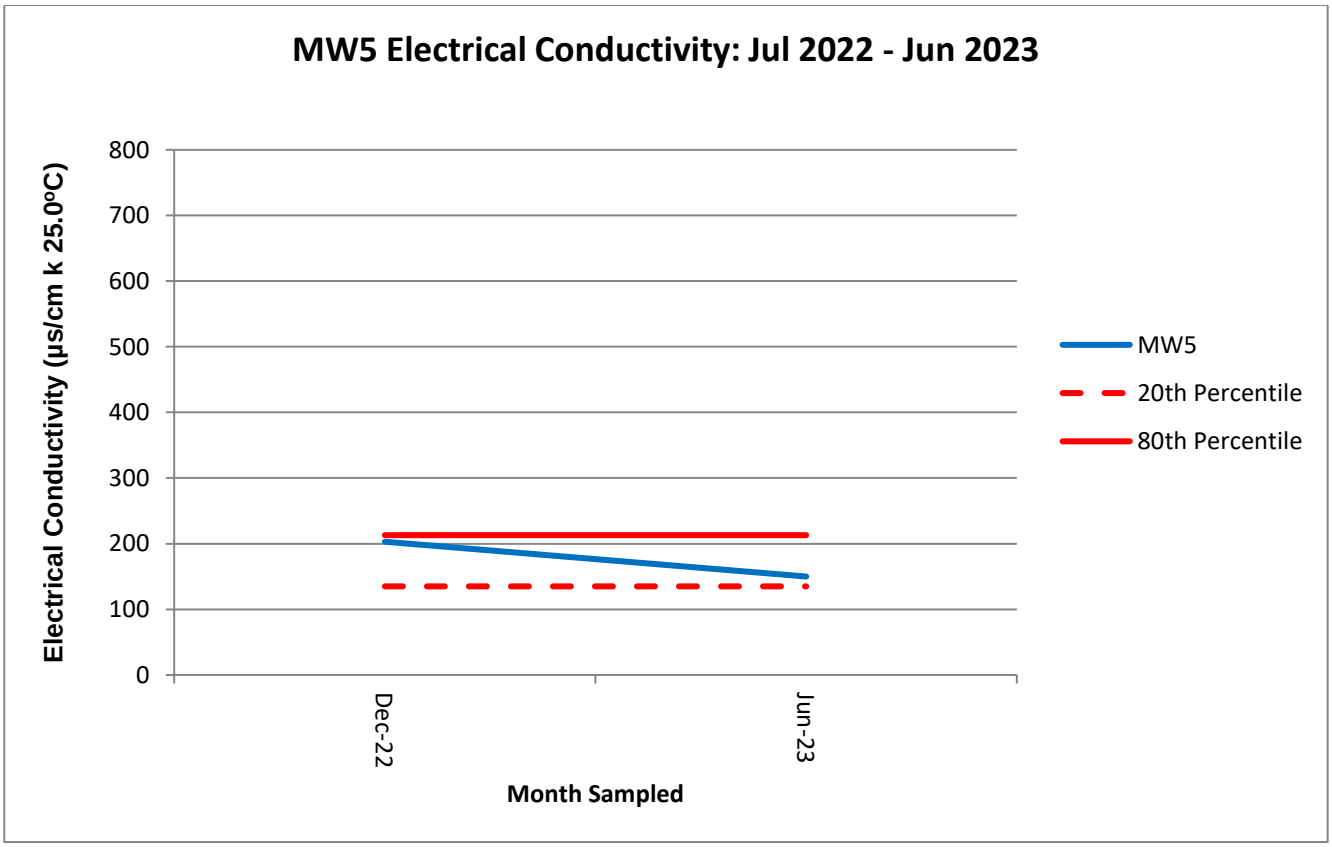


Chart 47: MW5 Electrical Conductivity Results July 2022 – June 2023.

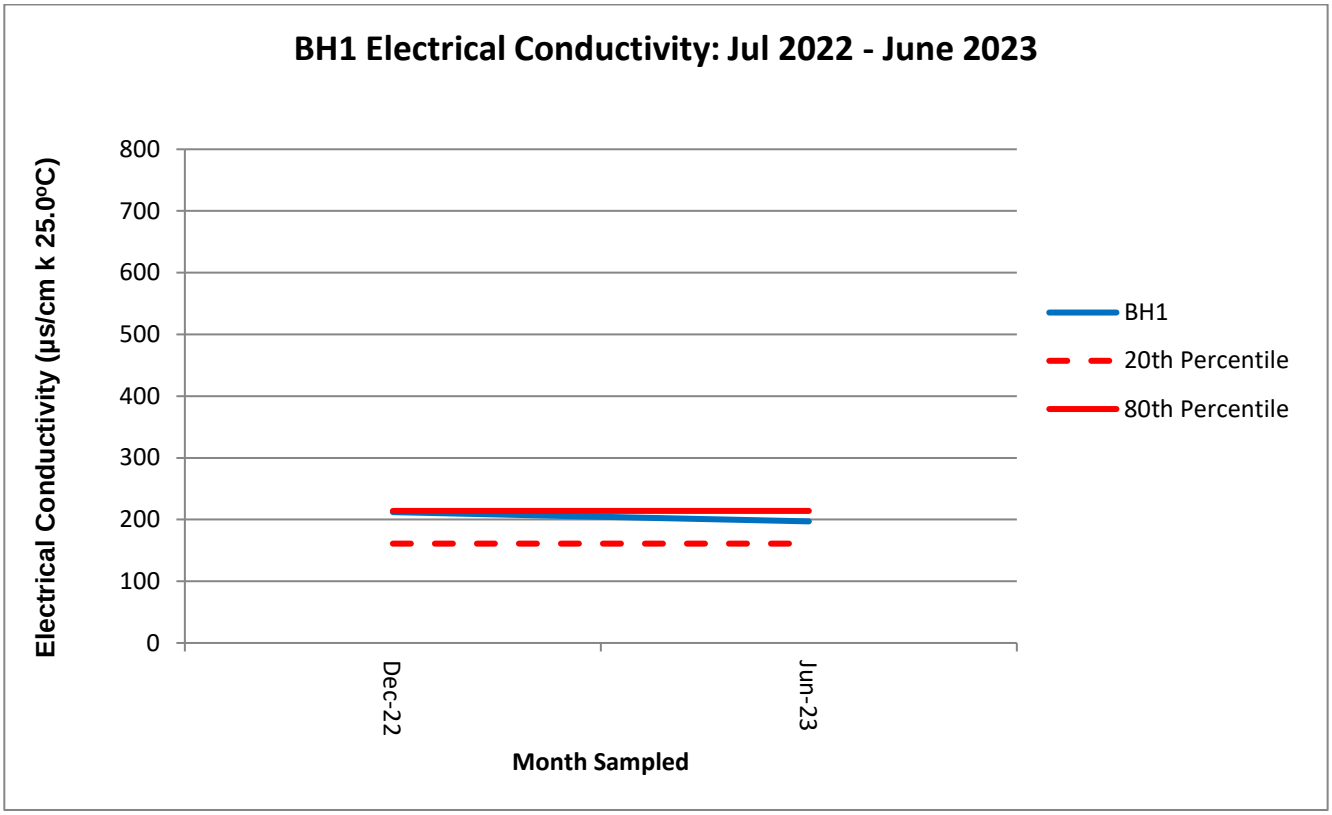


Chart 48: BH1 Electrical Conductivity Results July 2022 - June 2022.

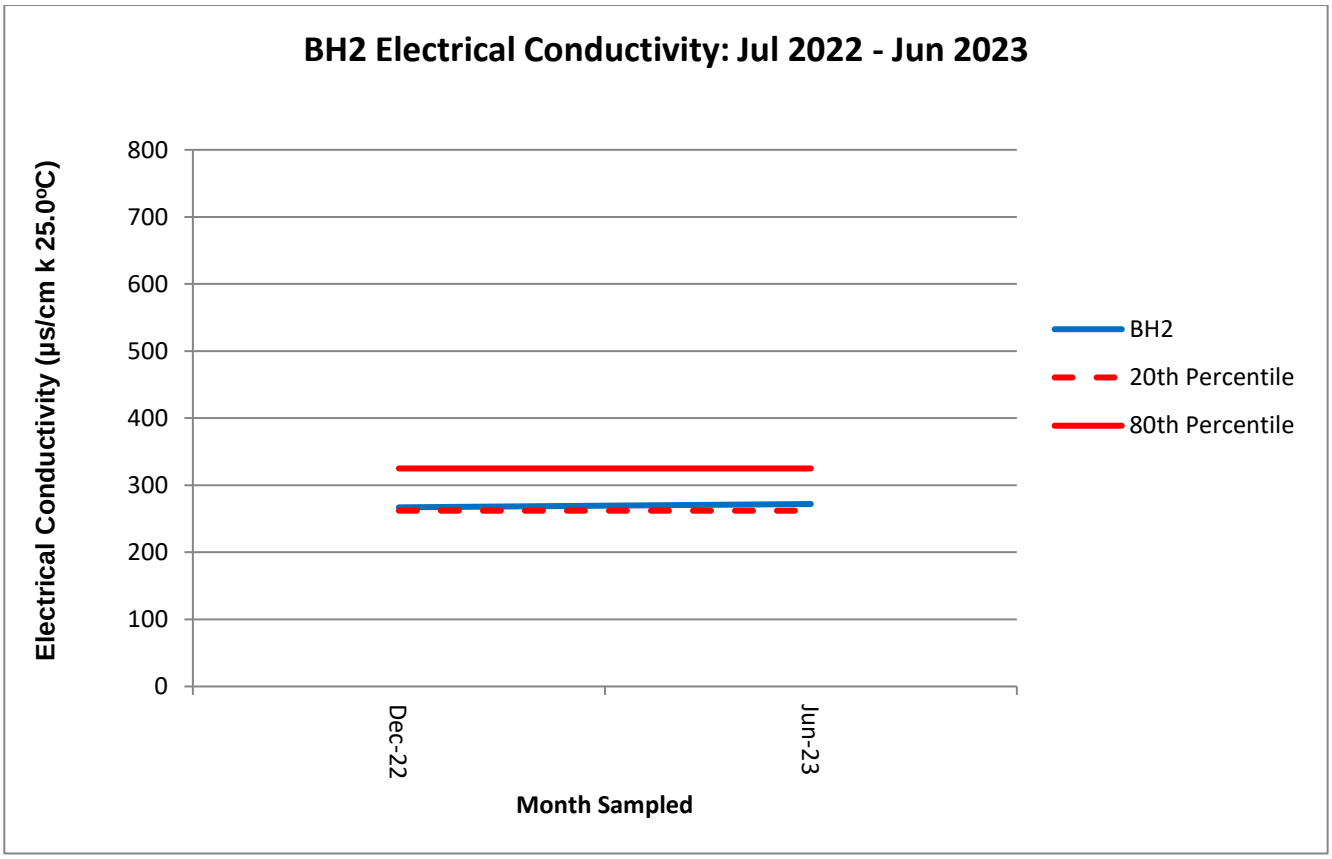


Chart 49: BH2 Electrical Conductivity Results July 2022 – June 2023.

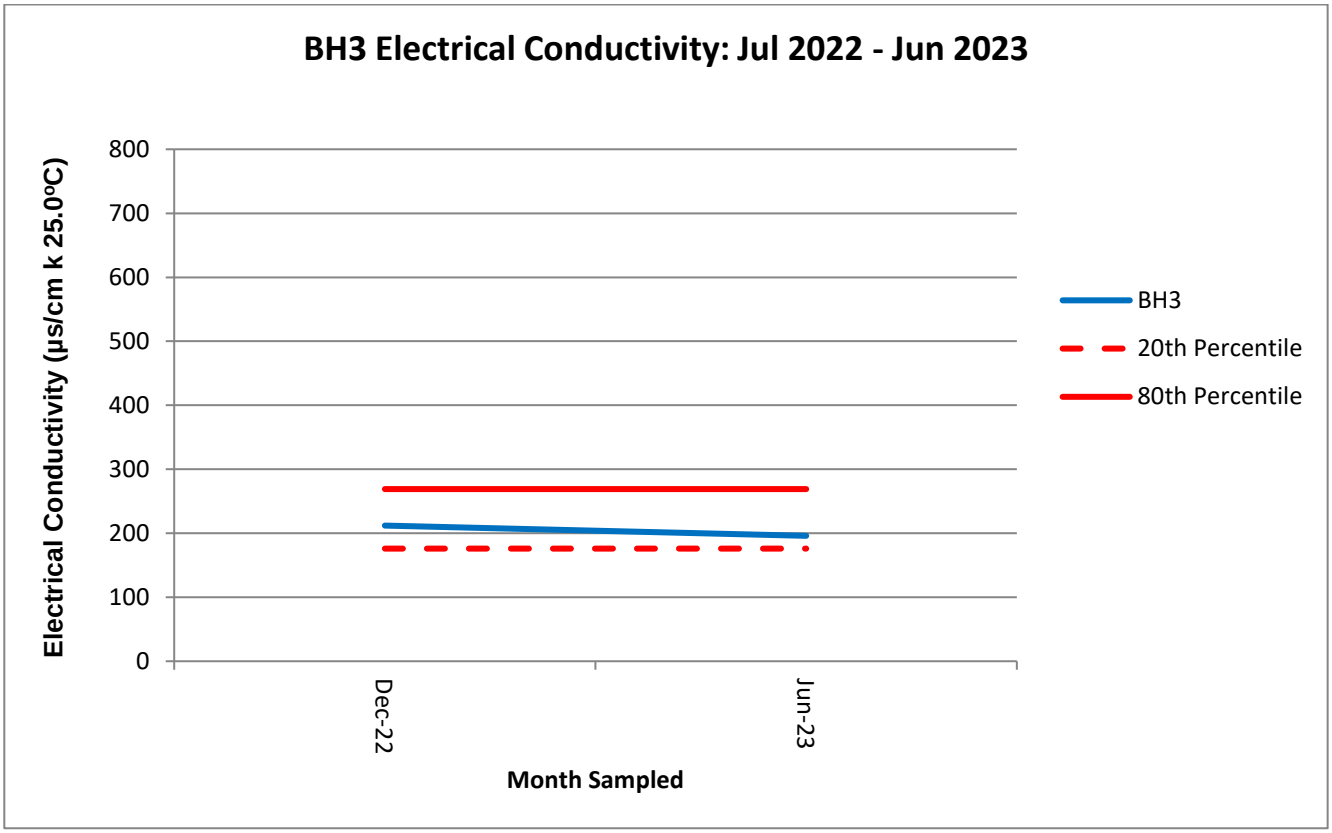


Chart 50: BH3 Electrical Conductivity Results July 2022 – June 2023.

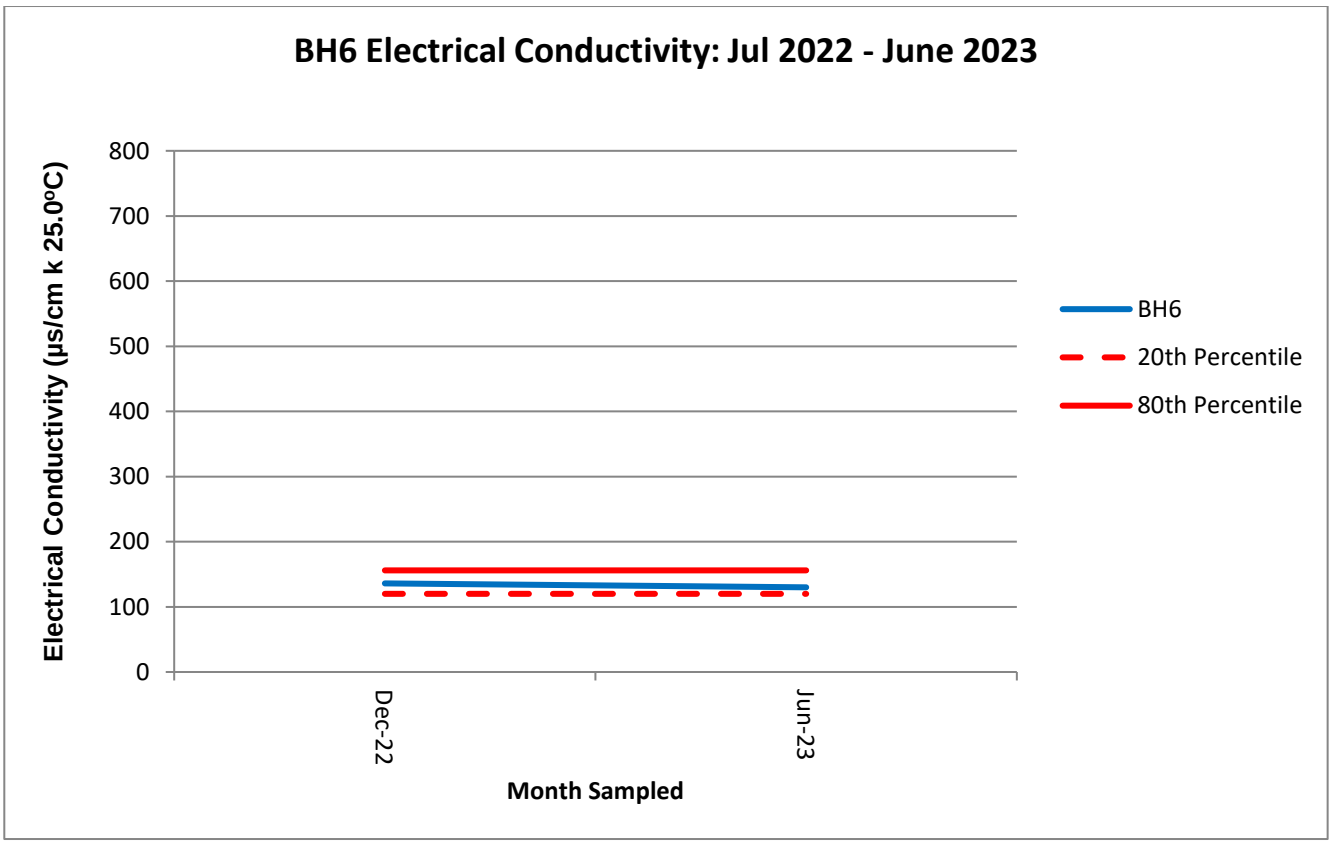


Chart 51: BH6 Electrical Conductivity Results July 2022– June 2023.

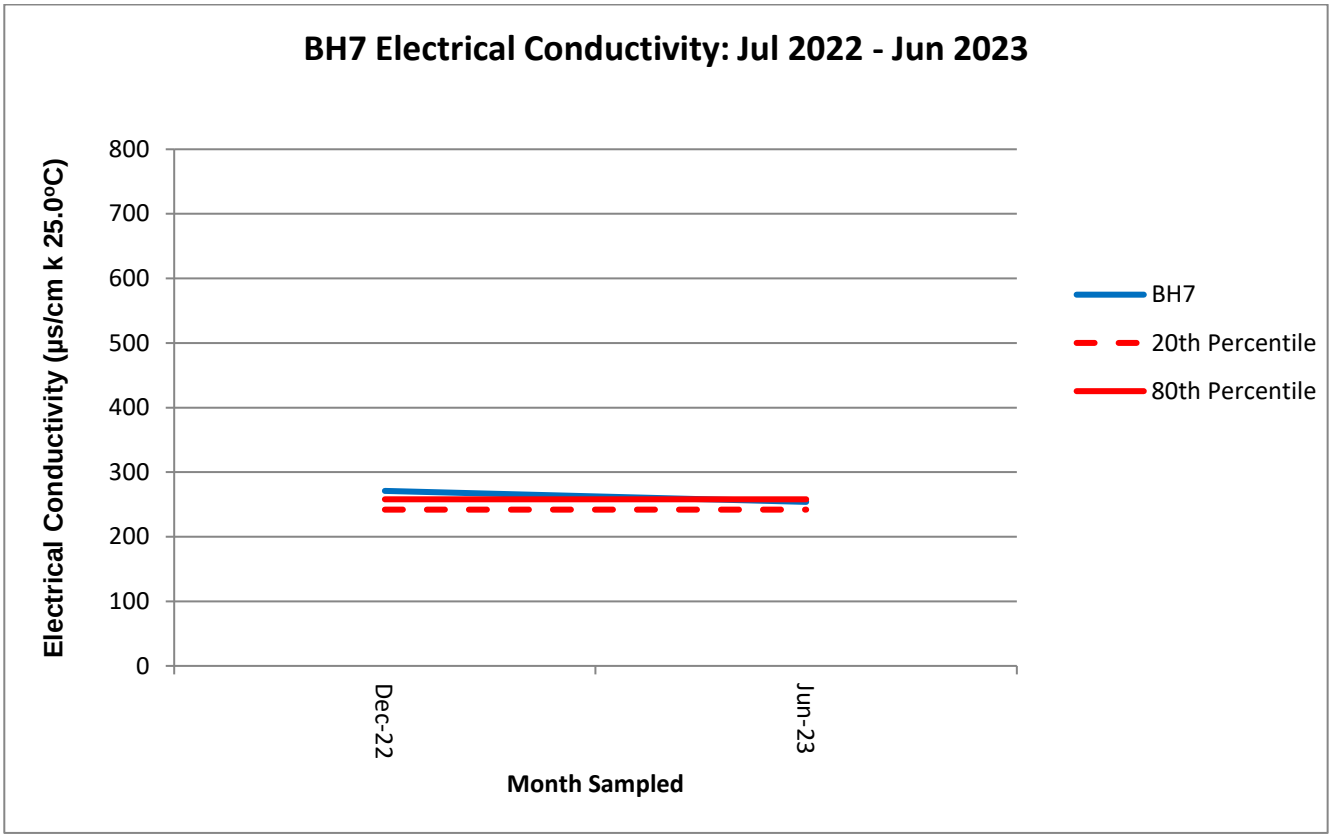


Chart 52: BH7 Electrical Conductivity Results July 2022 – June 2023.

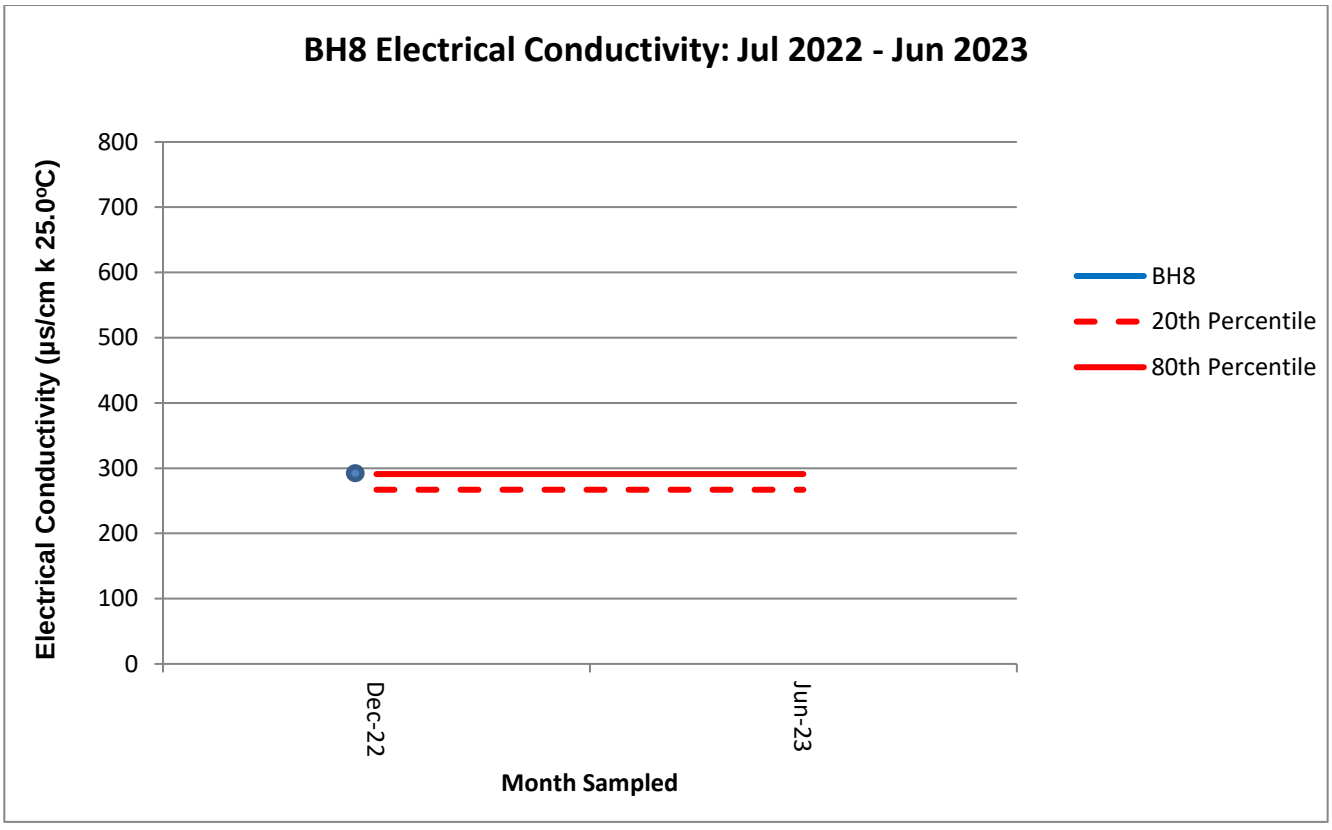


Chart 53: BH8 Electrical Conductivity Results July 2022 – June 2023.

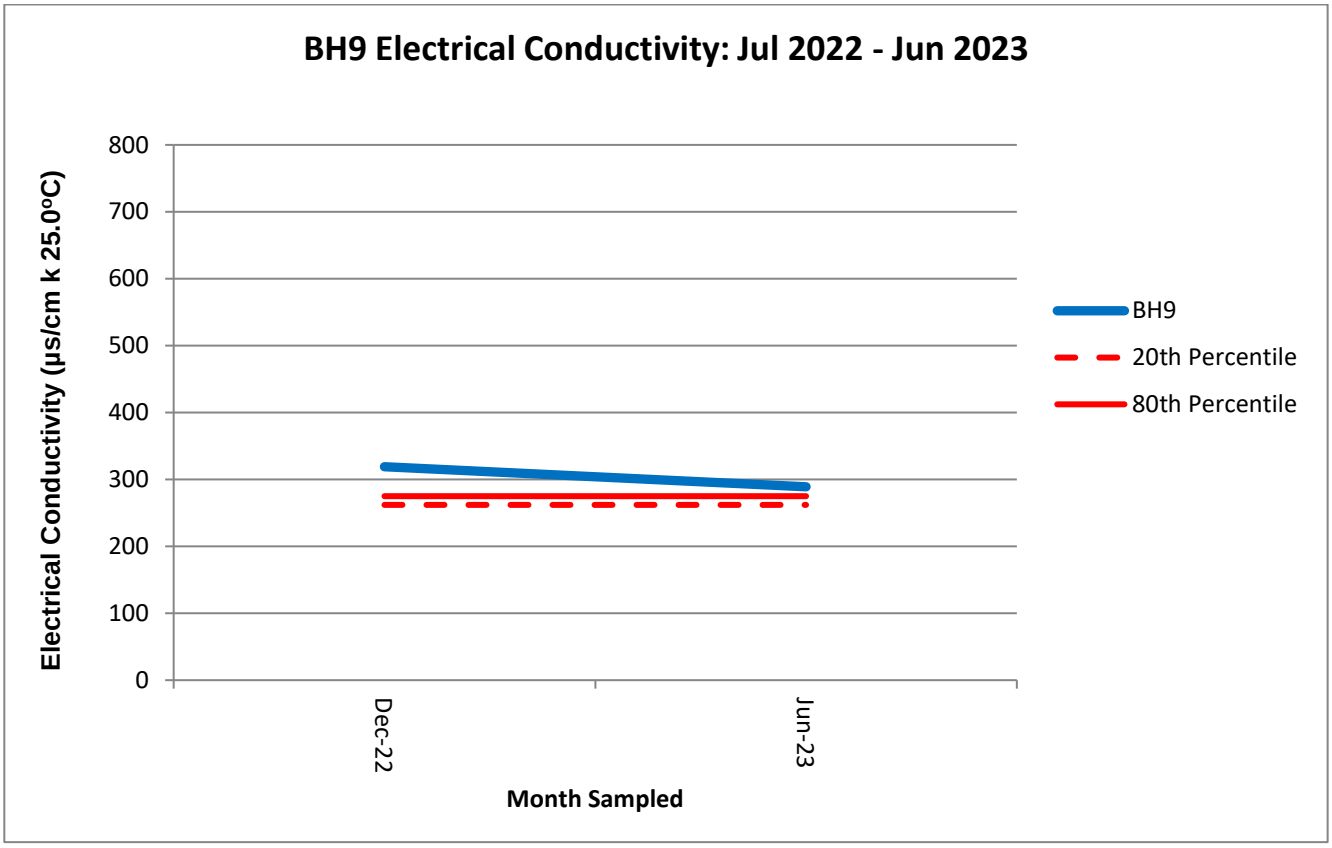


Chart 54: BH9 Electrical Conductivity Results July 2022 – June 2023.

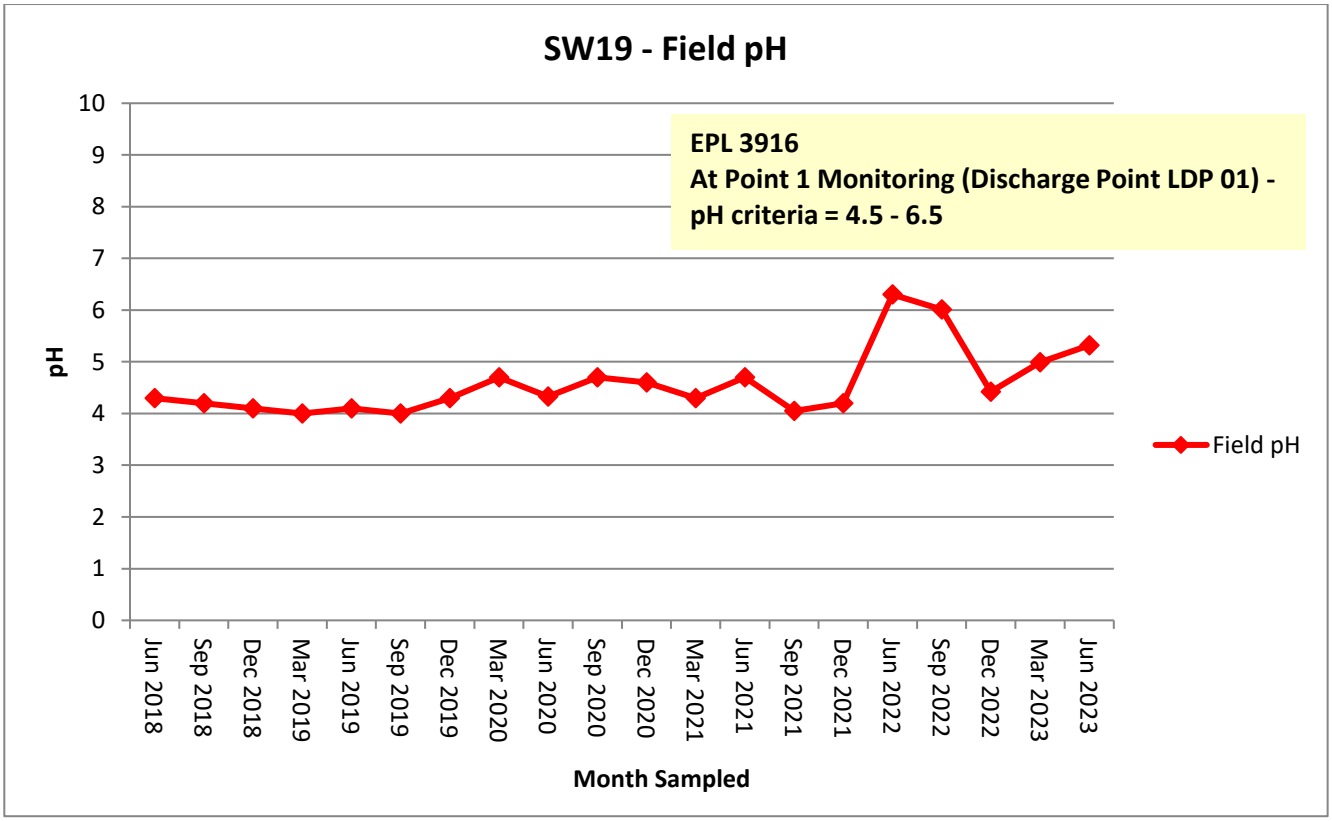


Chart 55: SW19 Field pH June 2018 – June 2023.

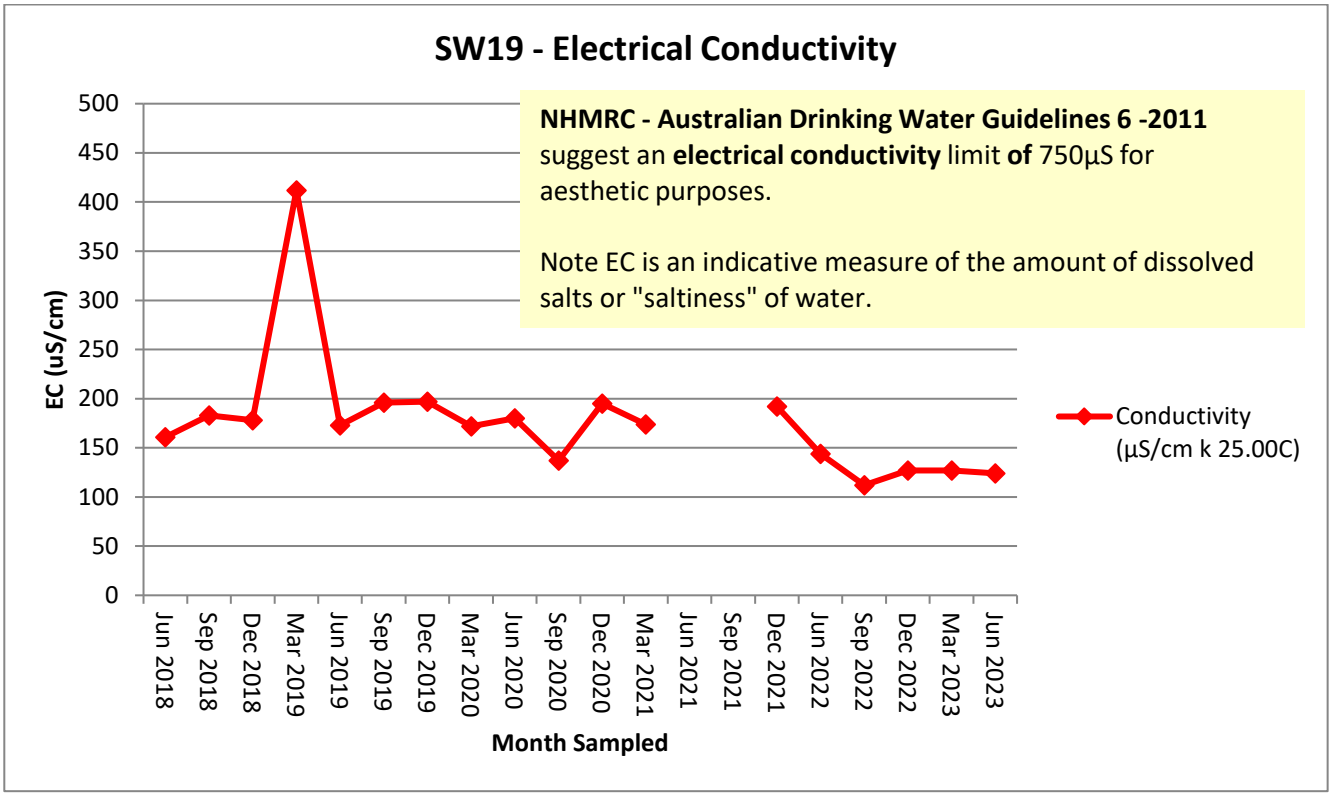


Chart 56: SW19 Electrical Conductivity June 2018 – June 2023.

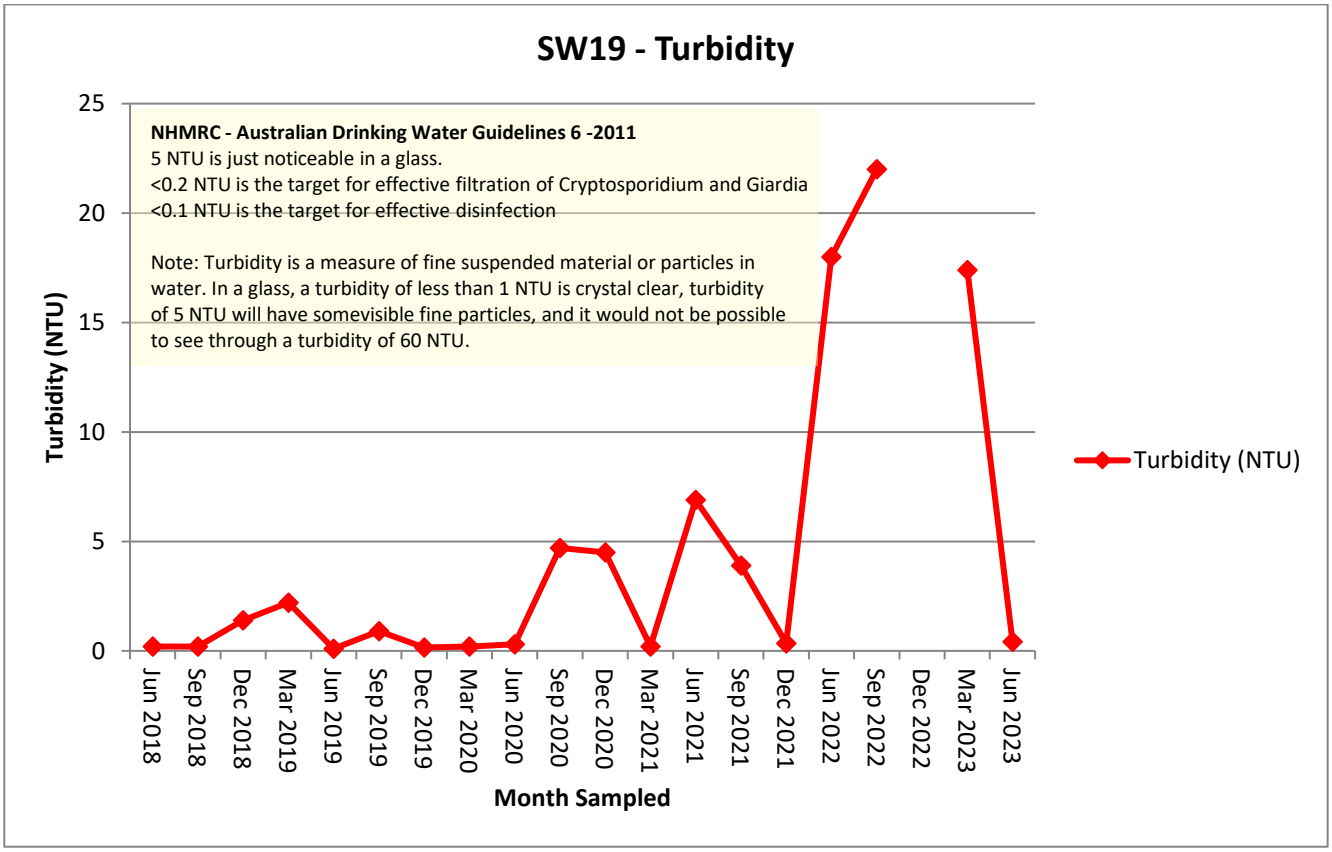


Chart 57: SW19 Turbidity June 2018 – June 2023.

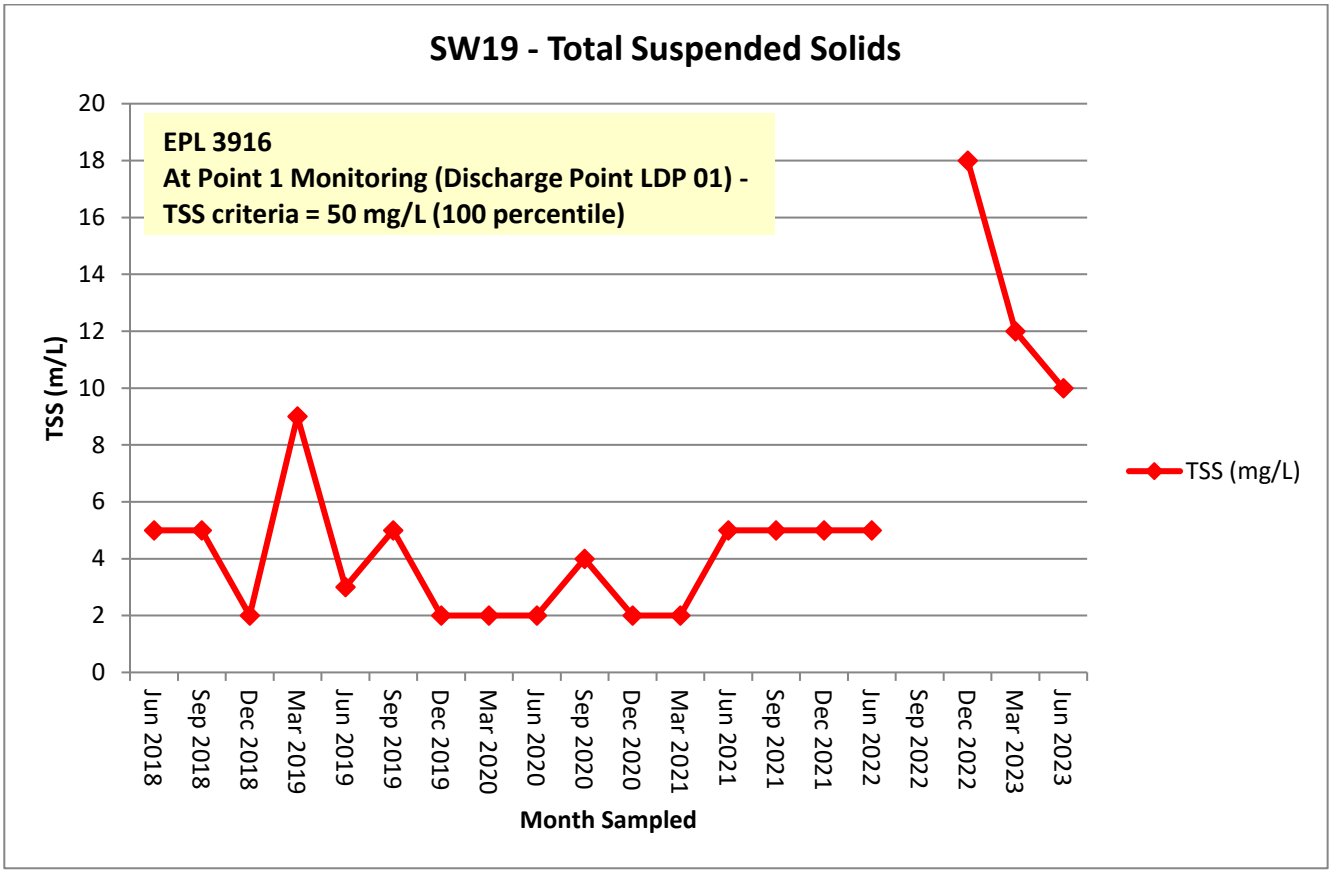


Chart 58: SW19 Total Suspended Solids June 2018 – June 2023.

Table 28: LDP01 laboratory results, relevant water criteria and compliance for discharge.

	pH			Total Suspended Solids (mg/L)			Turbidity (NTU)		
Sample Date	Laboratory Result	EPL Criteria	Criteria met	Laboratory Result	EPL Criteria	Criteria met	Laboratory Result	EPL Criteria	Criteria met
No discharge at LDP01 during this reporting period.									

6.4 Analyses

6.4.1 Groundwater Levels

Groundwater level results for bores which monitor localised perched groundwater aquifers (MW series and BH8) indicate relatively high fluctuations between water levels across the monitoring months. The majority of the measured groundwater levels in perched aquifer bores displaying a trend below the 20th percentiles (except MW2 and BH8) which are the lower limit of the adopted trigger levels in the Soil and Water Management Plan. An investigation into the monitoring results indicate that these water level fluctuations are directly correlated to the amount of aquifer recharge of water through ground infiltration and percolation. Perched aquifers have been shown to be more

responsive to surface water infiltration and percolation from rainfall events. With the return of the average rainfall, water levels in the perched aquifers have declined during this period, in comparison to the previous monitoring period which experienced wetter climatic conditions.

Water level results for boreholes which monitor the Sydney Basin Central Groundwater Source aquifer (BH1, BH2, BH3, BH6, BH7 and BH9) depict a strong trend across the monitoring months. Approximately half of the measured groundwater levels in SBCGS aquifer bores are recorded closer to the 80^{h} percentile values (upper limit of the adopted trigger levels in the Soil and Water Management Plan) with the remaining half recording water levels within the 20th and 80th percentiles during this monitoring period. Similarly, the slight reduction in groundwater level trends are directly correlated to the return of the average rainfall.

6.4.2 Groundwater Quality

Greater fluctuations of pH values in groundwater were recorded during the 2010 to 2015 period. Relatively more stable pH values were recorded from 2015 to date, with the exception of BH2 which was struck by a vehicle late 2018. BH2 was rectified and groundwater quality monitoring recommenced in December 2019. Generally, pH values for MW1, MW5, BH1, BH2, BH7 and BH9 fall within the 20th and 80th percentile trigger values during the reporting period. pH values for MW2, MW3, BH3 and BH6 were slightly below the 20th or above the 80th percentile ranges.

Electrical conductivity (EC) values in groundwater have been relatively stable from 2010 to the current reporting period, showing some fluctuations which were considered anomalies.

Electrical conductivity in MW2 showed greater fluctuations between 2010 and 2015 and started to stabilise from 2016 onwards. Elevated electrical conductivity value in MW5 was recorded in 2014 which then returned to stabilised values thereafter. Electrical conductivity values in BH2 showed greater fluctuations in 2015 to 2016 which subsequently stabilised thereafter. During this monitoring period, electrical conductivity values for the majority of boreholes fall within the 20th and 80th percentile trigger values. Electrical conductivity values in MW1, MW3, BH7 and BH9 BH2 were recorded slightly above or below the range.

In both instances, the variations in pH and electrical conductivity values over the years were likely to be influenced by prolonged drought conditions and the wetter condition experienced during this monitoring period, with the return of average annual rainfall during this reporting period.

Insufficient water sample from BH8 was able to be obtained for analysis during the December 2022 and June 2023 sampling events, therefore water quality for this borehole could not be reported.

6.4.3 Assessment of Surface Water Quality and Discharge Event

SW19 represents the receiving water downstream of the discharge point (LDP01 which is Monitoring Point 1 of EPL 3916). Quarterly sampling and analysis of surface water quality at SW19 re-commenced in June 2018.

Greater fluctuations of pH at SW19 have been recorded since the wetter climatic conditions experienced during the previous reporting period, pH ranged from 4.4 to 6.0 during this reporting period which generally comply with the EPL pH criteria of 4.5 – 6.5

Electrical Conductivity (EC) values fluctuated between 112 and 137 µS/cm during this reporting period. EC at SW19 were well below the *NHMRC - Australian Drinking Water Guidelines 6 - 2011* which suggests an electrical conductivity limit of 750µS for aesthetic purposes.

Turbidity values from SW19 varied between 0.41 and 22 NTU. According to the *NHMRC - Australian Drinking Water Guidelines 6,* a turbidity of 2 NTU implies that water samples were mostly clear to some fine particles being visible whilst 5 NTU will have some visible fine particles and 60 NTU implies the water cannot be see through. Higher EC of 22 NTU was obtained during high pH in September 2022, following high reading of 18 NTU from the previous reporting period.

Total suspended solids (TSS) at SW19 varied between 10 – 18 mg/L which are significantly lower than the EPL 3916 TSS criteria of 50 mg/L.

The receiving surface water quality monitoring at SW19 was undertaken on a quarterly basis during this monitoring period in September 2022, December 2022, March 2023 and June 2023.

Table 29 presents the baseline surface water (SW19) quality and trigger values contained in the ***Soil and Water Management Plan (v5, November 2020)*** (SWMP). The trigger values adopted in the SWMP are as follow:

- pH: 20th and 80th percentile
- TSS: 80th percentile
- Turbidity: 80th percentile

Table 30 presents the surface water (SW19) quality results yielded during this monitoring period.

Table 29: Baseline Surface Water (SW19) Quality and Trigger Values (June 2018 to June 2020).

Parameter	Minimum	20th Percentile	50th Percentile	80th Percentile	Maximum
pH	4.0	4.1	4.2	4.3	4.7
TSS (mg/L)	2.0	2.0	3.0	5.0	9.0
Turbidity (NTU)	0.1	0.2	0.2	1.1	2.2

Table 30: Surface Water (SW19) Quality Results 2022 – 2023.

Parameter	Sep 2022	Dec 2022	Mar 2023	Jun 2023
pH	6.0	4.4	5.0	5.3
TSS (mg/L)	Not measured	18	12	10
Turbidity (NTU)	22	Not measured	17.4	0.41
SW19 quality results fall within the Trigger Values (SWMP, V5, Nov 2020)	No (pH and Turbidity above 80th percentile)	No (pH and TSS above 80th percentile)	No (pH, TSS and Turbidity above 80th percentile)	No (pH and TSS above 80th percentile)

The surface water (SW19) quality results contained in Table 30 indicate that higher readings have been recorded since the June 2022 (previous reporting period) and potentially March 2022 where higher rainfall and flows within the creek have likely caused some of the parameters to fall outside the trigger value thresholds of Table 29. The water quality results for this reporting period, although higher than historic results and trigger levels, the majority of the parameters sit below the EPL 3916 criteria. A close monitoring of the water quality at SW19 will continue.

No planned water discharge occurred at the licensed discharge point LDP01 (main water channel) during this reporting period.

6.4.4 Comparison of Surface Water Discharge Volume and Quality with Historical Data

The long-term discharge volumes and analysed water quality at the EPA licensed discharge point LDP01 are shown in Table 31. A total of 1.50 megalitres of water have been discharged during the discharge events since the 2003 – 2004 monitoring period to date. No 'planned' water discharge at the license discharge point LDP01 occurred during this reporting period however, an 'unplanned' discharge event occurred in March 2022 during the extremely wet weather period (during the exemption period issued by the EPA) and it was not possible to determine the amount of water overtopping the weir at LDP01.

Condition M2.3 of EPL lists the limits of water quality criteria to be met for water discharge which are:

- pH: 4.5 – 6.5
- Total suspended solids: 50 mg/L

Historically, laboratory results indicate that all water quality suites have met the EPL discharge criteria since the commencement of monitoring, except for one discharge event in the 2014 – 2015 monitoring period where the total suspended solids were slightly elevated and exceeded the EPL criteria. There was no discharge during the 2022 – 2023 reporting period.

Table 31: Long Term Discharged Water Volume at LDP01 (EPL licensed discharged point)

Annual Review Monitoring Period	Discharge Volume (Megalitre)	pH	Total Suspended Solid (mg/L)	Turbidity (NTU)	EPL Discharge Criteria Met
2003 – 2004	0.062 *1 0.034 *2	4.9 *1 5.0 *2	16 *1 31 *2	21 *1 33 *2	Yes *1 Yes *2
2004 – 2005	0.374 *1 0.156 *2	5.9 *1 6.3 *2	33 *1 22 *2	60 *1 6.3 *2	Yes *1 Yes *2
2005 – 2006	0	-	-	-	-
2006 – 2007	0	-	-	-	-
2007 – 2008	0	-	-	-	-
2008 – 2009	0	-	-	-	-
2009 – 2010	0	-	-	-	-
2010 – 2011	0	-	-	-	-
2011 – 2012	0	-	-	-	-

Annual Review Monitoring Period	Discharge Volume (Megalitre)	pH	Total Suspended Solid (mg/L)	Turbidity (NTU)	EPL Discharge Criteria Met
2012 – 2013	0	-	-	-	-
2013 – 2014	0	-	-	-	-
2014 – 2015	Not measured *1 Not measured *2	4.7 *1 5.5 *2	64 *1 32 *2	40 *1 80 *2	No *1 Yes *2
2015 – 2016	0	-	-	-	-
2016 – 2017	0	-	-	-	-
2017 – 2018	0	-	-	-	-
2018 – 2019	0	-	-	-	-
2019 – 2020	0.350 *1 0.520 *2 0.005 *3	5.79 *1 4.60 *2 no sample *3	18 *1 2 *2 no sample *3	24.1 *1 4.2 *2 no sample *3	Yes *1 Yes *2 No *3
2020 – 2021	0	-	-	-	-
2021 – 2022	Not measured *4	-	-	-	-
2022 – 2023	0	-	-	-	-
TOTAL Volume Discharged (Megalitre)	**1.500**				

Note: *1 *denotes to discharge event number 1 within the monitoring period*
*2 *denotes to discharge event number 2 within the monitoring period*
*3 *denotes to discharge event number 3 within the monitoring period*
*4 *denotes to discharge event number 3 within the monitoring period*

6.5 Maximum Extraction Depth Map

The Maximum Extraction Depth Map (MEDM) is based on the wet weather groundwater elevation and is determined by the quarry groundwater monitoring network.

An Independent Environmental Audit (IEA) was completed, and the report submitted in January 2023. Condition 23 of Schedule 2 of DA 250-09-01 states that a review and update of the MEDM for the Quarry is to be undertaken within 3 months of the completion of the IEA, to the satisfaction of the Secretary. A review of the MEDM was undertaken by WSP Golder and the reviewed document was submitted to the DPE on 11 January 2023 for review and approval. The revised MEDM was approved by DPE on 17 March 2023.

The next revision and update of the MEDM will be undertaken within 3 months of the next IEA which is scheduled to occur late 2025.

6.6 Water Access License Usage

The Annual Returns for Water Access Licenses (WALs) 24325, 24341 and 43270 for the 2022 – 2023 reporting period were submitted to WaterNSW in July 2023. The total water usage for each WAL is listed in Table 32 below.

Table 32: Water usage for Water Access Licences

Water Access License Number	Annual Water Usage (Megalitres)
WAL 24325	0
WAL 24341	0
WAL 43270	0

6.7 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 Map for Old Northern Road quarry will require review following the next Independent Environmental Audit scheduled in late 2025.

Continue to monitor groundwater levels and quality, together with observations of any environmental or land use changes.

Any planned surface water discharge at LDP01 main water channel (Monitoring Point 1 of EPL 3916) will require grab samples prior to discharge for laboratory analysis to ensure pH, TSS and turbidity are within the specified EPL concentration limits. Dixon Sand staff to implement the Permit to Discharge procedure which outlines the steps required leading up to the allowable water discharge.

Quarterly sampling of surface water at SW19 to continue as normal.

7. Ecological Monitoring and Rehabilitation

7.1 Vegetation Clearing

One vegetation clearing event was carried out during this reporting period which was associated with maintenance of fence line for the 250m buffer to the Maroota Public School on Lots 1 and 2. All vegetation clearing was undertaken in accordance with the pre-clearing survey and primarily involved removal of weed and shrubby regrowth as the fence line was previously cleared a number of years ago. Appropriate briefings were provided to the relevant staff prior to the commencement of vegetation clearing.

7.2 Bush Regeneration and Weed Management

Rehabilitation and weed management at Old Northern Road quarry were undertaken by a bush regeneration contractor Bush-It Pty Ltd with multiple visits each month throughout the reporting period. 522

A total of 279 hours was spent on bush regeneration works at Old Northern Road Quarry, equating to approximately 53% of the time spent between Old Northern Road Quarry and Haerses Road Quarry scope of works.

Bush regeneration, native vegetation planting and weed management were carried at the following locations:

- Vegetated areas on Lots 1 and 2 excluding areas in the extraction pit and sediment ponds,
- Native Vegetation Corridor on 29,
- Southern border of extraction pit on Lot 196,
- Front embankment along the quarry entrance, and
- Biodiversity Offset Area located at Haerses Road (Lots 176 and 177 DP 752039).

Bush regeneration works involved mechanical and chemical methodologies.

Figures 3 and 4 show the locations where bush regeneration and weed management works have been undertaken at the Old Northern Road Quarry and Biodiversity Offset Area (located at Haerses Road) during this reporting period.

The Annual Bush Regeneration Report provided by the contractor for the 2022 – 2023 reporting period is attached as Appendix G.

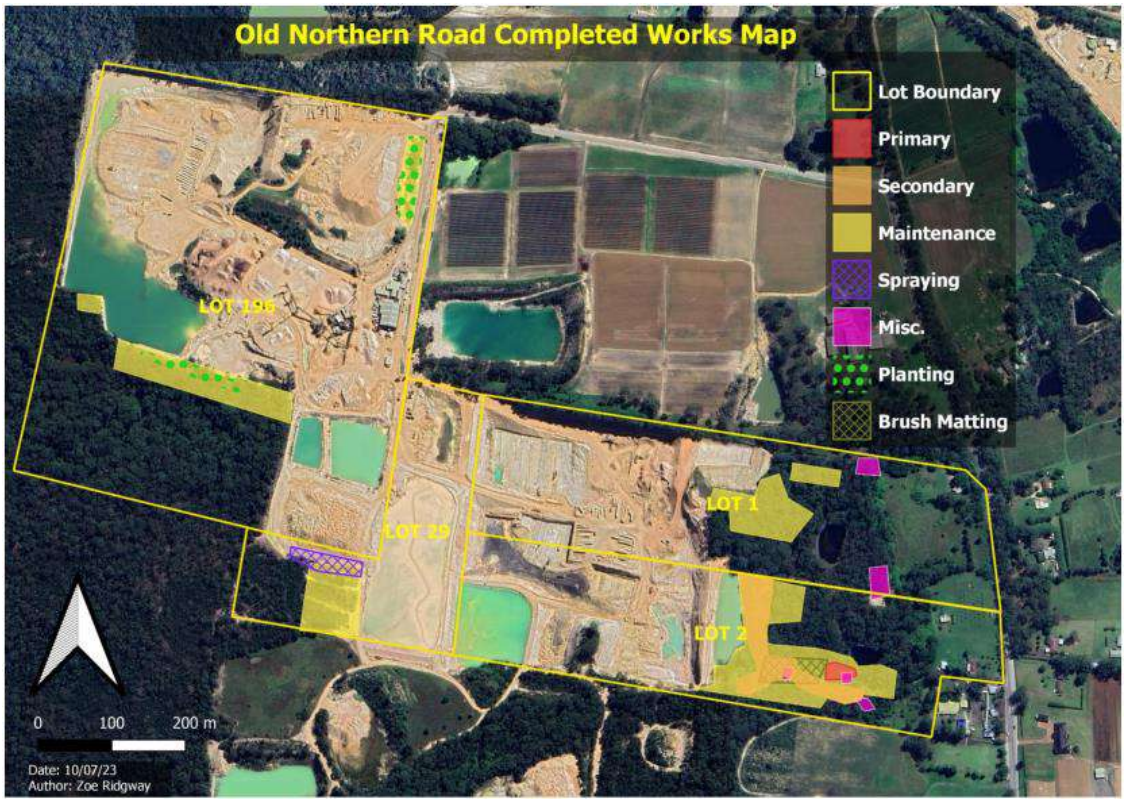


Figure 3: Bush regeneration and weed management works area at Old Northern Road Quarry (source: BushIT 2023).

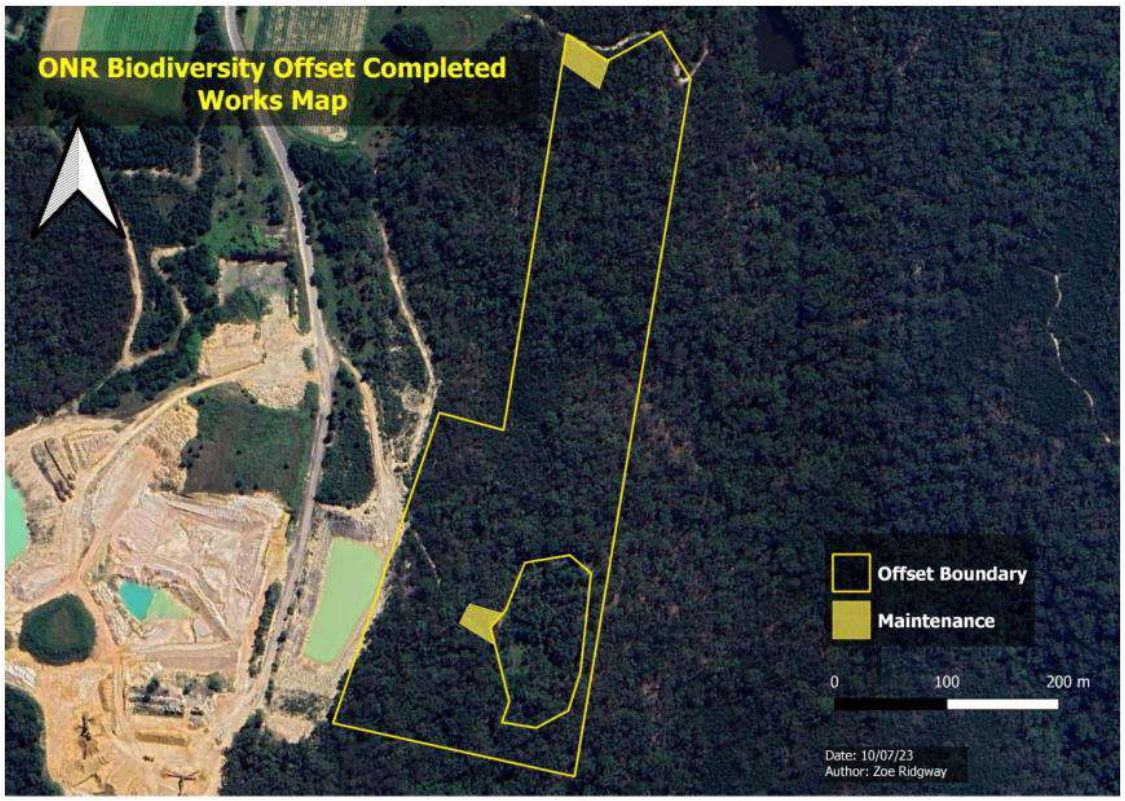


Figure 4: Bush regeneration and weed management works are at Haerses Road Biodiversity Offset Area (source: BushIT 2023).

7.3 Biodiversity and Rehabilitation

Dixon Sand engaged South East Environmental to undertake the annual biodiversity and rehabilitation monitoring and reporting for Old Northern Road Quarry. Progress assessments were made against the commitments in Old Northern Road Quarry Biodiversity and Rehabilitation Management Plan (BRMP). The Biodiversity and Rehabilitation Management Report (South East Environmental, 2023) aimed to:

- Identify native flora and fauna species, populations and ecological communities known to or likely to occur within the Native Vegetation Corridor (NVC) and Haerses Road Biodiversity Offset Area (HRBOA),
- describe the native vegetation and habitats within the NVC and HRBOA,
- describe the current condition of the threatened flora and its habitat found outside of the NVC at Old Northern Road,
- discuss the ongoing monitoring of threatened flora and fauna previously recorded at both ONR and HRBOA,
- determine the legislative and conservation significance of species, populations and ecological communities known or likely to occur within the NVC and HRBOA with reference to the Commonwealth *EPBC Act 1999* and the *NSW BC Act 2016*,
- recommend appropriate biodiversity and environmental management measures that should be implemented to reach criteria for monitoring success set by the Old Northern Road Quarry Biodiversity and Rehabilitation Management Plan (2018), and
- provide an independent monitoring report for inclusion as part of the external reporting for the quarry Annual Review.

Field surveys were conducted over July and August 2023 throughout the established monitoring sites across the quarry. Specific survey methodologies were adopted including the 20m x 50m quadrats, 2m x 20m subplot, 1m x 1m line plots and random meandering. Fauna survey methods included general searches for indirect evidence of native fauna including scratches, scats, nests, hollows in use, camps, roosts, den sites etc. Opportunistic sightings of all fauna species were recorded throughout the survey period. Unbaited motion detection infra-red digital camera for 16 nights and Anabat recording device for 30 nights were also utilised for the fauna survey.

It was noted that the flora survey was conducted over a short timeframe during winter and therefore some plant species may have been undetected and not identified due to their dormancy or lack of flower status. The study was limited by the timing and frequency of survey.

Sections 7.3.1 to 7.3.10 describe the findings at each nominated rehabilitation and monitoring area, assessment against completion criteria, together with discussion and recommendations. The full Biodiversity and Rehabilitation Management Report (South East Environmental, 2023) is contained in Appendix H.

7.3.1 Native Vegetation Corridor

The Native Vegetation Corridor (NVC) comprised of a minimum area of 6.83 hectares, extending from the south-western corner of Lot 29 and extending along the southern boundary of Lot 2 to the area located between the 250m buffer and the Maroota Public School.

Five out of nine vegetation monitoring sites are located within the NVC.

The location of the NVC and vegetation monitoring sites are shown in Figure 5.

Rehabilitation of native vegetation in the NVC commenced in late 2017 on the south-western boundary of Lot 29, comprising an area of approximately 0.8 hectares and utilising three rehabilitation methods. Parts of the current NVC are utilised as haul road, sediment ponds and active extraction area. The remaining area are existing areas containing native vegetation and disturbed areas which are remnants of orchard plantation, grazing land and farm dams.

Rehabilitation Area – Planted

The planted area in the NVC is approximately 0.4 hectares in size. One vegetation monitoring site, as specified by the BRMP, is located in this area. Native nursery tube stocks were planted in this location. Two of the species, *Melaleuca deanei* (vulnerable) and *Darwinia fascicularis* ssp*. oligantha* (endangered population) under the *Biodiversity Conservation Act* 2016, were propagated from onsite specimens, grown in commercial nurseries and replanted in the NVC.

A total of 47 native species have been planted in this area, including the abovementioned propagated threatened species. The ecological survey during this monitoring period identified an additional 65 native species which have emerged from seed bank storage from the sub-soil, including the vulnerable species *Tetratheca glandulosa*. This is an increase of 14 species since last monitoring year. The increased number of species observed can be attributed to ideal growing conditions, the available abundant seed bank stored in the soil in the rehabilitation and neighbouring bushland, together with the thinning of native species by Bush Regenerators to alleviate plant overcrowding and limitation of sunlight reaching the ground stratum.

There were 22 live specimens of *Melaleuca deanei*, 12 *Darwinia fascicularis* ssp*. oligantha* and 9 *Tetratheca glandulosa* located this reporting period. No *Acacia bynoeana* was identified during this period which is likely due to wet conditions in 2020-2022 causing unfavourable condition for the species to grow.

Plates 1 and 2 shows the view of the planted rehabilitation area from the north-west corner looking east by comparing images from 2021 and 2023.

Plates 3 and 4 shows the view of the planted rehabilitation area from the south-east corner looking west by comparing images from 2021 and 2023.

Plates 5 and 6 contains the current status of one of the propagated *Melaleuca deanei* and *Darwinia fascicularis* ssp *oligantha* cuttings planted in 2017.

Plate 7 shows the *Tetratheca glandulosa* within the planted rehabilitation area.

The annual survey indicates that the overall condition of the planted rehabilitation area is very good with canopy trees reaching reproductive maturity with flowering buds present during the survey event in July 2023. An increased in species diversity was noted in shrub and ground cover species. Native mammals observed include macropods, bandicoots and possums. An increased in bird diversity was observed with 10 species recorded during the survey.

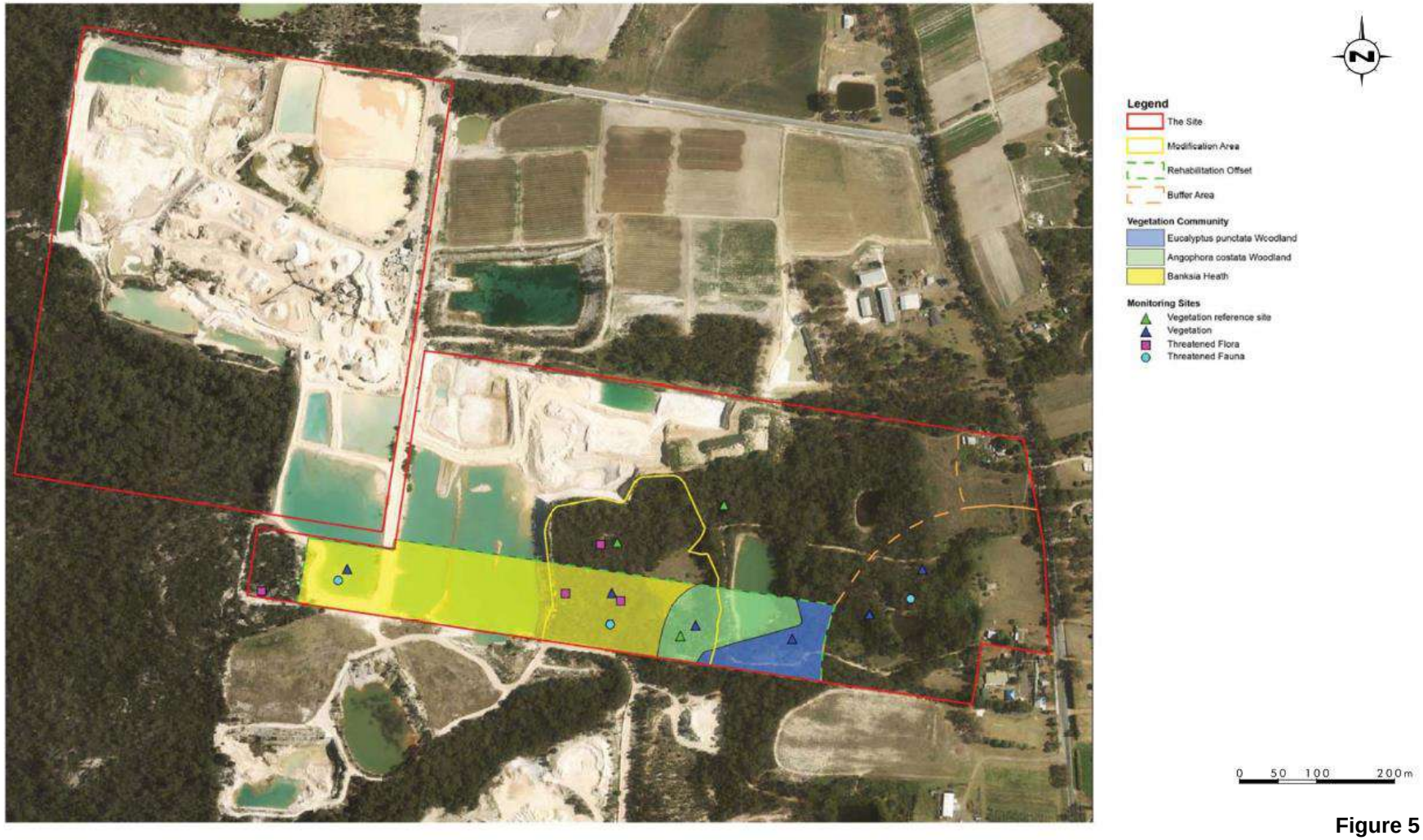


Figure 5

Location of Ecological Monitoring Sites
Old Northern Road Quarry

Image Source: Cumberland Ecology (2015)

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Plate 1: View of planted rehabilitation area from north-west corner looking east, 2021 (source: South East Environmental, 2023).



Plate 2: View of planted rehabilitation area from north-west corner looking east, 2023 (source: South East Environmental, 2023).



Plate 3: View of planted rehabilitation area from south-east corner looking west, 2021 (source: South East Environmental, 2023).



Plate 4: View of planted rehabilitation area from south-east corner looking west, 2023 (source: South East Environmental, 2023).

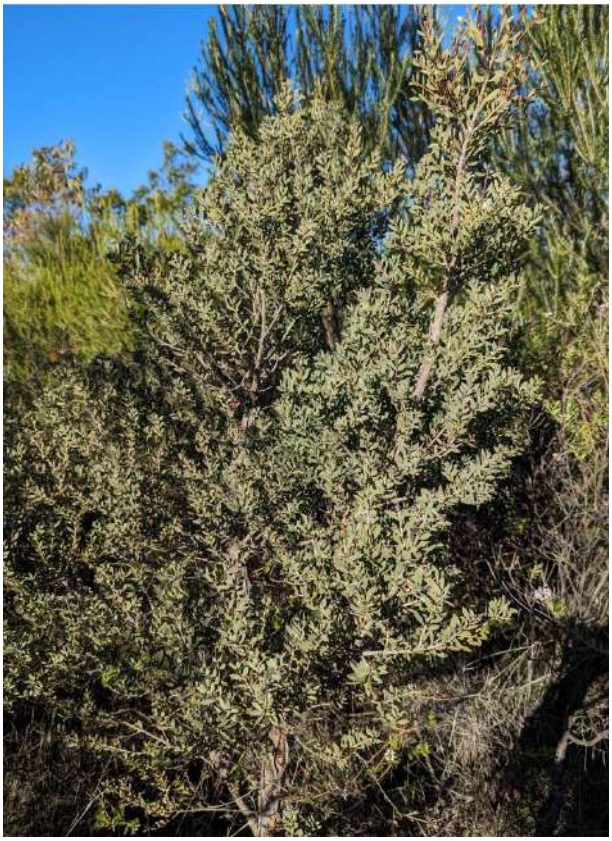


Plate 5: *Melaleuca deanei* planted in 2017 within the planted rehabilitation area 2023 (source: South East Environmental, 2023).

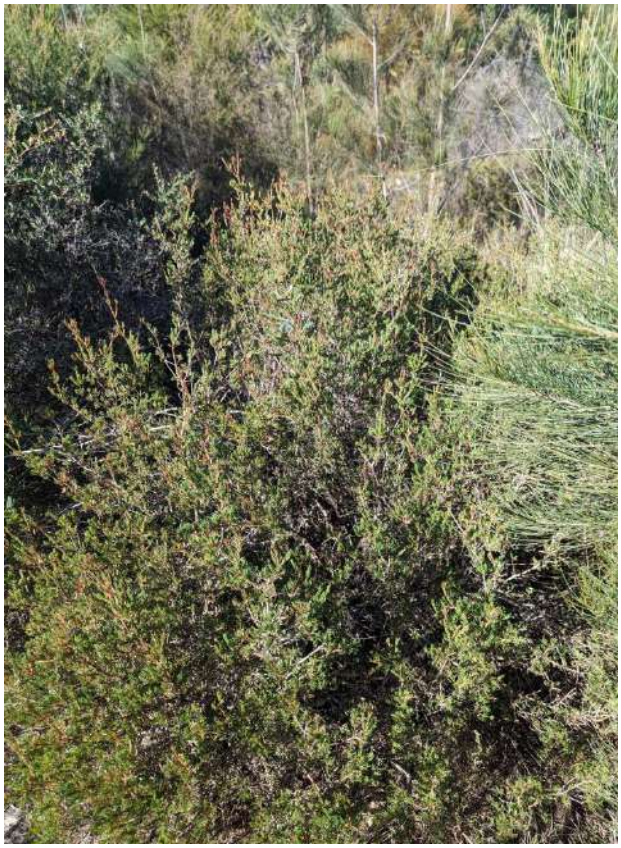


Plate 6*: Darwinia fascicularis* ssp *oligantha* planted in 2017 within the planted rehabilitation area 2023 (source: South East Environmental, 2023).



Plate 7: *Tetratheca glandulosa* within the planted rehabilitation area 2023 (source: South East Environmental, 2023).

Rehabilitation Area – Translocated

This area involved direct translation of material from Lots 1 and 2 vegetation clearing. Recruitment from seed bank storage were observed to be ample. All age classes ranging from small seedlings to adult shrubs were observed from small seedlings to adult shrubs which were in flower during the survey. Shrubs and ground cover species were reasonably abundant throughout the area. The canopy stratum is yet to fully establish however, *Eucalyptus sp*., *Corymbia sp*. and *Angophora hispada* recruits were observed.

Translocated *Darwinia fascicularis* ssp*. oligantha* is numerous, particularly on the western section of the area. One single translocated *Tetratheca glandulosa* were observed to be in a healthy state with flowers present during July suggesting that flowering will continue over the coming months. Another *Tetratheca glandulosa* specimen was located which has grown from seed bank within the soil.

Three *Melaleuca deanei* which were planted in 2017 are still present and observed to be in a healthy state. A further 26 *M. deanei* individuals have been planted within this area during the 2020 – 2021 reporting period. All plants appear to be doing well with some showing signs of active growth. Monitoring of these plants will continue over the coming months. The mother plant was translocated to this area after the 2:1 targeted species offset ratio was achieved. The mother plant was translocated using a loader with a large bucket with the aim of collecting as much soil and root ball as possible. Unfortunately, the main tap root was broken during the process causing the plant material died back. At the location of this translocated mother plant, two seedlings of *M. deanei* were observed to have emerged from the soil mounds. There will be on-going monitoring of these seedlings over the coming months.

Plate 8 shows the translocated Tetratheca glandulosa flowering within the translocation area. Plate 9 contains a specimen of *M. deanei* which was planted in the translocation area in 2017 with *Darwinia fascicularis ssp oligantha* specimen located alongside. Plate 10 shows another *Darwinia fascicularis ssp oligantha* specimen within this area. Plate 11 shows the *M. deanei* seedling emerging from parent plant root ball.



Plate 8: Translocated *Tetratheca glandulosa* flowing within the translocation area 2023 (source: South East Environmental, 2023)



Plate 9*: M. deanei planted in 2021 within the translocation area 2023 with Darwinia fascicularis* ssp *oligantha* to the right (source: South East Environmental, 2023).

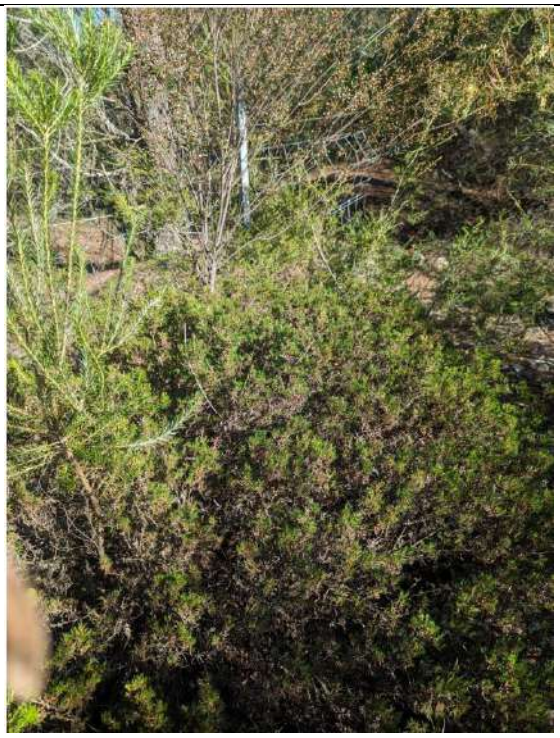


Plate 10: *Darwinia fascicularis ssp oligantha* within the translocation area 2023 (source: South East Environmental, 2023)



Plate 11: *M. deanei* seedling emerging from parent plant root ball within the translocation area 2023 (source: South East Environmental, 2023)

Rehabilitation Area – Soil Seed Bank

Ample natural recruitment of native species was observed in this area, including *Darwinia fascicularis* ssp*. oligantha* recruitment. Ground cover and shrub species are present throughout. The canopy stratum is beginning to emerge with *Eucalyptus* sp. and *Corymbia* sp. observed. *Banksia ericifolia* is observed to be to the dominated recovering shrub layer with *Grevillea buxifolia* and *Acacia suaveolens* being widespread. Previously *Acacia suaveolens* had dominated this layer however the Banksia has outgrown most of the other species present. Groundcover species are present throughout the aera but due to the density of the shrub layer the groundcover is found to be sporadically distributed.

Altogether 23 *Darwinia fascicularis* ssp*. oligantha* have been identified and are scattered throughout the site, some observed to have new recruits. The planted *Melaleuca deanei* which could not be identified during the previous survey was relocated during this survey period. The density of the shrub regrowth is suspected to be impeding on the efforts to locate other individuals. All the surviving threatened species which were located was observed to be in a healthy state.

Plates 12 and 13 compare the same view of the translocated rehabilitation area from south-west looking east in 2021 and 2023.

Plates 14 and 15 compare the same view of the soil seed bank rehabilitation area from north looking south in 2021 and 2023.

Plates 16 and 17 compare the same view of the soil seed bank rehabilitation area from south looking north in 2021 and 2023.

Plate 18 shows the M. deanei planted in 2017 within the seed bank rehabilitation area.

Front Gate Rehabilitation

The area around the front gate of the quarry underwent initial rehabilitation in 2017 with supplementary planting of native species. However, hot dry conditions in 2017 and 2020 have resulted in a number of losses and slow growth of the surviving plants, despite regular watering and maintenance. Since the return of more regular rainfall, vegetation in the area has thrived with many shrubs flowering well and new recruitments observed. Gaps in vegetation occupancy are present but is expected to fill in with time via natural recruitment. Two *M. deanei* propagated from cuttings were planted in this area and will be closely monitored over the coming months.

Plate 19 shows the status of the front gate rehabilitation.



Plate 12: View of soil seed bank rehabilitation area from south-west looking east, 2021 (source: South East Environmental, 2023).



Plate 13: View of soil seed bank rehabilitation area from south-west looking east, 2023 (source: South East Environmental, 2023).



Plate 14: View of soil seed bank rehabilitation area from north looking south, 2021 (source: South East Environmental, 2023).



Plate 15: View of soil seed bank rehabilitation area from north looking south, 2023 (source: South East Environmental, 2023).



Plate 16: View of soil seed bank rehabilitation area from south looking north, 2021 (source: South East Environmental, 2023).



Plate 17: View of soil seed bank rehabilitation area from south looking north, 2023 (source: South East Environmental, 2023).



Plate 18: M. deanei planted in 2017 within the seed bank rehabilitation area 2023 (source: South East Environmental, 2023)



Plate 19: Front gate rehabilitation area 2023 (source: South East Environmental, 2023)

Vegetation Monitoring within NVC

Out of the nine vegetation monitoring sites across the whole Old Northern Road Quarry site, five vegetation monitoring sites are located within the NVC including one site within the planted rehabilitation area previously discussed. From the remaining four sites, one site could be safely accessed for monitoring as the three remaining sites are currently in active quarry extraction area.

The overall health of the vegetation and biodiversity within the NVC is moderate. Historic disturbance was observed in this area and likely to be due to livestock grazing and timber removal. Recent continued rainfall in the local area has assisted in the recovery of vegetation from previous drought conditions across all affected stratums with ground cover species showing good signs of recovery.

The remaining areas throughout the NVC are impacted by the presence of *Lantana camara*. An effort to remove and control has been undertaken for a number of years however due to the distribution and density, long term management is required to completely remove the species across the entire site.

During the previous 2021-2022 reporting period, it was determined that the required number of cloned *Melaleuca deanei* specimens to offset vegetation clearing under DA 250-09-01 Modification 4 had been achieved and determined successful, meeting the 2:1 offset ratio. This enabled the parent plant to be removed from the original site on Lot 2 Strip 2. An attempt to translocation the parent plant was made via digging around the root ball and carrying the plant with the attached root ball using a loader bucket. However, the root system of the parent plant was found to

be extensive and had coiled around large sandstone boulders and throughout the cracks of others. The parent plant was translocated and planted in the NVC with the root ball and immediate surrounding soil. Two seedlings have been observed to emerge at the root ball locations where the parent plant was translocated to and the area will be monitored over time for regrowth potential.

Vegetation Monitoring outside NVC

Four vegetation monitoring sites are located outside the NVC. Access to two of the monitoring sites are located in the current extraction areas and therefore cannot be accessed. Access to one other monitoring site was restricted by the presence of *Lantana camara*.

The first accessible survey site is located outside the NVC within the 250m buffer to the Maroota Public School with vegetation determined to be *Smooth barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney* Basin Bioregion. This area was subjected to historic disturbance, most likely from timber harvesting. Survey indicated there is abundance *Eucalyptus piperita* regenerating within the survey quadrat, all being around the same age which indicates that the area had been previously cleared. Diversity within the survey site was categorised as reasonable and biodiversity values moderate. This survey site will not be subjected to future vegetation clearing for the quarry and therefore presents a good opportunity to monitor the effects of sand extraction in nearby retained vegetation.

The additional survey site is also classified as *Smooth barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney.* This survey location is located just within the 250m buffer to the Maroota Public School and will not be subjected to future vegetation clearing. Vegetation within this survey plot appears to have had very little disturbance and contains no exotic weeds. This survey location will also provide good baseline data for future reference for rehabilitation.

Lantana camara have some impacts on the remaining area outside the NVC. The third survey quadrat could not be accessed due to this. Removal and control of the species have commenced within this section however more efforts are required as progress is slow and favourable conditions for weed growth have affected weed management progress.



Figure 6

Location of Ecosystem Monitoring Sites
Haerses Road Biodiversity Offset Area

Image Source: Cumberland Ecology (2015)

File Name (A4): R06/4209_021.dgn
20180220 17.10

7.3.2 Haerses Road Biodiversity Offset Area

The Haerses Road Biodiversity Offset Area (HRBOA) has a minimum area of 8.70 hectares and is located east of Stage 2 extraction at the Haerses Road quarry. Five vegetation monitoring sites are located within the HRBOA. The HRBOA and locations of the monitoring sites are depicted in Figure 6.

Overall, there was a stabilisation to foliage cover and structure cover in most stratus at most survey sites. Grass and groundcover species appear to have decreased slightly in density following the return to average conditions. A reduction in forbs was observed which is likely attributed to drier condition than previous years. Extensive Long-nosed Bandicoot digs were noted in an area close to Quadrat 1, similar to previous years. Bird presence and density has remained consistent from the last survey period, likely due to favourable weather conditions.

7.3.3 Threatened Flora Monitoring

Four threatened flora species are being monitored at the Old Northern Road quarry.

Kunzea rupestris* and *Darwinia fascicularis* ssp. *oligantha

The far western area of Lot 29 contains two rock platforms (eastern and western) occupied by *Kunzea rupestris* and *Darwinia fascicularis* ssp. *oligantha.* The Eastern rock platform contains four individual patches of *Kunzea rupestris* with the presence of *Darwinia fascicularis* ssp. *oligantha.* Much of the surrounding vegetation has suffered die back including *Banksia ericifolia* and *Calytrix tetragona*, likely attributed to the dry conditions during the 2017 – 2019 followed by extreme wet conditions from 2020-2022. The Western rock platform contains five patches of *Kunzea rupestris* which was observed to be growing within a vegetation community with far more flora diversity than what is present on the eastern platform with shrubs growing in deeper soil profile in more protected conditions. The overall health of the *Kunzea rupestris* population is good following the ideal weather conditions in the local area over the past 12 months. During the 2017 – 2019 drought some dieback and plant loss was observed however the remaining plants appear to be in good health and new recruitment is evident, particularly on the western rock platform. New growth on most plants was observed during this survey period with flower buds present on much of the population. Mosses and lichens were present on both rock platforms.

The *Darwinia fascicularis* ssp. *oligantha* was observed to be plentiful in these locations with plants in flower and new recruits evident throughout the area. This species is also very well represented throughout the rehabilitation areas in the NVC.

***Melaleuca deanei* (parent plant)**

The parent plant of *Melaleuca deanei* located in the Banksia heath plant community on Lot 2 strip 2 had been translocated to the NVC following the success of the 2:1 offset of propagation and planting. The translocated parent plant suffered damaged to the main tap root which caused a die back. However, new recruits have been observed growing from the translocated root stock and continual monitoring of these specimens and the surrounding area will be carried out.

Tetratheca glandulosa

Several *Tetratheca glandulosa* plants have been identified in Quadrat 2 during this period including an abundance of flowering *Pimelea curviflora var curviflora*.

7.3.4 Threatened Fauna Monitoring

Old Northern Road Quarry

Feed trees for Glossy Black Cockatoo are confirmed to be present in transect 2 of the NVC and within the 250m buffer to the Maroota Public School. It is common for this species to return to the same stand of feed trees repetitively. However, there were no birds observed feeding in these trees during this reporting period.

The AnaBat Express sound recorder was left in place for 30 survey nights. However, upon analysing the results it was established that the equipment had failed for the entire 30 survey nights. It was deemed unsuitable to repeat the bat survey following suitable bat survey season. Therefore, bat survey will again be conducted during the summer season. Live trapping of bats was not conducted to reduce unnecessary stress on the fauna.

A pair of resident Wedge-tailed eagles were again observed flying over the site several times during this monitoring period. A White Breasted Sea Eagle was also observed flying over the quarry during this reporting period.

Haerses Road Biodiversity Offset Area

There is a historic Bionet record of a Koala and Glossy Black Cockatoo sighting to the north of HRBOA towards Hitchcock Road.

A search for Koala scat under *Eucalyptus punctata* within all survey quadrats at the HRBOA were undertaken and no scats were present. However, Koala sightings in the local area, particularly in Glenorie, have increased since the Wollemi/Yengo mega bushfire over the spring-summer of 2019 – 2020.

Glossy Black Cockatoo feed trees were recorded in Quadrat 1.

Several Brown Treecreepers were again observed foraging at various locations which indicate their permanent presence and residents within the site.

Survey utilising AnaBat Express sound recorder was undertaken in February 2023 for 16 nights which identified the presence of one species:

- *Mormopterus norfolkensis* (Eastern Free-tailed Bat),

AnaBat results also indicated the potential occurrence of the following five bat species:

- *Chalinolobus dwyeri* (Large-eared Pied Bat),
- *Falsistrellus tasmaniensis (*Eastern Falsistrelle*),*
- *Scoteanax rueppellii (*Greater Broad-nosed Bat*),*
- *Myotis Macropus* (Southern Myotis), and
- *Miniopterus australis (Little Bent-winged Bat).*

7.3.5 Exotic Flora

The weed distribution map has been reviewed and revised for the quarry during this reporting period. Weed species identified on this map will be the focus of weed management priority over the next reporting period. The map will continue to be reviewed and revised as required on an annual basis. Figure 7 shows the updated weed distribution map.

The following weed species were identified within the 250m buffer area, NVC and Lot 196 at the Old Northern Road Quarry:

- *Ageratina adenophora* (Crofton Weed),
- *Andropogon virginicus* (Whiskey Grass)
- *Bidens Pilosa* (Coblers Pegs),
- *Paspalum dilatatum* (Paspalum Grass),
- *Senecio madagascariensis* (Fireweed),
- *Lantana camara* (Lantana)*, and*
- *Bambusoideae sp.* (Bamboo)

Fireweed and Lantana are listed as Weeds of National Significance (WoNS) under the NSW *Biosecurity Act* 2015 and a weed management program is currently put in place for these species throughout the life of the rehabilitation plan.

Whiskey Grass (*Andropogan virginicus*) have been identified in rehabilitation area located in the south east area of the site.

Current progress of rehabilitation is in line with the 'Mid stage 2016 – 2023' staging of rehabilitation and rehabilitation strategy contained in Table 7.1 of the BRMP which includes:

- completion of rehabilitation on selected extracted areas on Lots 196 and 29,
- commencement of rehabilitation on strip 1,
- continual extraction on strips 2 and 3, and
- maintenance of previous revegetation, setbacks, buffer zones and bunds.

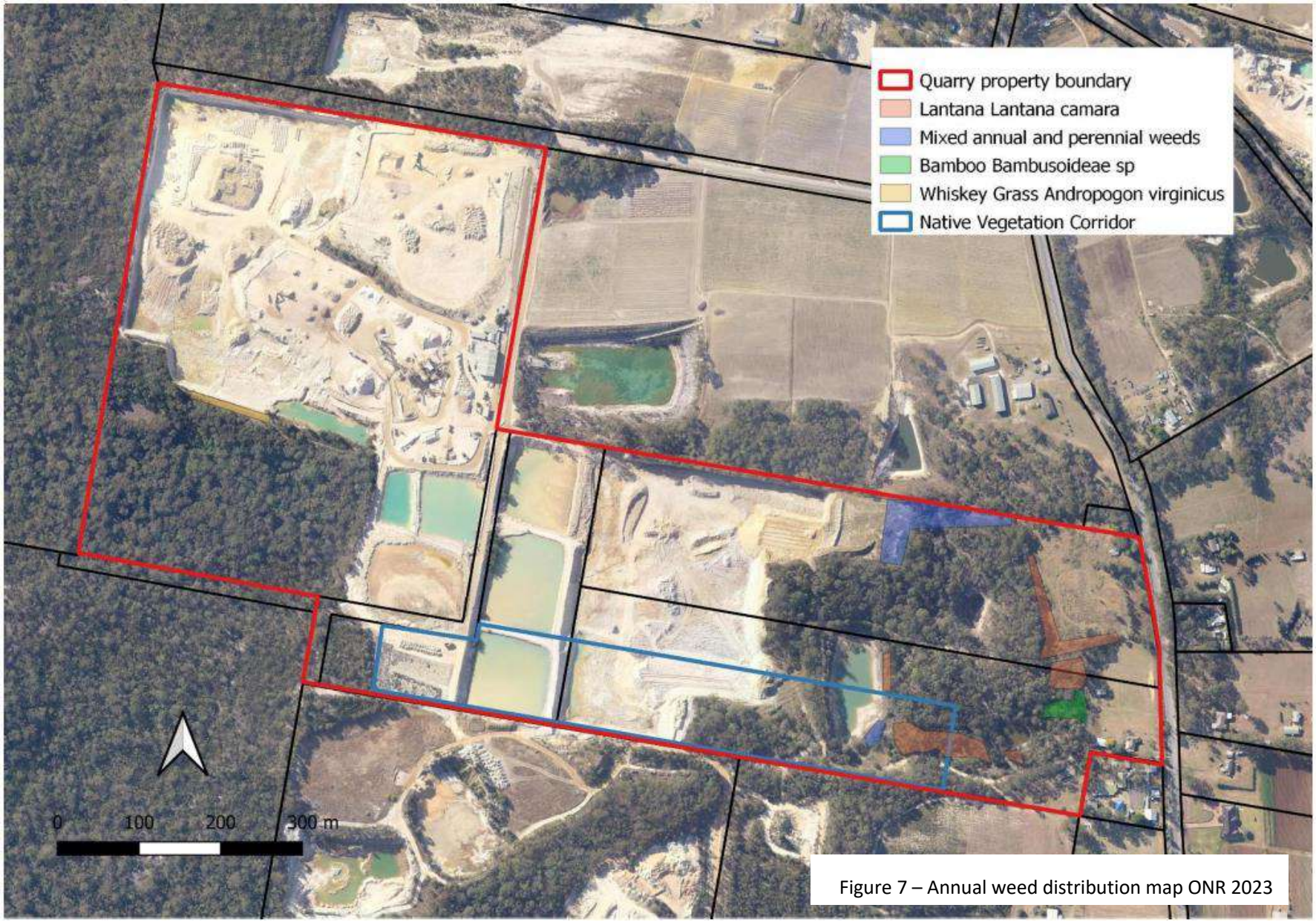


Figure 7 – Annual weed distribution map ONR 2023

7.3.6 Pest Species Monitoring and Control

Feral pest species monitoring was undertaken by South East Environmental utilising infrared cameras, direct observation of prints and burrows, scat identification and digs. Sand plots were not able to be utilised during this reporting period due to limited machinery access.

The following feral pest species were identified to be present on the quarry premise:

- European Red Fox – identified through prints
- Noisy Minor – identified through on-site observation,
- Dog – identified through prints
- European Rabbit – identified through scats

European rabbit scats were observed in several locations within the NVC in low density. Carnivore scats observed on site were highly likely to be those of European Red Fox. No rabbits were observed to be feeding during the day, scats were not in high density and warrens were not observed. The population of rabbits is therefore, considered to be low to moderate, and likely to be kept under control by biological means such as predation from foxes, dogs, cats and birds of prays such as Wedge-tailed Eagle that are present nearby. Should the number of rabbits become problematic, it may be necessary to engage in a control program to reduce or eliminate the population. Noisy minors, although a native species, was observed within the NVC and the 250m buffer area. Noisy minors are considered a pest if present in high density and is a key threatening process to a number of threatened native species of small birds such as the Brown Tree Creeper which is present in the area. The population of the Noisy Minor was considered to be small, and the presence of other small native bird species was observed on site. The population of the Noisy Minor is to be monitored over time and management strategy to be implemented to prevent the species from becoming dominant which can lead to elimination and displacement of other native bird species.

Overall, occurrences of fauna pest species are not at a level considered to require active management and on-going monitoring will be undertaken to determine appropriate dynamic management strategy.

7.3.7 Progressive Rehabilitation

Progressive rehabilitation of the quarry during this reporting period included:

- Continued capping and settlement of the silt pond located on Lot 196 directly north of the current Native Vegetation Corridor (NVC). Part of the silt pond will form the northern boundary of the NVC and the remainder will be revegetated to Class 4 Agriculture.
- Continued capping and settlement of the silt pond located on Lot 29 directly east of the current haul road separating Lots 29 and 196. Once optimal status is obtained, stockpiled windrows of material and topsoil will be applied to this area for rehabilitation of Banksia Heath Community, extending east from the current NVC on Lot 29.

The locations of the capped and settling silt ponds are shown in Figure 8 below.

No revegetation was carried out for rehabilitation during this reporting period as further settlement and stabilisation of the silt ponds are required in order to support top dressing of topsoil and revegetation material. The remaining of the propagated *Melaleuca deanei* were planted in two areas on Lot 196.

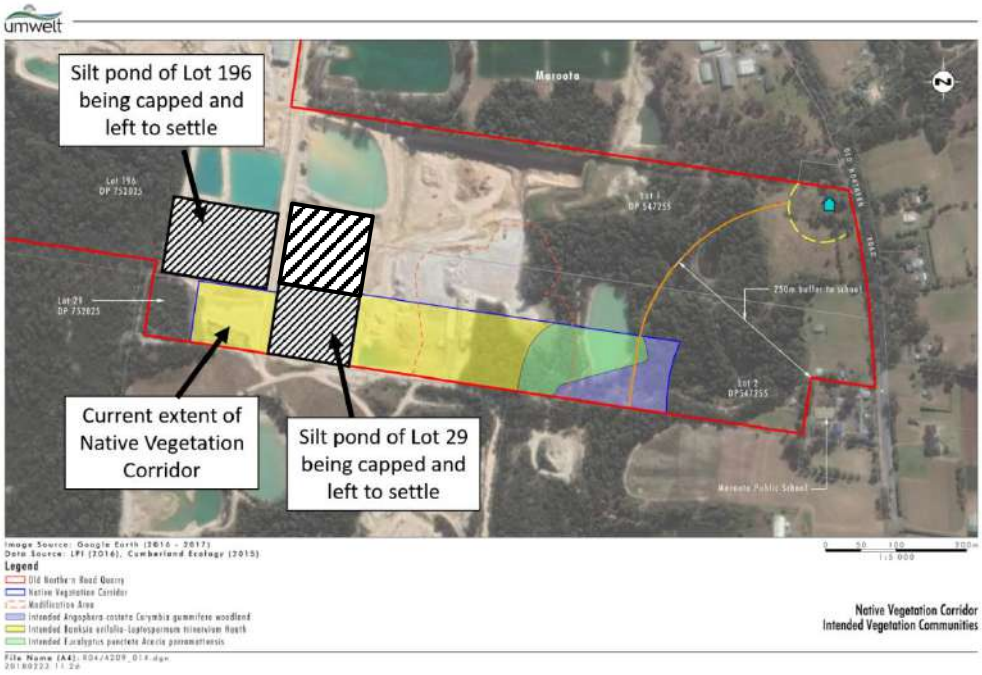


Figure 8: Locations of capped and settling silt ponds, in preparation for future rehabilitation/revegetation.

7.3.8 Progressive Achievement of Completion Criteria

Section 5.2 of the BRMP contains the preliminary rehabilitation performance and completion criteria. The status of targets being achieved against the preliminary rehabilitation performance and completion criteria are contained in Table 33.

Table 33: Assessment against criteria to monitor success of rehabilitation.

Aspect	Preliminary Rehabilitation Performance and Completion Criteria	Target Achieved	Comments
Decommissioning	All surface infrastructure will be decommissioned and removed.	N/A	Noted – completion criteria not yet triggered
Soil	Rehabilitated slopes are stable	Yes	Complied with – managed through a combination of weekly and monthly inspections by Quarry Managers and Environmental Officer, or Delegates.
	No significant erosion is present that would constitute a safety hazard or compromise the capability of supporting the end land use.		

Aspect	Preliminary Rehabilitation Performance and Completion Criteria	Target Achieved	Comments
	Contour banks are stable and there is no evidence of overtopping or significant scouring as a result of runoff.		Aspects managed through mitigation measures contained in the Soil and Water Management.
	Surface layer is free of any hazardous materials.		
Water	Runoff water quality from the site does not pose a threat to downstream water quality.	Yes	Complied with - aspect managed through downstream surface water monitoring, and other mitigation measures contained in the Soil and Water Management.
Native Vegetation	Revegetation areas contain flora species assemblages characteristic of the desired native vegetation communities.	N/A	At this stage it is too early in the rehabilitation process to determine if the desired vegetation community is being established. Species planted in the NVC have been specifically chosen to recreate a Banksia Heath community.
	Second generation tree seedlings are present or likely to be, based on monitoring in comparable older rehabilitation sites (i.e., evidence of fruiting of native species observed).	N/A	It is too early in the rehabilitation process for second generation tree seedlings. Fruiting of tree species has only just commenced therefore this KPI is likely to be achieved within the next 2-3 years.
	More than 75 per cent of trees are healthy and growing as indicated by long term monitoring.	Yes	More than 75% of the native vegetation within the active rehabilitation area is healthy and is growing as expected for long term survival. All shrub and ground cover species have reached maturity with flowering and seed production observed. Some species have begun self-propagation within rehabilitation sites. *Eucalyptus*, *Angophora* and *Corymbia* species have not yet reached maturity.

Aspect	Preliminary Rehabilitation Performance and Completion Criteria	Target Achieved	Comments
	More than 50 per cent of translocated or propagated threatened flora species survive as indicated by long term monitoring.	Yes	More than 50% of translocated and planted propagated threatened flora species has survived despite the extreme weather conditions of the past reporting periods to date, at least **45** propagated *Darwinia fascicularis subsp. Oligantha* and **52** propagated *Melaleuca deanei* have survived transplanting in the rehabilitation area. A complete count of translocated *Darwinia fascicularis subsp. Oligantha* was not undertaken at the time of relocation however it appears that any losses that may have occurred were minimal and new recruits are now visible throughout much of the area.
	There is no significant weed infestation such that weeds do not comprise a significant proportion of species in any stratum.	Yes	There is no significant weed infestation within the rehabilitation area. Significant weed infestations are located within the NVC outside of the rehabilitation area. These areas are being actively addressed by weed management contractors.
Stream and Riparian Zone Restoration	Drainage line stable displaying no signs of erosion	N/A	Noted – aspect not yet triggered.
	Weed species densities no greater than surrounding vegetation		
	Access to riparian zone is restricted		
	Riparian zone established to a width of 20 metres		
	Riparian zone is considered self-sustaining and exhibits 60% or more of the control site scores for each riparian condition monitoring attribute		
Weed and Pests	Regular inspections indicate a decline weed diversity, density and abundance and a decline in signs of feral animal activity.	Yes	There were very few weed species identified within the rehabilitation area. There are no signs of feral animal activity.
	There is no significant weed infestation such that weeds do not comprise a significant proportion of species in any stratum.	Yes	There is no significant weed infestation within the rehabilitation area. Significant weed infestations are located within the NVC outside of the rehabilitation area. These areas are being actively addressed by weed management contractors.

Aspect	Preliminary Rehabilitation Performance and Completion Criteria	Target Achieved	Comments
	There is no evidence of significant damage resulting from feral animal activity	Yes	There is no evidence of significant damage caused from feral animal activity within the rehabilitation area.
Bushfire Hazard	Appropriate bushfire hazard controls have been implemented.	Yes	Complied with – bushfire hazards are managed through the Bushfire Management Plan (Parts 1 and 2). Annual meeting between Dixon Sand and the representative of Rural Fire Service are carried out before the start of the bushfire season to review and revise the status of hazards and mitigation measures. The annual meeting was carried out in October 2022 for this reporting period.
Ongoing Public Safety	Appropriate mechanisms are established to control access and manage public safety post-closure.	N/A	Noted – aspect not yet triggered

7.3.9 Stream Restoration

Riparian stream restoration has not commenced. The areas where the riparian stream was to be reinstated are either still being extracted or yet to be extracted.

7.3.10 Discussion and Recommendations

The annual biodiversity monitoring and rehabilitation management report undertaken by South East Environmental for this reporting period marks the sixth year of monitoring and reporting for the quarry. The average rainfall over this reporting period of facilitated ideal growing conditions for the rehabilitation areas of the NVC. Vegetation within all stratums have shown an increase in size, maturity and density over the last twelve months. New juvenile recruits can be observed within the shrub and groundcover species, and an increase in diversity was recorded. Canopy species are growing well and have reached reproductive maturity during this reporting period.

Other vegetation within the Old Northern Road quarry have shown to recovered well from previous drought conditions from the 2017-2019. The average rainfall over the past 12 months provided ideal growing conditions for groundcover species particularly forbs, grasses and ferns. Native vegetation within areas of no weedy growth have proven resilient with no new weed growth or establishment of weed following the return of regular rainfall events.

Vegetation changes within the HRBOA is observed to be minimal which provides a good demonstration of the hardiness of native vegetation stand with minimal historic disturbances. A slight decreased in shrub and forb species density was observed and likely attributed to the average weather experienced following an over abundance of rainfall during the previous two reporting periods.

The threatened *Kunzea rupestris* located west of the NVC have been affected by the prolonged drought conditions of 2017 to 2019. The *Kunzea rupestris* was adversely impacted by the drought, particularly from radiant heat reflection from the surrounding sandstone outcrop. New juvenile recruits have been recorded since the return of regular rainfall.

Other threatened species previously recorded on site were located and appear to be in a healthy state.

Management of Lantana within the NVC and 250m school buffer area at the Old Northern Road Quarry will be the priority for bush regeneration contractors to prohibit the spread of the weed into new areas which can form potential habitat for exotic fauna such as the European Red Fox and European Rabbit.

A silt pond directly east of the NVC rehabilitation area is the designated area for continuing the NVC rehabilitation. Rehabilitation was scheduled to commence this reporting period however due to the prolonged wet weather conditions experienced previously, there has been a delay in the silt pond final capping, sufficient evaporation and stabilisation. It is anticipated that rehabilitation in this area can commence during the next reporting period. Rehabilitation will also focus on the western embankment at the front entrance to the quarry site.

Planting of the remaining propagated *Melaleuca deanei* and other local species was undertaken during this reporting period. Continue with supplementary planting within the rehabilitation area and locations within the NVC and 250m buffer to the school where Lantana has been removed.

7.4 Change in Environmental Procedures

Old Northern Road NVC Rehabilitation Area

- Continue with routine weed control and monitoring of regenerating native species.

Old Northern Road Lots 1 and 2

- Continued management of *Lantana camera* and review techniques recommended in the Ecological Monitoring Report (South East Environmental, 2022)
- Supplementary planting or similar treatment in identified areas as required.

Old Northern Road other areas

- Continue with routine weed management along the southern boundary of Cons Hill (Lot 196) and carry out direct seeding or supplementary planting where suitable, and
- Continue with rehabilitation works along the western embankment at the Quarry entrance gate. Carry out direct seeding or supplementary planting where suitable.

Haerses Road Biodiversity Offset Area

- Continue with management of invasive grass and annual species along the North-western border of the HRBOA, and

8. Community and Social Impacts

8.1 Compliance

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

Table 34: 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). Additional members have been endorsed by the Chair Person after this date.
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). Additional members have been endorsed by the Chair Person after this date.

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

No complaints were received for the Old Northern Road Quarry during the 2022-2023 reporting period, All complaints from the previous 2021-2022 reporting period have been closed out.

Table 35: Complaints received during the reporting period

Complaint	
Date complaint received	Not Applicable – no complaint received during this reporting period.
Issue	
Recommended Action(s)	
Outcome	
Close out Date	

A copy of the complaints register for this reporting period is contained in Appendix K.

8.3 Long Term Complaints Trend

Long term complaints monitoring data commencing since the 2003 – 2004 monitoring period is depicted in Chart 59 below. It must be noted that complaints were recorded for the Old Northern Road and Haerses Road quarries combined from the 2006 – 2007 to 2017 – 2018 monitoring periods, with complaints recorded separately for individual quarries from hereon.

A total of twenty-four complaints have been received by Dixon sand since the 2003 – 2004 monitoring period to date. The number complaints were between nil and up to three from the 2003 - 2004 to 2007 – 2008 monitoring periods, all of which were associated with haulage trucks driving in a dangerous manner or exceeding the speed limit.

During the 2008 – 2009 monitoring period, the number of complaints increased to six, with the majority associated with trucks driving in a dangerous manner or exceeding the school zone speed limit. One complaint was in regards to excessive noise generation where the source of noise was identified to be caused by a different operation.

From 2009 – 2010 to 2016 – 2017 monitoring periods, the number of complaints were minimal and fluctuated between nil and two. These complaints were associated with haulage trucks driving in a dangerous manner or exceeding the speed limit.

The 2016 – 2017 monitoring period recorded an increase in number of complaints to eight complaints which were associated with haulage trucks driving in a dangerous manner, excessive noise generation, operation outside of approved hours and excessive dust generation.

From this point, a downward trend in number of complaints was observed. The number of complaints received reduced to five haulage truck related complaints during the 2018 – 2019 monitoring period. The number of complaints further reduced to two truck related complaints (exceedance of speed limit) during this 2019 – 2020 monitoring period.

One haulage truck complaint (dangerous driving) was received during the 2019 - 2020 monitoring period.

Three complaints were received during this reporting period which were related to noise, sediment and haulage truck.

The majority of the complaints were made by residents of Maroota, residents of neighbouring suburbs or local road users. One complaint was made by Dixon Sand Quarry Manager. Timing of events leading to complaints were mainly during quarry operation hours with the exception of complaints associated with operations outside of consented hours.

The locations of haulage trucks driving in a dangerous manner, exceeding the speed limit or excessively using engine brakes were mainly on Old Northern Road and Wisemans Ferry Road in the local areas.

Dixon Sand did not receive any complaints during this 2022 - 2023 monitoring period.

Dixon Sand implemented the steps to identify the validity of the complaints received and employed appropriate actions outlined in the complaints procedure and the Maroota Local Traffic Management Policy (inter-pit policy).

Several complaints were identified to have been associated with other operations within or outside the local areas.

All complaints have been closed out.

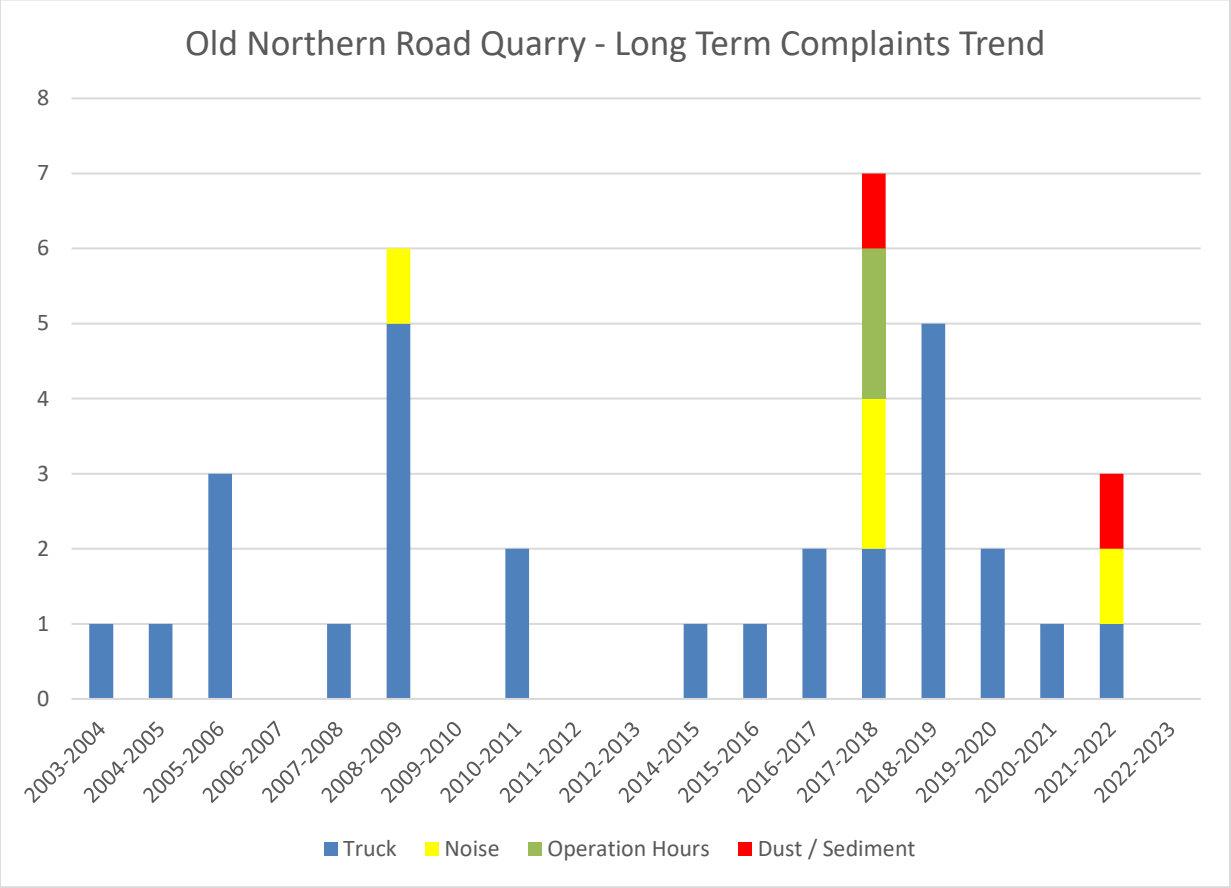


Chart 59: Long term complaints trend.

8.4 Community Consultative Committee, Meetings and Guidelines

Two CCC meetings were held in the 2022 - 2023 reporting period, in accordance with the consent conditions and CCC Guidelines (2016). The ordinary bi-annual CCC meetings were held on 9th November 2022 and 3rd May 2023.

The minutes from the ordinary CCC meeting are provided in Appendix J.

8.5 Community and Stakeholder Liaison

In addition to contacting the Community Representatives of the CCC, 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,

- Notifying the Maroota Public School regarding noise monitoring undertaken in December 2022 and June 2023, and
- Bi-annual CCC meetings in November 2021 and May 2022

Local Initiatives

Dixon Sand regularly makes monetary and resource contributions to a number of community initiatives such as:

- monetary contribution and participating in the Maroota Public School (Maroota Muster Festival),
- monetary contribution to the Cattai Public School,
- monetary contribution to the Royal Flying Doctor Service,
- Wings4Kids,
- Black Dog Institute, and
- publication of environmental monitoring data, and provision of all current consents and site management plans for public viewing on the Dixon Sand website.

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.

Dixon Sand’s Old Northern Road Quarry 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.

Threatened flora and fauna present on site are 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 requires Dixon Sand to ensure that the Quarry is suitably equipped to respond to any fires on site. The Quarry is 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 Quarry.

An annual meeting between Dixon Sand and the representative of the Rural Fire Service was conducted in October 2022 on the quarry premise to:

- review the Bushfire Management Plans,
- review risk assessment and procedures in the event of a bushfire,
- discuss key dates for the 2022-2023 bushfire season and any specific season predictions,
- discuss any planned hazard reduction burns in the area including locations, size and dates,
- discuss any changes to quarry operations which may affect bushfire risks, and
- discuss the locations of static water supplies including waters storage ponds and standpipe

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 responsible for ensuring 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,
- Permit to discharge protocols,

- Environmental hazard identification workshop,
- Regular toolbox talks, and
- Bushfire Management and Emergency evacuation training.

11. Incidents and Non-Compliances

11.1 Environmental Incidents and Non-Compliances

Details of incidents and non-compliance are listed in Table 36 below.

Table 36: Incidents and Non-compliances

Event No.	Date of Incident / Non-compliance	Applicable Condition(s)	Details, Cause and Mitigation of Incident	Incident classified as a Non-compliance
1	Submission of 2021-2022 Annual Review	Condition 12 of Schedule 5 of DA 250-09-01	Dixon Sand is required to submit the Annual Review for the Quarry by the end of March each year. The submission of this Annual Review at the end of September is technically non-compliant with the deadline required by the consent condition. However, Dixon Sand requested approval from the DPE for the submission deadline of the Annual Review to be adjusted to reflect the financial year reporting. Approval was granted by the DPE on 9 February 2018 to submit the Annual Review by the end of September each year.	Yes However, this non-compliance has been noted and withdrawn by DPE previously due to approval for an alternative submission date
2	05/04/2023 to 31/05/2023	Condition 7 of Schedule 3 of DA 250-09-01	During the period 05/04/2023 – 31/05/2023, the monthly dust deposition at D01A returned 33.6 g/m2/month which resulted in the rolling annual average dust deposition of 4.3 g/m2/month (exceeding the criteria of 4.0 g/m2/month). The elevated monthly reading is considered an anomaly and extraordinary event due to neighbouring farming activities. This incident was reported to DPE (DA-250-09-01-PA-29) and the incident withdrawn as no breach was identified.	No
3	31/05/2023 to 28/06/2023	Condition 7 of Schedule 3 of DA 250-09-01	The rolling annual average during the 31/05/2023 – 28/06/2023 monitoring period was 4.4 g/m2/month (exceeding the criteria of 4.0 g/m2/month). The cause of this exceedance is associated with the previous elevated monthly dust result of 33.6 g/m2/month (as discussed above). This incident was reported to DPE (DA-250-09-01-PA-30) and the incident withdrawn as no breach was identified.	No

11.2 Notices issued by MEG

Dixon Sand received eleven notices under the *Work Health and Safety Act* 2011 from MEG (Resources Regulator) as detailed in Table 37 below.

Table 37: Notices issued by MEG (Resources Regulator)

Date Issued	Notice Reference	Issues	Status
7 Nov 2022	NTCE0011172 – Section 23 Notice of Concern	Electrical Control Plan + isolation procedures	Open
7 Nov 2022	NTCE0011173 – Section 191 Improvement Notice	Electrical DR21 + arc welder	Open
7 Nov 2022	NTCE0011174 – Section 191 Improvement Notice	Electrical pump	Closed out
8 Nov 2022	NTCE0011180 – Section 191 Improvement Notice	Emergency Response + drill	Open
8 Nov 2022	NTCE0011181 – Section 191 Improvement Notice	Tail gate hazard	Closed out
8 Nov 2022	NTCE0011182 – Section 191 Improvement Notice	Guarding at plant	Closed out
8 Nov 2022	NTCE0011183 – Section 191 Improvement Notice	Pressure Vessels registration	Closed out
8 Nov 2022	NTCE0011184 – Section 23 Notice of Concern	ERP Radio Silence in Incident and Emergency Reporting	Open
1 May 2023	NTCE0012129 – Section 191 Improvement Notice	Working at Height + Lifting issues	Open
1 May 2023	NTCE0012130 – Section 23 Notice of Concern	Pressure vessels, Mechanical Engineering Control Plan	Closed out
2 May 2023	NTCE001239 -Section 191 Improvement Notice	Safety hazard reporting procedures and documentation, other general items	Open

12. Independent Environmental Audit

12.1 Independent Environmental Audit Requirements

Condition 14 of Schedule 5 of DA 250-09-01 requires:

> *Within 12 weeks of commencing this audit, or as otherwise agreed by the Secretary, the Applicant must submit a copy of the audit report to the Secretary and any other NSW agency that requests it, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of these recommendations as required. The Applicant must implement these recommendations, to the satisfaction of the Secretary.*

The appointment of R.W. Corkery and Co Pty Ltd (RWC) to carry out the Independent Environmental Audit (IEA) for Old Northern Road Quarry was approved by DPE on 8th September 2022.

The IEA commenced on 18 October 2022 which covers the 3-year audit period between 23 October 2019 and 18 October 2022. The *Independent Environmental Audit: Old Northern Road Report* (RW Corkery & Co, December 2022, Document No. 1021/02) was issued to Dixon Sand on 14th December 2022.

The *Response and Action Plan for the Independent Environmental Audit 2022, Old Northern Road Quarry* document was prepared to provide Dixon Sand's response and proposed actions addressing the IEA findings, recommendations for non-compliances and suggested improvements as identified in *the Independent Environmental Audit: Old Northern Road Report* (RW Corkery & Co, December 2022, Document No. 1021/02).

The IEA report and Response and Action Plan report were submitted to the DPE on 16th January 2023. The CCC members were provided a link to the reports published on Dixon Sand's website.

All proposed actions from the 2022 IEA have been implemented and closed out except for one item as is listed in Table 37 below. The matter of application to enact the Positive Public Covenant for the Haerses Road Biodiversity Offset Area is still on-going and terms of agreement still in negotiation between Dixon Sand and the DPE.

The next IEA is scheduled to be undertaken late 2025.

Table 38: Status of Proposed Action, Implementation Timeframe and Proposed Recommendations arising from 2022 IEA Non-Compliances with DA 250-09-01.

Consent Condition	Conditional Requirement	Compliance Status	IEA Comments and Recommendations	IEA Recommendation, Dixon Sand's Proposed Action and Implementation Timeframe
2(2)(b)	in accordance with the conditions of this consent and the Development Layout Plan. *Note: The Development Layout Plan is shown in Appendix 1.*	Non-compliant	The Quarry layout was observed to reflect the Development Layout Plan included as Appendix 1 of DA 250-09-01. However, several non-compliances have been recorded against the conditions of this consent during the audit period and hence contributed to the non-compliance status for this condition. See Conditions 3(3), 3(21), 3(24)(c), 4(1)(a), 5(5)(a), 5(7), 5(7)(c), & 5(10).	Refer to proposed actions for Conditions 3(3), 3(21), 3(24)(c), 4(1)(a), 5(5)(a), 5(7), 5(7)(c), & 5(10).
3(3)	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.	Non-compliant	Attended noise monitoring undertaken during the following periods during the audit period identified exceedances of the relevant noise criteria for the Quarry. • December 2019 • June 2021 Attended noise monitoring undertaken in December 2019 identified noise criteria exceedances at receivers R3, R4 and R5 during the shoulder period associated with the trialling of a diamond tip configurated blade attachment on an excavator used for sandstone cutting. The incident was notified and a written report was provided to the (then) DPIE and the EPA on 16 and 17 December 2019 respectively. Attended noise modelling undertaken in June 2021 identified noise criteria exceedances at receivers OR1, OR3, R4 and R5 during the daytime period. This incident was notified to the (then) DPIE and the EPA on 28 June 2021. However, as the noise monitoring results indicated an exceedance of =2dB above the relevant criteria, these exceedances are not considered to represent a non-compliance in accordance with Section 11.1.3 of the NSW Industrial Nosie Policy. See **Recommendation R8/22**.	**Recommendation R8/22** The introduction of new and potentially noisy items of equipment, or undertaking new tasks where operating circumstances are different to those previously encountered, should be planned to occur in an isolated area of the Quarry or at a time when all other equipment is not operating. *This modified procedure is recommended in response to the measured noise exceedances recorded in December 2019 and June 2021. Gaining an appreciation of the implications upon the total noise generated prior to the introduction of the new equipment or procedures would assist to identify if additional controls are needed or the use of certain equipment needs to be* adjusted. **Proposed Action:** Undertake noise monitoring on newly introduced equipment which has the potential to generate excessive noise to determine the overall implications of the quarry operation. **Implementation Timeframe:** Immediate – undertake an isolated noise monitoring on any future introduced noisy equipment prior to its introduction to the whole quarry operation.

Consent Condition	Conditional Requirement	Compliance Status	IEA Comments and Recommendations	IEA Recommendation, Dixon Sand's Proposed Action and Implementation Timeframe
			Attended noise monitoring undertaken during the following periods during the audit period indicated compliance with the relevant noise criteria for the Quarry. • June 2020 • December 2020 • December 2021 • June 2022	**Status** Not yet triggered since 2022 IEA
3(13)	The Applicant must comply with the discharge limits in any EPL, or with section 120 of the POEO Act.	Non-compliant	Water sampling at LDP01 prior to controlled discharge events (February and March 2020) indicated compliance with the relevant EPL discharge criteria. Procedures for controlled discharge are outlined in Section 5.1 of the WMP. An uncontrolled discharge at location LDP01 was observed on 16 June 2020during an inspection conducted by the NSW EPA. This uncontrolled discharge was the result of overtopping of the Main Dam weir following continued transfer of water from the Twin Ponds during a period where when pumps to the processing plant were not operational and the overflow pipe to Cons Hill was shut off. As monitoring was not undertaken prior to discharge to determine compliance with water quality parameters specified under EPL 3916, the uncontrolled discharge event was reported as an incident to the EPA on 30 June 2020 (see **Recommendation R11/22**). An uncontrolled discharge at location LDP01 also occurred during March 2022. This discharge event occurred during the exemption period nominated by the NSW EPA (3 March 2022 to 14 March 2022) during which discharge incidents were not required to be reported as a result of significant rainfall.	**Recommendation R11/22** The quality of any water discharging off site at the licenced discharge monitoring Point 1 should be established through the collection of a representative sample daily during the period of discharge (including uncontrolled discharge) and analysis at an accredited laboratory. Where access to Monitoring Point 1 (i.e. Main Dam weir, LDP01) is not possible during discharge due to safety concerns, a representative sample should be taken from the Main Dam daily during discharge. *The reported uncontrolled discharge of water at Monitoring Point 1 on16 June 2020 did not include any water quality data, which is a requirement of the EPA* and EPL 3916. **Proposed Action:** Dixon Sand will obtain a daily water sample for water quality analysis by an accredited laboratory during the period of discharge for future planned and uncontrolled discharge events. Where access to LDP01 for sampling is restricted due to extreme weather or safety concerns, a representative sample will be obtained from the Main Dam for analysis. **Implementation Timeframe:** Immediate – triggered in both instance during planned and uncontrolled discharge events.

Consent Condition	Conditional Requirement	Compliance Status	IEA Comments and Recommendations	IEA Recommendation, Dixon Sand's Proposed Action and Implementation Timeframe
				Status Not yet triggered since 2022 IEA
3(21)	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.	Non-compliant	Laden truck movement records are retained on site as weighbridge dockets and in an Excel spreadsheet. Weighbridge dockets do not record the time of arrival from laden trucks entering the site from the Haerses Road Quarry (see **Recommendation ONR R3/22**) It is noted that laden truck despatch times from HR Quarry can be used to determine arrival times at ONR Quarry. Dixon Sand advised that they are currently implementing new weighbridge software to track truck movements and expect this software to be operational from December 2022. A summary is published on the Dixon Sand website.	**Recommendation ONR R3/22** The new Clearway software program to be installed at the Old Northern Road Quarry in November/December 2022 should ensure that the vehicles entering the Quarry between 5:45am and 7:00am are accounted for in the total traffic counts for that period. *The new Clearway software program to be installed at the Old Northern Road Quarry in November/December 2022 should ensure that the vehicles entering the Quarry between 5:45am and 7:00am are accounted for in the total traffic counts for that period.* **Proposed Action:** The Clearway software program is to provide tracking of vehicles entering the quarry between 5:45 am and 7:00 am which will be included in the total traffic counts for the morning truck period. **Implementation Timeframe:** The Clearway software program is to provide tracking of vehicles entering the quarry between 5:45 am and 7:00 am which will be included in the total traffic counts for the morning truck period. **Status** Compliant – closed out. Clearway software launched for operation by 31 January 2023
3(25)(c)	provide appropriate long term security for the Haerses Road Biodiversity Offset Area; and	Non-compliant	Proposed terms for a Public Positive Covenant were submitted by Dixon Sand to DPIE on 24 August 2019. However, confirmation of these terms is awaited and, once confirmed, Dixon Sand will seek to register the Haerses Road Biodiversity Offset Area under this arrangement. See **Recommendation ONR R9/22**.	**Recommendation ONR R9/22** Continue to follow up with the DPE to ensure that the Positive Public Covenant to provide long-term security of the Haerses Road Biodiversity Offset Area is fully processed to enable it to be implemented. *Dixon Sand has submitted all required information regarding the Positive Public Covenant to DPE and*

Consent Condition	Conditional Requirement	Compliance Status	IEA Comments and Recommendations	IEA Recommendation, Dixon Sand's Proposed Action and Implementation Timeframe
				awaits the Department's response in order for this matter to be finalised. **Proposed Action:** Dixon Sand will contact DPE to continue with the review of the proposed draft conditions in order to finalise the Positive Public Covenant registration. **Implementation Timeframe:** Dixon Sand to contact DPE by 31 January 2023. **Status** Open – Dixon Sand contacted DPE on 31 January 2023, awaiting response.
4(1)(a)	an exceedance of any criteria in Schedule 3, the Applicant must notify the affected landowners in writing of the exceedance, and provide regular monitoring results, at least every 3 months, to each affected landowner until the development is again complying with the relevant criteria; and	Non-compliant	An exceedance of the relevant noise criteria under Schedule 3 was recorded during attended noise monitoring undertaken on 3 December 2019. The cause of this exceedance (trial use of a diamond tipped configurated blade during the shoulder period) was addressed immediately and no supplementary noise monitoring was required. Maroota Public School was notified of the attended noise monitoring results, however, other affected landowners (R3, R4 and R5) were not notified of the exceedance in writing within 7 days of obtaining the monitoring results. (See **Recommendation ONR R12/2022**).	**Recommendation ONR R12/22** All landowners affected by noise exceedances should be notified in the manner consistent with Condition 4(1)(a). *Not all affected landowners were notified regarding the results of noise* monitoring undertaken on 3 December 2019. **Proposed Action:** Dixon Sand will notify affected landowners of the result of any future noise exceedances in accordance with Condition 4(1)(a) of Schedule 4. **Implementation Timeframe:** Immediate – triggered when the noise criteria is exceeded at the receiver. **Status** Not yet triggered since 2022 IEA
5(5)(a)	Within 3 months of the submission of an: incident report under condition 10 below;	Non-compliant	The following incidents were recorded during the audit period. • 3/12/2019 – Noise exceedance during shoulder period. • 16/06/2020 – Uncontrolled discharge at LDP01.	**Recommendation ONR R10/22** A general Incident Response Checklist should be prepared for the Quarry to ensure that all relevant follow up actions, including review of strategies, plans and programs and notification of the review process to

Consent Condition	Conditional Requirement	Compliance Status	IEA Comments and Recommendations	IEA Recommendation, Dixon Sand's Proposed Action and Implementation Timeframe
			• 30/11/2020 – Rolling 24-hour PM10 exceedance (not Quarry-related). • 25/04/2021 – Rolling 24-hour PM10 exceedance (not Quarry-related). • 18/06/2021 – Exceedance of daytime noise criteria (not a noncompliance). The Environmental Officer advises that the relevant strategies, plans and programs were reviewed following each incident. However, no record of notification to DPIE of these reviews within 3 months following submission of each incident report was provided. (See **Recommendation R10/2022**). Management strategies and plans were reviewed within the applicable timeframes following submission of the 2019/2020 and 2020/2021 Annual Reviews. The period for review following submission of the 2021/2022 Annual Review had not elapsed during the audit period. Management strategies and plans were reviewed within the applicable timeframes following submission of the 2019 IEA. No Modifications to the consent were made during the audit period.	relevant authorities, are undertaken within appropriate timeframes in the event of an incident. *No record of strategies, plans and programs having been reviewed within three months following the submission of incident reports were maintained during the audit period. Additionally, DPE was not notified in writing that a review of strategies, plans and programs had been undertaken within 3 months following the submission of an incident report. The period between the identification of an uncontrolled discharge event and notification of the incident to DPE and the EPA exceeded the specified 7-day notification period and 14-day reporting* period. **Proposed Action:** The current Incident Response Checklist will be reviewed and revised to manage the relevant follow up actions, reporting and notification timeframes that are required to be undertaken within the appropriate timeframes in the event of an incident. **Implementation Timeframe:** The review and revision of the Incident Response Checklist will form part of the review and revision of the Environmental Management Strategy (EMS) and Management Plans post IEA. Timeline to undertake the review and revision will be in accordance with the Consent Condition 5(c) of Schedule 5 that is review the EMS and Management Plans within 3 months of the submission of the IEA and submit the revised documents within 6 weeks of the review notification. **Status** Compliant – Incident Response Checklist is an internal document, has been reviewed and currently implemented.
5(7)	The Applicant must assess and manage development-related risks to ensure that	Non-compliant	The following incidents represent Quarry-related exceedances of criteria and/or performance measures during the audit period.	**Recommendation ONR R10/22** A general Incident Response Checklist should be prepared for the Quarry to ensure that all relevant follow

Consent Condition	Conditional Requirement	Compliance Status	IEA Comments and Recommendations	IEA Recommendation, Dixon Sand's Proposed Action and Implementation Timeframe
	there are no exceedances of the criteria and/or performance measures in Schedule 3. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation. Where any exceedance of these criteria and/or performance measures has occurred, the Applicant must as soon as becoming aware of any exceedance:		• 3/12/2019 – Noise exceedance during shoulder period. • 16/06/2020 – Uncontrolled discharge at LDP01. • 18/06/2021 – Exceedance of daytime noise criteria (not a non-compliance under NSW Noise Policy for Industry guidelines). See **Recommendation ONR 10/2022** The period between the identification of the uncontrolled discharge incident on 16 June 2020 and the notification and provision of an incident report to the (then) DPIE was 24 days. All other incidents were notified to DPIE within 14 days of the incident (or within 14 days of receiving monitoring results identifying an incident had occurred).	up actions, including review of strategies, plans and programs and notification of the review process to relevant authorities, are undertaken within appropriate timeframes in the event of an incident. *No record of strategies, plans and programs having been reviewed within three months following the submission of incident reports were maintained during the audit period. Additionally, DPE was not notified in writing that a review of strategies, plans and programs had been undertaken within 3 months following the submission of an incident report. The period between the identification of an uncontrolled discharge event and notification of the incident to DPE and the EPA exceeded the specified 7-day notification period and 14-day reporting* period. **Proposed Action:** The current Incident Response Checklist will be reviewed and revised to manage the relevant follow up actions, reporting and notification timeframes that are required to be undertaken within the appropriate timeframes in the event of an incident. **Proposed Action:** The review and revision of the Incident Response Checklist will form part of the review and revision of the Environmental Management Strategy (EMS) and Management Plans post IEA. Timeline to undertake the review and revision will be in accordance with the Consent Condition 5(c) of Schedule 5 that is review the EMS and Management Plans within 3 months of the submission of the IEA and submit the revised documents within 6 weeks of the review notification. **Status** Compliant – Incident Response Checklist is an internal document, has been reviewed and currently implemented. Note document not submitted to DPE for

Consent Condition	Conditional Requirement	Compliance Status	IEA Comments and Recommendations	IEA Recommendation, Dixon Sand's Proposed Action and Implementation Timeframe
				review/approval as this is an internal company document.
5(7)(c)	The Applicant must assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures in Schedule 3. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation. Where any exceedance of these criteria and/or performance measures has occurred, the Applicant must as soon as becoming aware of any exceedance.	Non-compliant	The following incidents represent Quarry-related exceedances of criteria and/or performance measures during the audit period. • 3/12/2019 – Noise exceedance during shoulder period. • 16/06/2020 – Uncontrolled discharge at LDP01. • 18/06/2021 – Exceedance of daytime noise criteria (not a non-compliance under NSW Noise Policy for Industry guidelines). See **Recommendation ONR 10/2022** The period between the identification of the uncontrolled discharge incident on 16 June 2020 and the notification and provision of an incident report to the (then) DPIE was 24 days. All other incidents were notified to DPIE within 14 days of the incident (or within 14 days of receiving monitoring results identifying an incident had occurred).	**Refer to above**
5(10)	Within 7 days of the date of the incident, the Applicant must provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested. This report must include the time and date of the incident, details of the incident, measures implemented to prevent re-occurrence and must	Non-compliant	The following incidents occurred at the Quarry during the audit period. • 3/12/2019 – Noise exceedance during shoulder period. - Noise monitoring report received by Dixon Sand on 10/12/2019. - Preliminary notification to DPIE on 13/12/2019. - Reported to the EPA on 17/12/2019. - Full incident report to DPIE on 16/12/2019. - Full incident report to the EPA on 17/12/2019. • 16/06/2020 – Uncontrolled discharge at LDP01. - Incident notified to DPIE and full incident report provided on	**Refer to above**

Consent Condition	Conditional Requirement	Compliance Status	IEA Comments and Recommendations	IEA Recommendation, Dixon Sand's Proposed Action and Implementation Timeframe
	identify any non-compliance with this consent.		- 30/06/2020 - Full incident provided to the EPA on 30/06/2020. - Supplementary information provided to the EPA on 8/07/2020. • 30/11/2020 – Rolling 24-hour PM10 exceedance (not Quarry-related). - Exceedance reported to the EPA on 30/11/2020. • 25/04/2021 – Rolling 24-hour PM10 exceedance (not Quarry-related). - Exceedance notified and reported to the EPA and DPIE on 26/04/2021. • 18/06/2021 – Exceedance of daytime noise criteria (not a noncompliance). - Noise monitoring report received by Dixon Sand on 25/06/2021. - Incident notified to DPIE and the EPA on 28/06/2021. - Supplementary information provided to the EPA on 7/07/2021. The period between the identification of the uncontrolled discharge incident on 16 June 2020 and the notification and provision of an incident report to the (then) DPIE was 24 days. See **Recommendation R10/2022**.	

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

13.1 Vegetation Clearing and Extraction

Vegetation clearing will be undertaken in accordance with the Pre-clearing procedures.

13.2 Rehabilitation and Bush Regeneration

Old Northern Road NVC Rehabilitation Area

- Continue with routine weed control and monitoring of regenerating native species.

Old Northern Road Lots 1 and 2

- Continue with management of *Lantana camera* and review techniques recommended in the Ecological Monitoring Report (South East Environmental, 2023)
- Supplementary planting or similar treatment in identified areas as required.

Old Northern Road other areas

- Continue with routine weed management along the southern boundary of Cons Hill (Lot 196) and carry out direct seeding or supplementary planting where suitable, and
- Continue with rehabilitation works along the western embankment at the Quarry entrance gate. Carry out direct seeding or supplementary planting where suitable.

Haerses Road Biodiversity Offset Area

- Continue with management of invasive grass and annual species along the North-western border of the HRBOA

14. Conclusion

A number of recommendations and change in environmental procedures have been proposed throughout this Annual Review covering the 2022 – 2023 reporting period.

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.
ABN 77 621 943 600
NATA Accreditation 20375
Unit 4, 30 Glenwood Drive Thornton NSW 2322|
P: (02) 4028 6412 | **E:** lab@vgt.com.au | **www.vgt.com.au**

Report Number: 13176

Date Issued: 5/08/2022 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 27/07/2022

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	29/06/2022 10:46	27/07/2022 12:05	13176/1	Dust	
D10 Hearses Rd	29/06/2022 11:16	27/07/2022 12:38	13176/2	Dust	
D06 School	29/06/2022 11:41	27/07/2022 10:42	13176/3	Dust	
D05 Bund	29/06/2022 11:54	27/07/2022 11:54	13176/4	Dust	Need access track cleared.
D04 Rehab	29/06/2022 12:20	27/07/2022 11:23	13176/5	Dust	Need steps cut in bank for access.
D07 Mullock	29/06/2022 12:31	27/07/2022 11:37	13176/6	Dust	
D01(A) Front Gate	29/06/2022 12:07	27/07/2022 10:53	13176/7	Dust	
D11 Goldstien	29/06/2022 11:05	27/07/2022 14:36	13176/8	Dust	Track repair required for access.
D12 Ram	29/06/2022 11:28	27/07/2022 12:27	13176/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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



Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 5/08/2022.

Test Report Number: 13176

Date Issued: 5/08/2022 Revision No: 00

Results

Deposited Matter	Method	Units	13176/1 D08&9 Hitchcock Rd Olive Grove 27/07/2022	13176/2 D10 Hearses Rd 27/07/2022	13176/3 D06 School 27/07/2022	13176/4 D05 Bund 27/07/2022	13176/5 D04 Rehab 27/07/2022
Date Tested	--	--	3/08/2022	3/08/2022	3/08/2022	3/08/2022	3/08/2022
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.5	0.6	**10.3**	0.8	0.4
Ash	AS 3580.10.1	g/m2/mth	0.2	0.2	3.5	0.5	0.1
Combustible Matter	AS 3580.10.1	g/m2/mth	0.3	0.4	6.8	0.3	0.3
Calculated Rain	AS 3580.10.1	mm	285	287	288	288	286

Deposited Matter	Method	Units	13176/6 D07 Mullock 27/07/2022	13176/7 D01(A) Front Gate 27/07/2022	13176/8 D11 Goldstien 27/07/2022	13176/9 D12 Ram 27/07/2022
Date Tested	--	--	3/08/2022	3/08/2022	3/08/2022	3/08/2022
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.2	1.5	0.8	0.3
Ash	AS 3580.10.1	g/m2/mth	0.2	1.2	0.4	0.2
Combustible Matter	AS 3580.10.1	g/m2/mth	<0.1	0.3	0.4	0.1
Calculated Rain	AS 3580.10.1	mm	287	117	287	288

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 13176

Date Issued: 5/08/2022 Revision No: 00

Sampling Conditions: Fine 14°-17°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
13176/1	D08&9 Hitchcock Rd Olive Grove		T & D.Walker	27/07/2022 12:05	AS3580.10.1	CuSO4
13176/2	D10 Hearses Rd		T & D.Walker	27/07/2022 12:38	AS3580.10.1	CuSO4
13176/3	D06 School		T & D.Walker	27/07/2022 10:42	AS3580.10.1	CuSO4
13176/4	D05 Bund		T & D.Walker	27/07/2022 11:54	AS3580.10.1	CuSO4
13176/5	D04 Rehab		T & D.Walker	27/07/2022 11:23	AS3580.10.1	CuSO4
13176/6	D07 Mullock		T & D.Walker	27/07/2022 11:37	AS3580.10.1	CuSO4
13176/7	D01(A) Front Gate		T & D.Walker	27/07/2022 10:53	AS3580.10.1	CuSO4
13176/8	D11 Goldstien		T & D.Walker	27/07/2022 14:36	AS3580.10.1	CuSO4
13176/9	D12 Ram		T & D.Walker	27/07/2022 12:27	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
13176/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	Full.
13176/2	D10 Hearses Rd	312538	6294576	Full.
13176/3	D06 School	313518	6296537	Full, vegetation.
13176/4	D05 Bund	313160	6296838	Full.
13176/5	D04 Rehab	312385	6296932	Full.
13176/6	D07 Mullock	312579	6296676	Full.
13176/7	D01(A) Front Gate	313290	6297176	Full, minor sand.
13176/8	D11 Goldstien	312034	6294213	Full.
13176/9	D12 Ram	311750	6294159	Full.

Sampling procedures have been approved and report finalised on 5/08/2022.
Where method is "unknown" sampling procedures are not endorsed

VGT Laboratories Pty Ltd.
ABN 77 621 943 600
NATA Accreditation 20375
Unit 4, 30 Glenwood Drive Thornton NSW 2322|
P: (02) 4028 6412 | **E:** lab@vgt.com.au | **www.vgt.com.au**

Report Number: 13321

Date Issued: 1/09/2022 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 24/08/2022

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	27/07/2022 12:05	24/08/2022 10:25	13321/1	Dust	Olive tree adjacent needs trimming.
D10 Hearses Rd	27/07/2022 12:38	24/08/2022 10:50	13321/2	Dust	
D06 School	27/07/2022 10:42	24/08/2022 09:21	13321/3	Dust	
D05 Bund	27/07/2022 11:54	24/08/2022 10:12	13321/4	Dust	
D04 Rehab	27/07/2022 11:23	24/08/2022 09:46	13321/5	Dust	
D07 Mullock	27/07/2022 11:37	24/08/2022 09:58	13321/6	Dust	
D01(A) Front Gate	27/07/2022 10:53	24/08/2022 09:29	13321/7	Dust	
D11 Goldstien	27/07/2022 14:36	24/08/2022 12:02	13321/8	Dust	
D12 Ram	27/07/2022 12:27	24/08/2022 10:38	13321/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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



Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 1/09/2022.

Test Report Number: 13321

Date Issued: 1/09/2022 Revision No: 00

Results

Deposited Matter	Method	Units	13321/1 D08&9 Hitchcock Rd Olive Grove 24/08/2022	13321/2 D10 Hearses Rd 24/08/2022	13321/3 D06 School 24/08/2022	13321/4 D05 Bund 24/08/2022	13321/5 D04 Rehab 24/08/2022
Date Tested	--	--	29/08/2022	29/08/2022	29/08/2022	29/08/2022	29/08/2022
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.7	0.5	0.5	0.5	0.6
Ash	AS 3580.10.1	g/m2/mth	0.5	0.3	0.3	0.4	0.5
Combustible Matter	AS 3580.10.1	g/m2/mth	0.2	0.2	0.2	0.1	0.1
Calculated Rain	AS 3580.10.1	mm	28	28	29	29	27

Deposited Matter	Method	Units	13321/6 D07 Mullock 24/08/2022	13321/7 D01(A) Front Gate 24/08/2022	13321/8 D11 Goldstien 24/08/2022	13321/9 D12 Ram 24/08/2022
Date Tested	--	--	29/08/2022	29/08/2022	29/08/2022	29/08/2022
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.7	2.9	1.0	0.2
Ash	AS 3580.10.1	g/m2/mth	0.3	2.6	0.5	0.1
Combustible Matter	AS 3580.10.1	g/m2/mth	0.4	0.3	0.5	0.1
Calculated Rain	AS 3580.10.1	mm	27	29	27	28

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 13321

Date Issued: 1/09/2022 Revision No: 00

Sampling Conditions: Fine 12°-14°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
13321/1	D08&9 Hitchcock Rd Olive Grove		T.Walker	24/08/2022 10:25	AS3580.10.1	CuSO4
13321/2	D10 Hearses Rd		T.Walker	24/08/2022 10:50	AS3580.10.1	CuSO4
13321/3	D06 School		T.Walker	24/08/2022 09:21	AS3580.10.1	CuSO4
13321/4	D05 Bund		T.Walker	24/08/2022 10:12	AS3580.10.1	CuSO4
13321/5	D04 Rehab		T.Walker	24/08/2022 09:46	AS3580.10.1	CuSO4
13321/6	D07 Mullock		T.Walker	24/08/2022 09:58	AS3580.10.1	CuSO4
13321/7	D01(A) Front Gate		T.Walker	24/08/2022 09:29	AS3580.10.1	CuSO4
13321/8	D11 Goldstien		T.Walker	24/08/2022 12:02	AS3580.10.1	CuSO4
13321/9	D12 Ram		T.Walker	24/08/2022 10:38	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
13321/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
13321/2	D10 Hearses Rd	312538	6294576	
13321/3	D06 School	313518	6296537	Minor vegetation.
13321/4	D05 Bund	313160	6296838	
13321/5	D04 Rehab	312385	6296932	
13321/6	D07 Mullock	312579	6296676	Spider.
13321/7	D01(A) Front Gate	313290	6297176	Dust - crop farming adjacent.
13321/8	D11 Goldstien	312034	6294213	Minor vegetation.
13321/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 1/09/2022.
Where method is "unknown" sampling procedures are not endorsed

VGT Laboratories Pty Ltd.
ABN 77 621 943 600
NATA Accreditation 20375
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Report Number: 13465

Date Issued: 29/09/2022 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 21/09/2022

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	24/08/2022 10:25	21/09/2022 12:08	13465/1	Dust	
D10 Hearses Rd	24/08/2022 10:50	21/09/2022 12:29	13465/2	Dust	
D06 School	24/08/2022 09:21	21/09/2022 11:08	13465/3	Dust	
D05 Bund	24/08/2022 10:12	21/09/2022 11:21	13465/4	Dust	
D04 Rehab	24/08/2022 09:46	21/09/2022 11:43	13465/5	Dust	
D07 Mullock	24/08/2022 09:58	21/09/2022 11:55	13465/6	Dust	
D01(A) Front Gate	24/08/2022 09:29	21/09/2022 11:31	13465/7	Dust	
D11 Goldstien	24/08/2022 12:02	21/09/2022 12:52	13465/8	Dust	
D12 Ram	24/08/2022 10:38	21/09/2022 12:17	13465/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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



Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 29/09/2022.

Test Report Number: 13465

Date Issued: 29/09/2022 Revision No: 00

Results

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	13465/1 21/09/2022 D08&9 Hitchcock Rd Olive Grove	13465/2 21/09/2022 D10 Hearses Rd	13465/3 21/09/2022 D06 School	13465/4 21/09/2022 D05 Bund	13465/5 21/09/2022 D04 Rehab
Date Tested	--	--	28/09/2022	28/09/2022	[NT]	28/09/2022	28/09/2022
Number of Days	AS 3580.10.1	days	28	28	[NT]	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	2.9	1.0	[NT]	0.2	<0.1
Ash	AS 3580.10.1	g/m2/mth	2.6	0.5	[NT]	0.1	<0.1
Combustible Matter	AS 3580.10.1	g/m2/mth	0.3	0.5	[NT]	0.1	<0.1
Calculated Rain	AS 3580.10.1	mm	57	56	[NT]	52	49

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	13465/6 21/09/2022 D07 Mullock	13465/7 21/09/2022 D01(A) Front Gate	13465/8 21/09/2022 D11 Goldstien	13465/9 21/09/2022 D12 Ram
Date Tested	--	--	28/09/2022	28/09/2022	28/09/2022	28/09/2022
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.6	0.8	0.8	0.8
Ash	AS 3580.10.1	g/m2/mth	0.2	0.5	0.5	0.5
Combustible Matter	AS 3580.10.1	g/m2/mth	0.4	0.3	0.3	0.3
Calculated Rain	AS 3580.10.1	mm	52	52	53	58

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 13465

Date Issued: 29/09/2022 Revision No: 00

Sampling Conditions: 19-20 °C, cloudy

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
13465/1	D08&9 Hitchcock Rd Olive Grove		D.Walker	21/09/2022 12:08	AS3580.10.1	CuSO4
13465/2	D10 Hearses Rd		D.Walker	21/09/2022 12:29	AS3580.10.1	CuSO4
13465/3	D06 School		D.Walker	21/09/2022 11:08	AS3580.10.1	CuSO4
13465/4	D05 Bund		D.Walker	21/09/2022 11:21	AS3580.10.1	CuSO4
13465/5	D04 Rehab		D.Walker	21/09/2022 11:43	AS3580.10.1	CuSO4
13465/6	D07 Mullock		D.Walker	21/09/2022 11:55	AS3580.10.1	CuSO4
13465/7	D01(A) Front Gate		D.Walker	21/09/2022 11:31	AS3580.10.1	CuSO4
13465/8	D11 Goldstien		D.Walker	21/09/2022 12:52	AS3580.10.1	CuSO4
13465/9	D12 Ram		D.Walker	21/09/2022 12:17	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
13465/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
13465/2	D10 Hearses Rd	312538	6294576	Minor insects, minor vegetation
13465/3	D06 School	313518	6296537	Funnel missing, neck in bottle. Resident hit DG with mower. Funnel replaced.
13465/4	D05 Bund	313160	6296838	
13465/5	D04 Rehab	312385	6296932	
13465/6	D07 Mullock	312579	6296676	
13465/7	D01(A) Front Gate	313290	6297176	Minor sand, minor algae
13465/8	D11 Goldstien	312034	6294213	Minor bird droppings, algae
13465/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 29/09/2022.
Where method is "unknown" sampling procedures are not endorsed

VGT Laboratories Pty Ltd.
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Report Number: 13649

Date Issued: 25/10/2022 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 19/10/2022

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	21/09/2022 12:08	19/10/2022 10:41	13649/1	Dust	Clear sky view obstructed
D10 Hearses Rd	21/09/2022 12:29	19/10/2022 10:49	13649/2	Dust	
D06 School	21/09/2022 11:08	19/10/2022 09:33	13649/3	Dust	
D05 Bund	21/09/2022 11:21	19/10/2022 09:47	13649/4	Dust	
D04 Rehab	21/09/2022 11:43	19/10/2022 10:03	13649/5	Dust	
D07 Mullock	21/09/2022 11:55	19/10/2022 10:17	13649/6	Dust	
D01(A) Front Gate	21/09/2022 11:31	19/10/2022 09:40	13649/7	Dust	
D11 Goldstien	21/09/2022 12:52	19/10/2022 12:37	13649/8	Dust	
D12 Ram	21/09/2022 12:17	19/10/2022 11:08	13649/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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



Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 25/10/2022.

Test Report Number: 13649

Date Issued: 25/10/2022 Revision No: 00

Results

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	13649/1 19/10/2022 D08&9 Hitchcock Rd Olive Grove	13649/2 19/10/2022 D10 Hearses Rd	13649/3 19/10/2022 D06 School	13649/4 19/10/2022 D05 Bund	13649/5 19/10/2022 D04 Rehab
Date Tested	--	--	21/10/2022	21/10/2022	21/10/2022	21/10/2022	21/10/2022
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.8	1.6	1.0	0.7	0.5
Ash	AS 3580.10.1	g/m2/mth	0.2	1.1	0.4	0.5	0.4
Combustible Matter	AS 3580.10.1	g/m2/mth	0.6	0.5	0.6	0.2	0.1
Calculated Rain	AS 3580.10.1	mm	135	135	141	148	141

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	13649/6 19/10/2022 D07 Mullock	13649/7 19/10/2022 D01(A) Front Gate	13649/8 19/10/2022 D11 Goldstien	13649/9 19/10/2022 D12 Ram
Date Tested	--	--	21/10/2022	21/10/2022	21/10/2022	21/10/2022
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.3	2.2	2.6	0.3
Ash	AS 3580.10.1	g/m2/mth	0.2	2.0	0.8	0.1
Combustible Matter	AS 3580.10.1	g/m2/mth	0.1	0.2	1.8	0.2
Calculated Rain	AS 3580.10.1	mm	145	115	10	132

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 13649

Date Issued: 25/10/2022 Revision No: 00

Sampling Conditions: Cloudy, 22°- 25°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
13649/1	D08&9 Hitchcock Rd Olive Grove		T.Walker	19/10/2022 10:41	AS3580.10.1	CuSO4
13649/2	D10 Hearses Rd		T.Walker	19/10/2022 10:49	AS3580.10.1	CuSO4
13649/3	D06 School		T.Walker	19/10/2022 09:33	AS3580.10.1	CuSO4
13649/4	D05 Bund		T.Walker	19/10/2022 09:47	AS3580.10.1	CuSO4
13649/5	D04 Rehab		T.Walker	19/10/2022 10:03	AS3580.10.1	CuSO4
13649/6	D07 Mullock		T.Walker	19/10/2022 10:17	AS3580.10.1	CuSO4
13649/7	D01(A) Front Gate		T.Walker	19/10/2022 09:40	AS3580.10.1	CuSO4
13649/8	D11 Goldstien		T.Walker	19/10/2022 12:37	AS3580.10.1	CuSO4
13649/9	D12 Ram		T.Walker	19/10/2022 11:08	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
13649/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
13649/2	D10 Hearses Rd	312538	6294576	Insects.
13649/3	D06 School	313518	6296537	
13649/4	D05 Bund	313160	6296838	Minor insects.
13649/5	D04 Rehab	312385	6296932	
13649/6	D07 Mullock	312579	6296676	
13649/7	D01(A) Front Gate	313290	6297176	Minor insects.
13649/8	D11 Goldstien	312034	6294213	Insects, algae. Bottle cracked and leaking.
13649/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 25/10/2022.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 13806

Date Issued: 23/11/2022 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 16/11/2022

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	19/10/2022 10:41	16/11/2022 11:58	13806/1	Dust	
D10 Hearses Rd	19/10/2022 10:49	16/11/2022 12:27	13806/2	Dust	
D06 School	19/10/2022 09:33	16/11/2022 10:26	13806/3	Dust	
D05 Bund	19/10/2022 09:47	16/11/2022 10:38	13806/4	Dust	
D04 Rehab	19/10/2022 10:03	16/11/2022 11:26	13806/5	Dust	
D07 Mullock	19/10/2022 10:17	16/11/2022 11:39	13806/6	Dust	
D01(A) Front Gate	19/10/2022 09:40	16/11/2022 10:47	13806/7	Dust	
D11 Goldstien	19/10/2022 12:37	16/11/2022 14:02	13806/8	Dust	
D12 Ram	19/10/2022 11:08	16/11/2022 12:16	13806/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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



Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 23/11/2022.

Test Report Number: 13806

Date Issued: 23/11/2022 Revision No: 00

Results

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	13806/1 16/11/2022 D08&9 Hitchcock Rd Olive Grove	13806/2 16/11/2022 D10 Hearses Rd	13806/3 16/11/2022 D06 School	13806/4 16/11/2022 D05 Bund	13806/5 16/11/2022 D04 Rehab
Date Tested	--	--	18/11/2022	18/11/2022	18/11/2022	18/11/2022	18/11/2022
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	1.4	1.0	0.7	1.0	0.7
Ash	AS 3580.10.1	g/m2/mth	0.7	0.5	0.5	0.7	0.4
Combustible Matter	AS 3580.10.1	g/m2/mth	0.7	0.5	0.2	0.3	0.3
Calculated Rain	AS 3580.10.1	mm	53	52	49	52	45

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	13806/6 16/11/2022 D07 Mullock	13806/7 16/11/2022 D01(A) Front Gate	13806/8 16/11/2022 D11 Goldstien	13806/9 16/11/2022 D12 Ram
Date Tested	--	--	18/11/2022	18/11/2022	18/11/2022	18/11/2022
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.3	2.0	1.2	1.7
Ash	AS 3580.10.1	g/m2/mth	0.3	1.8	0.5	0.7
Combustible Matter	AS 3580.10.1	g/m2/mth	<0.1	0.2	0.7	1.0
Calculated Rain	AS 3580.10.1	mm	49	53	49	49

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 13806

Date Issued: 23/11/2022 Revision No: 00

Sampling Conditions: Cloudy, 18°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
13806/1	D08&9 Hitchcock Rd Olive Grove		T.Walker	16/11/2022 11:58	AS3580.10.1	CuSO4
13806/2	D10 Hearses Rd		T.Walker	16/11/2022 12:27	AS3580.10.1	CuSO4
13806/3	D06 School		T.Walker	16/11/2022 10:26	AS3580.10.1	CuSO4
13806/4	D05 Bund		T.Walker	16/11/2022 10:38	AS3580.10.1	CuSO4
13806/5	D04 Rehab		T.Walker	16/11/2022 11:26	AS3580.10.1	CuSO4
13806/6	D07 Mullock		T.Walker	16/11/2022 11:39	AS3580.10.1	CuSO4
13806/7	D01(A) Front Gate		T.Walker	16/11/2022 10:47	AS3580.10.1	CuSO4
13806/8	D11 Goldstien		T.Walker	16/11/2022 14:02	AS3580.10.1	CuSO4
13806/9	D12 Ram		T.Walker	16/11/2022 12:16	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
13806/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
13806/2	D10 Hearses Rd	312538	6294576	Minor vegetation, algae.
13806/3	D06 School	313518	6296537	Minor insects.
13806/4	D05 Bund	313160	6296838	Minor vegetation, algae.
13806/5	D04 Rehab	312385	6296932	Minor vegetation.
13806/6	D07 Mullock	312579	6296676	
13806/7	D01(A) Front Gate	313290	6297176	Minor sand.
13806/8	D11 Goldstien	312034	6294213	Minor vegetation.
13806/9	D12 Ram	311750	6294159	Insect, algae.

Sampling procedures have been approved and report finalised on 23/11/2022.
Where method is "unknown" sampling procedures are not endorsed

VGT Laboratories Pty Ltd.
ABN 77 621 943 600
NATA Accreditation 20375
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Report Number: 13940

Date Issued: 21/12/2022 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 14/12/2022

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	16/11/2022 11:58	14/12/2022 10:39	13940/1	Dust	
D10 Hearses Rd	16/11/2022 12:27	14/12/2022 11:10	13940/2	Dust	
D06 School	16/11/2022 10:26	14/12/2022 11:34	13940/3	Dust	
D05 Bund	16/11/2022 10:38	14/12/2022 11:48	13940/4	Dust	
D04 Rehab	16/11/2022 11:26	14/12/2022 12:13	13940/5	Dust	
D07 Mullock	16/11/2022 11:39	14/12/2022 12:22	13940/6	Dust	
D01(A) Front Gate	16/11/2022 10:47	14/12/2022 11:56	13940/7	Dust	
D11 Goldstien	16/11/2022 14:02	14/12/2022 10:58	13940/8	Dust	
D12 Ram	16/11/2022 12:16	14/12/2022 11:22	13940/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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



Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 21/12/2022.

Test Report Number: 13940

Date Issued: 21/12/2022 Revision No: 00

Results

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	13940/1 14/12/2022 D08&9 Hitchcock Rd Olive Grove	13940/2 14/12/2022 D10 Hearses Rd	13940/3 14/12/2022 D06 School	13940/4 14/12/2022 D05 Bund	13940/5 14/12/2022 D04 Rehab
Date Tested	--	--	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	1.5	0.9	1.3	**4.1**	1.1
Ash	AS 3580.10.1	g/m2/mth	1.0	0.5	0.6	3.2	0.7
Combustible Matter	AS 3580.10.1	g/m2/mth	0.5	0.4	0.7	0.9	0.4
Calculated Rain	AS 3580.10.1	mm	41	45	39	34	36

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	13940/6 14/12/2022 D07 Mullock	13940/7 14/12/2022 D01(A) Front Gate	13940/8 14/12/2022 D11 Goldstien	13940/9 14/12/2022 D12 Ram
Date Tested	--	--	20/12/2022	20/12/2022	20/12/2022	20/12/2022
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.5	2.3	2.4	0.5
Ash	AS 3580.10.1	g/m2/mth	0.4	2.0	1.1	0.3
Combustible Matter	AS 3580.10.1	g/m2/mth	0.1	0.3	1.3	0.2
Calculated Rain	AS 3580.10.1	mm	35	32	44	39

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 13940

Date Issued: 21/12/2022 Revision No: 00

Sampling Conditions: 18 - 22 °C, cloudy

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
13940/1	D08&9 Hitchcock Rd Olive Grove		D.Walker	14/12/2022 10:39	AS3580.10.1	CuSO4
13940/2	D10 Hearses Rd		D.Walker	14/12/2022 11:10	AS3580.10.1	CuSO4
13940/3	D06 School		D.Walker	14/12/2022 11:34	AS3580.10.1	CuSO4
13940/4	D05 Bund		D.Walker	14/12/2022 11:48	AS3580.10.1	CuSO4
13940/5	D04 Rehab		D.Walker	14/12/2022 12:13	AS3580.10.1	CuSO4
13940/6	D07 Mullock		D.Walker	14/12/2022 12:22	AS3580.10.1	CuSO4
13940/7	D01(A) Front Gate		D.Walker	14/12/2022 11:56	AS3580.10.1	CuSO4
13940/8	D11 Goldstien		D.Walker	14/12/2022 10:58	AS3580.10.1	CuSO4
13940/9	D12 Ram		D.Walker	14/12/2022 11:22	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
13940/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	Minor vegetation
13940/2	D10 Hearses Rd	312538	6294576	
13940/3	D06 School	313518	6296537	Insects, minor vegetation
13940/4	D05 Bund	313160	6296838	Vegetation, algae. Vegetation in capture zone.
13940/5	D04 Rehab	312385	6296932	Minor vegetation.
13940/6	D07 Mullock	312579	6296676	
13940/7	D01(A) Front Gate	313290	6297176	Minor sand
13940/8	D11 Goldstien	312034	6294213	Vegetation.
13940/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 21/12/2022.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 14052

Date Issued: 19/01/2023 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 11/01/2023

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	14/12/2022 10:39	11/01/2023 11:38	14052/1	Dust	
D10 Hearses Rd	14/12/2022 11:10	11/01/2023 12:04	14052/2	Dust	
D06 School	14/12/2022 11:34	11/01/2023 10:34	14052/3	Dust	
D05 Bund	14/12/2022 11:48	11/01/2023 10:46	14052/4	Dust	
D04 Rehab	14/12/2022 12:13	11/01/2023 11:12	14052/5	Dust	
D07 Mullock	14/12/2022 12:22	11/01/2023 11:24	14052/6	Dust	
D01(A) Front Gate	14/12/2022 11:56	11/01/2023 10:57	14052/7	Dust	
D11 Goldstien	14/12/2022 10:58	11/01/2023 13:16	14052/8	Dust	
D12 Ram	14/12/2022 11:22	11/01/2023 11:51	14052/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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



Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 19/01/2023.

Test Report Number: 14052

Date Issued: 19/01/2023 Revision No: 00

Results

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14052/1 11/01/2023 D08&9 Hitchcock Rd Olive Grove	14052/2 11/01/2023 D10 Hearses Rd	14052/3 11/01/2023 D06 School	14052/4 11/01/2023 D05 Bund	14052/5 11/01/2023 D04 Rehab
Date Tested	--	--	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.5	0.2	0.4	1.8	0.7
Ash	AS 3580.10.1	g/m2/mth	0.4	0.2	0.2	0.9	0.3
Combustible Matter	AS 3580.10.1	g/m2/mth	0.1	<0.1	0.2	0.9	0.4
Calculated Rain	AS 3580.10.1	mm	67	68	53	47	50

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14052/6 11/01/2023 D07 Mullock	14052/7 11/01/2023 D01(A) Front Gate	14052/8 11/01/2023 D11 Goldstien	14052/9 11/01/2023 D12 Ram
Date Tested	--	--	17/01/2023	17/01/2023	17/01/2023	17/01/2023
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.4	0.7	2.1	0.6
Ash	AS 3580.10.1	g/m2/mth	0.2	0.5	1.0	0.2
Combustible Matter	AS 3580.10.1	g/m2/mth	0.2	0.2	1.1	0.4
Calculated Rain	AS 3580.10.1	mm	51	49	76	84

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 14052

Date Issued: 19/01/2023 Revision No: 00

Sampling Conditions: Cloudy, 24°- 27°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
14052/1	D08&9 Hitchcock Rd Olive Grove		T.Walker	11/01/2023 11:38	AS3580.10.1	CuSO4
14052/2	D10 Hearses Rd		T.Walker	11/01/2023 12:04	AS3580.10.1	CuSO4
14052/3	D06 School		T.Walker	11/01/2023 10:34	AS3580.10.1	CuSO4
14052/4	D05 Bund		T.Walker	11/01/2023 10:46	AS3580.10.1	CuSO4
14052/5	D04 Rehab		T.Walker	11/01/2023 11:12	AS3580.10.1	CuSO4
14052/6	D07 Mullock		T.Walker	11/01/2023 11:24	AS3580.10.1	CuSO4
14052/7	D01(A) Front Gate		T.Walker	11/01/2023 10:57	AS3580.10.1	CuSO4
14052/8	D11 Goldstien		T.Walker	11/01/2023 13:16	AS3580.10.1	CuSO4
14052/9	D12 Ram		T.Walker	11/01/2023 11:51	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
14052/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	Minor insects - Adjacent olive tree encroaching funnel capture zone
14052/2	D10 Hearses Rd	312538	6294576	
14052/3	D06 School	313518	6296537	Minor insects
14052/4	D05 Bund	313160	6296838	Minor vegetation & algae - Adjacent wattles enchroaching funnel capture zone.
14052/5	D04 Rehab	312385	6296932	
14052/6	D07 Mullock	312579	6296676	
14052/7	D01(A) Front Gate	313290	6297176	Minor insects
14052/8	D11 Goldstien	312034	6294213	Minor insects, vegetation & algae
14052/9	D12 Ram	311750	6294159	Minor insects

Sampling procedures have been approved and report finalised on 19/01/2023.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 14153

Date Issued: 16/02/2023 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 8/02/2023

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	11/01/2023 11:38	08/02/2023 12:01	14153/1	Dust	Clear sky obstruction.
D10 Hearses Rd	11/01/2023 12:04	08/02/2023 12:37	14153/2	Dust	
D06 School	11/01/2023 10:34	08/02/2023 10:54	14153/3	Dust	
D05 Bund	11/01/2023 10:46	08/02/2023 11:08	14153/4	Dust	Clear sky obstruction.
D04 Rehab	11/01/2023 11:12	08/02/2023 11:31	14153/5	Dust	
D07 Mullock	11/01/2023 11:24	08/02/2023 11:45	14153/6	Dust	
D01(A) Front Gate	11/01/2023 10:57	08/02/2023 11:18	14153/7	Dust	
D11 Goldstien	11/01/2023 13:16	08/02/2023 13:21	14153/8	Dust	
D12 Ram	11/01/2023 11:51	08/02/2023 12:23	14153/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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



Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 16/02/2023.

Test Report Number: 14153

Date Issued: 16/02/2023 Revision No: 00

Results

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14153/1 8/02/2023 D08&9 Hitchcock Rd Olive Grove	14153/2 8/02/2023 D10 Hearses Rd	14153/3 8/02/2023 D06 School	14153/4 8/02/2023 D05 Bund	14153/5 8/02/2023 D04 Rehab
Date Tested	--	--	14/02/2023	14/02/2023	14/02/2023	14/02/2023	14/02/2023
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.9	0.4	0.5	1.6	0.6
Ash	AS 3580.10.1	g/m2/mth	0.5	0.2	0.2	1.0	0.4
Combustible Matter	AS 3580.10.1	g/m2/mth	0.4	0.2	0.3	0.6	0.2
Calculated Rain	AS 3580.10.1	mm	164	176	162	127	151

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14153/6 8/02/2023 D07 Mullock	14153/7 8/02/2023 D01(A) Front Gate	14153/8 8/02/2023 D11 Goldstien	14153/9 8/02/2023 D12 Ram
Date Tested	--	--	14/02/2023	14/02/2023	14/02/2023	14/02/2023
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.4	0.8	0.8	0.5
Ash	AS 3580.10.1	g/m2/mth	0.3	0.7	0.3	0.2
Combustible Matter	AS 3580.10.1	g/m2/mth	0.1	0.1	0.5	0.3
Calculated Rain	AS 3580.10.1	mm	152	113	192	186

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 14153

Date Issued: 16/02/2023 Revision No: 00

Sampling Conditions: Cloudy, 24°- 28°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
14153/1	D08&9 Hitchcock Rd Olive Grove		T & D.Walker	08/02/2023 12:01	AS3580.10.1	CuSO4
14153/2	D10 Hearses Rd		T & D.Walker	08/02/2023 12:37	AS3580.10.1	CuSO4
14153/3	D06 School		T & D.Walker	08/02/2023 10:54	AS3580.10.1	CuSO4
14153/4	D05 Bund		T & D.Walker	08/02/2023 11:08	AS3580.10.1	CuSO4
14153/5	D04 Rehab		T & D.Walker	08/02/2023 11:31	AS3580.10.1	CuSO4
14153/6	D07 Mullock		T & D.Walker	08/02/2023 11:45	AS3580.10.1	CuSO4
14153/7	D01(A) Front Gate		T & D.Walker	08/02/2023 11:18	AS3580.10.1	CuSO4
14153/8	D11 Goldstien		T & D.Walker	08/02/2023 13:21	AS3580.10.1	CuSO4
14153/9	D12 Ram		T & D.Walker	08/02/2023 12:23	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
14153/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	Minor vegetation
14153/2	D10 Hearses Rd	312538	6294576	
14153/3	D06 School	313518	6296537	Minor insects
14153/4	D05 Bund	313160	6296838	Minor insects, minor vegetation
14153/5	D04 Rehab	312385	6296932	Minor vegetation.
14153/6	D07 Mullock	312579	6296676	
14153/7	D01(A) Front Gate	313290	6297176	
14153/8	D11 Goldstien	312034	6294213	
14153/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 16/02/2023.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 14277

Date Issued: 16/03/2023 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 8/03/2023

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	08/02/2023 12:01	08/03/2023 11:51	14277/1	Dust	
D10 Hearses Rd	08/02/2023 12:37	08/03/2023 12:21	14277/2	Dust	
D06 School	08/02/2023 10:54	08/03/2023 10:42	14277/3	Dust	
D05 Bund	08/02/2023 11:08	08/03/2023 10:52	14277/4	Dust	
D04 Rehab	08/02/2023 11:31	08/03/2023 11:19	14277/5	Dust	
D07 Mullock	08/02/2023 11:45	08/03/2023 11:33	14277/6	Dust	
D01(A) Front Gate	08/02/2023 11:18	08/03/2023 11:01	14277/7	Dust	
D11 Goldstien	08/02/2023 13:21	08/03/2023 13:32	14277/8	Dust	
D12 Ram	08/02/2023 12:23	08/03/2023 12:06	14277/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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



Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 16/03/2023.

Test Report Number: 14277

Date Issued: 16/03/2023 Revision No: 00

Results

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14277/1 8/03/2023 D08&9 Hitchcock Rd Olive Grove	14277/2 8/03/2023 D10 Hearses Rd	14277/3 8/03/2023 D06 School	14277/4 8/03/2023 D05 Bund	14277/5 8/03/2023 D04 Rehab
Date Tested	--	--	14/03/2023	14/03/2023	14/03/2023	14/03/2023	14/03/2023
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.9	0.4	1.1	1.6	0.9
Ash	AS 3580.10.1	g/m2/mth	0.5	0.3	0.5	1.1	0.4
Combustible Matter	AS 3580.10.1	g/m2/mth	0.4	0.1	0.6	0.5	0.5
Calculated Rain	AS 3580.10.1	mm	165	172	144	145	144

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14277/6 8/03/2023 D07 Mullock	14277/7 8/03/2023 D01(A) Front Gate	14277/8 8/03/2023 D11 Goldstien	14277/9 8/03/2023 D12 Ram
Date Tested	--	--	14/03/2023	14/03/2023	14/03/2023	14/03/2023
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.4	1.5	1.0	0.9
Ash	AS 3580.10.1	g/m2/mth	0.1	1.2	0.3	0.4
Combustible Matter	AS 3580.10.1	g/m2/mth	0.3	0.3	0.7	0.5
Calculated Rain	AS 3580.10.1	mm	151	115	182	183

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 14277

Date Issued: 16/03/2023 Revision No: 00

Sampling Conditions: Fine, 25°- 30°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
14277/1	D08&9 Hitchcock Rd Olive Grove		T.Walker	08/03/2023 11:51	AS3580.10.1	CuSO4
14277/2	D10 Hearses Rd		T.Walker	08/03/2023 12:21	AS3580.10.1	CuSO4
14277/3	D06 School		T.Walker	08/03/2023 10:42	AS3580.10.1	CuSO4
14277/4	D05 Bund		T.Walker	08/03/2023 10:52	AS3580.10.1	CuSO4
14277/5	D04 Rehab		T.Walker	08/03/2023 11:19	AS3580.10.1	CuSO4
14277/6	D07 Mullock		T.Walker	08/03/2023 11:33	AS3580.10.1	CuSO4
14277/7	D01(A) Front Gate		T.Walker	08/03/2023 11:01	AS3580.10.1	CuSO4
14277/8	D11 Goldstien		T.Walker	08/03/2023 13:32	AS3580.10.1	CuSO4
14277/9	D12 Ram		T.Walker	08/03/2023 12:06	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
14277/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	Minor insects.
14277/2	D10 Hearses Rd	312538	6294576	
14277/3	D06 School	313518	6296537	Vegetation.
14277/4	D05 Bund	313160	6296838	MInor insects, minor vegetation.
14277/5	D04 Rehab	312385	6296932	Minor insects.
14277/6	D07 Mullock	312579	6296676	
14277/7	D01(A) Front Gate	313290	6297176	Minor sand, minor insects.
14277/8	D11 Goldstien	312034	6294213	Minor vegetation.
14277/9	D12 Ram	311750	6294159	Minor insects.

Sampling procedures have been approved and report finalised on 16/03/2023.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 14394

Date Issued: 14/04/2023 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 5/04/2023

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	08/03/2023 11:51	05/04/2023 11:40	14394/1	Dust	
D10 Hearses Rd	08/03/2023 12:21	05/04/2023 12:05	14394/2	Dust	
D06 School	08/03/2023 10:42	05/04/2023 10:39	14394/3	Dust	
D05 Bund	08/03/2023 10:52	05/04/2023 10:51	14394/4	Dust	Clear Sky 120° Fail/10m Clearance Fail -Trees
D04 Rehab	08/03/2023 11:19	05/04/2023 11:16	14394/5	Dust	
D07 Mullock	08/03/2023 11:33	05/04/2023 11:28	14394/6	Dust	
D01(A) Front Gate	08/03/2023 11:01	05/04/2023 11:02	14394/7	Dust	
D11 Goldstien	08/03/2023 13:32	05/04/2023 13:03	14394/8	Dust	
D12 Ram	08/03/2023 12:06	05/04/2023 11:53	14394/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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



Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 14/04/2023.

Test Report Number: 14394

Date Issued: 14/04/2023 Revision No: 00

Results

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14394/1 5/04/2023 D08&9 Hitchcock Rd Olive Grove	14394/2 5/04/2023 D10 Hearses Rd	14394/3 5/04/2023 D06 School	14394/4 5/04/2023 D05 Bund	14394/5 5/04/2023 D04 Rehab
Date Tested	--	--	12/04/2023	12/04/2023	12/04/2023	12/04/2023	12/04/2023
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.7	1.3	1.1	1.2	0.4
Ash	AS 3580.10.1	g/m2/mth	0.4	1.0	0.4	0.4	0.2
Combustible Matter	AS 3580.10.1	g/m2/mth	0.3	0.3	0.7	0.8	0.2
Calculated Rain	AS 3580.10.1	mm	83	74	82	89	78

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14394/6 5/04/2023 D07 Mullock	14394/7 5/04/2023 D01(A) Front Gate	14394/8 5/04/2023 D11 Goldstien	14394/9 5/04/2023 D12 Ram
Date Tested	--	--	12/04/2023	12/04/2023	12/04/2023	12/04/2023
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.2	2.1	0.7	1.5
Ash	AS 3580.10.1	g/m2/mth	0.2	1.8	0.2	0.7
Combustible Matter	AS 3580.10.1	g/m2/mth	<0.1	0.3	0.5	0.8
Calculated Rain	AS 3580.10.1	mm	83	88	71	70

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 14394

Date Issued: 14/04/2023 Revision No: 00

Sampling Conditions: Cloudy, 20°- 24°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
14394/1	D08&9 Hitchcock Rd Olive Grove		T.Walker	05/04/2023 11:40	AS3580.10.1	CuSO4
14394/2	D10 Hearses Rd		T.Walker	05/04/2023 12:05	AS3580.10.1	CuSO4
14394/3	D06 School		T.Walker	05/04/2023 10:39	AS3580.10.1	CuSO4
14394/4	D05 Bund		T.Walker	05/04/2023 10:51	AS3580.10.1	CuSO4
14394/5	D04 Rehab		T.Walker	05/04/2023 11:16	AS3580.10.1	CuSO4
14394/6	D07 Mullock		T.Walker	05/04/2023 11:28	AS3580.10.1	CuSO4
14394/7	D01(A) Front Gate		T.Walker	05/04/2023 11:02	AS3580.10.1	CuSO4
14394/8	D11 Goldstien		T.Walker	05/04/2023 13:03	AS3580.10.1	CuSO4
14394/9	D12 Ram		T.Walker	05/04/2023 11:53	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
14394/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
14394/2	D10 Hearses Rd	312538	6294576	
14394/3	D06 School	313518	6296537	Insects.
14394/4	D05 Bund	313160	6296838	Vegetation
14394/5	D04 Rehab	312385	6296932	
14394/6	D07 Mullock	312579	6296676	
14394/7	D01(A) Front Gate	313290	6297176	Minor sand, minor insects
14394/8	D11 Goldstien	312034	6294213	Minor insects
14394/9	D12 Ram	311750	6294159	Insects

Sampling procedures have been approved and report finalised on 14/04/2023.
Where method is "unknown" sampling procedures are not endorsed

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NATA Accreditation 20375
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Report Number: 14556

Date Issued: 12/05/2023 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 4/05/2023

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	05/04/2023 11:40	03/05/2023 12:43	14556/1	Dust	Adjacent olive will need trimming prior to next month to ensure compliance
D10 Hearses Rd	05/04/2023 12:05	03/05/2023 13:17	14556/2	Dust	
D06 School	05/04/2023 10:39	03/05/2023 12:36	14556/3	Dust	
D05 Bund	05/04/2023 10:51	03/05/2023 12:17	14556/4	Dust	Non compliant due to trees
D04 Rehab	05/04/2023 11:16	03/05/2023 11:36	14556/5	Dust	Adjacent eucalypt sapling on pond side will need trimming prior to next month to ensure compliance
D07 Mullock	05/04/2023 11:28	03/05/2023 11:52	14556/6	Dust	
D01(A) Front Gate	05/04/2023 11:02	03/05/2023 11:14	14556/7	Dust	
D11 Goldstien	05/04/2023 13:03	03/05/2023 14:16	14556/8	Dust	
D12 Ram	05/04/2023 11:53	03/05/2023 12:59	14556/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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



Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 12/05/2023.

Test Report Number: 14556

Date Issued: 12/05/2023 Revision No: 00

Results

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14556/1 3/05/2023 D08&9 Hitchcock Rd Olive Grove	14556/2 3/05/2023 D10 Hearses Rd	14556/3 3/05/2023 D06 School	14556/4 3/05/2023 D05 Bund	14556/5 3/05/2023 D04 Rehab
Date Tested	--	--	10/05/2023	10/05/2023	10/05/2023	10/05/2023	10/05/2023
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.6	2.0	0.4	0.7	0.4
Ash	AS 3580.10.1	g/m2/mth	0.4	1.1	0.2	0.4	0.2
Combustible Matter	AS 3580.10.1	g/m2/mth	0.2	0.9	0.2	0.3	0.2
Calculated Rain	AS 3580.10.1	mm	60	60	57	58	57

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14556/6 3/05/2023 D07 Mullock	14556/7 3/05/2023 D01(A) Front Gate	14556/8 3/05/2023 D11 Goldstien	14556/9 3/05/2023 D12 Ram
Date Tested	--	--	10/05/2023	10/05/2023	10/05/2023	10/05/2023
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.7	**33.6**	1.2	0.5
Ash	AS 3580.10.1	g/m2/mth	0.5	32.8	0.7	0.2
Combustible Matter	AS 3580.10.1	g/m2/mth	0.2	0.8	0.5	0.3
Calculated Rain	AS 3580.10.1	mm	58	61	64	67

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 14556

Date Issued: 12/05/2023 Revision No: 00

Sampling Conditions: Fine, 21°- 23°C. Winds wnw @ 40km/hr

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
14556/1	D08&9 Hitchcock Rd Olive Grove		T.Walker	03/05/2023 12:43	AS3580.10.1	CuSO4
14556/2	D10 Hearses Rd		T.Walker	03/05/2023 13:17	AS3580.10.1	CuSO4
14556/3	D06 School		T.Walker	03/05/2023 12:36	AS3580.10.1	CuSO4
14556/4	D05 Bund		T.Walker	03/05/2023 12:17	AS3580.10.1	CuSO4
14556/5	D04 Rehab		T.Walker	03/05/2023 11:36	AS3580.10.1	CuSO4
14556/6	D07 Mullock		T.Walker	03/05/2023 11:52	AS3580.10.1	CuSO4
14556/7	D01(A) Front Gate		T.Walker	03/05/2023 11:14	AS3580.10.1	CuSO4
14556/8	D11 Goldstien		T.Walker	03/05/2023 14:16	AS3580.10.1	CuSO4
14556/9	D12 Ram		T.Walker	03/05/2023 12:59	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
14556/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	Adjacent olive will need trimming prior to next month to ensure compliance
14556/2	D10 Hearses Rd	312538	6294576	Minor vegetation, algae, bird droppings in funnel
14556/3	D06 School	313518	6296537	Minor insects
14556/4	D05 Bund	313160	6296838	Minor insects, minor vegetation.
14556/5	D04 Rehab	312385	6296932	Adjacent eucalypt sapling on pond side will need trimming prior to next month to ensure compliance
14556/6	D07 Mullock	312579	6296676	Very minor sand
14556/7	D01(A) Front Gate	313290	6297176	Major sand - Strong westerly winds, water cart active on site
14556/8	D11 Goldstien	312034	6294213	Minor insects, minor vegetation
14556/9	D12 Ram	311750	6294159	Minor insects

Sampling procedures have been approved and report finalised on 12/05/2023.
Where method is "unknown" sampling procedures are not endorsed

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NATA Accreditation 20375
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Report Number: 14654

Date Issued: 9/06/2023 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 31/05/2023

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	03/05/2023 12:43	31/05/2023 12:21	14654/1	Dust	
D10 Hearses Rd	03/05/2023 13:17	31/05/2023 12:46	14654/2	Dust	
D06 School	03/05/2023 12:36	31/05/2023 11:09	14654/3	Dust	
D05 Bund	03/05/2023 12:17	31/05/2023 11:23	14654/4	Dust	
D04 Rehab	03/05/2023 11:36	31/05/2023 11:51	14654/5	Dust	2x small saplings on dam side need removing to allow clear sky compliance
D07 Mullock	03/05/2023 11:52	31/05/2023 12:04	14654/6	Dust	
D01(A) Front Gate	03/05/2023 11:14	31/05/2023 11:34	14654/7	Dust	
D11 Goldstien	03/05/2023 14:16	31/05/2023 13:49	14654/8	Dust	
D12 Ram	03/05/2023 12:59	31/05/2023 12:36	14654/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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



Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 9/06/2023.

Test Report Number: 14654

Date Issued: 9/06/2023 Revision No: 00

Results

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14654/1 31/05/2023 D08&9 Hitchcock Rd Olive Grove	14654/2 31/05/2023 D10 Hearses Rd	14654/3 31/05/2023 D06 School	14654/4 31/05/2023 D05 Bund	14654/5 31/05/2023 D04 Rehab
Date Tested	--	--	7/06/2023	7/06/2023	7/06/2023	7/06/2023	7/06/2023
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.3	3.6	0.4	0.7	0.3
Ash	AS 3580.10.1	g/m2/mth	0.2	2.1	0.2	0.4	<0.1
Combustible Matter	AS 3580.10.1	g/m2/mth	0.1	1.5	0.2	0.3	0.3
Calculated Rain	AS 3580.10.1	mm	16	16	21	22	22

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14654/6 31/05/2023 D07 Mullock	14654/7 31/05/2023 D01(A) Front Gate	14654/8 31/05/2023 D11 Goldstien	14654/9 31/05/2023 D12 Ram
Date Tested	--	--	7/06/2023	7/06/2023	7/06/2023	7/06/2023
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	**18.0**	2.6	0.3	0.2
Ash	AS 3580.10.1	g/m2/mth	17.3	2.4	0.1	<0.1
Combustible Matter	AS 3580.10.1	g/m2/mth	0.7	0.2	0.2	0.2
Calculated Rain	AS 3580.10.1	mm	23	21	13	15

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 14654

Date Issued: 9/06/2023 Revision No: 00

Sampling Conditions: Cloudy, 19°- 21°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
14654/1	D08&9 Hitchcock Rd Olive Grove		T.Walker	31/05/2023 12:21	AS3580.10.1	CuSO4
14654/2	D10 Hearses Rd		T.Walker	31/05/2023 12:46	AS3580.10.1	CuSO4
14654/3	D06 School		T.Walker	31/05/2023 11:09	AS3580.10.1	CuSO4
14654/4	D05 Bund		T.Walker	31/05/2023 11:23	AS3580.10.1	CuSO4
14654/5	D04 Rehab		T.Walker	31/05/2023 11:51	AS3580.10.1	CuSO4
14654/6	D07 Mullock		T.Walker	31/05/2023 12:04	AS3580.10.1	CuSO4
14654/7	D01(A) Front Gate		T.Walker	31/05/2023 11:34	AS3580.10.1	CuSO4
14654/8	D11 Goldstien		T.Walker	31/05/2023 13:49	AS3580.10.1	CuSO4
14654/9	D12 Ram		T.Walker	31/05/2023 12:36	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
14654/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
14654/2	D10 Hearses Rd	312538	6294576	Bird droppings, algae, minor insects & vegetation. - Paddock slashed.
14654/3	D06 School	313518	6296537	
14654/4	D05 Bund	313160	6296838	Minor vegetation
14654/5	D04 Rehab	312385	6296932	
14654/6	D07 Mullock	312579	6296676	Sand (large particle size)
14654/7	D01(A) Front Gate	313290	6297176	Minor sand - visible airborne dust on entrance road
14654/8	D11 Goldstien	312034	6294213	Minor vegetation
14654/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 9/06/2023.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 14746

Date Issued: 5/07/2023 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 28/06/2023

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	31/05/2023 12:21	28/06/2023 10:44	14746/1	Dust	
D10 Hearses Rd	31/05/2023 12:46	28/06/2023 11:11	14746/2	Dust	
D06 School	31/05/2023 11:09	28/06/2023 11:33	14746/3	Dust	
D05 Bund	31/05/2023 11:23	28/06/2023 11:44	14746/4	Dust	
D04 Rehab	31/05/2023 11:51	28/06/2023 12:10	14746/5	Dust	
D07 Mullock	31/05/2023 12:04	28/06/2023 12:21	14746/6	Dust	
D01(A) Front Gate	31/05/2023 11:34	28/06/2023 11:53	14746/7	Dust	
D11 Goldstien	31/05/2023 13:49	28/06/2023 10:56	14746/8	Dust	
D12 Ram	31/05/2023 12:36	28/06/2023 11:26	14746/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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



Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 5/07/2023.

Test Report Number: 14746

Date Issued: 5/07/2023 Revision No: 00

Results

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14746/1 28/06/2023 D08&9 Hitchcock Rd Olive Grove	14746/2 28/06/2023 D10 Hearses Rd	14746/3 28/06/2023 D06 School	14746/4 28/06/2023 D05 Bund	14746/5 28/06/2023 D04 Rehab
Date Tested	--	--	30/06/2023	30/06/2023	30/06/2023	30/06/2023	30/06/2023
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.7	**6.3**	0.6	0.6	0.2
Ash	AS 3580.10.1	g/m2/mth	0.5	3.0	0.3	0.3	0.1
Combustible Matter	AS 3580.10.1	g/m2/mth	0.2	3.3	0.3	0.3	0.1
Calculated Rain	AS 3580.10.1	mm	16	13	15	15	12

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	14746/6 28/06/2023 D07 Mullock	14746/7 28/06/2023 D01(A) Front Gate	14746/8 28/06/2023 D11 Goldstien	14746/9 28/06/2023 D12 Ram
Date Tested	--	--	30/06/2023	30/06/2023	30/06/2023	30/06/2023
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.3	2.1	0.5	0.3
Ash	AS 3580.10.1	g/m2/mth	0.2	1.7	0.2	0.2
Combustible Matter	AS 3580.10.1	g/m2/mth	0.1	0.4	0.3	0.1
Calculated Rain	AS 3580.10.1	mm	14	14	12	13

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 14746

Date Issued: 5/07/2023 Revision No: 00

Sampling Conditions: 9 °C, cloudy

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
14746/1	D08&9 Hitchcock Rd Olive Grove		D.Walker	28/06/2023 10:44	AS3580.10.1	CuSO4
14746/2	D10 Hearses Rd		D.Walker	28/06/2023 11:11	AS3580.10.1	CuSO4
14746/3	D06 School		D.Walker	28/06/2023 11:33	AS3580.10.1	CuSO4
14746/4	D05 Bund		D.Walker	28/06/2023 11:44	AS3580.10.1	CuSO4
14746/5	D04 Rehab		D.Walker	28/06/2023 12:10	AS3580.10.1	CuSO4
14746/6	D07 Mullock		D.Walker	28/06/2023 12:21	AS3580.10.1	CuSO4
14746/7	D01(A) Front Gate		D.Walker	28/06/2023 11:53	AS3580.10.1	CuSO4
14746/8	D11 Goldstien		D.Walker	28/06/2023 10:56	AS3580.10.1	CuSO4
14746/9	D12 Ram		D.Walker	28/06/2023 11:26	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
14746/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
14746/2	D10 Hearses Rd	312538	6294576	Major vegetation, bird droppings, algae. Paddock recently slashed
14746/3	D06 School	313518	6296537	Minor vegetation
14746/4	D05 Bund	313160	6296838	Minor vegetation
14746/5	D04 Rehab	312385	6296932	Minor vegetation, tree approaching capture zone
14746/6	D07 Mullock	312579	6296676	
14746/7	D01(A) Front Gate	313290	6297176	Minor sand
14746/8	D11 Goldstien	312034	6294213	Minor vegetation
14746/9	D12 Ram	311750	6294159	Minor insects

Sampling procedures have been approved and report finalised on 5/07/2023.
Where method is "unknown" sampling procedures are not endorsed

Appendix B – 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

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JULY 2022

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 24 August 2022

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

1.0 Summary

CBased Environmental Pty Limited 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 programme includes:

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

This monthly report for July 2022 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results; and
- Meteorological results

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

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/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. Year to date annual average for PM_{10} is calculated from 1 July 2022 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 75% of valid meteorological data was recorded for July 2022. Loss of valid data was due to a faulty humidity sensor (replaced 2/8/2022) and a power outage (5-6 July 2022).

Approximately 94% of TEOM data was recovered for July 2022. Loss of Loss of valid data was due to a power outage (5-6 July 2022).

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*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*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

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.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand 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 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/m3.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry 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/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2022 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted 2 August 2022 (rescheduled from June 2022) with the next calibration due to be completed in September 2022. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for June 2022 from AQMS and Annual Average PM_{10} calculated from the 1 July 2022.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/07/2022	13.9	13.9	34.8	34.8
2/07/2022	5.4	9.7	13.5	24.1
3/07/2022	5.9	8.4	14.8	21.0
4/07/2022	6.0	7.8	15.0	19.5
5/07/2022	No Valid Data	7.8	No Valid Data	19.5
6/07/2022	No Valid Data	7.8	No Valid Data	19.5
7/07/2022	2.1	6.7	5.3	16.7
8/07/2022	5.9	6.5	14.8	16.3
9/07/2022	5.8	6.4	14.5	16.1
10/07/2022	7.1	6.5	17.8	16.3
11/07/2022	6.3	6.5	15.8	16.2
12/07/2022	9.4	6.8	23.5	17.0
13/07/2022	5.6	6.7	14.0	16.7
14/07/2022	7.6	6.8	19.0	16.9
15/07/2022	12.0	7.2	30.0	17.9
16/07/2022	6.0	7.1	15.0	17.7
17/07/2022	7.1	7.1	17.8	17.7
18/07/2022	9.2	7.2	23.0	18.0
19/07/2022	9.0	7.3	22.5	18.3
20/07/2022	7.7	7.3	19.3	18.3
21/07/2022	6.1	7.3	15.3	18.2
22/07/2022	6.4	7.2	16.0	18.1
23/07/2022	5.9	7.2	14.8	17.9
24/07/2022	6.2	7.1	15.5	17.8
25/07/2022	12.0	7.3	30.0	18.3
26/07/2022	8.0	7.4	20.0	18.4
27/07/2022	10.0	7.5	25.0	18.7
28/07/2022	11.3	7.6	28.3	19.0
29/07/2022	8.6	7.6	21.5	19.1
30/07/2022	10.2	7.7	25.5	19.3
31/07/2022	9.4	7.8	23.5	19.5

*Calculated from PM10

**Calculated from PM10 Annual Average

"No Valid Data" – when displayed, indicates when no valid 1-hour data is available to calculate a 24hr average (5-6 July 2022 power outage)

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 highlighted in yellow, when applicable

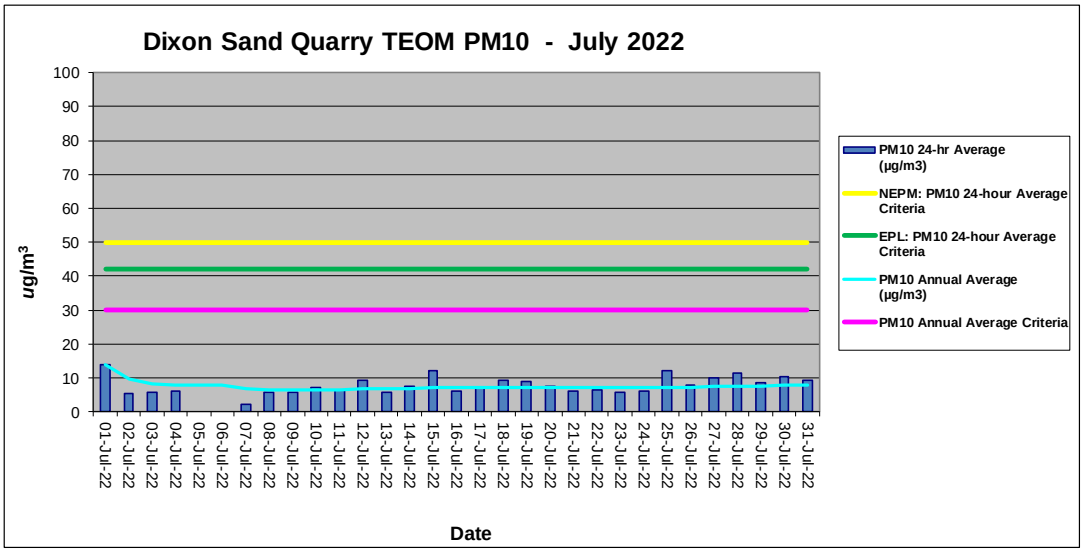


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

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.

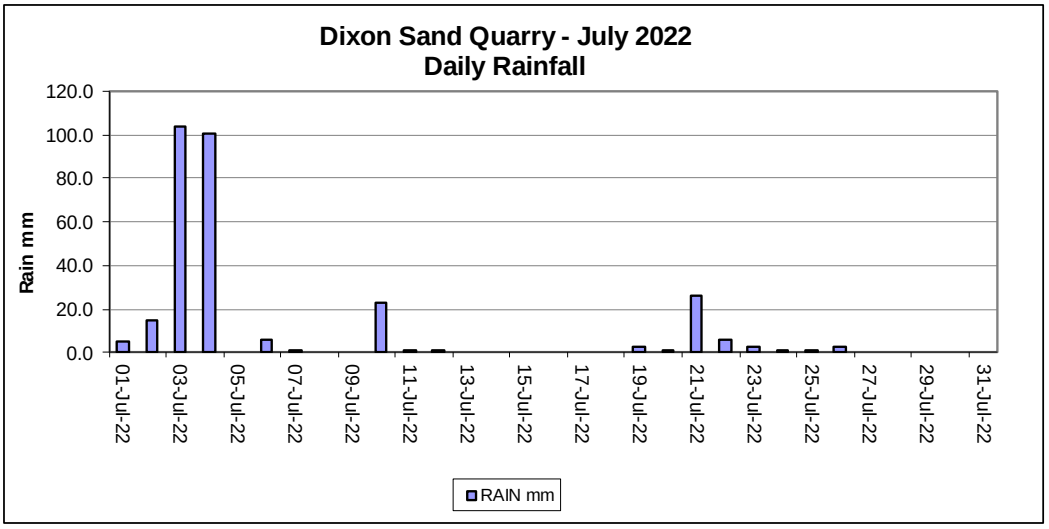
A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

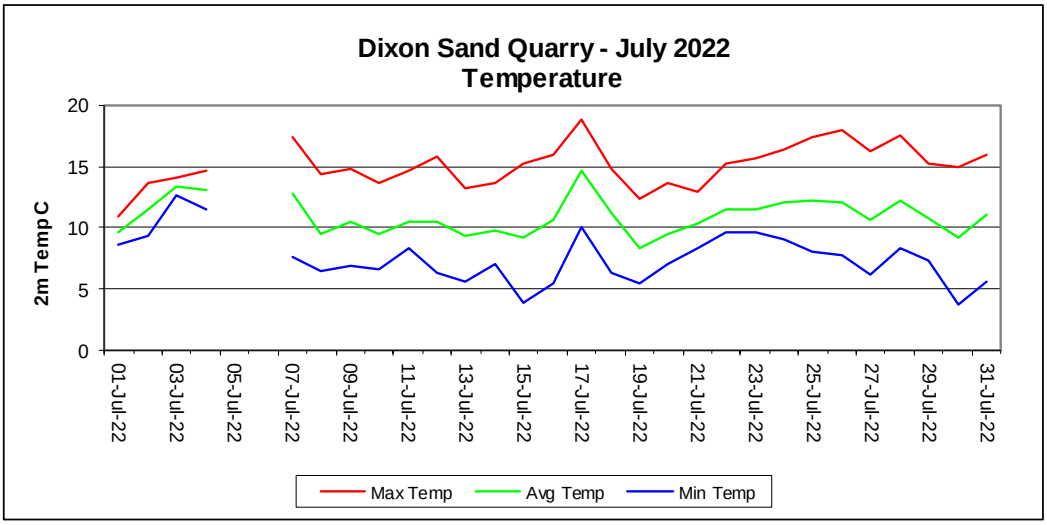
An annual physical screening and system check of the meteorological station was conducted March 2022 and is next due in March 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for July 2022

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/07/2022	8.6	9.6	10.9	5.0	0.5	4.0	9.6				1002.6	1004.0	1005.7
2/07/2022	9.4	11.5	13.6	14.8	0.2	4.2	14.7				997.8	999.9	1002.7
3/07/2022	12.6	13.3	14.1	104.2	0.3	6.6	27.2				994.1	996.3	998.4
4/07/2022	11.5	13.1	14.7	100.4	0.2	5.2	17.1				993.2	994.8	997.1
5/07/2022				0.0									
6/07/2022				5.6									
7/07/2022	7.6	12.8	17.4	1.2	0.2	4.9	18.2				989.0	990.9	992.5
8/07/2022	6.5	9.5	14.4	0.0	0.0	3.7	15.2				990.4	991.9	994.0
9/07/2022	6.9	10.4	14.8	0.0	0.3	3.1	11.1				993.6	996.8	999.9
10/07/2022	6.6	9.4	13.6	22.6	0.8	5.4	17.6				999.5	1002.6	1005.2
11/07/2022	8.4	10.5	14.6	0.6	0.2	3.5	14.1				999.5	1002.8	1005.2
12/07/2022	6.3	10.4	15.8	1.4	0.0	2.3	17.4				993.3	995.8	999.5
13/07/2022	5.6	9.3	13.2	0.0	0.0	4.2	15.7				991.5	993.2	996.0
14/07/2022	7.0	9.8	13.6	0.0	0.1	6.3	26.6				996.0	1001.1	1005.6
15/07/2022	3.9	9.2	15.2	0.0	0.1	2.5	8.5				1004.2	1005.8	1007.9
16/07/2022	5.5	10.6	15.9	0.0	0.0	4.8	13.4				999.2	1002.4	1005.1
17/07/2022	10.1	14.6	18.8	0.0	0.6	8.7	42.4				991.7	994.9	999.2
18/07/2022	6.3	11.2	14.8	0.0	0.2	4.7	23.7				991.6	996.7	1003.1
19/07/2022	5.5	8.3	12.4	2.4	0.0	4.7	18.2				1003.1	1006.4	1009.4
20/07/2022	7.1	9.4	13.7	1.2	0.2	2.9	7.6				1008.3	1010.2	1011.8
21/07/2022	8.4	10.4	13.0	26.4	0.2	2.3	9.0				1009.3	1010.5	1012.0
22/07/2022	9.6	11.5	15.2	6.2	0.1	3.1	17.1				1005.9	1008.0	1010.0
23/07/2022	9.7	11.5	15.6	2.8	0.1	2.6	10.0				1002.4	1004.1	1006.1
24/07/2022	9.1	12.1	16.4	0.2	0.0	2.2	7.8				1000.0	1001.7	1003.4
25/07/2022	8.1	12.2	17.4	0.2	0.1	3.1	12.6				994.2	998.1	1001.2
26/07/2022	7.8	12.0	18.0	2.6	0.5	5.3	17.5				988.3	991.4	994.1
27/07/2022	6.2	10.6	16.2	0.0	0.0	3.5	15.1				992.9	996.7	1001.6
28/07/2022	8.4	12.3	17.5	0.0	0.1	2.7	10.9				1000.5	1001.7	1003.4
29/07/2022	7.3	10.7	15.3	0.0	0.1	3.8	17.9				1000.9	1003.1	1006.3
30/07/2022	3.8	9.2	15.0	0.0	0.1	2.9	10.5				1004.9	1006.4	1008.6
31/07/2022	5.6	11.0	16.0	0.0	0.5	4.3	15.5				997.4	1002.0	1005.6
Monthly	**3.8**	**10.9**	**18.8**	**297.8**	**0.0**	**4.1**	**42.4**	**0.0**	**#DIV/0!**	**0.0**	**988.3**	**1000.4**	**1012.0**

Faulty humidity sensor & power outage (5-6 July 2022)





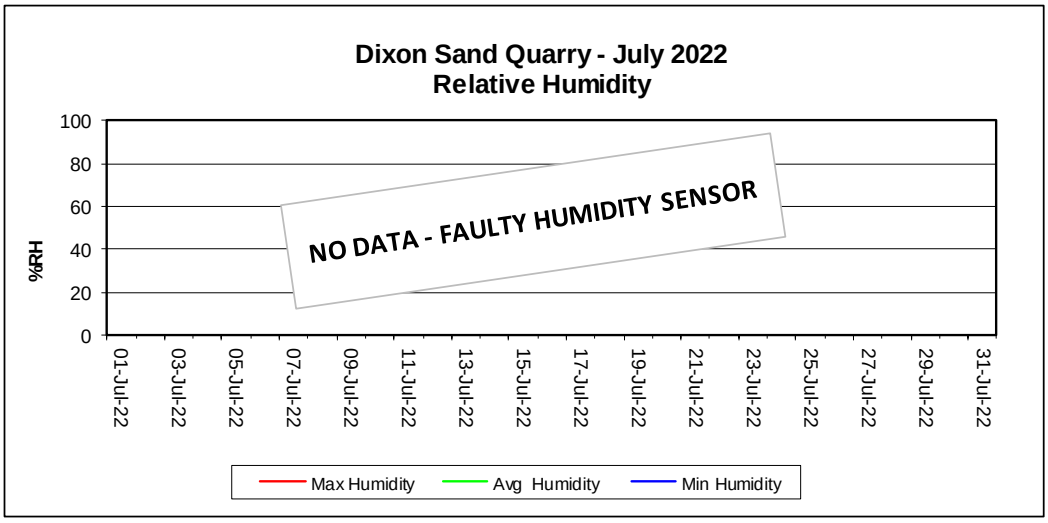
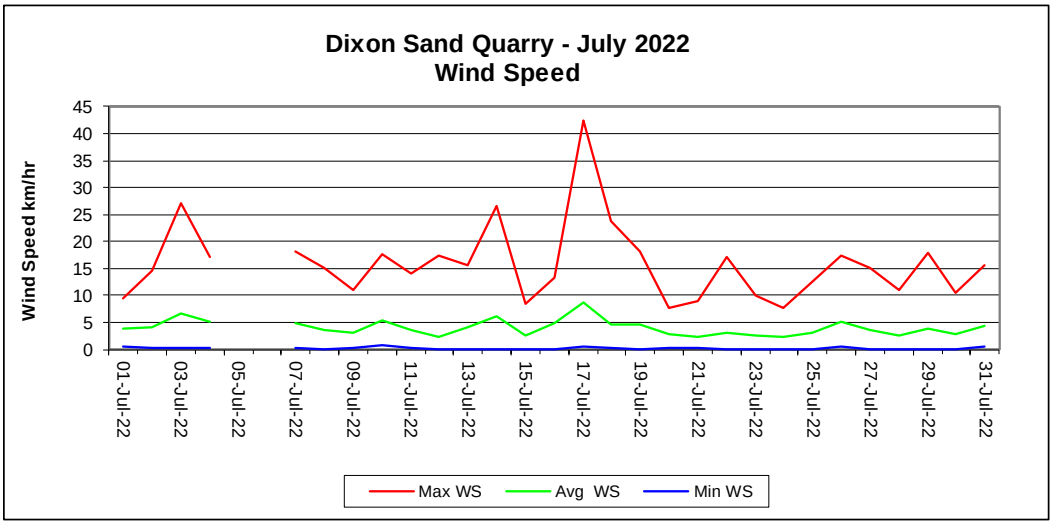


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*



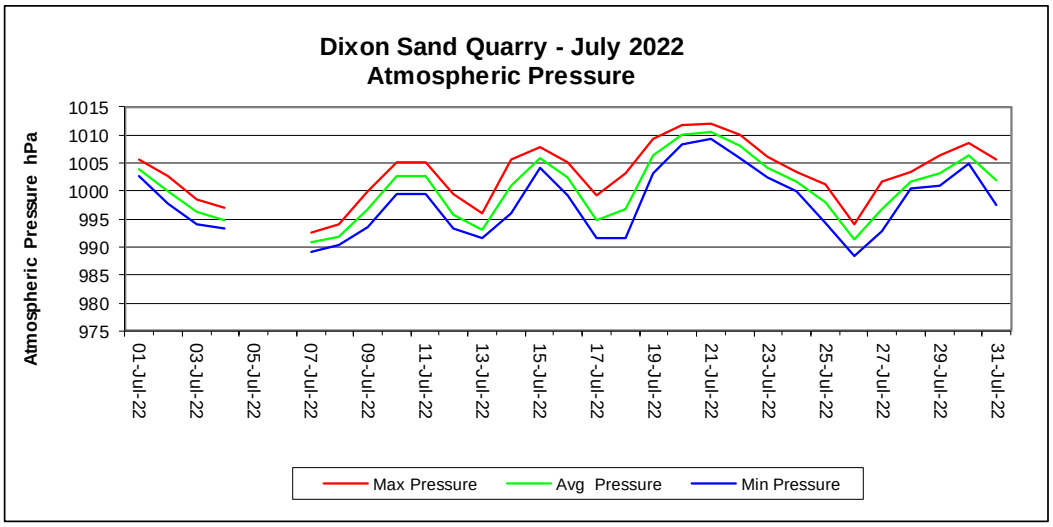
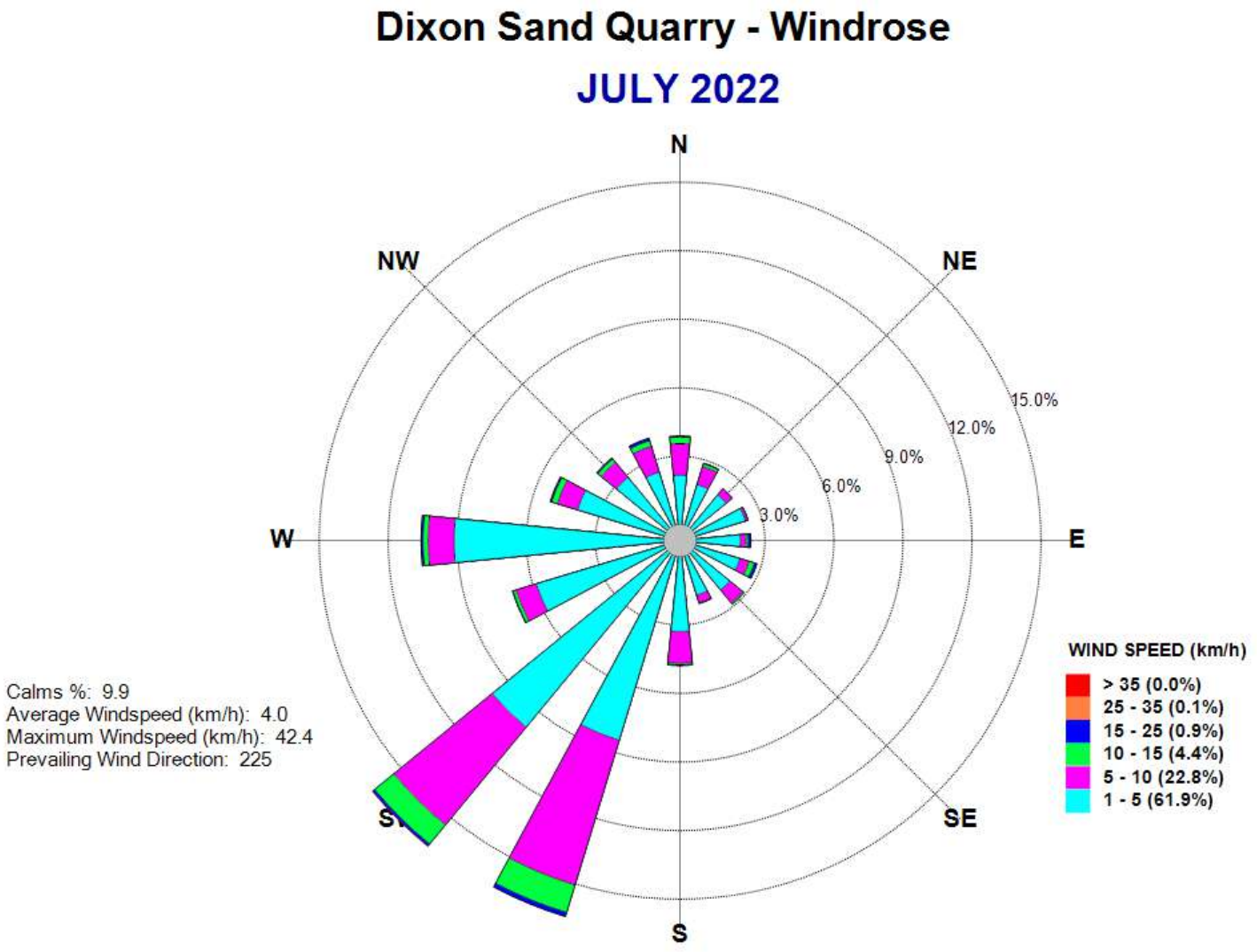


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
JULY 2022
N
NE
E
SE
S
W
NW
3.0%
6.0%
9.0%
12.0%
15.0%
Calms %: 9.9
Average Windspeed (km/h): 4.0
Maximum Windspeed (km/h): 42.4
Prevailing Wind Direction: 225
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.1%)
15 - 25 (0.9%)
10 - 15 (4.4%)
5 - 10 (22.8%)
1 - 5 (61.9%)

Appendix 1

Calibration Documents (when required)

CARBON BASED

Continuous Air Quality
Monthly/Quarterly/Six Monthly/Annual
TEOM Maintenance and Calibration – 1400AB

teledata

TEOM Client/Site: Dixon Sanit TEOM **Date:** 2·8·22

1. TEOM Data Screen **SERIAL No:** 25570 **Firmware:** N/A AB Model

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Operating Condition	4 OK	Green - Normal	✓	
Date/time	TEOM: 2·8·22 1336 Actual: 2·8·22 12·40	Current Date/time correct within 5 minutes	✓ BST	
PM-10 24hr av	10·0	Positive values	✓	
Filter loading PM10	52	<80 %	✓	
Frequency PM-10	252.29823	200-300 Hz	✓	
Noise PM-10	0·057	<0.100ug	✓	

Comment: If filter load >80% but <90% and if flows Ok then data is OK

Comments:

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: Cleaned rain-gauge – very dirty
Replaced H/T 10m sensors which OK ✓ Some rust.
Cleaned ~~ws~~ WD sensor Wire OK

Data Downloaded: YES/NO (circle)

Technician Name : Colin James **Signed**

3. Instrument Conditions Ambient Conditions and Temperatures

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Ambient Temperature	21.9	-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	13.69	12.95 – 14.39 lpm	✓	
Total Flow rate	16.69	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	255.71694	255.71694	255.71698	255.71693

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.

✓ OK
noise = 0.091 ✓ good

4. Instrument clock verified (Refer Section 1) YES/NO.
If Time changed – clock reset OK YES/NO or NA (not changed)
Comments:

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

Ref

P = 744.5 mmHg
T = 20.5 °C

6. TEOM Cleaned and Air Conditioner checked YES/NO. Air Conditioner settings or operational status: 5 med cool,

Tetracal Flow/Temp/Pressure Calibrator Serial No: 172357 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 3.02 Error % 0.7 (allowed error <6%) PASS/FAIL

Bypass Flow verified Flow l/min 13.85 Error % 1.3 (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:**

2. Leak Check – Conducted YES/NO

PM10 actual 0.10 < Limit 0.15

Bypass actual 0.35 < Limit 0.60

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

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.

NA

2. Flow Calibration – Conducted YES/NO
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:-

New install
2/8/22
Dixon Sundt Mat

CERTIFICATE

Dixon Sundt 2/8/22

rotronic
LEADING IN HUMIDITY MEASUREMENT

Device type	**HC2A-S3**
Serialnumber	**0020596685**
RPC-number	**99-0463051533**

ROTRONIC AG certifies that this instrument meets the published specifications. It has been calibrated using standards and instruments as stated below and corresponds to the process requirements of ISO 9001. The references are traceable to national standards. The calibrated values are only valid at the time of measurement and are referenced to the indicated references and working standards

FACTORY CALIBRATION

Adjustment

Temperature	23.41°C
Humidity 1	10.56%rH (@23.43°C)
Humidity 2	34.03%rH (@23.51°C)
Humidity 3	78.86%rH (@23.55°C)

Calibration

	Device	Reference
Temperature	23.47°C	23.50°C
Humidity	49.75%rH	49.71%rH

Date of calibration: 06.04.2022

Reference System

HC2A-S (traceable to national standards)

FUNCTION TEST

Firmware	V1.2
Analog Output	Out1: Humi 0..100%rH (0..1V) Set: 40.00%rH, measured 39.95%rH (0.400V) Out2: Temp -40..60°C (0..1V) Set: 20.00°C, measured 19.96°C (0.600V)
Printnumber	66.1085.0301

Final test passed – 07.04.2022 – quality engineer: M. Bicanin
Control number: 303

ROTRONIC AG, Grindelstrasse 6, CH - 8303 Bassersdorf
www.rotronic.com

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

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AUGUST 2022

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 21 August 2022

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

1.0 Summary

CBased Environmental Pty Limited 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 programme includes:

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

This monthly report for August 2022 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results;
- Meteorological results; and
- Quarterly TEOM calibration and maintenance.

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

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/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. Year to date annual average for PM_{10} is calculated from 1 July 2022 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 98% of valid meteorological data was recorded for August 2022. Loss of valid data was due to a faulty humidity sensor (replaced 2/8/2022).

Approximately 100% of TEOM data was recovered for August 2022.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*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*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

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.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand 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 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/m3.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry 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/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2022 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted 2 August 2022 (rescheduled from June 2022) with the next calibration due to be completed in September 2022. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for August 2022 from AQMS and Annual Average PM_{10} calculated from the 1 July 2022.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/08/2022	10.3	7.9	25.8	19.7
2/08/2022	7.1	7.9	17.6	19.6
3/08/2022	7.8	7.9	19.5	19.6
4/08/2022	11.1	8.0	27.8	19.9
5/08/2022	8.1	8.0	20.3	19.9
6/08/2022	5.6	7.9	14.0	19.7
7/08/2022	6.0	7.8	15.0	19.6
8/08/2022	10.0	7.9	25.0	19.7
9/08/2022	9.0	7.9	22.5	19.8
10/08/2022	7.6	7.9	19.0	19.8
11/08/2022	11.0	8.0	27.5	20.0
12/08/2022	8.7	8.0	21.8	20.0
13/08/2022	4.4	7.9	11.0	19.8
14/08/2022	3.1	7.8	7.8	19.5
15/08/2022	12.4	7.9	31.0	19.8
16/08/2022	8.6	7.9	21.5	19.8
17/08/2022	14.3	8.1	35.8	20.2
18/08/2022	11.2	8.1	28.0	20.3
19/08/2022	15.2	8.3	38.0	20.7
20/08/2022	9.8	8.3	24.5	20.8
21/08/2022	12.2	8.4	30.5	21.0
22/08/2022	23.8	8.7	59.5	21.7
23/08/2022	14.8	8.8	37.0	22.0
24/08/2022	6.9	8.8	17.3	21.9
25/08/2022	10.7	8.8	26.8	22.0
26/08/2022	8.7	8.8	21.8	22.0
27/08/2022	6.3	8.8	15.8	21.9
28/08/2022	9.8	8.8	24.5	22.0
29/08/2022	12.2	8.8	30.5	22.1
30/08/2022	10.9	8.9	27.3	22.2
31/08/2022	14.0	9.0	35.0	22.4

*Calculated from PM10

**Calculated from PM10 Annual Average

"No Valid Data" – when displayed, indicates when no valid 1-hour data is available to calculate a 24hr average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 highlighted in yellow, when applicable

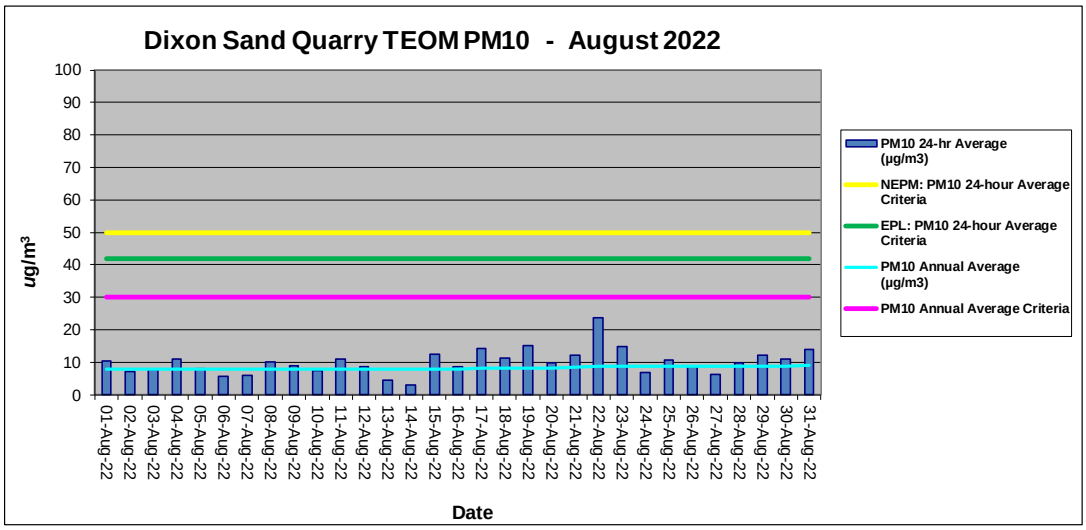


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

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.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. 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 physical screening and system check of the meteorological station was conducted March 2022 and is next due in March 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for August 2022

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/08/2022	9.8	13.5	18.7	0.0	0.2	5.6	23.9				994.6	996.2	998.3
2/08/2022	6.2	12.1	19.0	0.2	0.0	4.0	12.4				996.0	998.2	1001.2
3/08/2022	9.9	15.6	21.9	0.0	1.0	7.5	19.0	46.0	58.0	69.6	990.9	993.8	997.2
4/08/2022	14.9	17.5	20.1	7.6	0.9	8.2	23.6	58.5	73.9	97.1	983.3	987.7	992.3
5/08/2022	13.7	16.5	19.6	0.2	0.6	5.7	20.2	38.9	62.8	87.4	983.1	985.0	986.9
6/08/2022	10.0	13.6	18.1	0.0	0.2	4.9	34.6	33.0	54.2	74.8	986.3	989.1	992.9
7/08/2022	8.6	11.4	16.8	0.0	0.3	3.7	15.0	43.1	64.6	79.7	992.2	995.4	999.8
8/08/2022	6.4	10.5	16.1	0.0	0.0	4.5	17.4	45.1	73.6	93.5	999.5	1001.2	1003.0
9/08/2022	6.4	9.5	13.7	0.2	0.2	5.2	19.6	64.9	82.4	98.7	1001.5	1003.8	1006.4
10/08/2022	8.1	10.7	16.1	0.6	0.2	3.6	12.2	51.1	83.6	99.5	1005.3	1006.7	1008.9
11/08/2022	7.9	11.6	14.2	0.0	0.1	3.6	13.7	69.0	82.0	98.5	999.4	1002.5	1006.0
12/08/2022	11.6	12.6	14.3	1.8	0.2	5.9	15.8	67.7	81.1	97.5	994.9	997.1	999.4
13/08/2022	9.4	12.3	17.5	6.8	0.2	3.9	14.1	39.4	76.0	100.0	989.8	991.8	994.8
14/08/2022	8.6	11.0	15.0	0.0	0.1	6.4	22.3	46.0	63.1	75.5	987.0	989.1	990.3
15/08/2022	8.8	11.7	16.1	0.0	0.4	5.2	19.3	35.9	58.9	73.6	986.9	988.7	990.2
16/08/2022	7.9	11.7	17.4	0.0	0.3	4.4	15.2	33.9	58.9	77.6	988.0	990.7	996.2
17/08/2022	6.9	11.8	17.7	0.0	0.0	2.7	11.1	39.3	66.5	84.1	995.8	997.9	1000.2
18/08/2022	8.7	13.9	19.7	0.0	0.3	4.7	12.7	42.4	61.0	82.5	992.0	994.3	997.5
19/08/2022	8.9	14.2	19.0	0.0	0.0	4.8	18.6	42.0	54.8	62.1	990.5	993.4	998.9
20/08/2022	7.0	11.7	17.8	0.0	0.0	3.6	14.8	41.6	57.8	70.6	998.0	999.7	1003.8
21/08/2022	8.8	12.0	16.8	0.0	0.1	3.4	13.3	41.0	65.5	82.9	1003.2	1004.7	1007.2
22/08/2022	7.6	13.6	19.1	0.0	0.2	6.1	31.3	35.2	57.1	90.8	994.4	998.2	1003.3
23/08/2022	5.2	11.9	20.1	9.0	0.0	8.5	24.8	35.5	68.5	98.6	986.0	991.7	996.9
24/08/2022	5.2	9.7	15.2	0.0	0.1	5.6	21.9	35.6	56.6	76.8	996.7	999.4	1001.5
25/08/2022	6.2	11.3	17.0	0.0	0.2	3.1	14.1	44.5	62.5	87.0	999.2	1001.8	1005.1
26/08/2022	8.9	11.8	15.9	0.0	0.5	4.3	16.0	61.3	81.8	100.0	1004.7	1006.4	1008.2
27/08/2022	8.4	11.7	15.4	1.2	0.0	2.8	11.0	74.1	92.6	100.0	1006.4	1008.1	1009.8
28/08/2022	9.1	13.2	19.7	0.2	0.1	3.5	14.0	55.0	88.4	100.0	1005.6	1007.2	1009.6
29/08/2022	9.7	13.6	18.6	0.2	0.1	2.6	14.7	69.6	91.6	100.0	999.3	1003.3	1006.5
30/08/2022	12.7	16.5	20.1	0.2	1.1	7.2	23.5	41.3	67.0	80.6	994.9	997.2	1000.0
31/08/2022	10.3	13.6	19.3	0.2	0.0	3.8	17.5	45.5	73.7	100.0	1000.0	1002.9	1004.7
Monthly	**5.2**	**12.7**	**21.9**	**28.4**	**0.0**	**4.8**	**34.6**	**33.0**	**69.6**	**100.0**	**983.1**	**997.5**	**1009.8**

Faulty humidity sensor, replaced 2/8/2022

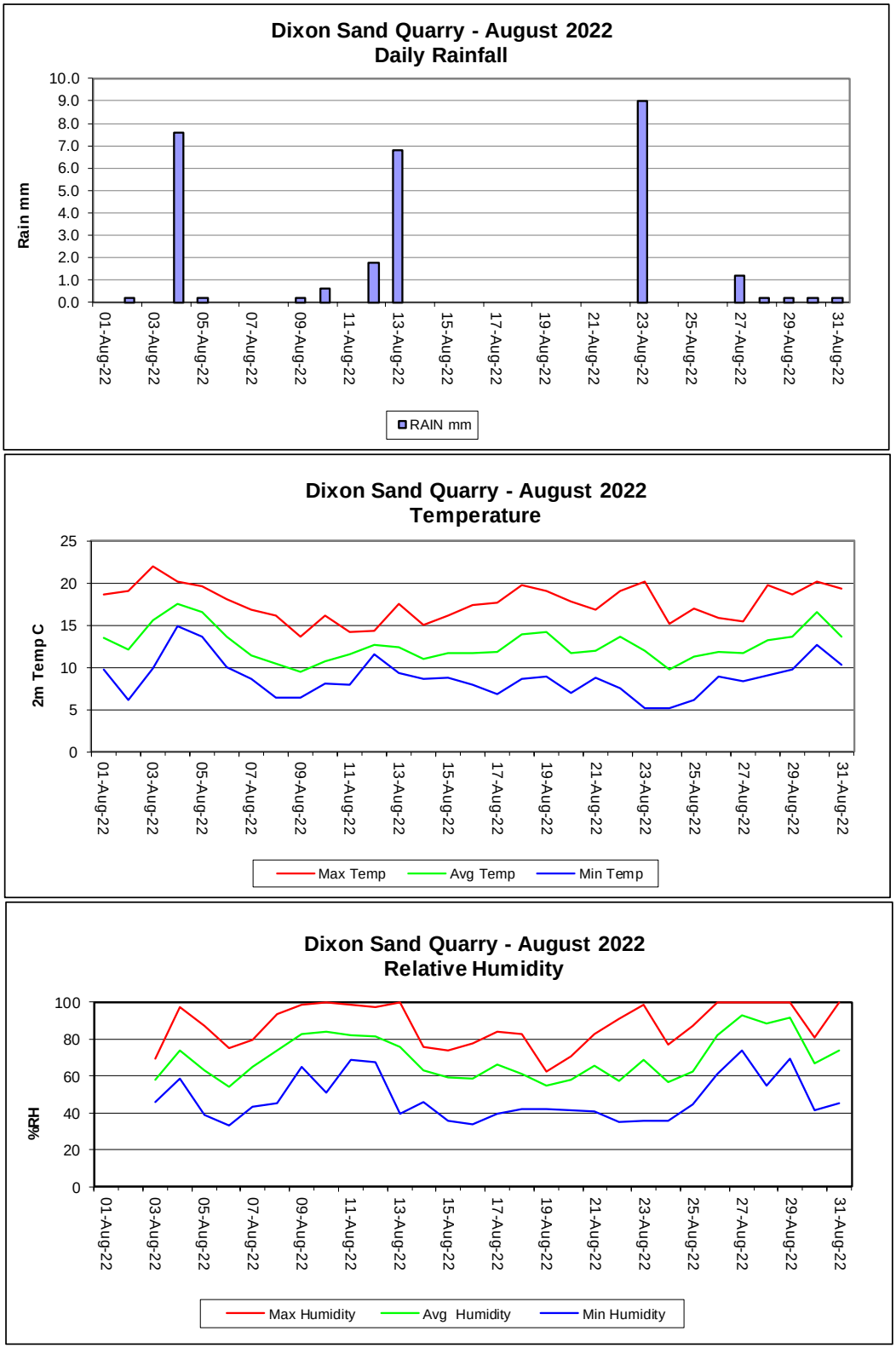
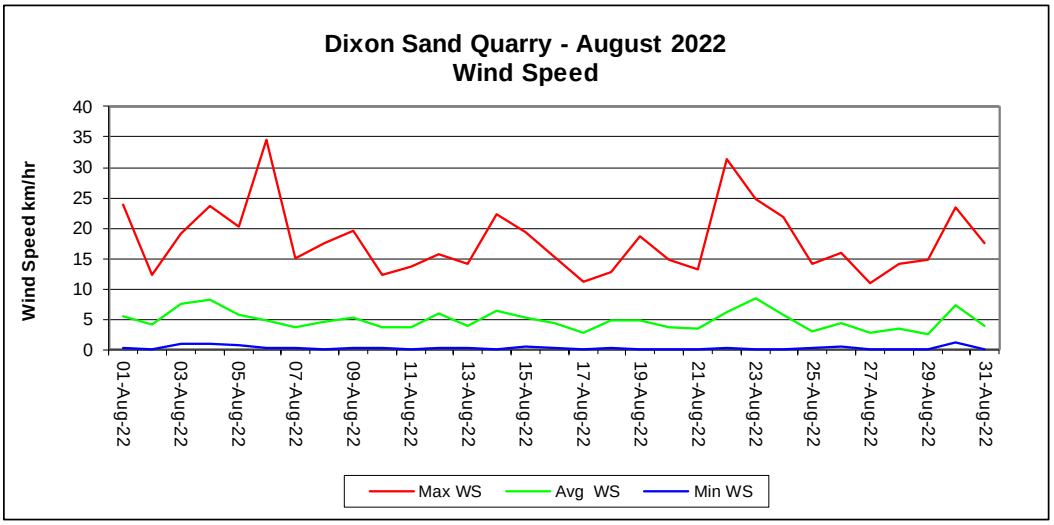


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*



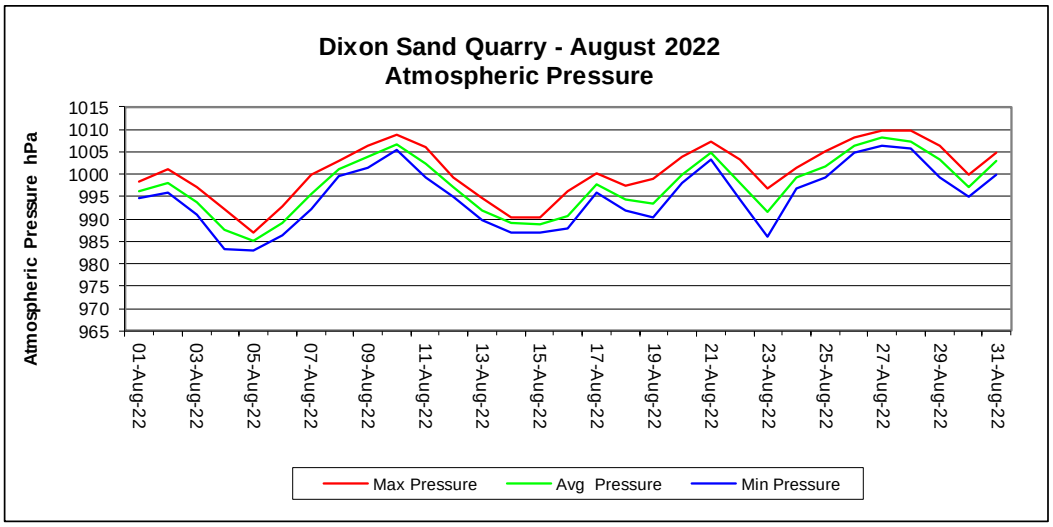
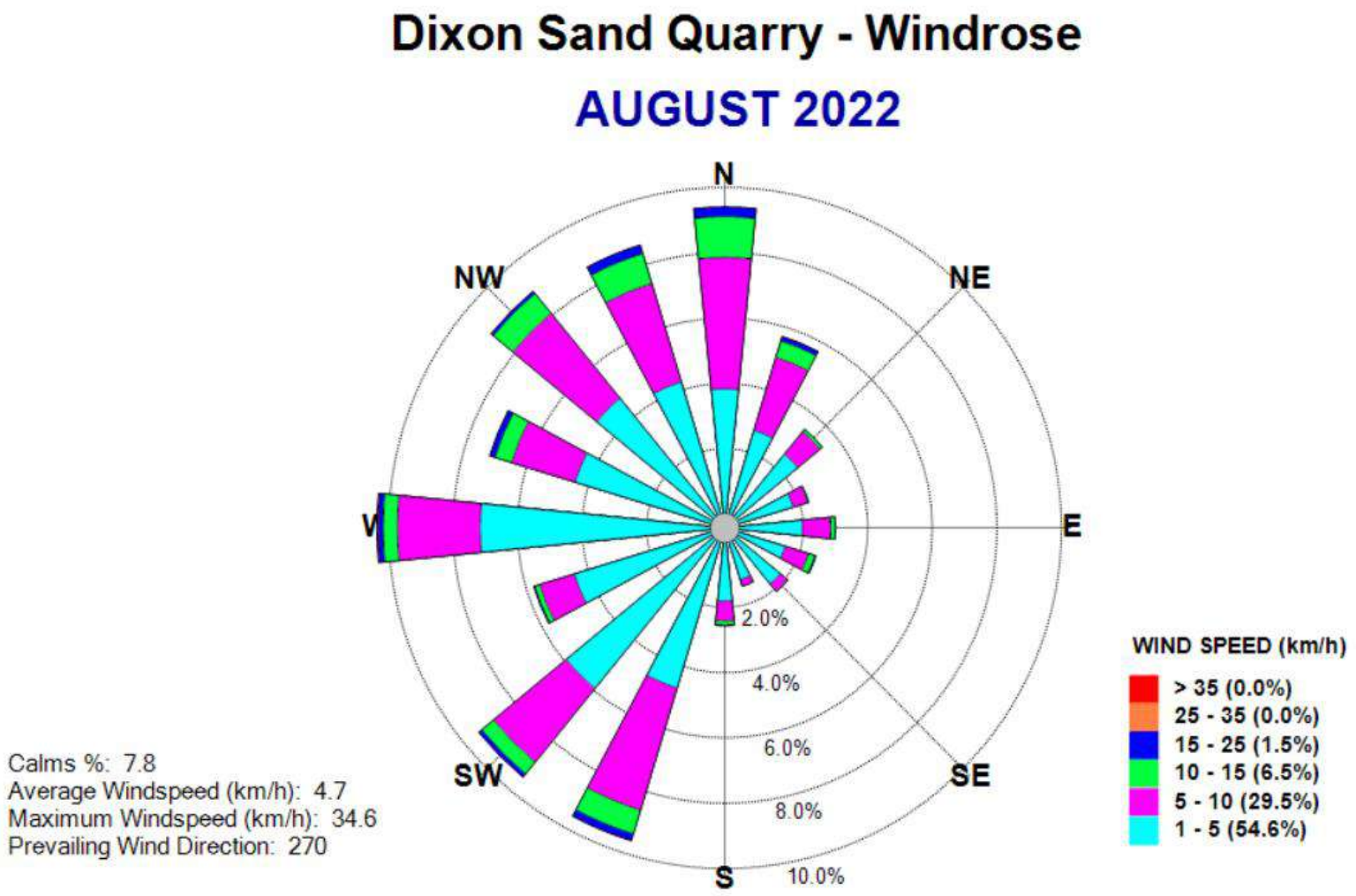


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
AUGUST 2022
N
NE
E
SE
S
SW
W
NW
2.0%
4.0%
6.0%
8.0%
10.0%
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.0%)
15 - 25 (1.5%)
10 - 15 (6.5%)
5 - 10 (29.5%)
1 - 5 (54.6%)
Calms %: 7.8
Average Windspeed (km/h): 4.7
Maximum Windspeed (km/h): 34.6
Prevailing Wind Direction: 270

Appendix 1

Calibration Documents (when required)

CARBON BASED

Continuous Air Quality
Monthly/Quarterly/Six Monthly/Annual
TEOM Maintenance and Calibration – 1400AB

teledata

TEOM Client/Site: Dixon Sanit TEOM **Date:** 2·8·22

1. TEOM Data Screen **SERIAL No:** 25570 **Firmware:** N/A AB Model

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Operating Condition	4 OK	Green - Normal	✓	
Date/time	TEOM: 2·8·22 1336 Actual: 2·8·22 12·40	Current Date/time correct within 5 minutes	✓ BST	
PM-10 24hr av	10·0	Positive values	✓	
Filter loading PM10	52	<80 %	✓	
Frequency PM-10	252.29823	200-300 Hz	✓	
Noise PM-10	0·057	<0.100ug	✓	

Comment: If filter load >80% but <90% and if flows Ok then data is OK

Comments:

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: Cleaned rain-gauge – very dirty
Replaced H/T 10m sensors which OK ✓ Some rust.
Cleaned ~~ws~~ WD sensor Wire OK

Data Downloaded: YES/NO (circle)

Technician Name : Colin James **Signed**

3. Instrument Conditions Ambient Conditions and Temperatures

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Ambient Temperature	21.9	-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	13.69	12.95 – 14.39 lpm	✓	
Total Flow rate	16.69	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	255.71694	255.71694	255.71698	255.71693

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.

✓ OK
noise = 0.091 ✓ good

4. Instrument clock verified (Refer Section 1) YES/NO.
If Time changed – clock reset OK YES/NO or NA (not changed)
Comments:

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

Ref

P = 744.5 mmHg
T = 20.5 °C

6. TEOM Cleaned and Air Conditioner checked YES/NO. Air Conditioner settings or operational status: 5 med cool,

Tetracal Flow/Temp/Pressure Calibrator Serial No: 172357 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 3.02 Error % 0.7 (allowed error <6%) PASS/FAIL

Bypass Flow verified Flow l/min 13.85 Error % 1.3 (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:**

2. Leak Check – Conducted YES/NO

PM10 actual 0.10 < Limit 0.15

Bypass actual 0.35 < Limit 0.60

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

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.

NA

2. Flow Calibration – Conducted YES/NO
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:-

New install
2/8/22
Dixon Sundt Mat

CERTIFICATE

Dixon Sundt 2/8/22

rotronic
LEADING IN HUMIDITY MEASUREMENT

Device type	**HC2A-S3**
Serialnumber	**0020596685**
RPC-number	**99-0463051533**

ROTRONIC AG certifies that this instrument meets the published specifications. It has been calibrated using standards and instruments as stated below and corresponds to the process requirements of ISO 9001. The references are traceable to national standards. The calibrated values are only valid at the time of measurement and are referenced to the indicated references and working standards

FACTORY CALIBRATION

Adjustment

Temperature	23.41°C
Humidity 1	10.56%rH (@23.43°C)
Humidity 2	34.03%rH (@23.51°C)
Humidity 3	78.86%rH (@23.55°C)

Calibration

	Device	Reference
Temperature	23.47°C	23.50°C
Humidity	49.75%rH	49.71%rH

Date of calibration: 06.04.2022

Reference System

HC2A-S (traceable to national standards)

FUNCTION TEST

Firmware	V1.2
Analog Output	Out1: Humi 0..100%rH (0..1V) Set: 40.00%rH, measured 39.95%rH (0.400V) Out2: Temp -40..60°C (0..1V) Set: 20.00°C, measured 19.96°C (0.600V)
Printnumber	66.1085.0301

Final test passed – 07.04.2022 – quality engineer: M. Bicanin
Control number: 303

ROTRONIC AG, Grindelstrasse 6, CH - 8303 Bassersdorf
www.rotronic.com

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

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SEPTEMBER 2022

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 21 October 2022

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

1.0 Summary

CBased Environmental Pty Limited 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 programme includes:

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

This monthly report for September 2022 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results;
- Meteorological results; and
- Quarterly TEOM calibration and maintenance.

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

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/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. Year to date annual average for PM_{10} is calculated from 1 July 2022 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 100% of valid meteorological data was recorded for September 2022.

Approximately 81% of TEOM valid data was available for September 2022.
Loss of valid data was due to a lightning strike causing damage to the TEOM from 25 September 2022. Unit was repaired on 7 October 2022.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*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*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

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.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand 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 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/m3.

Approximately 81% of TEOM valid data was available during September 2022 reporting period. Loss of valid data was due to a lightning strike which damage to the TEOM from 25 September 2022. Unit was repaired on 7 October 2022.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry 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/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2022 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted 23 September 2022 with the next calibration due to be completed in December 2022. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for September 2022 from AQMS and Annual Average PM_{10} calculated from the 1 July 2022.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/09/2022	11.3	9.0	28.3	22.5
2/09/2022	18.1	9.1	45.3	22.9
3/09/2022	8.8	9.1	22.0	22.9
4/09/2022	7.6	9.1	19.0	22.8
5/09/2022	9.7	9.1	24.3	22.8
6/09/2022	10.2	9.1	25.5	22.9
7/09/2022	11.7	9.2	29.3	23.0
8/09/2022	12.4	9.2	31.0	23.1
9/09/2022	8.0	9.2	20.0	23.0
10/09/2022	5.4	9.2	13.5	22.9
11/09/2022	6.5	9.1	16.3	22.8
12/09/2022	12.5	9.2	31.3	22.9
13/09/2022	12.5	9.2	31.3	23.0
14/09/2022	11.9	9.2	29.8	23.1
15/09/2022	9.3	9.2	23.3	23.1
16/09/2022	11.1	9.3	27.8	23.2
17/09/2022	9.5	9.3	23.8	23.2
18/09/2022	6.6	9.2	16.5	23.1
19/09/2022	18.4	9.4	46.0	23.4
20/09/2022	14.0	9.4	35.0	23.5
21/09/2022	18.3	9.5	45.8	23.8
22/09/2022	9.7	9.5	24.3	23.8
23/09/2022	11.5	9.5	28.6	23.9
24/09/2022	8.6	9.5	21.5	23.8
25/09/2022	ND	9.5	ND	23.8
26/09/2022	ND	9.5	ND	23.8
27/09/2022	ND	9.5	ND	23.8
28/09/2022	ND	9.5	ND	23.8
29/09/2022	ND	9.5	ND	23.8
30/09/2022	ND	9.5	ND	23.8

*Calculated from PM10

**Calculated from PM10 Annual Average

ND (No Valid Data) – when displayed, indicates when no valid 1-hour data is available to calculate a 24hr average.

NOTE: Lightning strike/damage to TEOM (from 25/09/2022), repaired 7/10/22

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 highlighted in yellow, when applicable

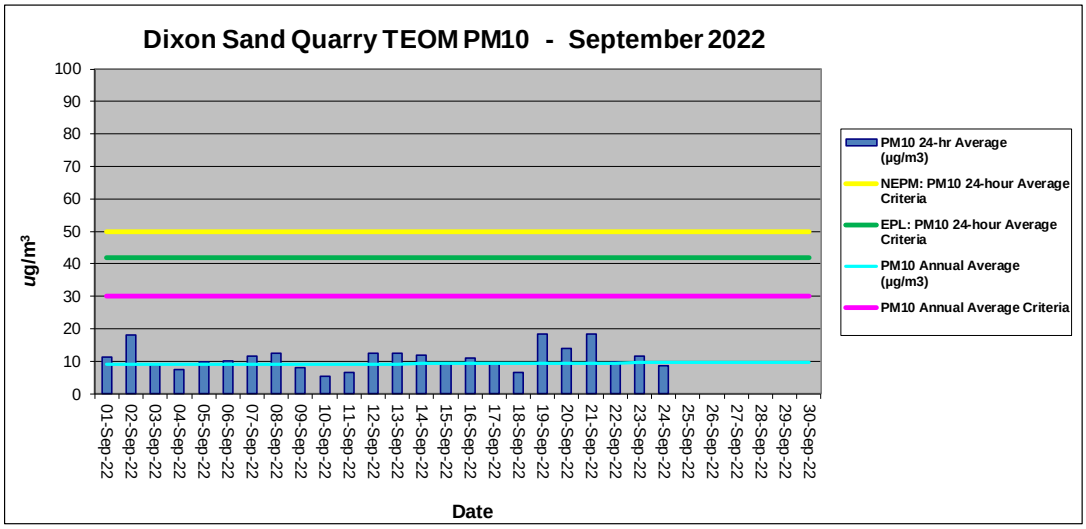


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

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.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. 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 physical screening and system check of the meteorological station was conducted March 2022 and is next due in March 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for September 2022

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/09/2022	11.5	14.5	20.4	0.8	0.0	3.4	15.3	54.1	88.5	100.0	999.8	1001.9	1004.2
2/09/2022	10.6	12.8	16.8	0.8	0.0	3.1	12.0	67.1	88.0	100.0	999.5	1001.6	1003.4
3/09/2022	7.6	9.4	12.3	11.2	0.0	5.2	17.1	83.6	95.9	100.0	1002.5	1003.5	1004.7
4/09/2022	8.6	10.8	16.0	3.8	0.5	5.6	16.9	54.4	92.0	100.0	1002.7	1004.1	1005.2
5/09/2022	7.4	11.5	17.3	0.2	0.1	3.7	12.8	39.6	75.3	100.0	1001.1	1003.1	1004.8
6/09/2022	7.9	11.1	15.4	0.0	0.0	3.1	13.4	60.0	81.5	100.0	1002.9	1004.2	1005.6
7/09/2022	8.0	12.1	16.9	0.0	0.1	3.1	19.6	58.4	84.9	100.0	1001.0	1003.3	1005.9
8/09/2022	9.3	14.6	19.8	0.0	0.2	4.1	15.1	51.5	79.0	100.0	994.4	998.2	1001.9
9/09/2022	12.6	14.9	20.2	2.0	0.1	4.6	19.2	48.5	78.9	100.0	989.6	992.0	994.5
10/09/2022	12.0	15.5	20.8	0.0	0.3	4.6	17.2	42.5	66.9	87.0	987.3	989.5	991.9
11/09/2022	10.0	14.2	20.4	0.0	0.3	3.5	16.3	32.3	51.8	79.2	992.0	993.9	996.3
12/09/2022	7.2	12.6	17.9	0.0	0.0	3.0	10.5	36.0	54.5	75.1	995.7	997.8	1001.3
13/09/2022	7.8	11.3	15.7	0.0	0.0	4.1	19.2	59.6	73.8	91.1	1001.2	1004.9	1007.9
14/09/2022	7.1	11.8	16.8	0.0	0.1	4.1	19.9	45.4	71.0	86.5	1001.5	1005.3	1008.5
15/09/2022	9.0	11.4	12.8	23.8	0.1	3.2	19.5	83.2	97.7	100.0	986.3	994.4	1001.6
16/09/2022	11.6	16.6	22.3	0.0	0.5	5.7	23.3	29.0	61.3	100.0	984.0	985.8	987.9
17/09/2022	13.0	16.2	20.1	0.0	1.2	7.1	25.2	37.9	48.1	68.1	984.0	986.5	989.7
18/09/2022	11.7	15.7	20.7	0.0	0.2	5.2	20.8	29.7	46.2	62.6	988.0	990.3	993.3
19/09/2022	11.8	15.4	20.8	0.0	0.2	4.5	16.0	24.7	51.6	77.9	991.5	994.7	999.8
20/09/2022	6.9	13.7	20.2	0.0	0.1	4.1	17.1	44.7	69.1	93.7	998.5	1000.9	1003.4
21/09/2022	10.8	14.6	18.3	1.0	0.2	2.6	12.0	72.2	91.7	100.0	995.7	998.2	1000.4
22/09/2022	13.6	14.8	17.3	10.8	0.3	6.2	27.1	71.5	92.1	100.0	995.2	997.3	998.6
23/09/2022	13.2	15.7	18.7	2.2	0.1	3.6	13.0	76.9	95.1	100.0	992.2	995.2	997.9
24/09/2022	11.6	14.8	21.0	16.2	0.2	3.6	13.4	56.7	95.4	100.0	989.3	991.2	994.9
25/09/2022	9.2	14.4	21.4	0.2	0.2	3.7	14.1	34.1	75.6	99.9	993.2	995.2	997.7
26/09/2022	10.5	14.0	19.0	0.0	0.1	3.3	13.6	61.8	90.8	100.0	994.4	996.2	998.2
27/09/2022	11.8	15.4	20.5	1.6	0.2	3.6	13.6	53.5	85.7	99.9	990.6	992.8	995.1
28/09/2022	11.0	15.0	21.7	4.2	0.3	4.3	13.6	31.0	82.8	100.0	989.6	991.4	994.2
29/09/2022	10.3	13.6	18.4	4.0	1.0	7.3	24.9	65.8	92.0	99.9	993.8	997.5	1002.1
30/09/2022	11.0	13.1	16.9	7.8	0.2	6.6	19.5	71.2	95.1	100.0	1000.9	1003.2	1004.5
Monthly	**6.9**	**13.7**	**22.3**	**90.6**	**0.0**	**4.3**	**27.1**	**24.7**	**78.4**	**100.0**	**984.0**	**997.1**	**1008.5**

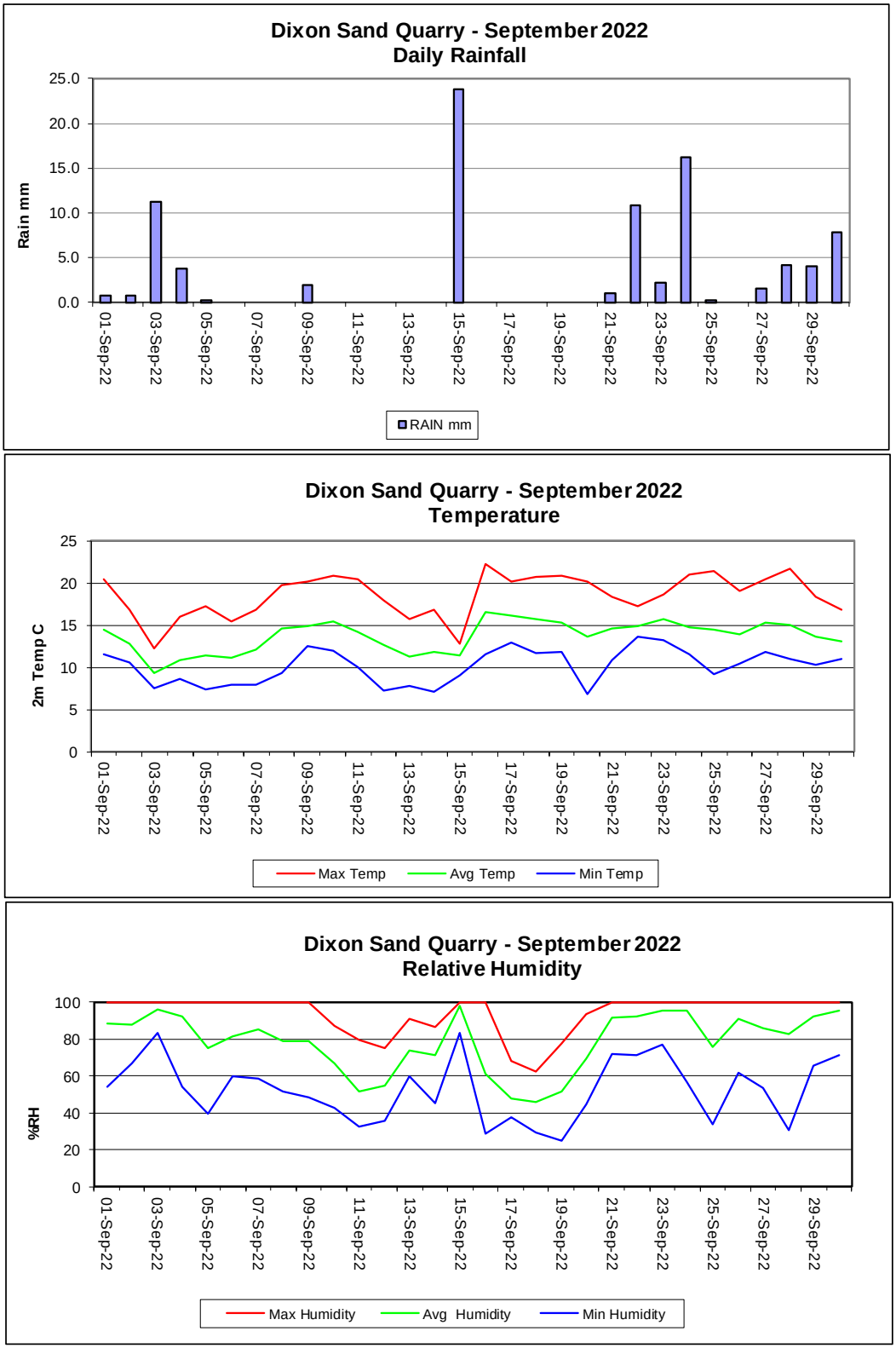
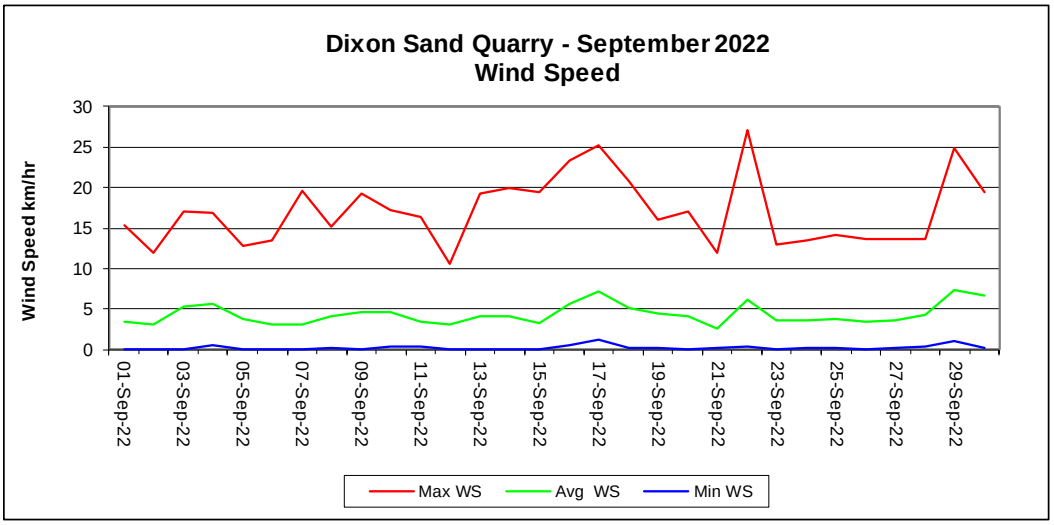


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*



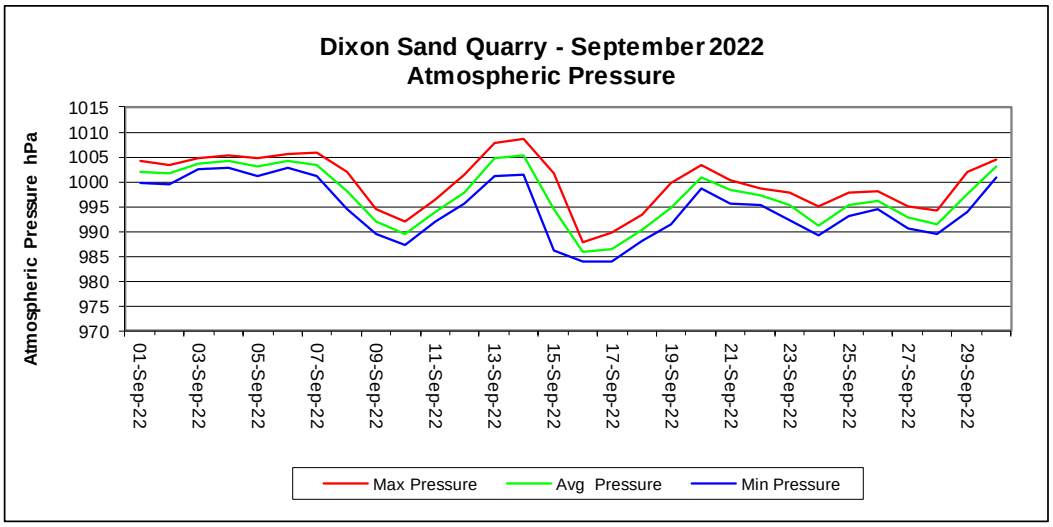
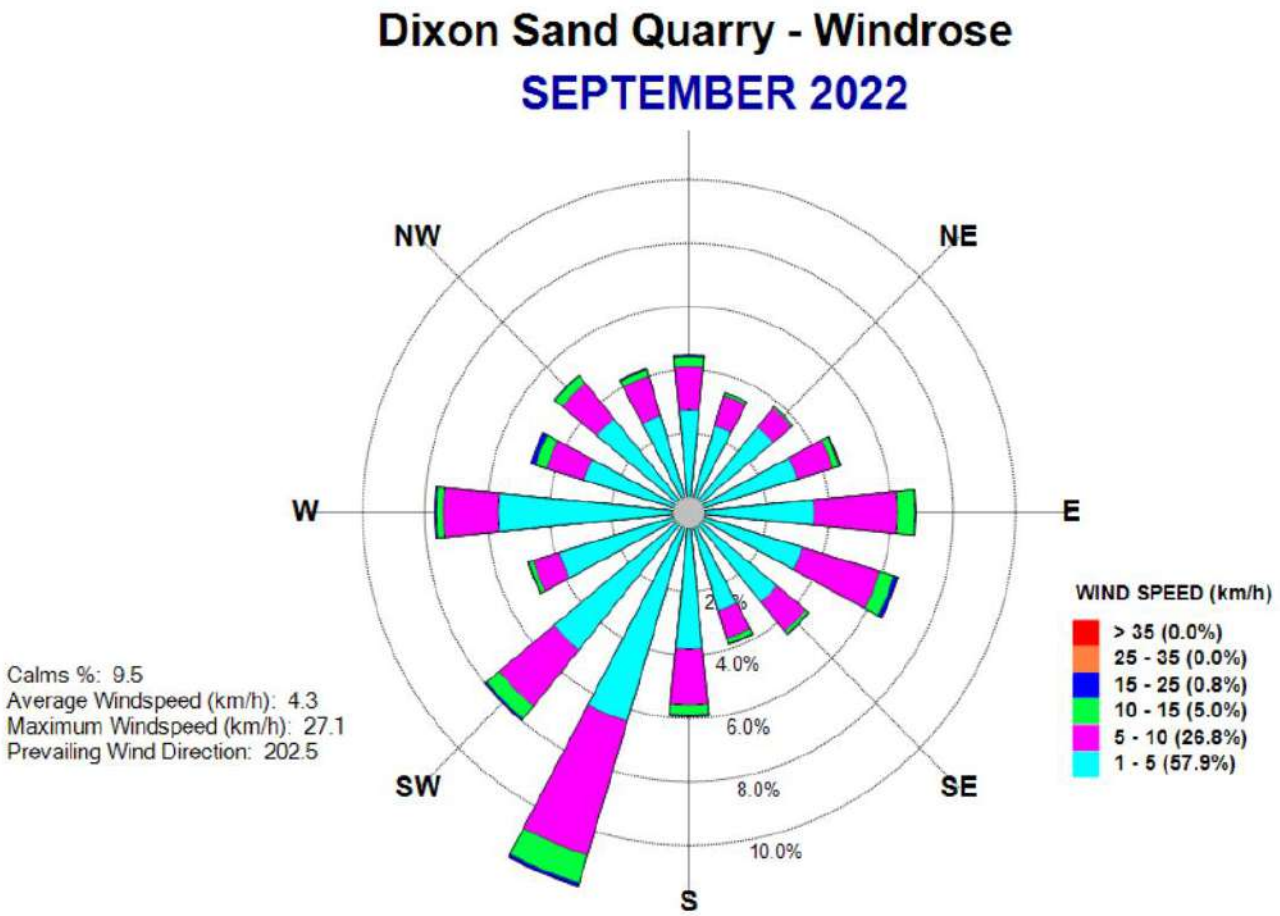


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
SEPTEMBER 2022
NW
NE
W
E
SW
SE
S
4.0%
6.0%
8.0%
10.0%
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.0%)
15 - 25 (0.8%)
10 - 15 (5.0%)
5 - 10 (26.8%)
1 - 5 (57.9%)
Calms %: 9.5
Average Windspeed (km/h): 4.3
Maximum Windspeed (km/h): 27.1
Prevailing Wind Direction: 202.5

Appendix 1

Calibration Documents (when required)

CARBON BASED ENVIRONMENTAL

Continuous Air Quality Monthly/Quarterly/Six Monthly/Annual TEOM Maintenance and Calibration – 1400AB

teledata

TEOM Client/Site: Dixon Sands / TEOM Eco Tech 05-0721 **Date:** 23.9.22

1. TEOM Data Screen **SERIAL No:** 25570 **Firmware:** NA

1400AB 25570503

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Operating Condition	4 – OK	Green - Normal	✓	
Date/time	TEOM: 23/9/22 12.12 Actual: 23/9/22 12.16	Current Date/time correct within 5 minutes	✓	
PM-10 24hr av	10.5	Positive values	✓	
Filter loading PM10	37	<80 %	✓	
Frequency PM-10	254.5147	200-300 Hz	✓	
Noise PM-10	0.026	<0.100ug	✓	

Comment: If filter load >80% but <90% and if flows Ok then data is OK

Comments:

2. System Status

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

Comments:

Data Downloaded: YES (NO) (circle)

Technician Name : COLIN DAVIES **Signed**

3. Instrument Conditions Ambient Conditions and Temperatures

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Ambient Temperature	19.5	-10 to 50 C	✓	
Ambient Dew Point	NA	-10 to 50 C	✓	
Ambient Pressure	0.971	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	13.69	12.95 – 14.39 lpm	✓	
Total Flow rate	16.69	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	255.57073	255.57012	255.57071	255.57076

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.

✓ good

4. Instrument clock verified (Refer Section 1) YES/NO.
If Time changed – clock reset OK YES/NO or NA (not changed)
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 **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 3.02 Error % 0.7 (allowed error <6%) PASS/FAIL

Bypass Flow verified Flow l/min 13.54 Error % 1.0 (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:**

2. Leak Check – Conducted YES/NO

PM10 actual 0.09 < Limit 0.15

Bypass actual 0.36 < Limit 0.60

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

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.

NA

2. Flow Calibration – Conducted YES/NO
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

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OCTOBER 2022

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 30 November 2022

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

1.0 Summary

CBased Environmental Pty Limited 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 programme includes:

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

This monthly report for October 2022 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results;
- Meteorological results; and

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

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/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. Year to date annual average for PM_{10} is calculated from 1 July 2022 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 84% of valid meteorological data was recorded for October 2022 due power outages.

Approximately 68% of TEOM valid data was available for October 2022. Loss of valid data was due to a lightning strike in late September causing damage to the TEOM and power outages in late October 2022.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*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*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

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.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand 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 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/m3.

Approximately 68% of TEOM valid data was available for October 2022. Loss of valid data was due to a lightning strike in late September causing damage to the TEOM and power outages in late October 2022.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry 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/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2022 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted in September 2022 with the next calibration due to be completed in December 2022. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for October 2022 from AQMS and Annual Average PM_{10} calculated from the 1 July 2022.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/10/2022	ND	9.5	ND	23.8
2/10/2022	ND	9.5	ND	23.8
3/10/2022	ND	9.5	ND	23.8
4/10/2022	ND	9.5	ND	23.8
5/10/2022	ND	9.5	ND	23.8
6/10/2022	ND	9.5	ND	23.8
7/10/2022	ND	9.5	ND	23.8
8/10/2022	4.7	9.5	11.7	23.7
9/10/2022	3.8	9.4	9.5	23.5
10/10/2022	9.6	9.4	24.0	23.5
11/10/2022	10.0	9.4	25.0	23.6
12/10/2022	16.1	9.5	40.3	23.7
13/10/2022	14.4	9.6	36.0	23.9
14/10/2022	9.5	9.6	23.8	23.9
15/10/2022	8.8	9.5	22.0	23.9
16/10/2022	12.0	9.6	30.0	23.9
17/10/2022	11.2	9.6	28.0	24.0
18/10/2022	11.1	9.6	27.8	24.0
19/10/2022	17.5	9.7	43.8	24.2
20/10/2022	13.2	9.7	33.0	24.3
21/10/2022	9.8	9.7	24.5	24.3
22/10/2022	8.2	9.7	20.5	24.3
23/10/2022	10.3	9.7	25.8	24.3
24/10/2022	7.3	9.7	18.3	24.2
25/10/2022	11.1	9.7	27.8	24.3
26/10/2022	10.7	9.7	26.8	24.3
27/10/2022	13.8	9.8	34.5	24.4
28/10/2022	19.3	9.8	48.2	24.6
29/10/2022	ND	9.8	ND	24.6
30/10/2022	ND	9.8	ND	24.6
31/10/2022	ND	9.8	ND	24.6

*Calculated from PM10

**Calculated from PM10 Annual Average

ND (No Valid Data) – when displayed, indicates when no valid 1-hour data is available to calculate a 24hr average.

NOTE: Lightening strike/damage to TEOM (25/09/2022 - 7/10/22) & power outage 29/10/22 - 2/11/22)

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 highlighted in yellow, when applicable

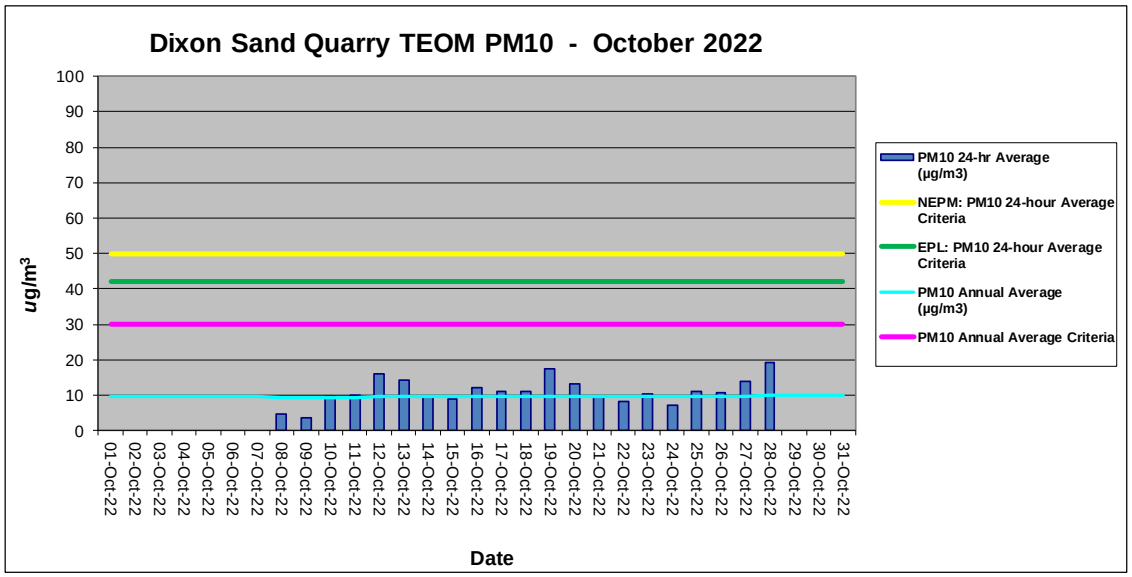


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

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.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. 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 physical screening and system check of the meteorological station was conducted March 2022 and is next due in March 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for October 2022

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/10/2022	9.5	11.7	15.6	0.0	0.6	4.2	12.3	69.5	93.2	100.0	1000.2	1002.3	1004.3
2/10/2022	8.5	12.2	17.8	0.0	0.2	4.1	19.7	41.6	81.1	99.9	996.3	999.0	1000.8
3/10/2022	7.4	12.7	19.0	0.0	0.0	3.0	11.6	42.0	75.9	99.9	998.8	1000.9	1003.3
4/10/2022	10.3	14.3	22.3	0.0	0.2	3.3	12.4	39.8	71.1	96.0	999.9	1001.1	1002.5
5/10/2022													
6/10/2022													
7/10/2022	15.1	16.1	21.7	0.6	0.4	4.8	17.7	43.0	98.5	100.0	993.3	994.6	999.9
8/10/2022	13.3	16.6	20.4	2.8	0.0	3.3	14.0	83.1	98.8	100.0	992.1	994.2	996.4
9/10/2022	9.6	12.2	15.5	0.2	0.0	6.3	22.8	55.3	86.5	100.0	993.1	999.2	1004.1
10/10/2022	8.9	12.4	15.9	0.0	0.0	4.1	18.4	62.3	87.3	100.0	1003.8	1005.3	1007.1
11/10/2022	11.1	13.7	17.6	0.0	0.0	4.0	23.9	65.0	89.7	100.0	1002.1	1004.0	1006.2
12/10/2022	10.6	14.2	18.3	0.0	0.0	4.3	18.1	72.6	93.3	100.0	1001.3	1003.0	1004.6
13/10/2022	11.6	16.1	19.7	0.0	0.1	4.2	19.8	65.7	88.6	100.0	992.2	998.3	1003.7
14/10/2022	13.7	17.8	23.1	0.0	0.4	5.6	21.4	25.4	67.7	100.0	988.2	991.4	996.4
15/10/2022	11.7	16.1	22.6	0.0	0.1	4.2	21.6	32.5	58.4	86.9	995.7	997.7	999.9
16/10/2022	11.8	16.0	21.2	0.0	0.0	5.0	26.4	59.1	88.8	100.0	996.1	998.4	999.9
17/10/2022	12.7	14.6	17.9	0.0	0.2	5.0	16.4	76.4	96.8	100.0	999.1	1000.8	1002.7
18/10/2022	12.2	15.2	19.4	0.0	0.0	3.7	15.7	84.1	99.6	100.0	997.7	1000.1	1002.1
19/10/2022	14.9	18.0	24.2	0.0	0.3	3.8	22.5	49.9	90.8	100.0	995.5	997.3	998.5
20/10/2022	16.1	17.3	20.5	0.2	0.3	3.3	12.1	99.8	99.9	99.9	994.3	996.3	997.9
21/10/2022	16.7	18.7	22.8	0.2	0.2	3.6	11.8	69.1	96.1	100.0	991.4	993.8	995.8
22/10/2022	15.9	19.5	24.9	0.0	0.1	4.8	17.3	58.3	90.5	100.0	990.4	992.3	994.0
23/10/2022	16.6	18.1	21.5	0.4	0.3	5.2	17.1	85.8	99.7	100.0	991.4	993.1	994.5
24/10/2022	15.1	17.5	20.9	0.2	0.0	3.8	12.1	92.1	99.8	100.0	987.2	990.5	994.4
25/10/2022	16.1	19.9	25.9	0.2	0.2	3.9	20.2	50.6	81.3	100.0	982.6	984.8	987.7
26/10/2022	17.6	21.9	27.0	0.0	0.2	4.1	19.6	33.5	58.1	83.7	980.2	982.4	985.0
27/10/2022	16.8	20.0	25.9	0.6	0.2	4.3	13.9	37.2	61.9	99.9	980.2	982.4	984.3
28/10/2022	14.8	18.8	22.7	4.2	1.0	6.6	22.0	24.5	43.7	69.4	981.5	983.3	984.6
29/10/2022													
30/10/2022													
31/10/2022													
Monthly	**7.4**	**16.2**	**27.0**	**9.6**	**0.0**	**4.3**	**26.4**	**24.5**	**84.5**	**100.0**	**980.2**	**995.6**	**1007.1**

No data due to power outages

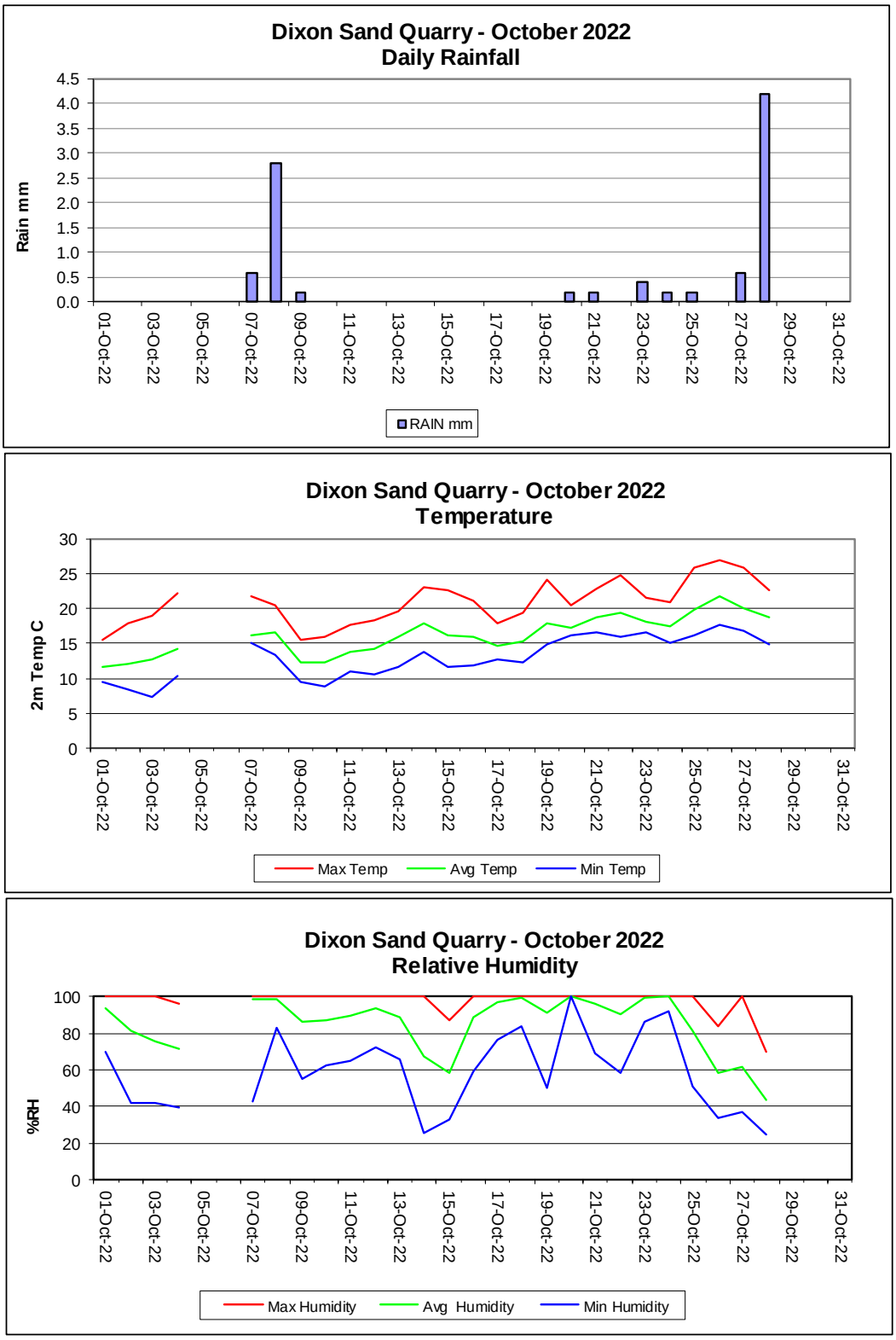


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

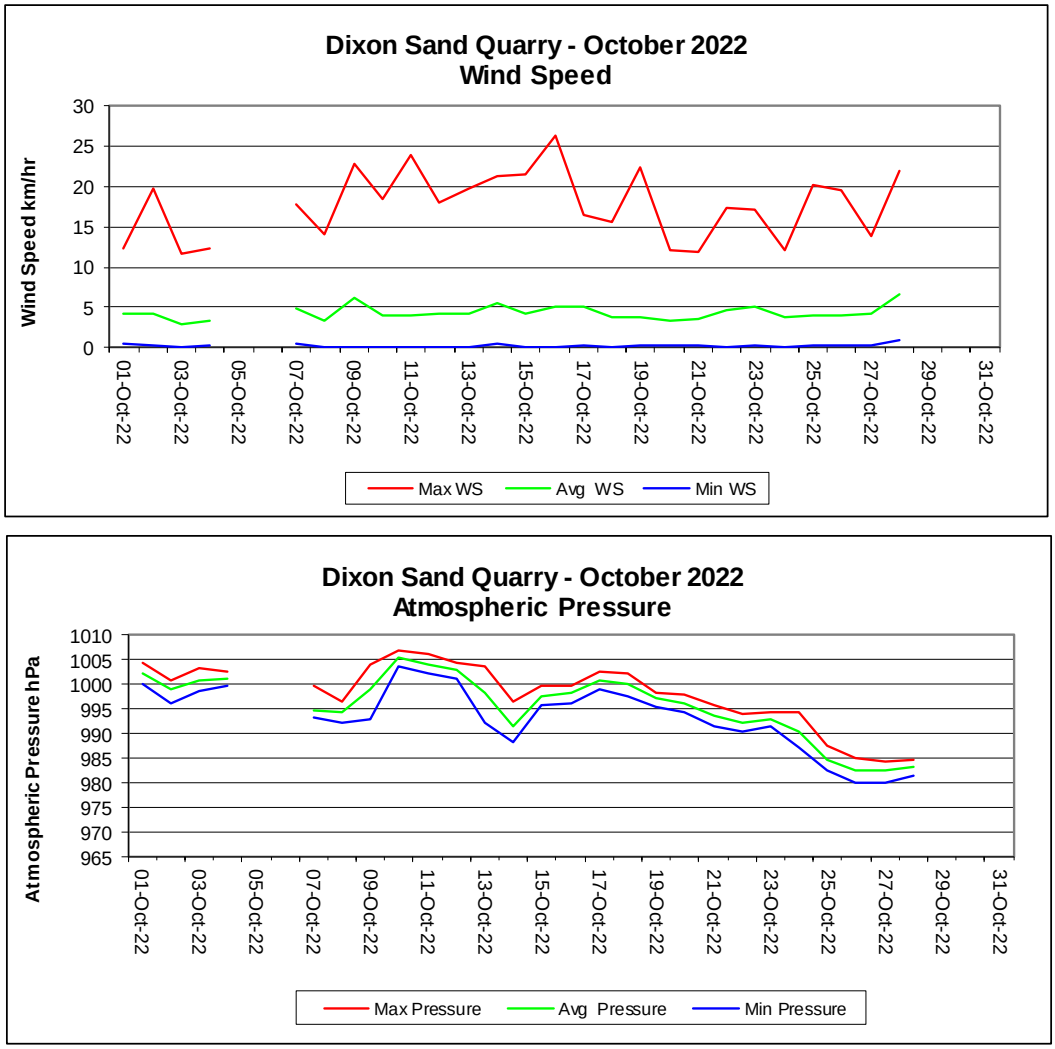
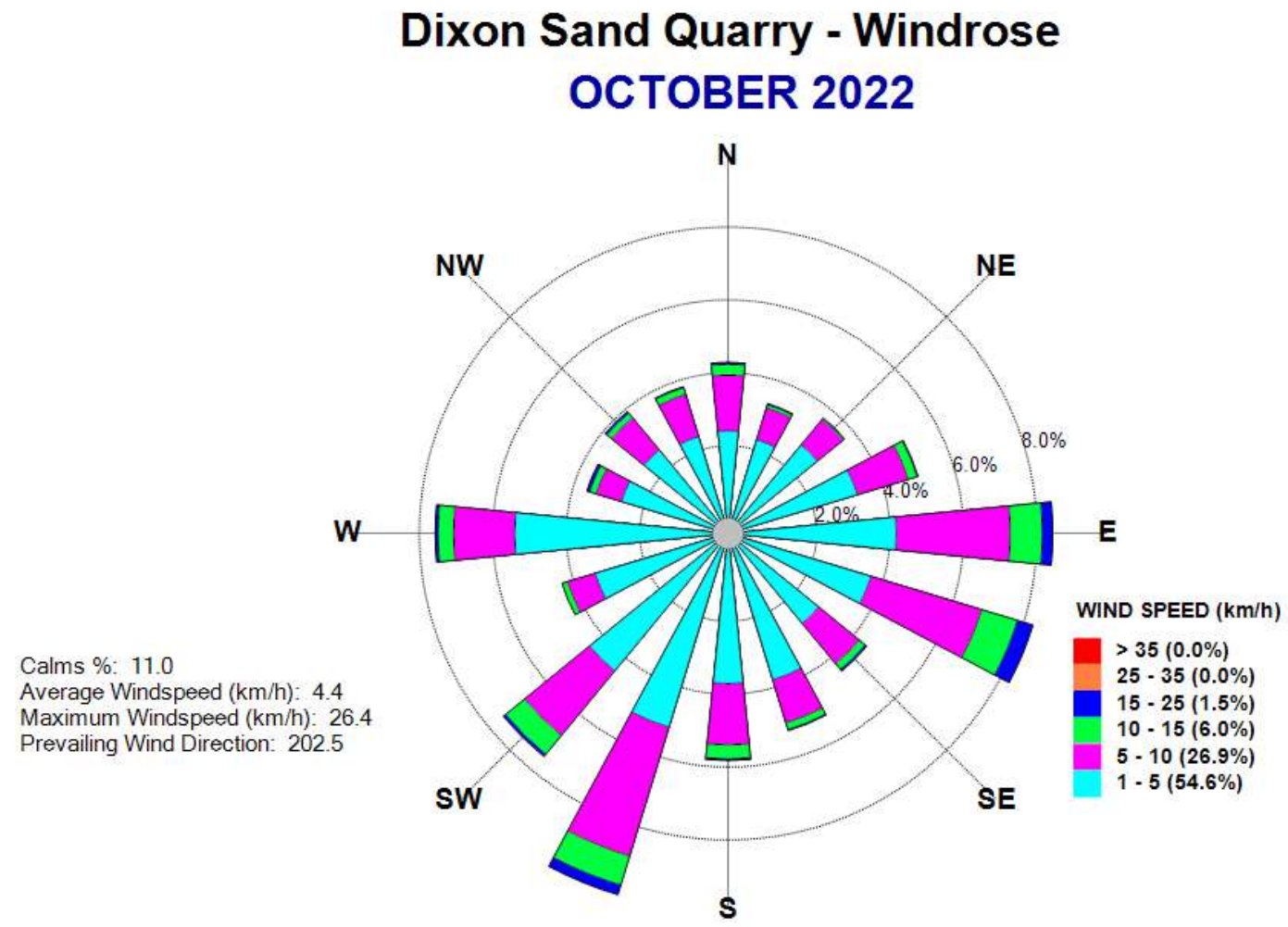


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
OCTOBER 2022
N
NE
E
SE
S
SW
W
NW
2.0%
4.0%
6.0%
8.0%
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.0%)
15 - 25 (1.5%)
10 - 15 (6.0%)
5 - 10 (26.9%)
1 - 5 (54.6%)
Calms %: 11.0
Average Windspeed (km/h): 4.4
Maximum Windspeed (km/h): 26.4
Prevailing Wind Direction: 202.5

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

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NOVEMBER 2022

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 22 December 2022

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

1.0 Summary

CBased Environmental Pty Limited 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 programme includes:

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

This monthly report for November 2022 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results;
- Meteorological results; and

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

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/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. Year to date annual average for PM_{10} is calculated from 1 July 2022 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 97% of valid meteorological data was recorded for November 2022 due power outages.

Approximately 94% of TEOM valid data was available for November 2022. Loss of valid data was due to a power outage in late October-early November 2022.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*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*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

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.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand 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 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/m3.

Approximately 94% of TEOM valid data was available for November 2022. Loss of valid data was due to a power outage in late October-early November 2022.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry 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/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2022 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted in September 2022 with the next calibration due to be completed in December 2022. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for November 2022 from AQMS and Annual Average PM_{10} calculated from the 1 July 2022.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/11/2022	ND	9.8	ND	24.6
2/11/2022	ND	9.8	ND	24.6
3/11/2022	10.7	9.9	26.8	24.6
4/11/2022	13.5	9.9	33.8	24.7
5/11/2022	13.0	9.9	32.5	24.8
6/11/2022	9.8	9.9	24.5	24.8
7/11/2022	11.3	9.9	28.3	24.8
8/11/2022	10.0	9.9	25.0	24.8
9/11/2022	11.7	9.9	29.3	24.9
10/11/2022	9.8	9.9	24.5	24.9
11/11/2022	15.1	10.0	37.8	25.0
12/11/2022	11.2	10.0	28.0	25.0
13/11/2022	13.6	10.0	34.0	25.1
14/11/2022	17.2	10.1	43.0	25.2
15/11/2022	8.6	10.1	21.5	25.2
16/11/2022	9.9	10.1	24.8	25.2
17/11/2022	9.8	10.1	24.5	25.2
18/11/2022	11.4	10.1	28.5	25.2
19/11/2022	13.7	10.1	34.3	25.3
20/11/2022	11.6	10.1	29.0	25.3
21/11/2022	23.5	10.2	58.8	25.6
22/11/2022	11.6	10.2	29.0	25.6
23/11/2022	16.2	10.3	40.5	25.7
24/11/2022	13.6	10.3	34.0	25.8
25/11/2022	24.8	10.4	62.0	26.1
26/11/2022	13.3	10.5	33.3	26.1
27/11/2022	14.5	10.5	36.3	26.2
28/11/2022	16.4	10.5	41.0	26.3
29/11/2022	14.8	10.6	37.0	26.4
30/11/2022	22.7	10.7	56.8	26.6

*Calculated from PM10

**Calculated from PM10 Annual Average

ND (No Valid Data) – when displayed, indicates when no valid 1-hour data is available to calculate a 24hr average. Power outage 29/10/22 - 2/11/22

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 highlighted in yellow, when applicable

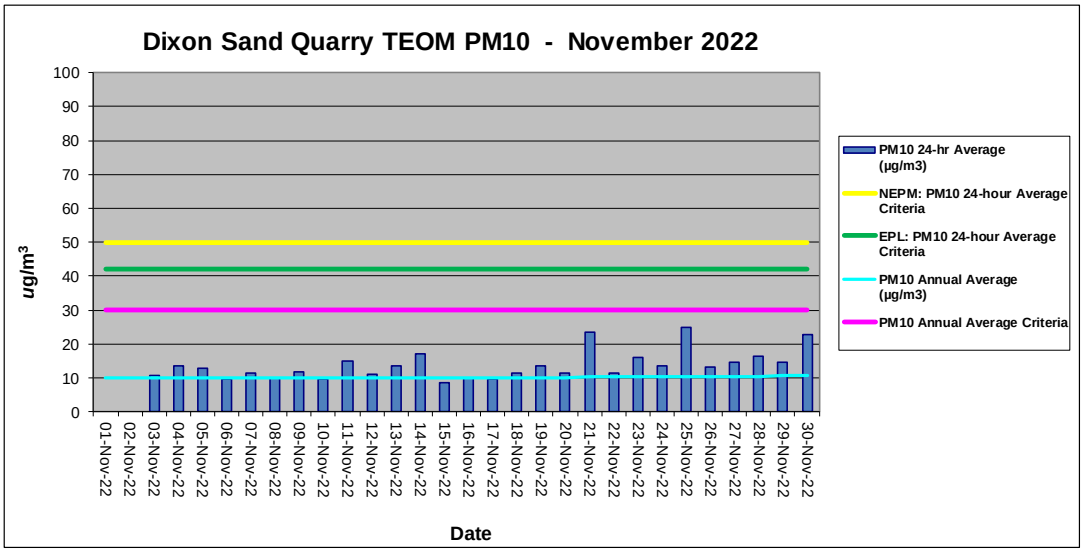


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

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.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. 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.

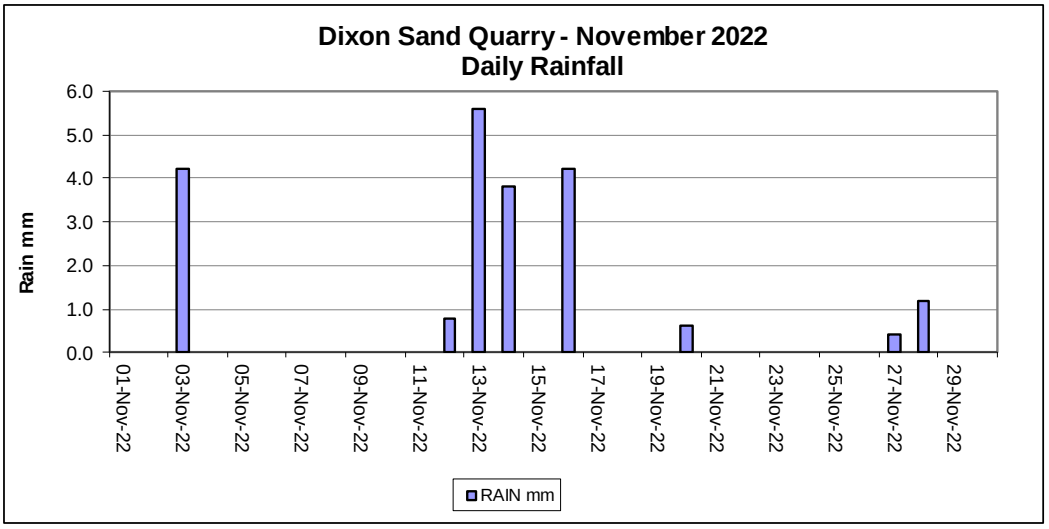
An annual physical screening and system check of the meteorological station was conducted March 2022 and is next due in March 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

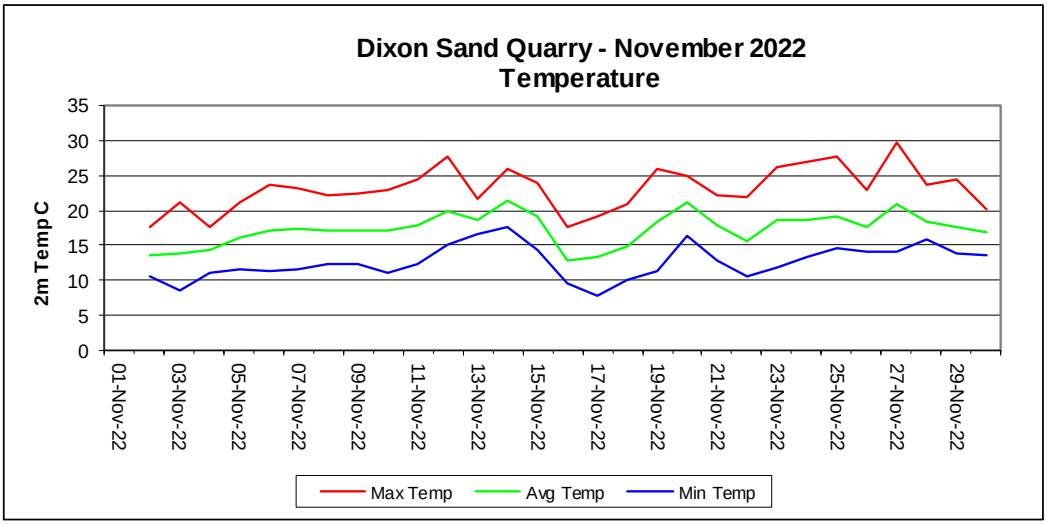
Approximately 97% of valid meteorological data was recorded for November 2022 due power outages.

Table 3: *Meteorological Data Summary for November 2022*

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/11/2022													
2/11/2022	10.5	13.6	17.6	0.0	0.5	5.6	19.5	29.0	41.8	57.5	986.3	990.4	993.3
3/11/2022	8.6	14.0	21.1	4.2	0.2	5.3	20.1	30.5	60.5	99.9	992.5	996.4	1003.7
4/11/2022	11.2	14.4	17.7	0.0	0.1	3.6	13.8	64.2	88.1	100.0	1003.5	1006.0	1008.7
5/11/2022	11.6	16.1	21.1	0.0	0.1	3.8	19.1	55.5	81.3	100.0	1005.1	1007.4	1009.3
6/11/2022	11.4	17.1	23.6	0.0	0.0	4.4	23.4	41.1	80.6	100.0	1001.1	1004.2	1006.9
7/11/2022	11.7	17.3	23.1	0.0	0.1	4.4	21.8	50.2	81.9	100.0	999.1	1001.7	1003.5
8/11/2022	12.3	17.2	22.2	0.0	0.1	4.8	34.4	50.5	79.8	100.0	998.5	1000.6	1002.3
9/11/2022	12.4	17.0	22.3	0.0	0.0	5.0	24.2	43.6	74.8	100.0	1000.4	1001.6	1002.9
10/11/2022	11.0	17.0	22.9	0.0	0.0	4.0	23.4	47.3	75.6	99.9	996.7	1000.0	1002.8
11/11/2022	12.3	17.8	24.4	0.0	0.1	4.3	24.0	43.9	78.2	100.0	991.3	993.8	997.6
12/11/2022	15.0	19.8	27.6	0.8	0.2	5.1	20.6	45.5	83.2	100.0	990.2	991.9	994.0
13/11/2022	16.5	18.7	21.6	5.6	0.2	5.4	22.0	99.9	99.9	99.9	982.5	988.6	993.6
14/11/2022	17.6	21.3	25.9	3.8	0.5	6.0	32.8	27.9	60.8	100.0	978.7	982.7	987.9
15/11/2022	14.3	19.0	23.9	0.0	0.0	3.5	17.6	34.4	51.9	88.4	985.2	987.4	989.9
16/11/2022	9.5	12.8	17.6	4.2	0.2	4.0	39.2	27.0	59.8	99.9	988.6	990.3	994.0
17/11/2022	7.8	13.3	19.2	0.0	0.0	3.4	16.5	34.9	68.2	99.9	992.3	993.9	996.2
18/11/2022	10.2	15.0	20.8	0.0	0.2	3.9	17.8	35.8	72.8	100.0	992.6	994.6	996.5
19/11/2022	11.4	18.4	25.9	0.0	0.1	4.8	16.8	34.6	73.9	100.0	980.8	988.1	994.1
20/11/2022	16.3	21.2	24.9	0.6	0.5	6.2	28.5	22.2	46.9	100.0	974.8	979.6	985.2
21/11/2022	12.8	17.9	22.2	0.0	0.7	7.2	44.1	25.0	36.6	46.6	982.6	984.8	990.0
22/11/2022	10.5	15.5	21.8	0.0	0.2	5.1	26.1	23.9	39.8	56.4	988.7	991.8	994.5
23/11/2022	11.9	18.7	26.2	0.0	0.1	3.2	16.3	28.6	46.8	65.7	992.2	993.9	996.9
24/11/2022	13.4	18.7	26.8	0.0	0.2	4.5	21.9	29.4	67.8	100.0	994.7	997.1	999.4
25/11/2022	14.5	19.2	27.7	0.0	0.1	4.8	25.7	29.3	77.7	99.9	993.2	996.3	999.3
26/11/2022	14.2	17.5	22.9	0.0	0.2	5.1	29.4	47.5	79.0	99.9	989.7	992.8	995.9
27/11/2022	14.2	20.9	29.7	0.4	0.0	4.9	19.4	32.3	71.4	100.0	979.9	984.3	989.9
28/11/2022	15.8	18.3	23.6	1.2	0.2	5.1	22.0	65.4	93.1	100.0	983.4	986.1	989.5
29/11/2022	13.9	17.5	24.5	0.0	0.1	5.3	24.3	26.0	72.4	99.9	988.5	992.5	998.3
30/11/2022	13.5	16.8	20.1	0.0	0.2	4.2	21.8	52.9	68.8	88.6	995.0	997.4	999.2
Monthly	**7.8**	**17.3**	**29.7**	**20.8**	**0.0**	**4.7**	**44.1**	**22.2**	**69.4**	**100.0**	**974.8**	**993.7**	**1009.3**

No data due to power outages





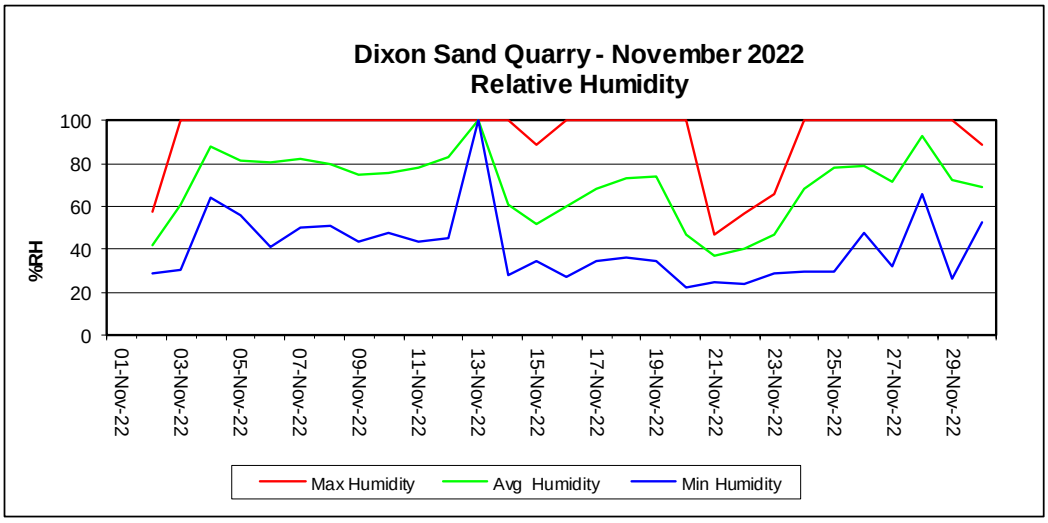


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

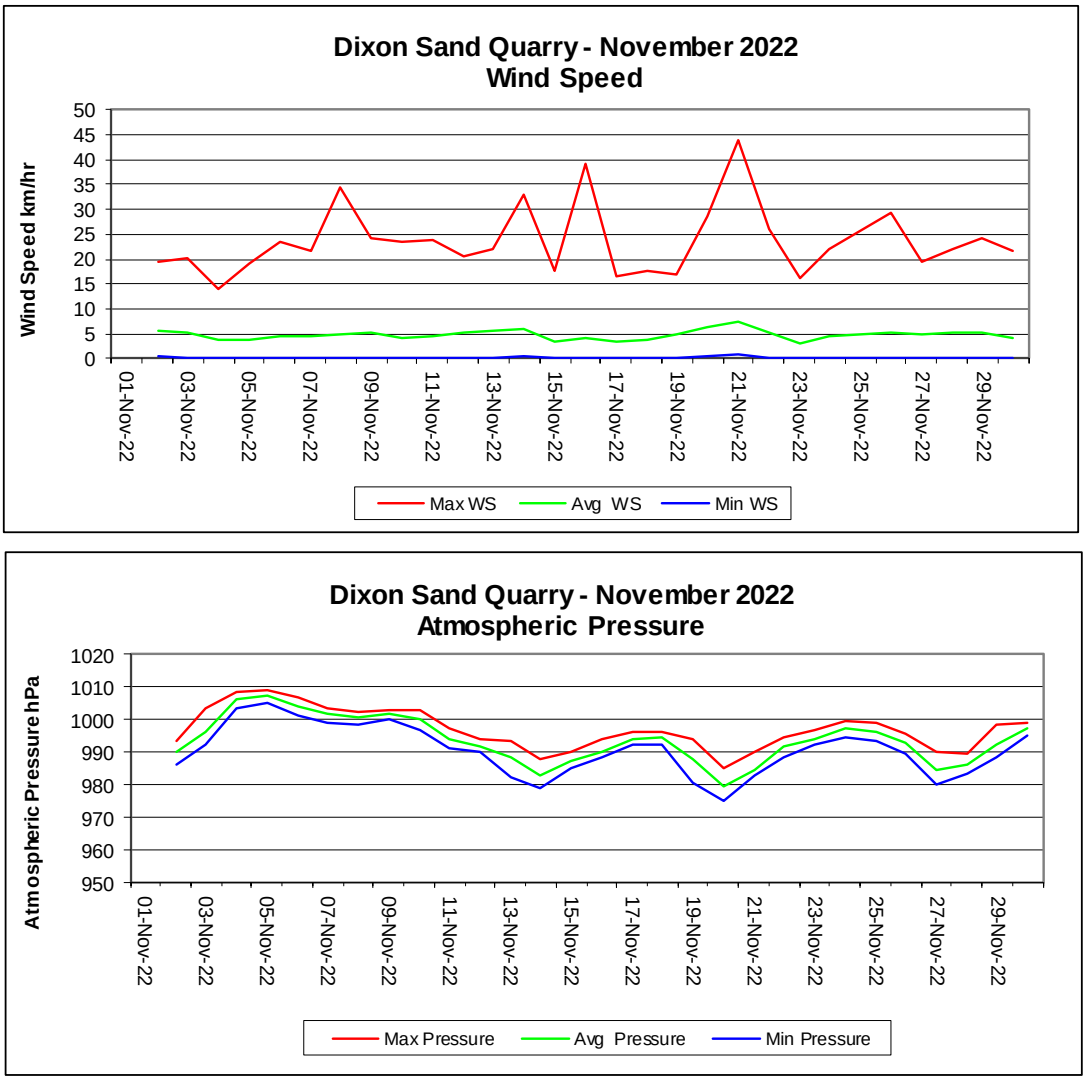


Figure 3: *Wind Speed and Atmospheric Pressure Charts*

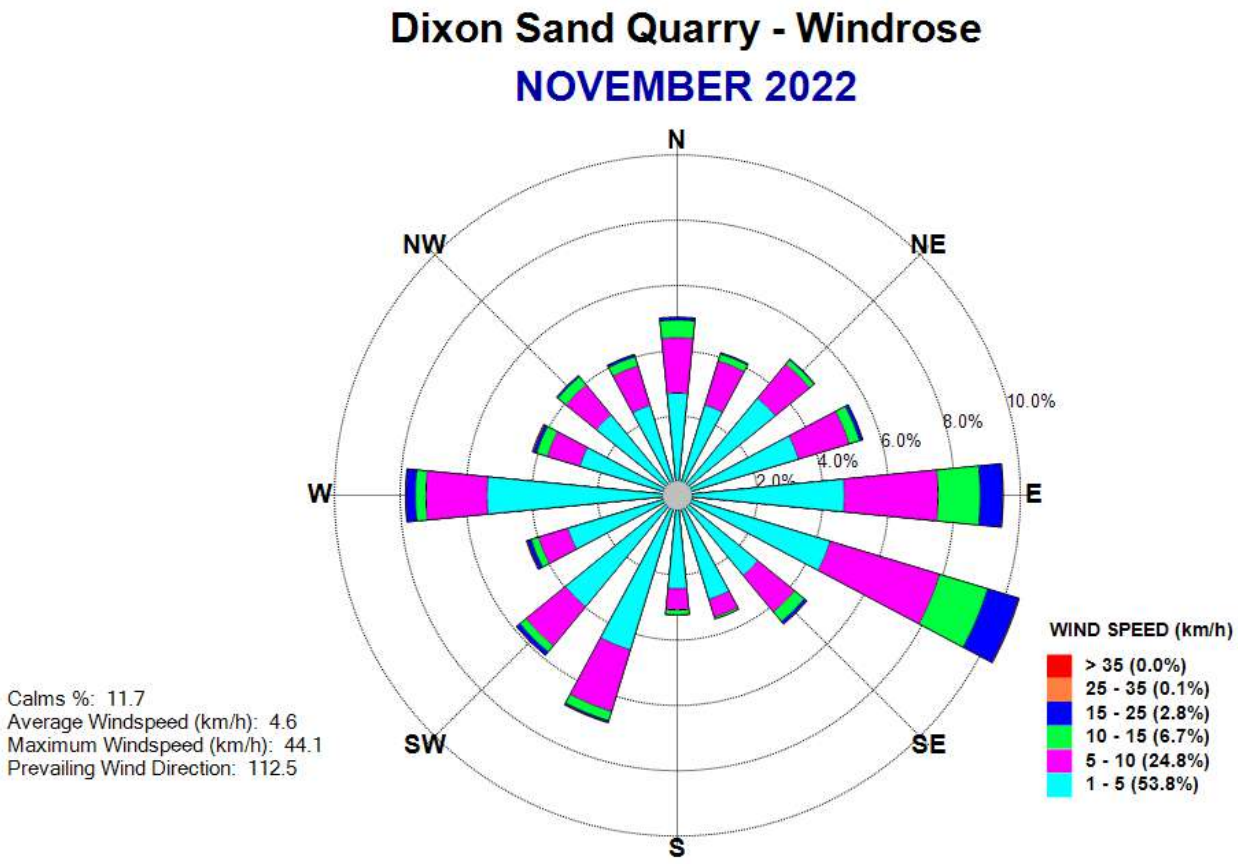


Figure 4: *Monthly Windrose*

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

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DECEMBER 2022

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 24 January 2023

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

1.0 Summary

CBased Environmental Pty Limited 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.

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- One continuous Meteorological Station.

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- TEOM (PM_{10}) monitoring results;
- Meteorological results; and

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

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/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. Year to date annual average for PM_{10} is calculated from 1 July 2022 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has now been collected.

Approximately 100% of valid meteorological data was recorded for December 2022 due power outages.

Approximately 100% of TEOM valid data was available for December 2022.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

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- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

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.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand 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 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/m3.

Approximately 100% of TEOM valid data was available for December 2022.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry 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/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2022 and therefore an annual amount of data has now been collected.

The quarterly TEOM calibration was conducted on 2 December 2022 with the next calibration due to be completed in March 2023. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for December 2022 from AQMS and Annual Average PM_{10} calculated from the 1 July 2022.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/12/2022	15.7	10.7	39.3	26.7
2/12/2022	14.2	10.7	35.5	26.8
3/12/2022	10.8	10.7	27.0	26.8
4/12/2022	9.2	10.7	23.0	26.8
5/12/2022	18.8	10.8	47.0	26.9
6/12/2022	17.6	10.8	44.0	27.0
7/12/2022	20.3	10.9	50.8	27.2
8/12/2022	15.6	10.9	39.0	27.3
9/12/2022	17.9	11.0	44.8	27.4
10/12/2022	17.8	11.0	44.5	27.5
11/12/2022	14.6	11.0	36.5	27.6
12/12/2022	18.3	11.1	45.8	27.7
13/12/2022	19.1	11.1	47.8	27.9
14/12/2022	18.4	11.2	46.0	28.0
15/12/2022	16.4	11.2	41.0	28.1
16/12/2022	13.6	11.2	34.0	28.1
17/12/2022	12.9	11.3	32.3	28.1
18/12/2022	7.4	11.2	18.5	28.1
19/12/2022	20.1	11.3	50.3	28.2
20/12/2022	18.1	11.3	45.3	28.3
21/12/2022	10.2	11.3	25.5	28.3
22/12/2022	12.2	11.3	30.5	28.3
23/12/2022	12.0	11.3	30.0	28.3
24/12/2022	10.3	11.3	25.8	28.3
25/12/2022	22.1	11.4	55.3	28.5
26/12/2022	9.9	11.4	24.8	28.5
27/12/2022	10.2	11.4	25.5	28.4
28/12/2022	13.9	11.4	34.8	28.5
29/12/2022	19.9	11.4	49.8	28.6
30/12/2022	11.2	11.4	28.0	28.6
31/12/2022	12.1	11.4	30.3	28.6

*Calculated from PM10

**Calculated from PM10 Annual Average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 highlighted in yellow, when applicable

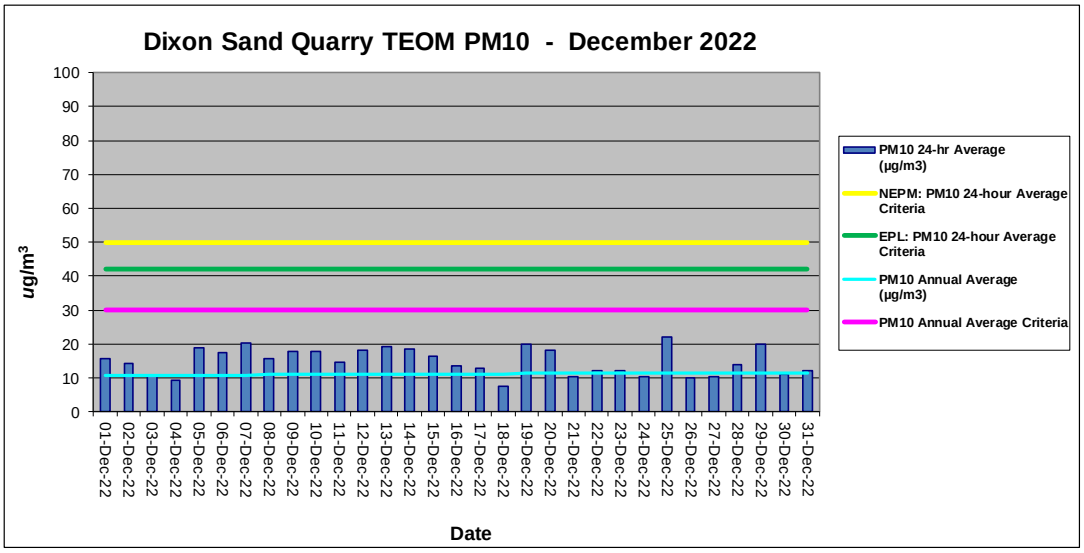


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

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.

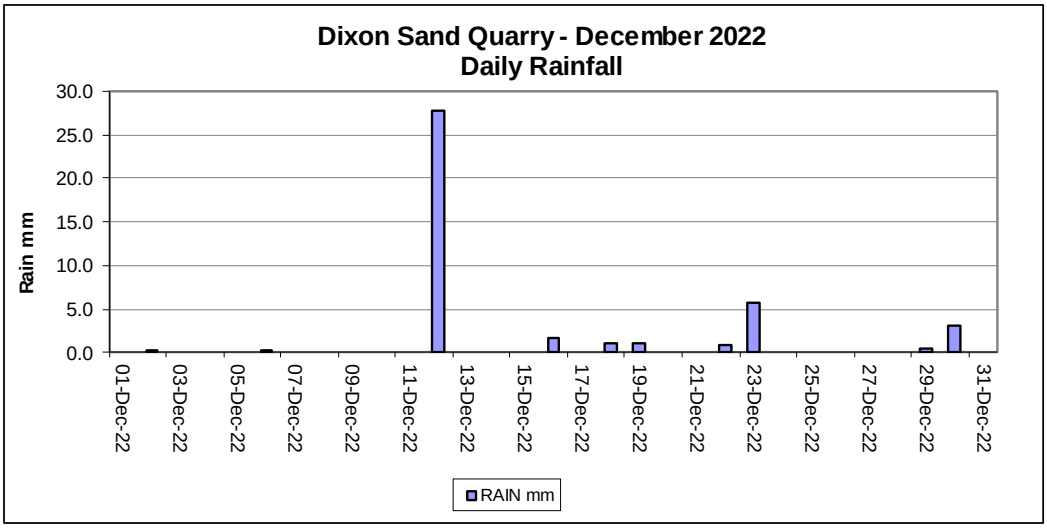
A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

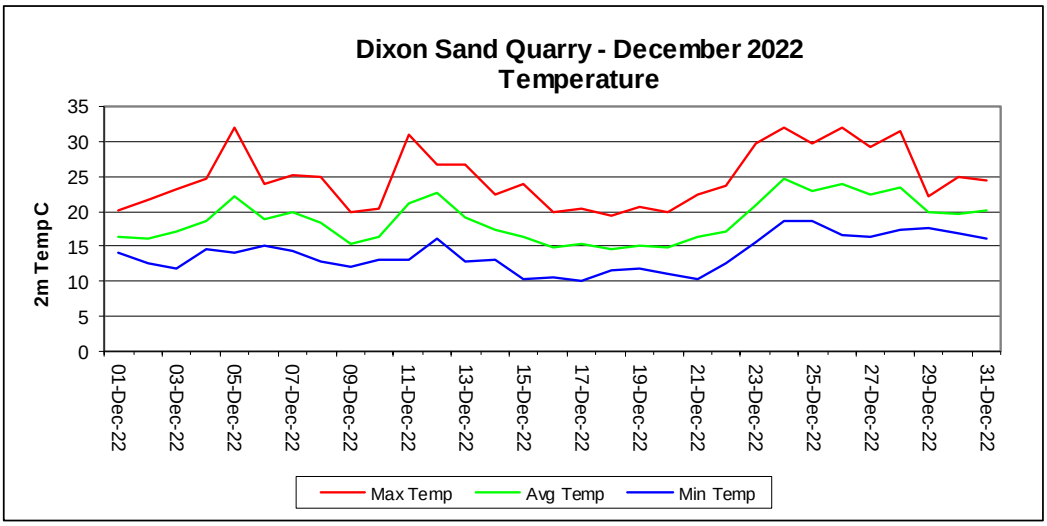
An annual physical screening and system check of the meteorological station was conducted March 2022 and is next due in March 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

Approximately 100% of valid meteorological data was recorded for December 2022.

Table 3: *Meteorological Data Summary for December 2022*

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/12/2022	14.0	16.4	20.1	0.0	0.0	3.8	19.4	50.6	80.2	100.0	994.1	995.6	997.0
2/12/2022	12.5	16.1	21.6	0.2	0.1	4.7	21.3	47.9	83.7	100.0	994.8	996.6	998.8
3/12/2022	11.9	17.2	23.1	0.0	0.0	4.2	21.0	44.9	77.4	100.0	995.5	997.5	999.4
4/12/2022	14.5	18.7	24.6	0.0	0.2	4.1	23.4	40.6	76.3	100.0	992.4	995.4	997.8
5/12/2022	14.1	22.1	32.0	0.0	0.2	4.6	15.0	27.5	72.3	100.0	982.7	987.4	993.5
6/12/2022	15.0	18.8	24.0	0.2	0.0	5.4	33.8	44.3	82.4	100.0	985.3	987.1	989.9
7/12/2022	14.3	19.8	25.1	0.0	0.1	4.3	25.1	30.6	65.8	99.9	981.6	985.4	988.9
8/12/2022	12.8	18.4	25.0	0.0	0.1	5.8	31.9	19.7	50.6	80.3	982.5	986.4	992.8
9/12/2022	12.0	15.5	19.8	0.0	0.1	4.3	23.4	47.2	65.4	95.9	991.6	993.6	997.4
10/12/2022	13.2	16.4	20.5	0.0	0.2	3.9	17.1	54.7	73.2	95.9	994.3	996.7	999.0
11/12/2022	13.2	21.2	30.9	0.0	0.0	4.8	19.1	30.7	69.4	100.0	986.0	990.7	995.7
12/12/2022	16.1	22.7	26.7	27.8	0.5	7.8	30.6	26.9	49.7	99.9	979.8	983.0	989.0
13/12/2022	12.9	19.2	26.7	0.0	0.1	4.1	18.6	22.2	40.1	65.0	985.7	988.5	990.8
14/12/2022	13.1	17.4	22.3	0.0	0.0	3.4	24.6	19.2	43.5	90.2	986.0	987.9	989.7
15/12/2022	10.4	16.3	23.9	0.0	0.0	4.2	20.1	25.4	50.3	80.2	987.0	988.8	991.6
16/12/2022	10.7	14.9	20.0	1.6	0.1	4.2	13.5	38.9	69.7	100.0	991.2	994.3	998.4
17/12/2022	10.0	15.3	20.5	0.0	0.1	5.5	17.8	48.4	74.4	100.0	997.3	999.7	1001.8
18/12/2022	11.7	14.7	19.3	1.0	1.0	5.5	15.5	52.9	86.8	99.9	1000.1	1001.5	1002.7
19/12/2022	11.9	15.1	20.6	1.0	0.2	5.3	19.5	40.8	73.5	100.0	1001.2	1002.8	1004.2
20/12/2022	11.0	14.9	19.8	0.0	0.1	4.2	21.5	49.8	74.5	99.9	998.7	1001.0	1003.2
21/12/2022	10.3	16.3	22.4	0.0	0.0	4.8	23.2	43.2	75.2	100.0	994.8	997.4	1000.1
22/12/2022	12.5	17.0	23.7	0.8	0.2	3.4	16.7	41.7	84.8	100.0	992.8	994.7	996.5
23/12/2022	15.5	21.0	29.7	5.8	0.1	4.0	38.4	37.9	80.5	100.0	987.8	990.7	993.1
24/12/2022	18.5	24.8	31.9	0.0	0.0	4.8	20.5	26.0	62.0	100.0	988.1	990.2	992.9
25/12/2022	18.7	22.9	29.6	0.0	0.1	4.9	18.2	52.0	82.5	100.0	992.6	995.5	998.5
26/12/2022	16.7	23.8	32.0	0.0	0.0	4.4	22.9	18.6	67.8	99.9	998.3	1000.0	1001.9
27/12/2022	16.4	22.4	29.2	0.0	0.0	5.9	22.9	40.0	77.8	100.0	999.3	1001.1	1003.6
28/12/2022	17.3	23.3	31.4	0.0	0.0	5.0	20.7	21.7	74.0	100.0	990.6	994.7	999.5
29/12/2022	17.6	19.9	22.1	0.4	0.3	4.2	11.7	82.1	97.5	100.0	990.8	995.6	999.0
30/12/2022	16.8	19.6	25.0	3.0	0.2	5.6	23.4	52.9	87.6	100.0	995.5	997.3	999.2
31/12/2022	16.0	20.1	24.3	0.0	0.1	4.1	26.5	67.5	88.3	100.0	993.9	995.5	997.1
Monthly	**10.0**	**18.8**	**32.0**	**41.8**	**0.0**	**4.7**	**38.4**	**18.6**	**72.2**	**100.0**	**979.8**	**993.9**	**1004.2**





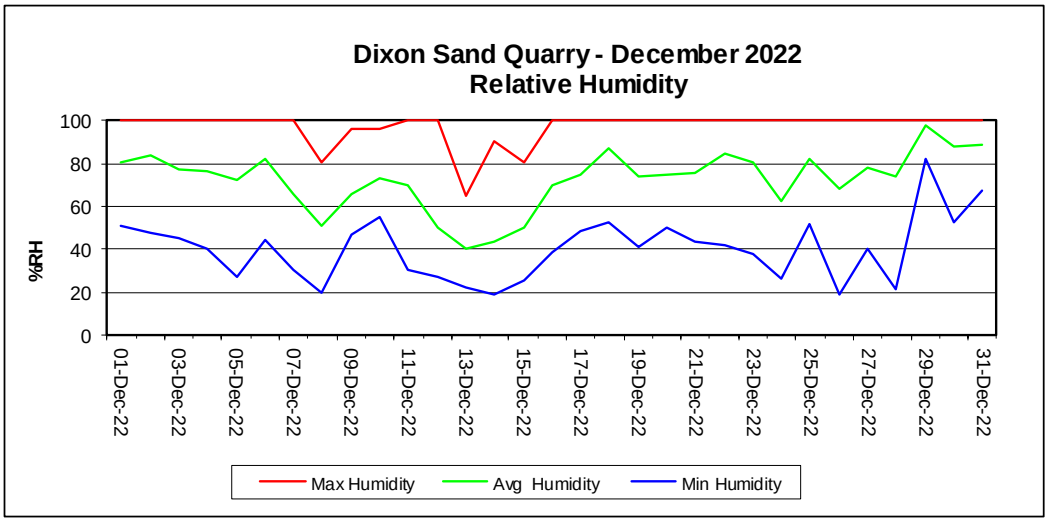


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

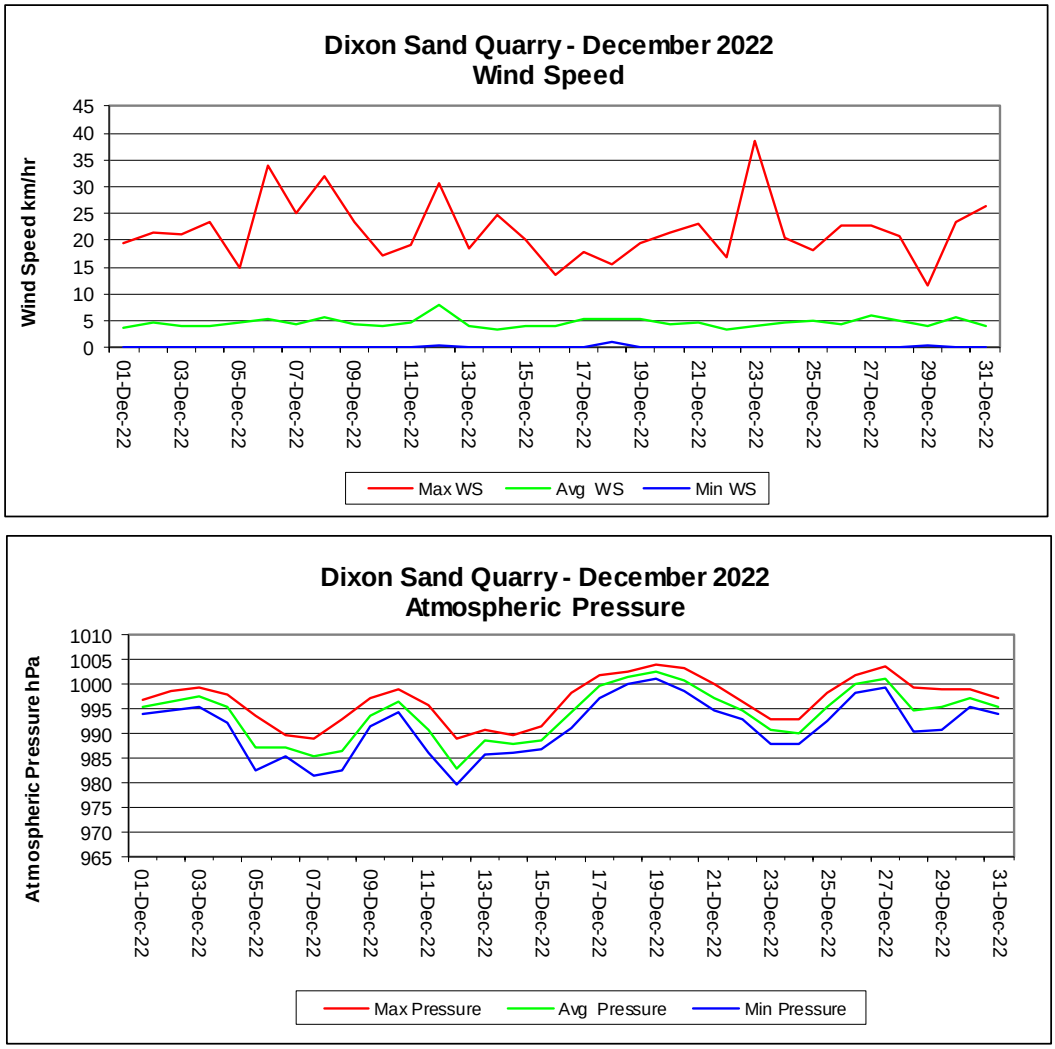


Figure 3: *Wind Speed and Atmospheric Pressure Charts*

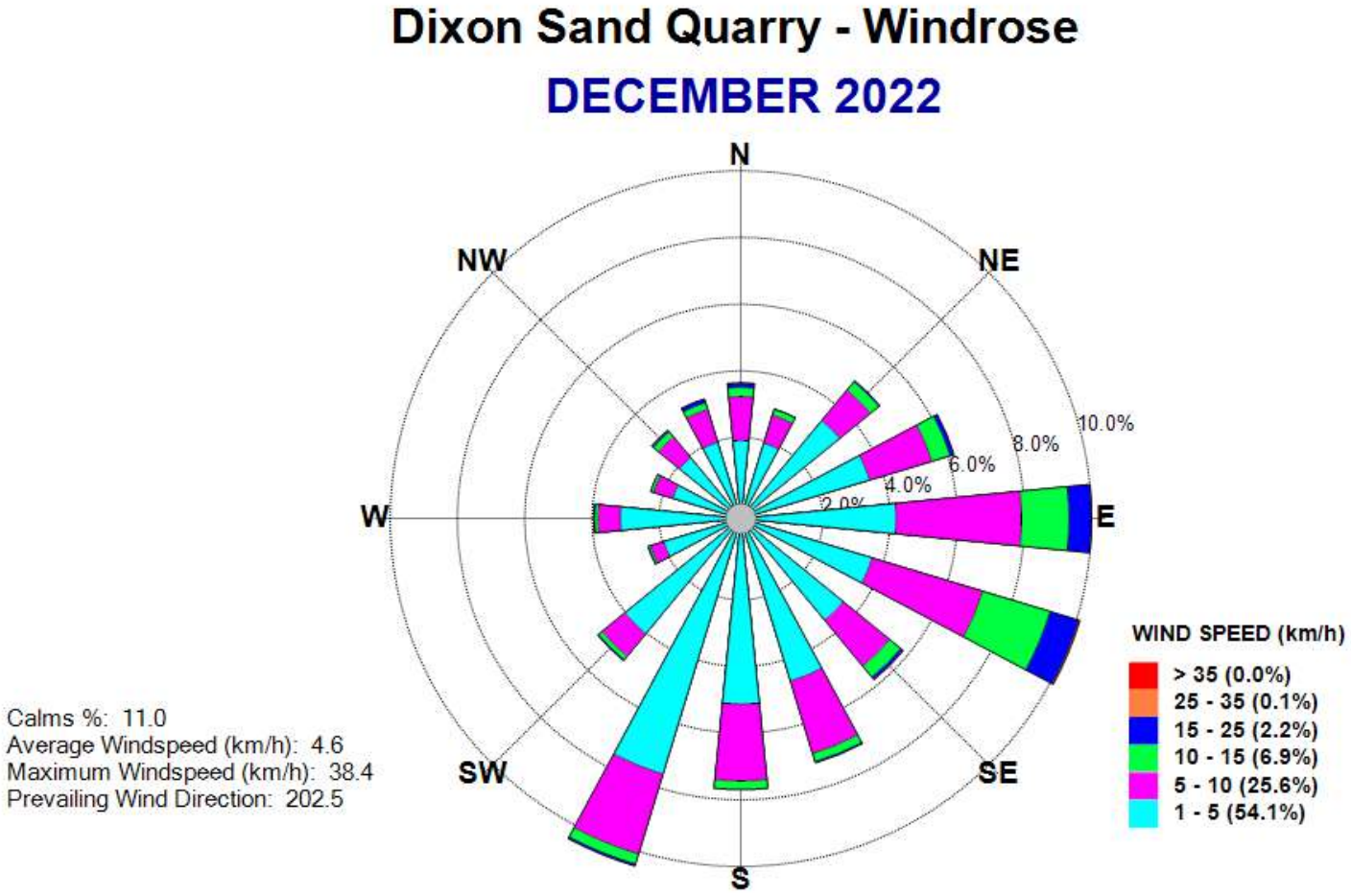


Figure 4: *Monthly Windrose*

Appendix 1

Calibration Documents (when required)

CARBON BASED ENVIRONMENTAL

Continuous Air Quality
Monthly/Quarterly/Six Monthly/Annual
TEOM Maintenance and Calibration – 1400AB

teledata

TEOM Client/Site: Dixon Sandy TEOM1 **Date:** 2/12/22

1. TEOM Data Screen **SERIAL No:** 2557U **Firmware:** NA AB ✓

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Operating Condition	Full of 4	Green - Normal	✓	
Date/time	TEOM: 2/12/22 11:50 Actual: 2/12/22 11:51	Current Date/time correct within 5 minutes	✓	
PM-10 24hr av	14.8	Positive values	✓	
Filter loading PM10	32	<80 %	✓	
Frequency PM-10	254.070200	200-300 Hz	✓	
Noise PM-10	0.033	<0.100ug	✓	

Comment: If filter load >80% but <90% and if flows Ok then data is OK

Comments:

2. System Status

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

Comments:

Data Downloaded: YES/NO (circle)

Technician Name : COLIN DANIEL **Signed**

3. Instrument Conditions Ambient Conditions and Temperatures

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Ambient Temperature	27.3	-10 to 50 C	✓	
Ambient Dew Point	NA	-10 to 50 C	✓	
Ambient Pressure	0.973	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	255.69714	255.69714	255.69713	255.69713

✓good.

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:

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 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 3.02 Error % 0.7 (allowed error <6%) PASS/FAIL

Bypass Flow verified Flow l/min 13.58 Error % 0.7 (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:** Adj recal → see over

2. Leak Check – Conducted YES/NO

PM10 actual 0.13 < Limit 0.15

Bypass actual 0.45 < Limit 0.60

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

Annual Calibration/Maintenance

1. Temperature and Pressure Calibration – Conducted YES/NO
Reference Temperature: 27.2 C TEOM Temperature 27.5 C
if difference +/- 1 C recalibrate sensor. Sensor recalibrated YES/NO

Reference Pressure: 0.975 atm TEOM Pressure 0.973 atm
if difference +/- 0.010 atm recalibrate sensor. Sensor recalibrated YES/NO

Ref = 1004
T = 27.2 °C
P = 987.9 mb
0.975 atm ✓ OK

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
PM10
Set point 2.4 Actual:_____
Set point 3.6 Actual:_____
Set point 3.0 Actual:_____ After calibration Final:_____l/min

Hardware Cal

	Pre	Post	
Fadj man	1.060	1.055	3.00 l/m
Fadj aux	1.000	1.005	13.72 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 13748 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. NA

4. Annual Noise check - Conducted YES/NO
Zero filter applied to TEOM and TEOM operated for at least 12 hours:
Start date/time: 9/10/22 0:00 Finish date/time: 9/10/22 18:00
Standard deviation of all recorded data (min 30 min averages) = 1-2 ug/m³
Noise was less than 5ug/m³ YES/NO

Average = 2.1 µg/m³ ✓ OK

5. Maintenance
Air Inlet system cleaned YES/NO
Pump Reconditioned YES/NO
Check Waterproofing 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

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JANUARY 2023

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 28 February 2023

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

1.0 Summary

CBased Environmental Pty Limited 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 programme includes:

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

This monthly report for January 2023 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results;
- Meteorological results; and

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

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/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. Year to date annual average for PM_{10} is calculated from 1 July 2022 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 100% of valid meteorological data was recorded for January 2023.

Approximately 92% of TEOM valid data was available for January 2023.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*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*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

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.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand 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 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/m3.

Approximately 92% of TEOM valid data was available for January 2023 due to power outages.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry 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/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2022 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted in December 2022 with the next calibration due to be completed in March 2023. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for January 2023 from AQMS and Annual Average PM_{10} calculated from the 1 July 2022.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/01/2023	13.9	11.5	34.8	28.7
2/01/2023	14.8	11.5	37.0	28.7
3/01/2023	18.4	11.5	46.0	28.8
4/01/2023	12.5	11.5	31.3	28.8
5/01/2023	11.6	11.5	29.0	28.8
6/01/2023	8.9	11.5	22.3	28.8
7/01/2023	10.8	11.5	27.0	28.8
8/01/2023	13.2	11.5	33.0	28.8
9/01/2023	12.7	11.5	31.8	28.8
10/01/2023	10.5	11.5	26.3	28.8
11/01/2023	15.7	11.5	39.3	28.9
12/01/2023	17.3	11.6	43.3	28.9
13/01/2023	14.6	11.6	36.5	29.0
14/01/2023	11.8	11.6	29.5	29.0
15/01/2023	13.3	11.6	33.3	29.0
16/01/2023	12.0	11.6	30.0	29.0
17/01/2023	11.1	11.6	27.8	29.0
18/01/2023	15.6	11.6	39.0	29.1
19/01/2023	11.5	11.6	28.8	29.1
20/01/2023	13.7	11.6	34.3	29.1
21/01/2023	12.1	11.6	30.3	29.1
22/01/2023	8.6	11.6	21.5	29.1
23/01/2023	10.6	11.6	26.5	29.0
24/01/2023	13.9	11.6	34.8	29.1
25/01/2023	7.8	11.6	19.6	29.0
26/01/2023	15.0	11.6	37.5	29.1
27/01/2023	24.7	11.7	61.8	29.2
28/01/2023	15.2	11.7	38.0	29.3
29/01/2023	ND	11.7	ND	29.3
30/01/2023	ND	11.7	ND	29.3
31/01/2023	ND	11.7	ND	29.3

*Calculated from PM10

**Calculated from PM10 Annual Average
Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 highlighted in yellow, when applicable

No Data (ND) = <18hrs hour of valid data to calculate a 24hr average

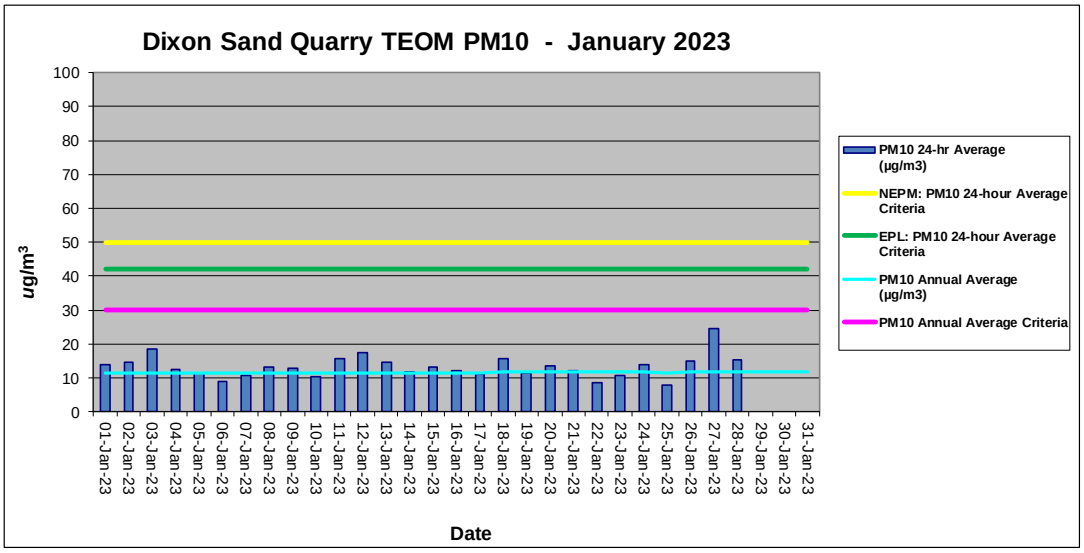


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

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.

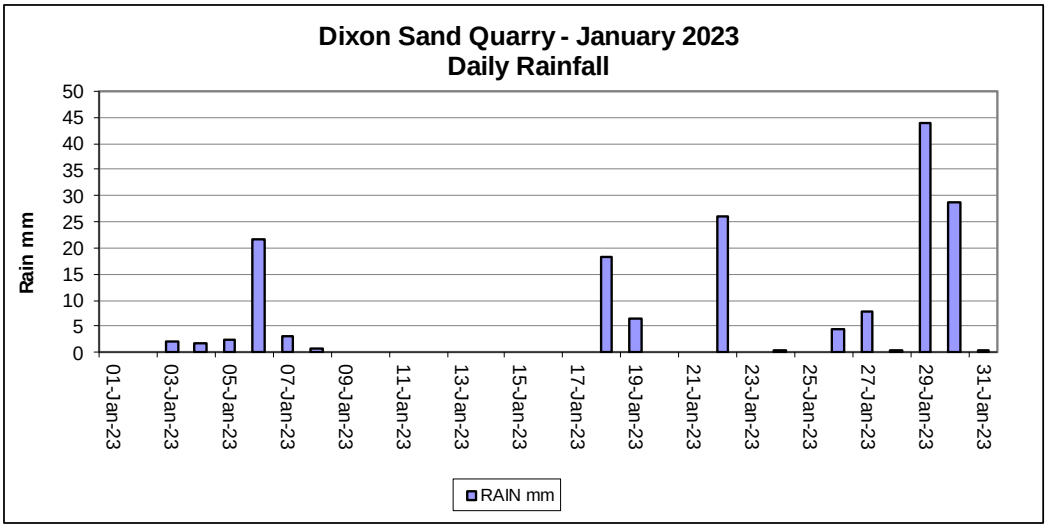
A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

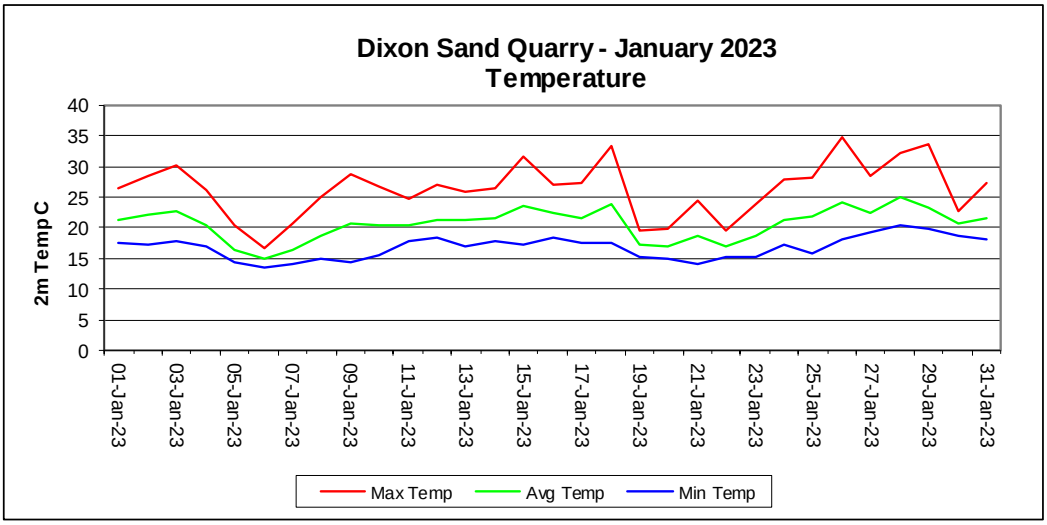
An annual physical screening and system check of the meteorological station was conducted March 2022 and is next due in March 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

Approximately 100% of valid meteorological data was recorded for January 2023.

Table 3: *Meteorological Data Summary for January 2023*

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/01/2023	17.6	21.3	26.5	0.0	0.1	4.7	22.0	56.3	84.4	100.0	993.5	995.1	996.7
2/01/2023	17.4	22.0	28.4	0.0	0.2	5.3	25.4	42.6	77.3	99.9	987.9	991.8	995.3
3/01/2023	17.9	22.8	30.1	2.2	0.1	5.3	23.9	45.5	78.6	99.9	983.1	985.8	988.8
4/01/2023	17.0	20.3	26.1	1.8	0.2	4.3	19.1	64.9	94.8	99.9	981.9	984.5	986.5
5/01/2023	14.3	16.5	20.3	2.4	0.9	6.6	18.2	60.2	85.2	99.9	986.5	989.7	992.8
6/01/2023	13.4	14.8	16.8	21.8	0.7	6.5	22.6	77.8	94.2	99.9	991.2	992.7	995.5
7/01/2023	14.1	16.4	20.8	3.2	0.5	4.4	13.9	66.1	94.4	99.9	993.1	994.5	995.6
8/01/2023	14.9	18.6	24.9	0.6	0.3	3.9	26.0	36.7	76.0	99.9	991.9	993.7	995.3
9/01/2023	14.5	20.6	28.8	0.0	0.1	4.3	22.2	39.5	74.6	100.0	990.8	992.7	994.7
10/01/2023	15.4	20.4	26.6	0.0	0.0	3.9	21.6	41.2	79.0	100.0	992.8	994.1	995.7
11/01/2023	17.7	20.3	24.7	0.0	0.2	4.3	18.4	61.8	83.5	100.0	992.9	994.9	996.3
12/01/2023	18.4	21.3	27.0	0.0	0.2	5.3	25.8	59.7	83.3	100.0	993.5	995.8	998.1
13/01/2023	17.1	21.2	25.9	0.0	0.1	4.5	23.8	61.0	85.0	100.0	996.4	998.1	999.8
14/01/2023	17.7	21.6	26.5	0.0	0.3	5.3	18.6	56.8	81.3	100.0	995.6	997.7	999.8
15/01/2023	17.2	23.5	31.6	0.0	0.1	4.7	25.4	36.5	74.9	100.0	993.8	996.4	999.1
16/01/2023	18.3	22.4	27.0	0.0	0.1	6.4	23.6	54.6	80.9	100.0	998.9	1000.8	1002.3
17/01/2023	17.6	21.6	27.2	0.0	0.2	3.7	17.5	56.9	84.6	100.0	995.9	998.9	1001.8
18/01/2023	17.6	23.8	33.3	18.4	0.1	5.2	33.4	29.9	75.6	99.9	985.3	990.7	996.4
19/01/2023	15.2	17.4	19.7	6.6	0.2	3.6	11.6	99.2	99.9	99.9	986.8	990.9	994.9
20/01/2023	15.1	17.1	19.9	0.0	0.1	3.4	12.6	69.0	91.1	100.0	993.4	996.1	998.3
21/01/2023	14.1	18.6	24.3	0.0	0.1	4.1	26.7	47.8	82.5	100.0	994.0	996.2	998.3
22/01/2023	15.2	17.0	19.5	26.2	0.2	2.6	8.7	88.6	99.4	100.0	994.0	995.4	996.8
23/01/2023	15.2	18.8	24.0	0.0	0.0	3.7	17.2	57.6	87.4	100.0	991.2	993.1	995.3
24/01/2023	17.2	21.3	27.9	0.4	0.0	4.3	22.6	53.1	85.4	99.9	988.7	991.8	993.6
25/01/2023	15.8	21.9	28.3	0.0	0.0	4.5	21.3	53.6	82.1	99.9	991.1	992.5	994.3
26/01/2023	18.0	24.0	34.7	4.6	0.1	3.9	18.6	23.9	77.9	99.9	989.9	992.6	995.2
27/01/2023	19.3	22.4	28.4	7.8	0.0	3.5	19.6	66.4	91.9	100.0	992.7	994.9	996.3
28/01/2023	20.3	25.1	32.2	0.2	0.0	4.0	17.7	49.5	83.2	100.0	989.6	992.9	995.3
29/01/2023	19.8	23.3	33.7	43.8	0.4	3.6	17.8	44.9	93.7	99.9	991.2	993.0	995.5
30/01/2023	18.7	20.6	22.7	28.6	0.0	4.8	16.4	99.8	99.8	99.9	986.5	989.8	994.5
31/01/2023	18.1	21.6	27.4	0.2	0.2	4.3	12.1	56.6	82.5	100.0	982.3	985.1	987.4
Monthly	**13.4**	**20.6**	**34.7**	**168.8**	**0.0**	**4.5**	**33.4**	**23.9**	**85.3**	**100.0**	**981.9**	**993.3**	**1002.3**





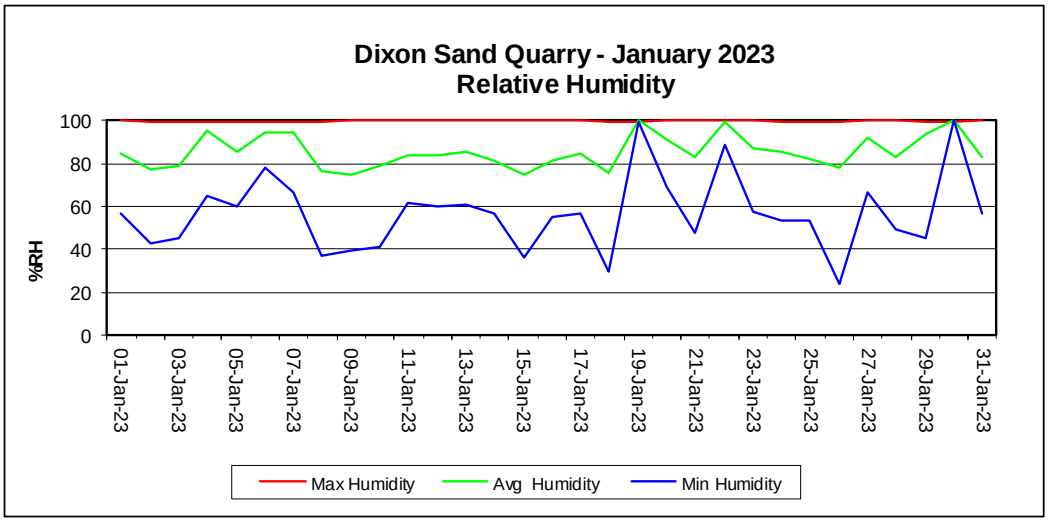


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

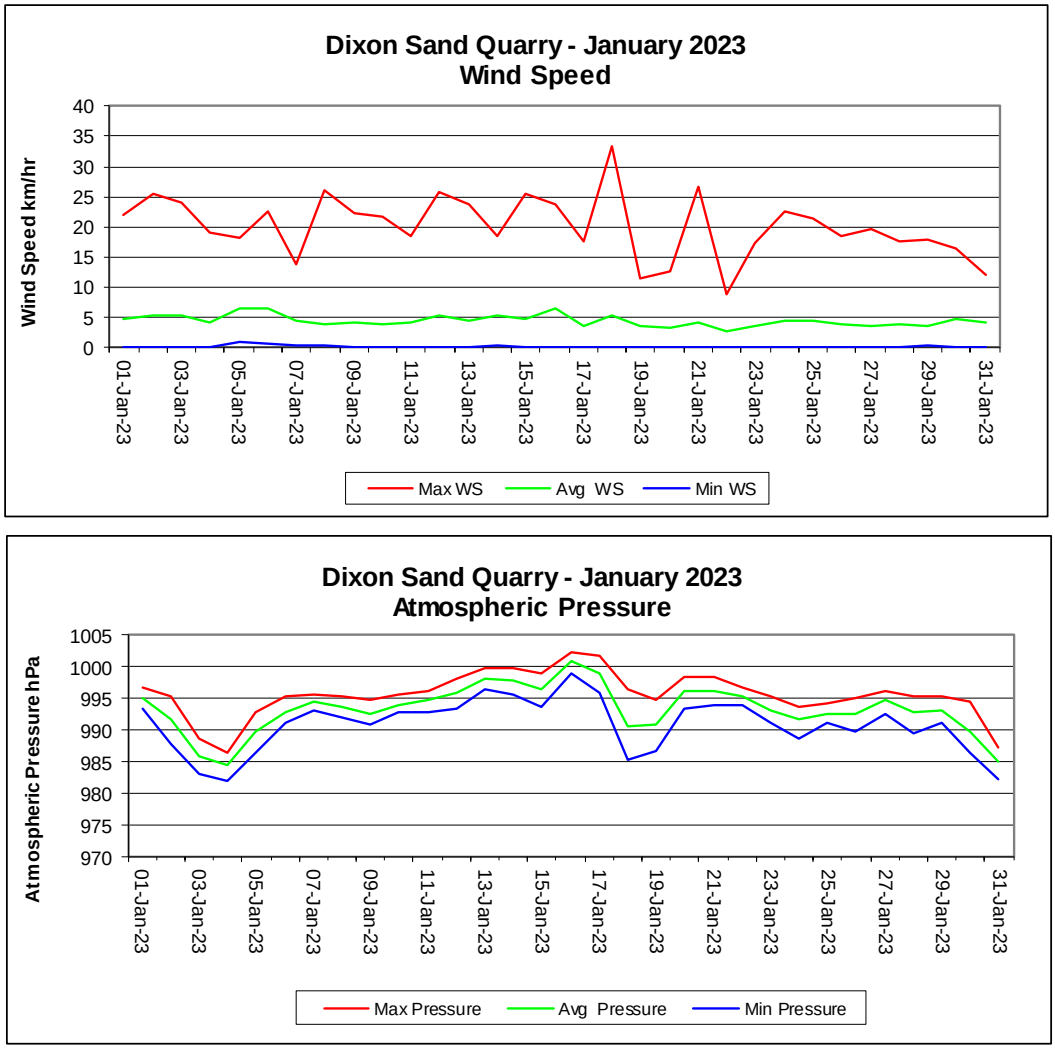


Figure 3: *Wind Speed and Atmospheric Pressure Charts*

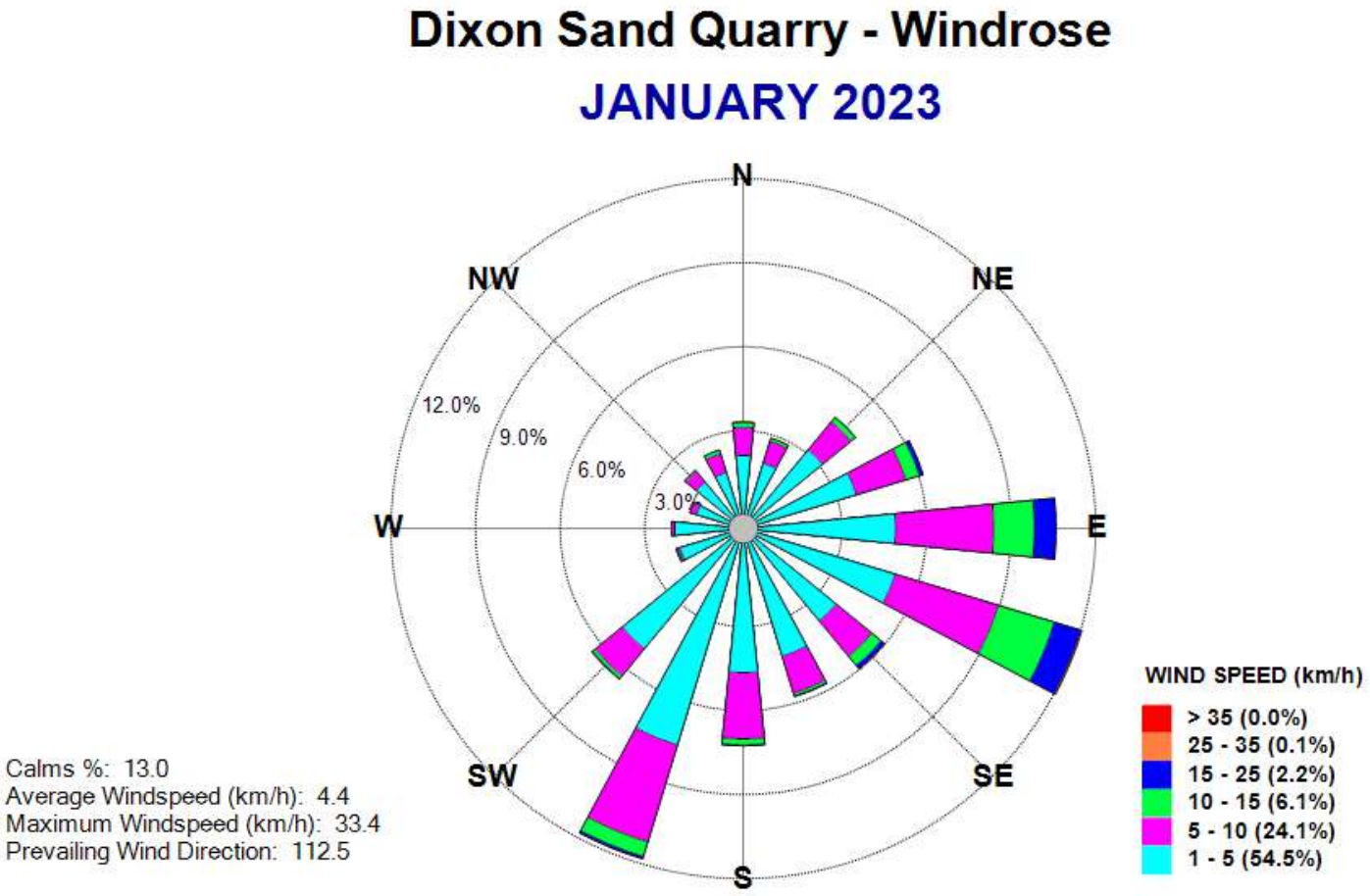


Figure 4: *Monthly Windrose*

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 2023

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 30 March 2023

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

1.0 Summary

CBased Environmental Pty Limited 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 programme includes:

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

This monthly report for February 2023 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results;
- Meteorological results; and

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

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/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. Year to date annual average for PM_{10} is calculated from 1 July 2022 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 96% of valid meteorological data was recorded for February 2023 due to a power outage on 19 February 2023.

Approximately 65% of TEOM valid data was available for February 2023 due to a flow fault and power issues. Main and bypass filter replaced on 19 February 2023.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*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*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

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.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand 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 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/m3.

Approximately 65% of TEOM valid data was available for February 2023 due to a flow fault and power issues. Main and bypass filter replaced on 9 February 2023. Calibration certificate after repair is provided in **Appendix 1**.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry 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/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2022 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted in December 2022 with the next calibration due to be completed in March 2023. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for February 2023 from AQMS and Annual Average PM_{10} calculated from the 1 July 2022.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/02/2023	ND	11.7	ND	29.3
2/02/2023	ND	11.7	ND	29.3
3/02/2023	ND	11.7	ND	29.3
4/02/2023	ND	11.7	ND	29.3
5/02/2023	ND	11.7	ND	29.3
6/02/2023	ND	11.7	ND	29.3
7/02/2023	ND	11.7	ND	29.3
8/02/2023	ND	11.7	ND	29.3
9/02/2023	ND	11.7	ND	29.3
10/02/2023	ND	11.7	ND	29.3
11/02/2023	14.2	11.7	35.5	29.3
12/02/2023	18.7	11.8	46.8	29.4
13/02/2023	22.1	11.8	55.3	29.5
14/02/2023	25.3	11.9	63.3	29.7
15/02/2023	13.4	11.9	33.5	29.7
16/02/2023	11.6	11.9	29.0	29.7
17/02/2023	16.0	11.9	40.0	29.8
18/02/2023	18.3	11.9	45.8	29.9
19/02/2023	17.9	12.0	44.8	29.9
20/02/2023	ND	12.0	ND	29.9
21/02/2023	17.2	12.0	43.0	30.0
22/02/2023	15.8	12.0	39.5	30.0
23/02/2023	12.3	12.0	30.8	30.1
24/02/2023	16.2	12.0	40.5	30.1
25/02/2023	12.9	12.0	32.3	30.1
26/02/2023	9.8	12.0	24.5	30.1
27/02/2023	12.0	12.0	30.0	30.1
28/02/2023	22.6	12.1	56.5	30.2

*Calculated from PM_{10}
**Calculated from PM_{10} Annual Average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m^3 highlighted in yellow, when applicable

No Data (ND) = <18hrs hour of valid data to calculate a 24hr average

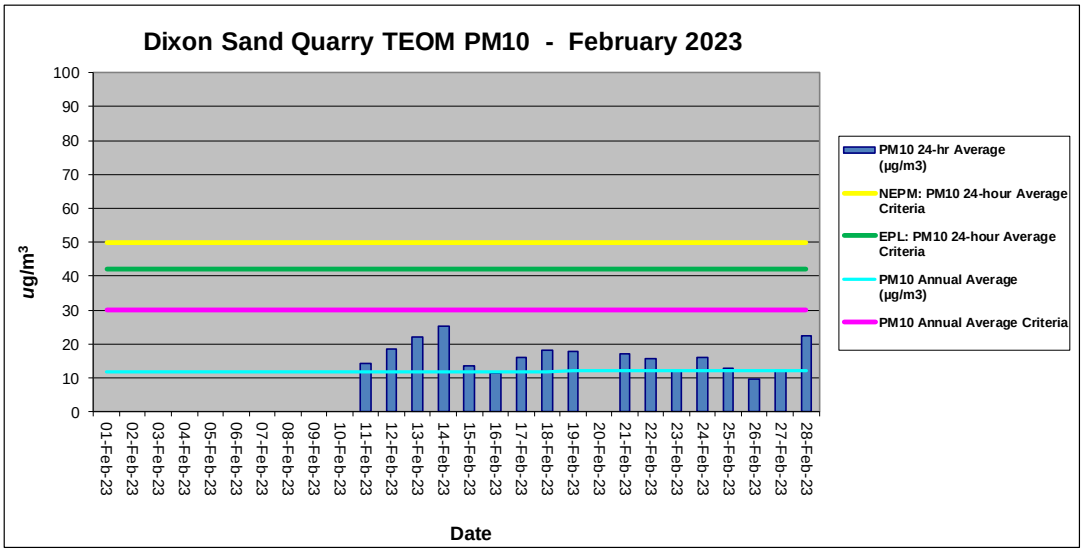


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

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.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. 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.

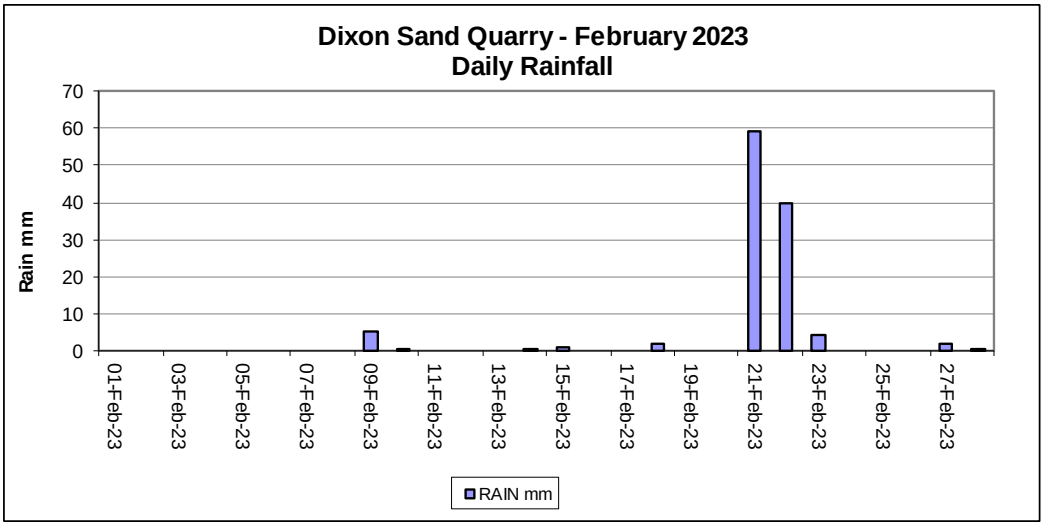
An annual physical screening and system check of the meteorological station was conducted March 2022 and is next due in March 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

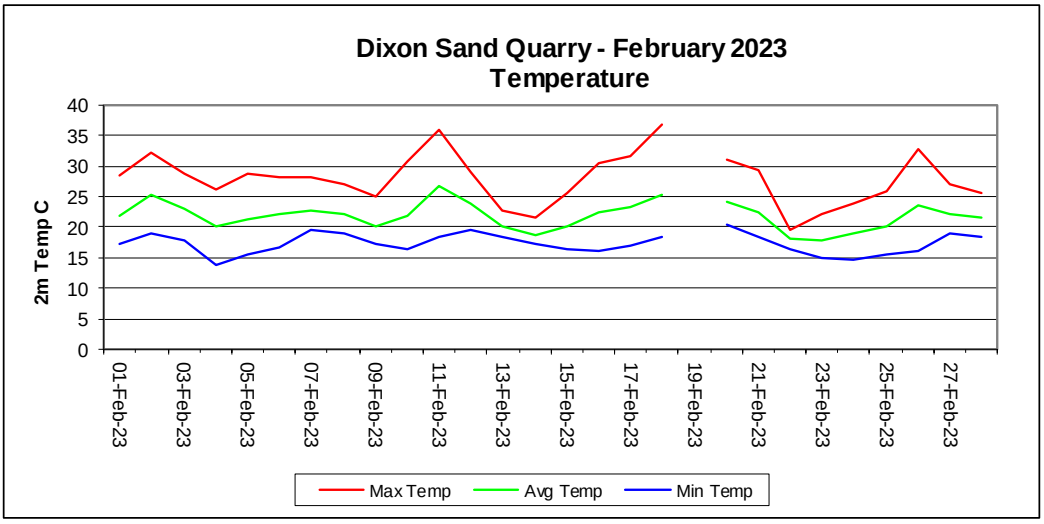
Approximately 96% of valid meteorological data was recorded for February 2023 due to a power outage on 19 February 2023.

Table 3: Meteorological Data Summary for February 2023

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/02/2023	17.4	21.9	28.5	0.0	0.0	4.7	25.9	55.1	80.4	100.0	981.3	983.3	984.9
2/02/2023	19.0	25.3	32.1	0.0	0.2	4.8	18.9	22.4	64.7	100.0	973.1	978.3	983.9
3/02/2023	17.8	23.1	28.7	0.0	0.0	4.4	23.6	25.1	49.6	100.0	972.7	976.1	981.7
4/02/2023	13.9	20.2	26.2	0.0	0.0	2.9	20.6	18.4	40.2	99.9	981.1	985.7	991.5
5/02/2023	15.5	21.2	28.8	0.0	0.1	4.3	26.9	22.8	48.8	92.0	991.4	994.5	997.8
6/02/2023	16.6	22.0	28.3	0.0	0.0	4.1	23.5	52.3	85.5	100.0	994.0	996.7	998.8
7/02/2023	19.7	22.8	28.1	0.0	0.1	5.0	25.3	58.2	82.9	99.9	993.0	995.4	996.8
8/02/2023	19.0	22.2	26.9	0.0	0.0	4.9	21.1	53.9	81.0	100.0	992.6	994.7	996.2
9/02/2023	17.2	20.1	24.9	5.4	0.0	2.8	9.8	64.7	94.6	100.0	989.2	992.0	994.7
10/02/2023	16.4	21.8	30.7	0.4	0.2	3.4	14.2	37.6	81.0	99.9	985.2	988.1	990.4
11/02/2023	18.5	26.6	35.9	0.0	0.3	4.7	16.7	21.0	62.3	100.0	981.3	984.8	988.1
12/02/2023	19.6	23.7	29.0	0.0	0.0	3.8	18.2	33.2	67.2	94.3	980.9	984.8	989.9
13/02/2023	18.5	20.1	22.6	0.0	0.1	3.4	19.3	71.8	92.3	100.0	988.8	990.3	991.8
14/02/2023	17.3	18.7	21.5	0.6	0.1	3.2	12.8	72.4	98.3	100.0	990.4	992.7	996.0
15/02/2023	16.3	20.1	25.5	1.0	0.1	3.3	18.5	57.1	82.4	99.9	995.0	996.2	998.0
16/02/2023	16.2	22.4	30.5	0.0	0.2	3.9	12.5	36.1	69.9	99.9	994.3	996.8	998.7
17/02/2023	17.0	23.3	31.7	0.0	0.1	5.0	22.7	35.3	75.4	99.9	993.2	995.7	997.5
18/02/2023	18.4	25.4	36.7	2.0	0.4	5.0	18.1	25.8	74.3	100.0	989.4	993.3	995.3
19/02/2023													
20/02/2023	20.4	24.3	31.1	0.0	0.0	4.3	17.9	51.7	82.7	100.0	997.5	999.3	1001.0
21/02/2023	18.3	22.3	29.3	59.0	0.0	3.6	18.1	54.9	88.7	100.0	999.1	1001.6	1005.1
22/02/2023	16.4	18.0	19.7	39.8	0.0	3.7	13.1	71.5	91.6	99.9	1003.0	1005.0	1006.2
23/02/2023	15.1	17.8	22.0	4.2	0.0	4.7	27.5	70.1	91.0	100.0	1001.9	1003.4	1004.9
24/02/2023	14.6	19.0	24.0	0.0	0.0	3.7	19.7	53.9	80.7	100.0	998.4	1000.9	1002.7
25/02/2023	15.6	20.2	25.9	0.0	0.0	3.0	13.8	45.4	77.0	100.0	994.4	997.2	1000.1
26/02/2023	16.1	23.7	32.9	0.0	0.1	4.9	14.0	28.6	68.1	99.9	989.1	991.9	995.0
27/02/2023	19.0	22.1	27.1	2.0	0.0	4.6	25.9	52.8	88.0	100.0	989.3	992.0	994.8
28/02/2023	18.4	21.4	25.6	0.4	0.2	3.7	26.9	68.0	89.8	100.0	987.4	991.3	994.3
Monthly	**13.9**	**21.8**	**36.7**	**114.8**	**0.0**	**4.1**	**27.5**	**18.4**	**77.4**	**100.0**	**972.7**	**992.7**	**1006.2**

No data due to power outage on 19/02/2023





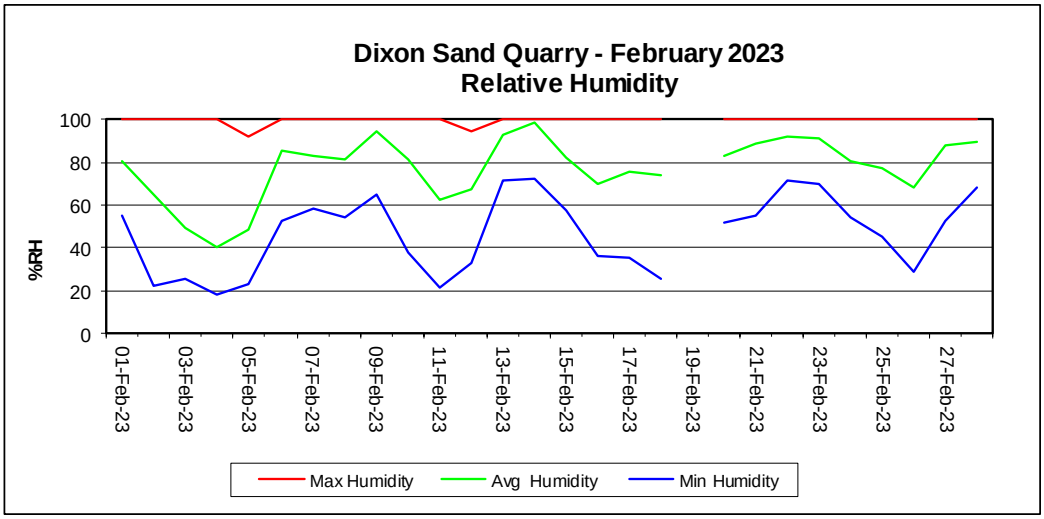


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

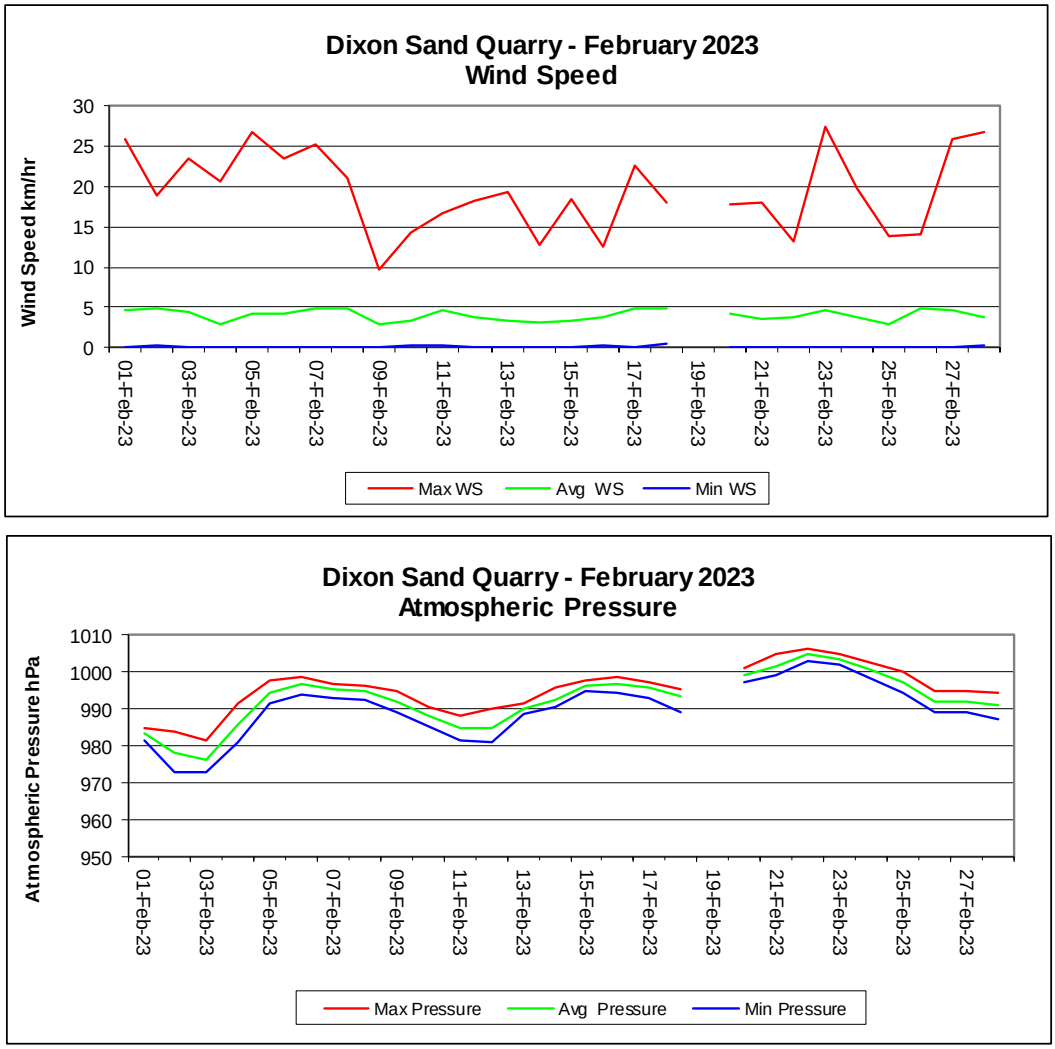


Figure 3: *Wind Speed and Atmospheric Pressure Charts*

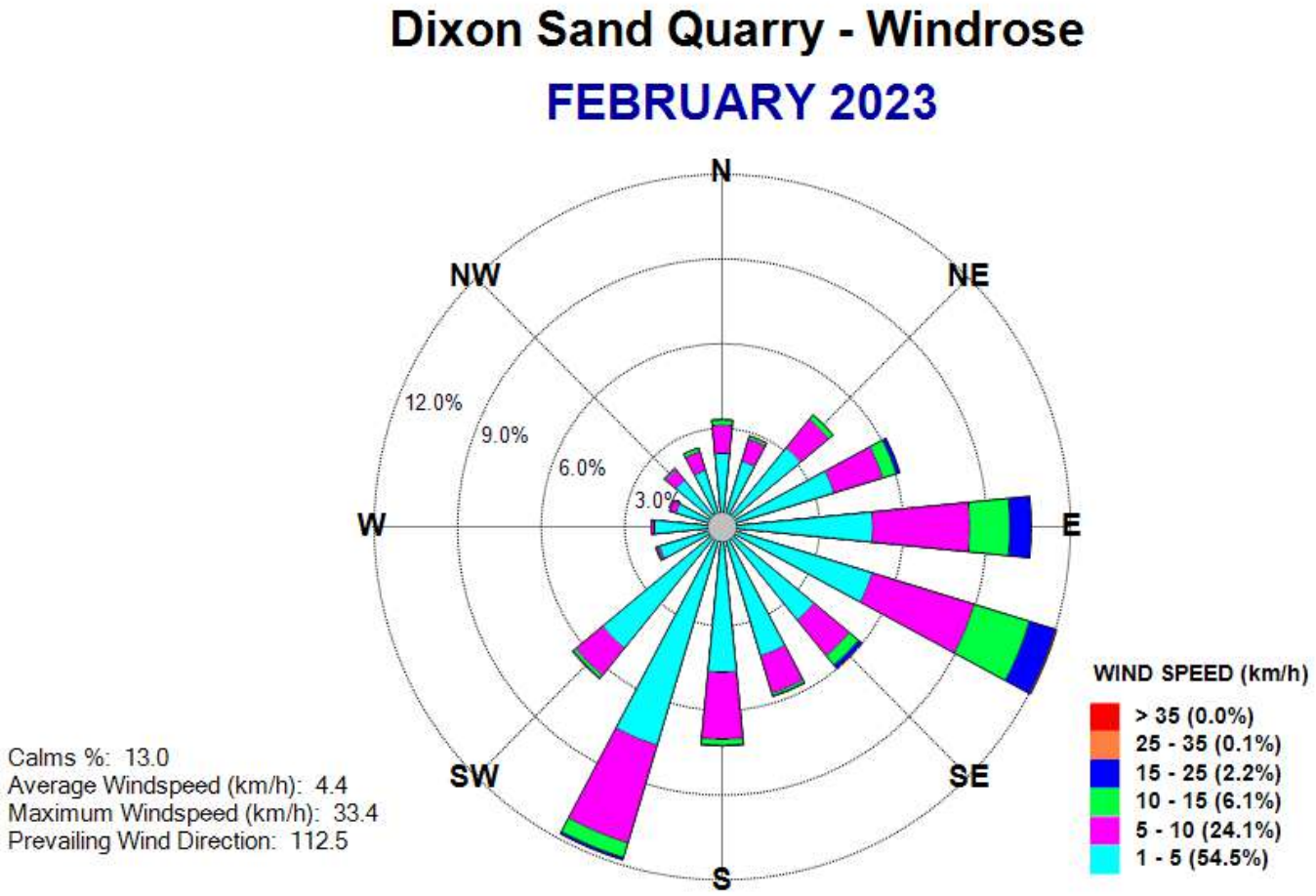


Figure 4: *Monthly Windrose*

Appendix 1

Calibration Documents (when required)

Special visit for TEOM repair.

UNCONTROLLED DOCUMENT IF PRINTED

CARBON BASED ENVIRONMENTAL

Continuous Air Quality
Monthly/Quarterly/Six Monthly/Annual
TEOM Maintenance and Calibration – 1400AB

teledata

TEOM Client/Site: Dixon Sands / Teom1 **Date:** 9.2.22

Ecotech 05-0721

1. TEOM Data Screen **SERIAL No:** 1400AB255700503 **Firmware:** A/B

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Operating Condition	F-1	Green - Normal		✓
Date/time	TEOM: 11:27 Actual: 11:31	Current Date/time correct within 5 minutes	✓	
PM-10 24hr av	0	Positive values		✓
Filter loading PM10	77	<80 %	✓	
Frequency PM-10	254.0009	200-300 Hz	✓	
Noise PM-10	0.000	<0.100ug	✓	✓

Comment: If filter load >80% but <90% and if flows Ok then data is OK

Comments: Fault → System not working Flow fail → TEOM not operational

* After main + bypass filter replacement TEOM working OK ✓ No errors

2. System Status

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

Comments: on arrival Flow bypass 13.52 l/m Before filters replaced.
Main 2.23 l/mm Main Flow fail

Data Downloaded: YES/(NO) (circle)

Technician Name : COLIN DANIEL **Signed**

3. Instrument Conditions Ambient Conditions and Temperatures

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Ambient Temperature	22.4	-10 to 50 C	✓	
Ambient Dew Point	~~0.49~~ M	-10 to 50 C	—	—
Ambient Pressure	0.97	0.9-1.1 atm	✓	
Ambient Relative Humidity	NA M	10-100 %RH	—	—
Cap temperature	50.02	50.00 +/- 0.10 C	✓	
Case temperature	49.99	50.00 +/- 0.10 C	✓	
Main (PM-10) Air Tube temp	50.01	50.00 +/- 0.10 C	✓	

Comments:

Ref 22.6°C ✓ok
Pres 983.9 mb = 0.971 atm ✓ok

4. Instrument Conditions – Flows

After filter replaced ✓

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: 6/2/23

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%	255.53094	255.53099	255.53163	

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:

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: low Cool 6

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 After fixed

1. Flow Verification – Conducted (YES/NO)

PM10 Flow verified Flow l/min 3.04 Error % 1.3 (allowed error <6%) (PASS/FAIL)

Bypass Flow verified Flow l/min 13.60 Error % 0.5 (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:**

Flow Board
Fadj Man = 1.06
Fadj Avx = 1.00
✓ yes

2. Leak Check – Conducted (YES/NO)

PM10 actual 0.14 < Limit 0.15

Bypass actual 0.46 < Limit 0.60

Leak check (PASS/FAIL – If fail then find leak and retest.
Comments: Slight leak, same as previous.

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
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:

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

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MARCH 2023

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 27 April 2023

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

1.0 Summary

CBased Environmental Pty Limited 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 programme includes:

- One continuous TEOM PM_{10} monitor; and
- One continuous meteorological station.

This monthly report for March 2023 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results;
- Meteorological results;
- Quarterly TEOM calibration and maintenance; and
- 6-monthly meteorological station physical screening and system check.

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

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/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. Year to date annual average for PM_{10} is calculated from 1 July 2022 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 87% of valid meteorological data was recorded for March 2023 due to a power outages from 16-19 March 2023.

Approximately 71% of valid TEOM data was available for March 2023 due to power issues and blocked filter from 15-24 March 2023. Mass transducer filter replaced on 24 March 2023 when quarterly maintenance and calibration was conducted.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*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*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

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.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand 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 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/m3.

Approximately 71% of valid TEOM data was available for March 2023 due to power issues and blocked filter from 15-24 March 2023. Mass transducer filter replaced on 24 March 2023 when quarterly maintenance and calibration was conducted.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry 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/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2022 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted in 24 March 2023 with the next calibration due to be completed in June 2023. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for March 2023 from AQMS and Annual Average PM_{10} calculated from the 1 July 2022.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/03/2023	15.0	12.1	37.5	30.2
2/03/2023	17.4	12.1	43.5	30.3
3/03/2023	14.3	12.1	35.8	30.3
4/03/2023	13.0	12.1	32.5	30.3
5/03/2023	9.7	12.1	24.3	30.3
6/03/2023	11.1	12.1	27.8	30.3
7/03/2023	31.8	12.2	79.5	30.5
8/03/2023	30.5	12.3	76.3	30.7
9/03/2023	22.4	12.3	56.0	30.9
10/03/2023	17.2	12.4	43.0	30.9
11/03/2023	21.5	12.4	53.8	31.0
12/03/2023	17.1	12.4	42.8	31.1
13/03/2023	22.3	12.5	55.8	31.2
14/03/2023	14.4	12.5	36.0	31.2
15/03/2023	12.8	12.5	32.0	31.2
16/03/2023	ND	12.5	ND	31.2
17/03/2023	ND	12.5	ND	31.2
18/03/2023	ND	12.5	ND	31.2
19/03/2023	ND	12.5	ND	31.2
20/03/2023	ND	12.5	ND	31.2
21/03/2023	ND	12.5	ND	31.2
22/03/2023	ND	12.5	ND	31.2
23/03/2023	ND	12.5	ND	31.2
24/03/2023	ND	12.5	ND	31.2
25/03/2023	ND	12.5	ND	31.2
26/03/2023	10.3	12.5	25.8	31.2
27/03/2023	10.3	12.5	25.8	31.2
28/03/2023	9.8	12.5	24.5	31.1
29/03/2023	13.3	12.5	33.3	31.1
30/03/2023	11.0	12.4	27.5	31.1
31/03/2023	7.8	12.4	19.5	31.1

*Calculated from PM_{10}
**Calculated from PM_{10} Annual Average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m^3 highlighted in yellow, when applicable

No Data (ND) = <18hrs hour of valid data to calculate a 24hr average

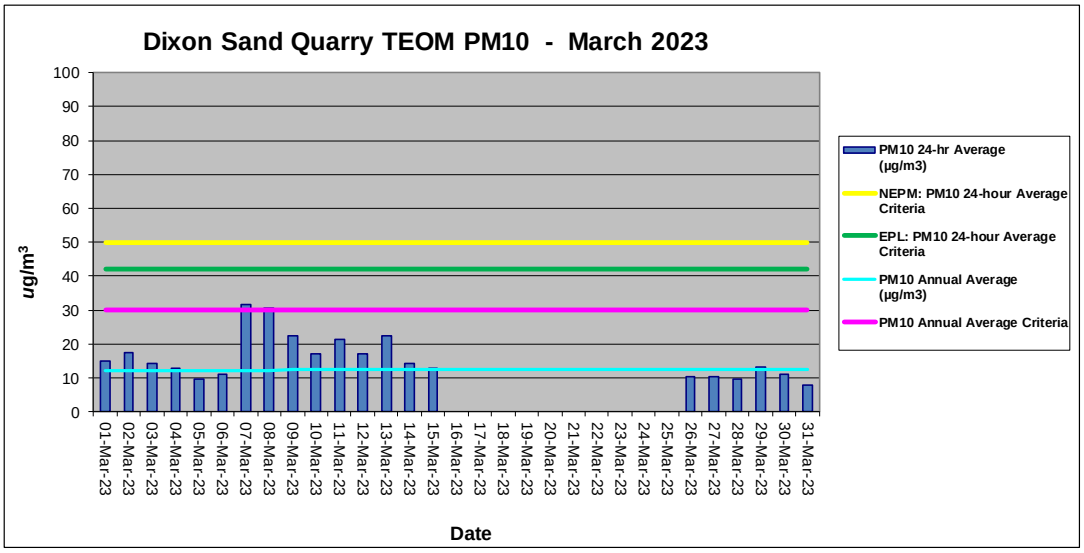


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

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.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. 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.

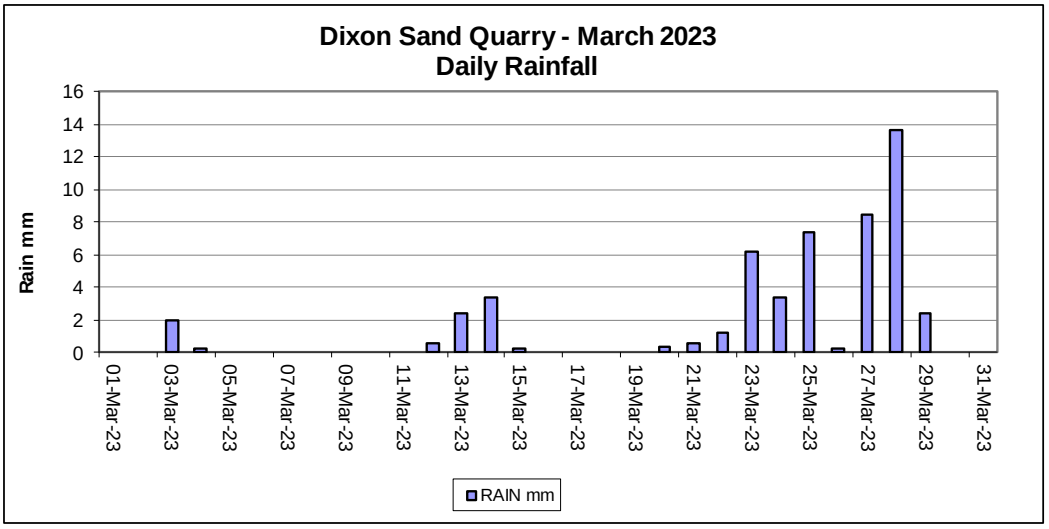
A 6-monthly physical screening and system check of the meteorological station was conducted on 24 March 2023 and is next due in September 2024. The screening and system check certificates are provided in **Appendix 1** (when required).

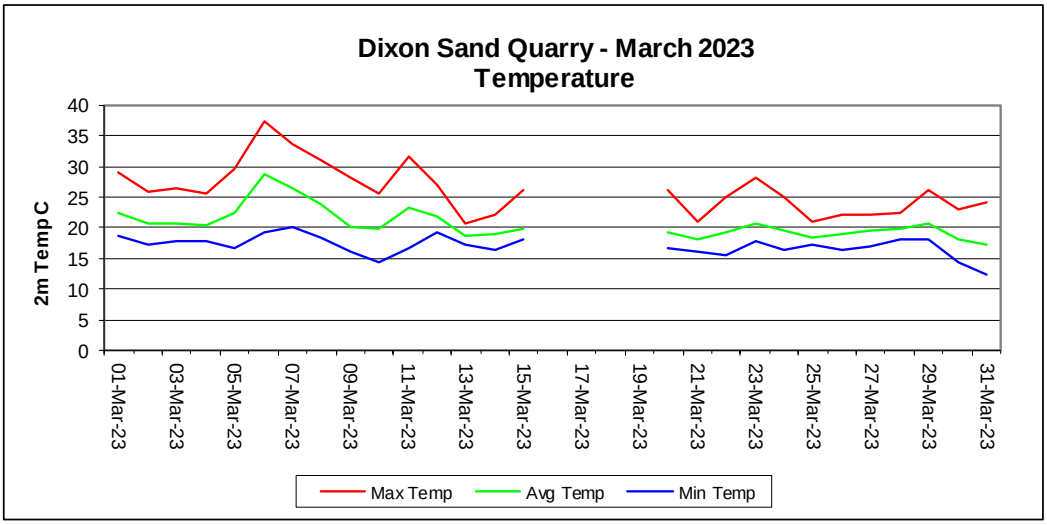
Approximately 87% of valid meteorological data was recorded for March 2023 due to a power outages from 16-19 March 2023.

Table 3: Meteorological Data Summary for March 2023

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/03/2023	18.8	22.5	29.1	0.0	0.0	2.8	12.4	32.9	77.7	99.9	986.0	988.4	992.9
2/03/2023	17.2	20.8	25.8	0.0	0.0	3.9	17.4	58.5	85.8	100.0	990.9	992.8	994.7
3/03/2023	17.9	20.8	26.4	2.0	0.1	3.0	20.3	60.1	89.0	100.0	993.1	995.7	997.9
4/03/2023	17.9	20.3	25.7	0.2	0.1	3.2	15.8	57.7	86.9	100.0	994.8	996.4	998.4
5/03/2023	16.7	22.3	29.5	0.0	0.1	3.7	17.5	44.1	76.8	100.0	987.6	991.4	995.6
6/03/2023	19.3	28.8	37.3	0.0	0.1	5.3	26.2	14.9	44.4	100.0	982.3	984.9	987.6
7/03/2023	20.0	26.6	33.6	0.0	0.0	3.8	19.0	22.0	47.5	100.0	983.8	985.5	988.1
8/03/2023	18.5	24.0	31.1	0.0	0.4	3.5	15.9	11.9	31.2	51.3	982.8	985.7	988.9
9/03/2023	16.0	20.3	28.1	0.0	0.1	3.2	24.0	22.1	50.9	78.0	988.2	990.3	994.7
10/03/2023	14.4	19.7	25.6	0.0	0.0	4.1	21.4	61.0	77.5	98.7	993.6	995.3	997.5
11/03/2023	16.8	23.3	31.7	0.0	0.0	3.3	16.7	32.5	74.2	100.0	989.4	992.4	994.9
12/03/2023	19.4	21.8	27.0	0.6	0.0	3.3	19.6	65.4	89.9	100.0	990.0	991.2	994.0
13/03/2023	17.3	18.8	20.8	2.4	0.1	2.9	14.8	80.1	96.3	100.0	993.6	996.2	998.2
14/03/2023	16.3	19.0	22.0	3.4	0.0	2.2	11.2	87.9	99.0	100.0	995.6	997.0	998.6
15/03/2023	18.1	19.9	26.3	0.2	0.2	1.8	7.2	60.1	93.4	99.9	992.2	994.2	995.5
16/03/2023													
17/03/2023													
18/03/2023													
19/03/2023													
20/03/2023	16.6	19.2	26.3	0.4	0.5	3.1	14.5	60.2	93.0	100.0	992.2	1006.4	1008.7
21/03/2023	16.0	18.0	21.1	0.6	0.1	3.0	12.5	63.9	87.2	100.0	1005.9	1007.7	1009.7
22/03/2023	15.5	19.2	25.0	1.2	0.0	1.7	5.8	68.7	90.5	100.0	999.4	1002.1	1006.0
23/03/2023	17.9	20.7	28.3	6.2	0.1	3.1	11.0	60.5	92.2	100.0	994.7	997.4	1000.1
24/03/2023	16.4	19.6	24.9	3.4	0.1	3.3	17.0	66.0	91.8	100.0	995.0	997.1	999.4
25/03/2023	17.3	18.5	21.0	7.4	0.0	2.2	15.8	88.7	99.2	99.9	997.1	998.3	999.7
26/03/2023	16.4	18.9	22.1	0.2	0.1	2.4	10.6	73.6	92.8	100.0	995.3	997.2	999.0
27/03/2023	17.1	19.5	22.2	8.4	0.4	3.3	13.0	86.0	97.1	100.0	991.4	993.4	995.6
28/03/2023	18.0	19.8	22.4	13.6	0.1	2.7	11.9	76.7	91.7	99.9	992.0	993.9	995.3
29/03/2023	18.0	20.7	26.2	2.4	0.3	5.3	19.8	40.1	79.2	100.0	982.4	986.8	991.8
30/03/2023	14.4	18.0	23.0	0.0	0.2	2.5	9.9	32.3	57.1	84.3	985.5	987.3	990.5
31/03/2023	12.4	17.3	24.2	0.0	0.1	2.5	14.4	38.2	56.8	71.1	989.8	991.4	993.9
Monthly	**12.4**	**20.7**	**37.3**	**52.6**	**0.0**	**3.1**	**26.2**	**11.9**	**79.6**	**100.0**	**982.3**	**993.9**	**1009.7**

No data due to power outage 16-19 March 2023.





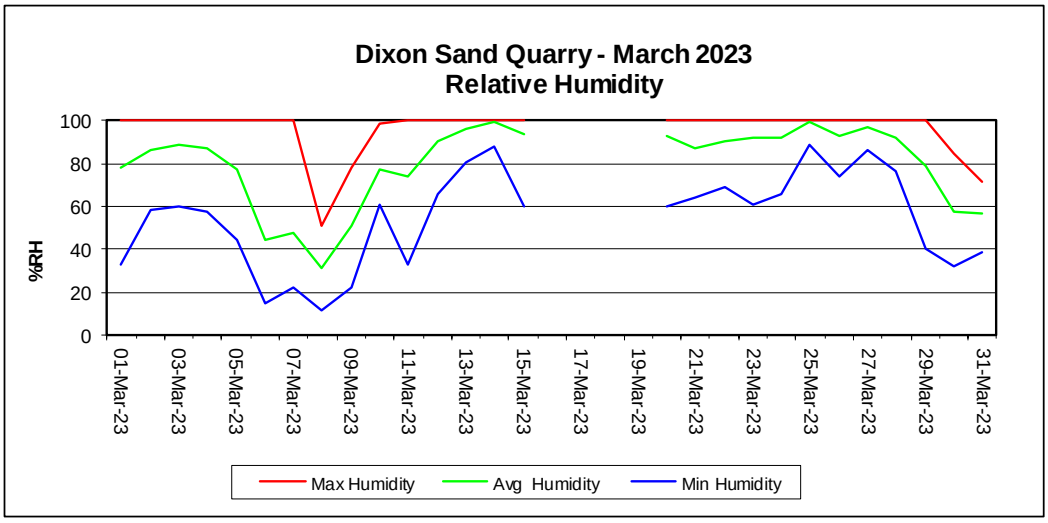


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

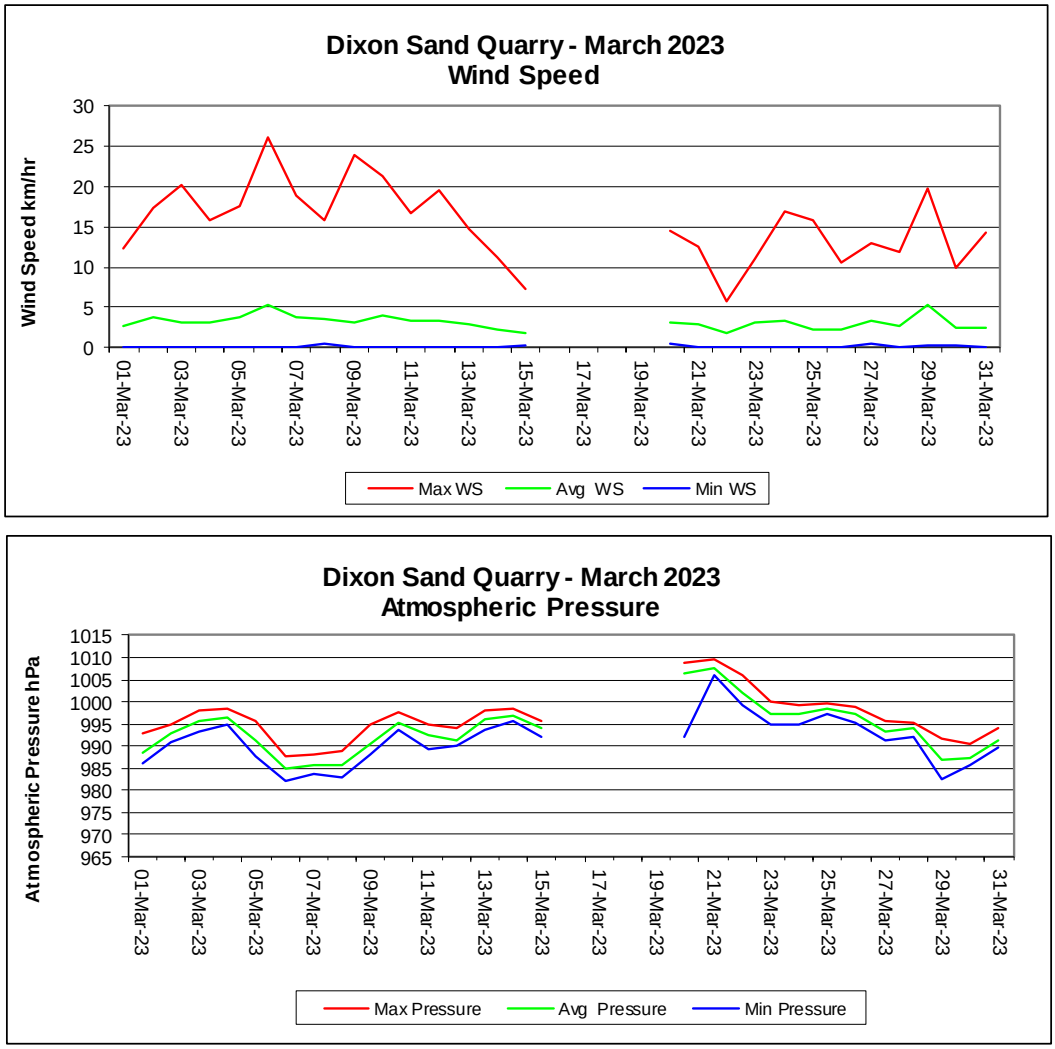


Figure 3: *Wind Speed and Atmospheric Pressure Charts*

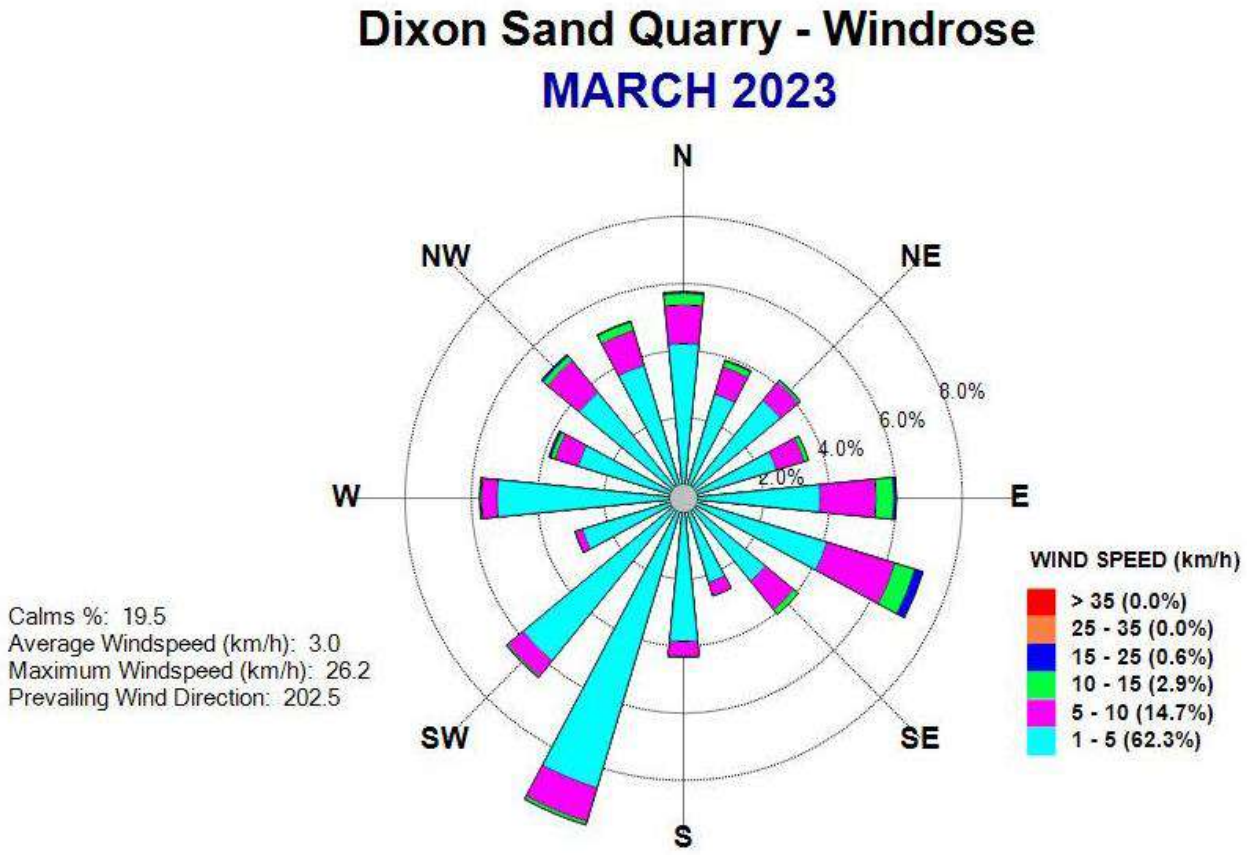


**Chart excludes 16-19 March 2023 due to site power outage*

Figure 4: *Monthly Windrose*

Appendix 1

Calibration Documents (when required)

CBased Environmental Pty Limited
ABN 62 611 924 264

Weather Station Field Check

Site: Dixon Sands

Date/Time: 24/03/2023 15:30-16:30

Measured Against Reference Sensors

Parameter	Units	Site	Reference	Difference	Pass/Fail	Reference Description
Temperature 10m	°C	21.3	21.6	-0.3	Pass	Ref Thermometer
Humidity	%RH	82	79	3.0	Pass	Ref RH sensor
Rainfall	mm	3.0	3.2	-0.2	Pass	Glass Pipette
Wind Speed	km/hr	8.0	8.0	0.0	Pass	Ref Anemometer
Wind Direction	Degrees	109	111	-2.0	Pass	Sighting compass

Reference Instruments Specifications: *Calibration expires: 10/06/2023

Sensor	Serial Number	Specifications	Accuracy
*Temperature	220610N01	-40 to 65°C	+/- 0.3°C
*Barometer	BF211103059	20 to 30" Hg	+/- 1.1hPa
*Humidity	220610N01	10 to 90%RH	+/- 2%RH
*Anemometer	220610N03	0 to 64km/hr	+/- 3.6km/hr or 5%
**Rainfall	Standard number of tips	3.2mm	+/- 0.2mm
Compass	Sighting Compass	0 to 360 degrees	+/- 5 Deg

** 100mL used.

Reference sensors were certified by Davis Instruments USA using a reference traceable to National Institute of Standards and Technology (NIST) and were "in calibration" when used.

Comments:

The weatherstation was in conformance with the reference instruments at the monitored levels. Wind direction is referenced to true north. The calibration check of the raingauge involved adding water to the raingauge. Rain total of 3.0mm should be deleted from site records on the 24/3/2023.

NA=Not Available

The meteorological station meets the requirements of the Approved Methods for the Sampling and Analysis of Air Pollutants in NSW.

The weather station has Passed the field check. Next annual field check due: Mar-24

Checked by: Colin Davies 27/03/2023

CBased Environmental Pty Limited
Unit 3, 2 Enterprise Crescent
SINGLETON NSW 2330
P: 65 713 334

CBased Environmental Pty Limited

ABN 62 611 924 264

Weather Station Physical Screening Field Check

Client DIXON SANDS Site Name: DIXON SAND TEOM

Date: 15-30 - 16.30 24/3/23 Time: 15:30 - 16:30

	Yes (Pass)	No (Fail)	Comments
Grass / Vegetation Impacts			
Compound Grass height <10cm	✓		
No objects within impact area (10 x height of object)		✓	Trees nerby, Buildings nerby
Ground Anchor / Guy Wires / Mast Condition			
Bottom guy wires tight (correct tension = 35-50mm deflection, with only moderate hand force at 1.5 metres up the guy wire)	NA		fixed mast
Top Guy wires tensioned (correct tension = 60-75mm deflection, with only moderate hand force at 1.5 metres up the guy wire)	NA		fixed mast
Mast Vertical and in good condition	✓		
Ground anchors/star pickets tight in ground	NA		fixed mast
Guy Wires insignificant corrosion	NA		✓ ✓
Ground anchors/D shackles/ winders insignificant corrosion	NA		✓ ✓
Bolts/hinge points in mast are secure	NA		✓ ✓
Cables / Connectors / Logger Cabinet / Solar Panel			
Cables attached to mast/guy wires via ties are secure	✓		OK → loose wires due to wind system
Insignificant corrosion to plugs/connectors	✓		
No water ingress in logger/battery cabinet	✓		
Wiring/plugs in cabinet OK, Logger OK	✓		
Battery terminals and condition OK	NA		Battery Volts = NA 240V system
Battery volts (charging>13V, not charging >12V)	NA		" "
Solar panel undamaged and clean	NA		" "
Sensor shields clean	NA		" "
Sensor Check			
Wind direction alighed True North/~~Magnetic North~~ (strike out N/A)	✓		Compass Bearing: 350 degrees
Rain gauge cleaned, working OK (1 tip check) or 100ml Cal	✓		70 mm cal deck, cleaned.
Rain gauge level OK	✓		
Anemometer/wind vane moving freely (analogue sensors)	NA		Gill Ultrasonic
Other sensors visually checked and OK	✓		
Last months data checked and OK / Logging data OK	✓		

Checked By: Name COLIN DANIEL Signed CDM

CBased Environmental Pty Limited
Unit 3, 2 Enterprise Crescent
SINGLETON NSW 2330
P: (02) 6571 3334

CARBON BASED ENVIRONMENTAL

Continuous Air Quality Monthly/Quarterly/Six Monthly/Annual TEOM Maintenance and Calibration – 1400AB

teledata

TEOM Client/Site: DIXON SAND1 TEOM **Date:** 24/3/23

1. TEOM Data Screen

SERIAL No: 05-0721 **Firmware:** (AB)

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Operating Condition	OK-4	Green - Normal	✓	
Date/time	TEOM: 24/3/23 15:33 Actual: 24/3/23 15:29	Current Date/time correct within 5 minutes	✓	
PM-10 24hr av	0	Positive values		
Filter loading PM10	80	<80 %		✓
Frequency PM-10	254.4260	200-300 Hz	✓	
Noise PM-10	0	<0.100ug	✓	

Comment: If filter load >80% but <90% and if flows Ok then data is OK

Comments: Note: TEOM was not operating due to a blocked filter (flow error) Replacing mass transducer filter / TEOM reset fixed the issue.

2. System Status

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Vacuum pump pressure	OK	<0.50 atm	✓	
Warnings	Flow	No Warnings		✓
If any warnings list:				
Flow fail				

Comments: (See above)

Data Downloaded: YES (NO) (circle)

Technician Name : COLIN DAVIES **Signed**

3. Instrument Conditions Ambient Conditions and Temperatures

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Ambient Temperature	23.2	-10 to 50 C	✓	
Ambient Dew Point	NA	-10 to 50 C	—	—
Ambient Pressure	0.973	0.9-1.1 atm	✓	
Ambient Relative Humidity	NA	10-100 %RH	—	—
Cap temperature	50.00	50.00 +/- 0.10 C	—	
Case temperature	49.99	50.00 +/- 0.10 C	—	
Main (PM-10) Air Tube temp	50.00	50.00 +/- 0.10 C	—	

Comments:

4. Instrument Conditions – Flows after filter fix.

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)** After filter change that we knew would be required.

☐ **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	16	255.51641	255.51644	255.51643	255.51641

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:

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: low cool 6

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 3.07 Error % 2.3 (allowed error <6%) (PASS/FAIL Final 3.02

Bypass Flow verified Flow l/min 13.60 Error % 0.5 (allowed error <6%) (PASS/FAIL Final 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

PM10 actual 0.13 < Limit 0.15

Bypass actual 0.46 < Limit 0.60

Leak check (PASS/FAIL – If fail then find leak and retest.
Comments: slight leak but OK ✓

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
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

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APRIL 2023

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 29 May 2023

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

1.0 Summary

CBased Environmental Pty Limited 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 programme includes:

- One continuous TEOM PM_{10} monitor; and
- One continuous meteorological station.

This monthly report for April 2023 was prepared by CBased Environmental and includes the following:

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

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

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/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. Year to date annual average for PM_{10} is calculated from 1 July 2022 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 100% of valid meteorological data was recorded for April 2023.

Approximately 100% of valid TEOM data was available for April 2023.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*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*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

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.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand 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 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/m3.

Approximately 100% of valid TEOM data was available for April 2023.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry 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/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2022 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted in March 2023 with the next calibration due to be completed in June 2023. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for April 2023 from AQMS and Annual Average PM_{10} calculated from the 1 July 2022.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/04/2023	10.3	12.4	25.8	31.0
2/04/2023	8.3	12.4	20.8	31.0
3/04/2023	10.8	12.4	27.0	31.0
4/04/2023	10.6	12.4	26.5	30.9
5/04/2023	12.5	12.4	31.3	30.9
6/04/2023	11.0	12.4	27.5	30.9
7/04/2023	7.7	12.3	19.3	30.9
8/04/2023	7.7	12.3	19.3	30.8
9/04/2023	7.5	12.3	18.8	30.8
10/04/2023	6.8	12.3	17.0	30.7
11/04/2023	12.7	12.3	31.8	30.7
12/04/2023	11.5	12.3	28.8	30.7
13/04/2023	10.5	12.3	26.3	30.7
14/04/2023	9.0	12.3	22.5	30.7
15/04/2023	7.8	12.2	19.5	30.6
16/04/2023	9.4	12.2	23.5	30.6
17/04/2023	11.9	12.2	29.8	30.6
18/04/2023	13.6	12.2	34.0	30.6
19/04/2023	16.5	12.3	41.3	30.6
20/04/2023	14.4	12.3	36.0	30.7
21/04/2023	14.6	12.3	36.5	30.7
22/04/2023	13.6	12.3	34.0	30.7
23/04/2023	11.0	12.3	27.5	30.7
24/04/2023	11.0	12.3	27.5	30.7
25/04/2023	12.5	12.3	31.3	30.7
26/04/2023	15.8	12.3	39.5	30.7
27/04/2023	12.5	12.3	31.3	30.7
28/04/2023	9.9	12.3	24.8	30.7
29/04/2023	12.7	12.3	31.8	30.7
30/04/2023	6.8	12.3	17.0	30.6

*Calculated from PM_{10}
**Calculated from PM_{10} Annual Average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m^3 highlighted in yellow, when applicable

No Data (ND) = <18hrs hour of valid data to calculate a 24hr average

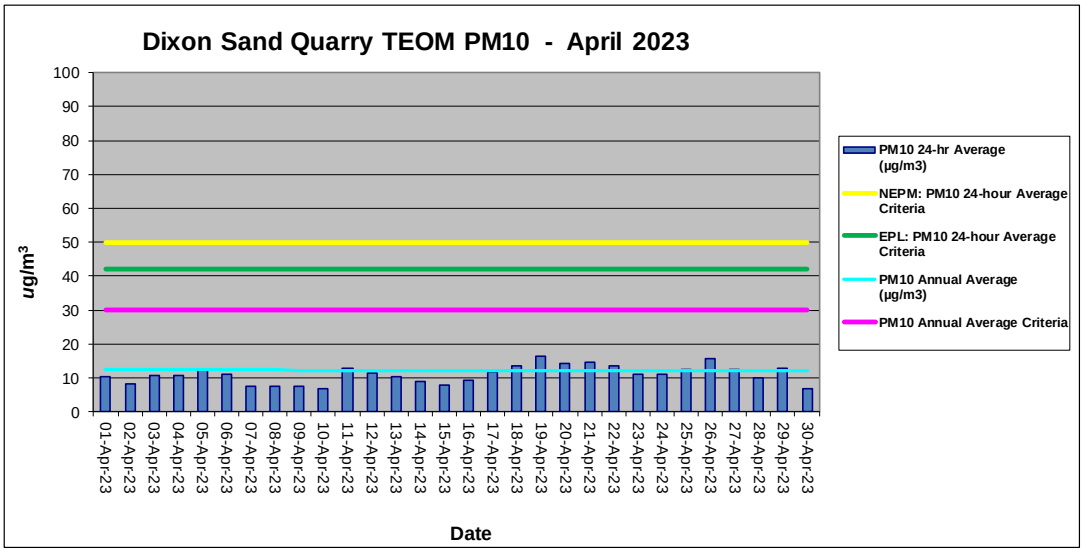


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

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.

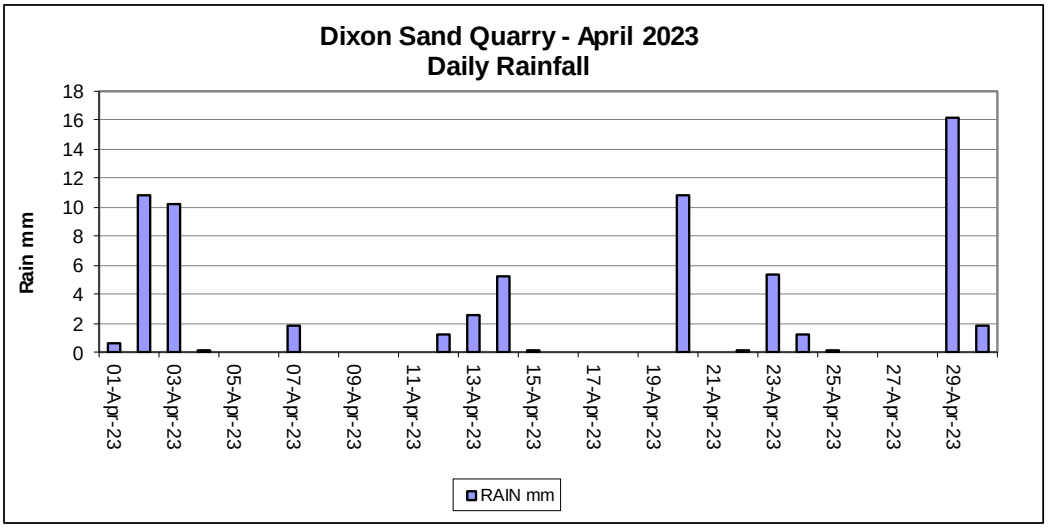
A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

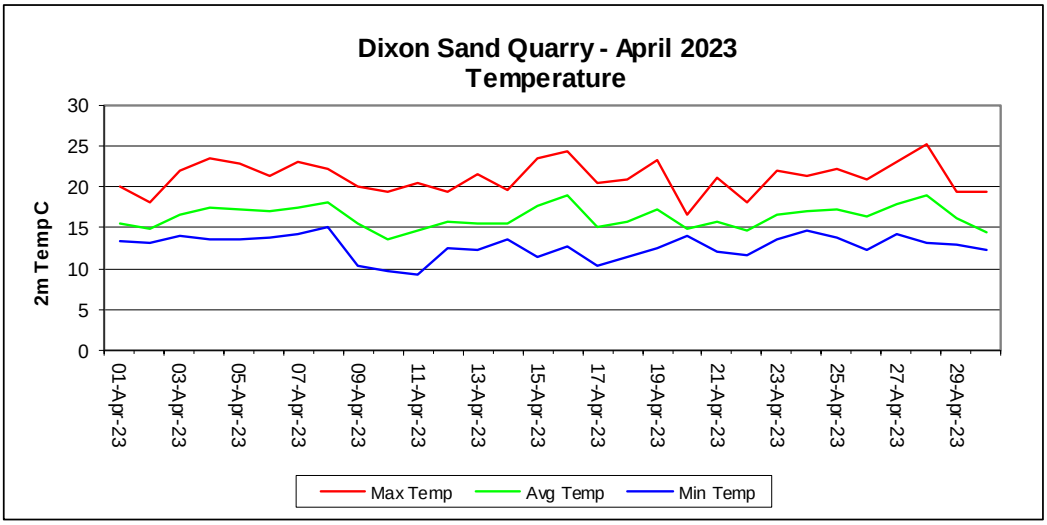
A 6-monthly physical screening and system check of the meteorological station was conducted in March 2023 and is next due in September 2024. The screening and system check certificates are provided in **Appendix 1** (when required).

Approximately 100% of valid meteorological data was recorded for April 2023.

Table 3: Meteorological Data Summary for April 2023

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/04/2023	13.3	15.5	20.1	0.6	0.1	2.4	13.2	57.1	79.2	100.0	992.7	994.8	997.6
2/04/2023	13.1	14.9	18.1	10.8	0.2	3.3	13.6	89.1	97.7	100.0	996.6	998.7	1000.9
3/04/2023	14.1	16.5	21.9	10.2	0.0	2.9	10.0	71.4	94.0	100.0	999.5	1000.6	1002.0
4/04/2023	13.6	17.4	23.6	0.2	0.0	2.5	14.7	55.5	89.6	100.0	996.9	999.2	1001.6
5/04/2023	13.6	17.3	22.9	0.0	0.1	3.3	10.7	59.0	88.2	100.0	994.7	996.2	997.4
6/04/2023	13.8	17.1	21.3	0.0	0.0	2.4	9.7	71.5	89.6	100.0	991.1	994.2	996.5
7/04/2023	14.2	17.4	23.1	1.8	0.0	3.7	21.7	65.4	88.6	100.0	979.1	984.6	991.1
8/04/2023	15.0	18.1	22.2	0.0	0.1	3.7	13.3	41.1	58.5	89.2	978.8	981.4	984.7
9/04/2023	10.4	15.5	20.0	0.0	0.2	3.6	25.2	33.1	50.5	72.6	983.2	985.9	988.8
10/04/2023	9.8	13.5	19.3	0.0	0.1	2.6	11.9	30.4	51.7	70.4	987.5	989.1	991.3
11/04/2023	9.2	14.7	20.4	0.0	0.0	2.4	12.3	46.5	62.1	75.4	990.0	991.4	993.0
12/04/2023	12.5	15.8	19.4	1.2	0.0	3.0	14.3	56.9	75.4	99.9	985.3	988.3	991.8
13/04/2023	12.2	15.6	21.6	2.6	0.1	3.6	13.5	62.2	91.2	100.0	985.2	989.7	993.4
14/04/2023	13.5	15.6	19.6	5.2	0.1	3.4	13.7	72.6	95.5	100.0	991.8	993.1	995.0
15/04/2023	11.4	17.6	23.6	0.2	0.2	3.8	14.7	44.9	74.1	99.9	986.2	989.1	991.8
16/04/2023	12.7	18.9	24.3	0.0	0.1	4.5	28.1	35.7	57.3	72.9	983.8	987.4	996.3
17/04/2023	10.3	15.2	20.4	0.0	0.0	3.0	17.7	55.1	72.4	89.9	996.1	1001.6	1005.5
18/04/2023	11.5	15.8	21.0	0.0	0.0	2.6	12.3	57.8	83.0	100.0	1001.7	1003.7	1006.0
19/04/2023	12.5	17.3	23.2	0.0	0.1	2.6	12.6	45.5	80.2	99.9	996.7	999.0	1001.8
20/04/2023	14.1	15.0	16.6	10.8	0.4	3.8	12.3	89.7	98.7	100.0	999.7	1003.1	1006.5
21/04/2023	12.1	15.7	21.2	0.0	0.4	3.4	10.8	51.2	80.2	96.7	1005.8	1007.8	1010.0
22/04/2023	11.7	14.7	18.2	0.2	0.0	2.4	8.5	83.0	94.6	100.0	1009.0	1009.9	1011.1
23/04/2023	13.5	16.7	22.1	5.4	0.1	3.1	15.2	62.4	91.3	100.0	1009.8	1011.5	1013.3
24/04/2023	14.7	17.0	21.4	1.2	0.2	3.2	13.5	61.6	90.9	100.0	1010.8	1012.2	1013.9
25/04/2023	13.9	17.2	22.3	0.2	0.0	2.7	11.1	50.4	84.3	99.9	1006.2	1008.8	1011.0
26/04/2023	12.3	16.4	20.9	0.0	0.0	2.4	11.8	69.3	87.2	100.0	1005.3	1007.1	1009.3
27/04/2023	14.3	17.9	23.0	0.0	0.1	2.8	11.7	45.4	77.5	97.3	1001.1	1003.6	1006.3
28/04/2023	13.2	19.1	25.3	0.0	0.3	4.2	13.4	43.5	74.2	100.0	991.5	996.1	1001.0
29/04/2023	12.9	16.1	19.3	16.2	0.2	3.0	10.5	71.2	90.2	99.9	989.4	990.5	992.0
30/04/2023	12.4	14.4	19.4	1.8	0.0	2.6	11.5	66.4	89.0	99.9	988.8	991.1	994.1
Monthly	**9.2**	**16.3**	**25.3**	**68.6**	**0.0**	**3.1**	**28.1**	**30.4**	**81.2**	**100.0**	**978.8**	**997.0**	**1013.9**





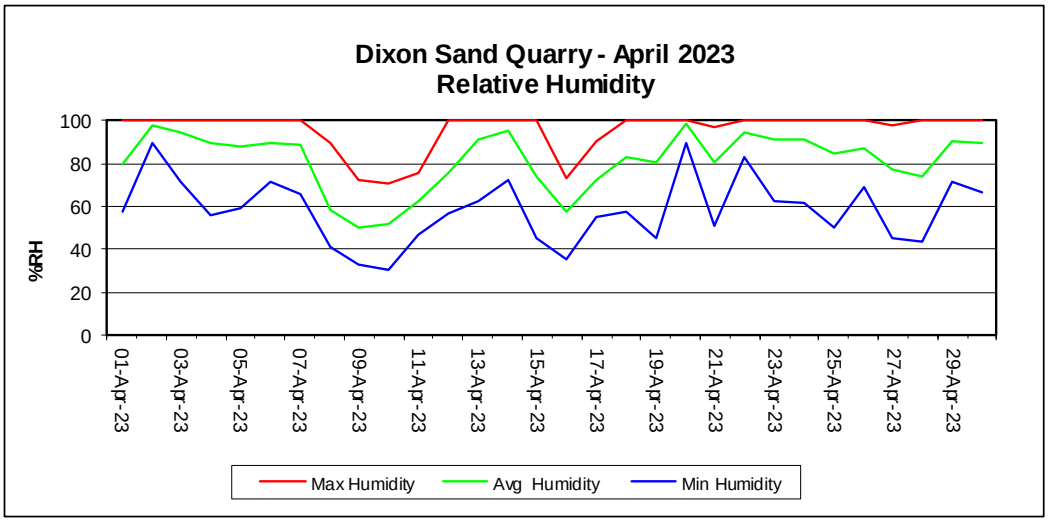


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

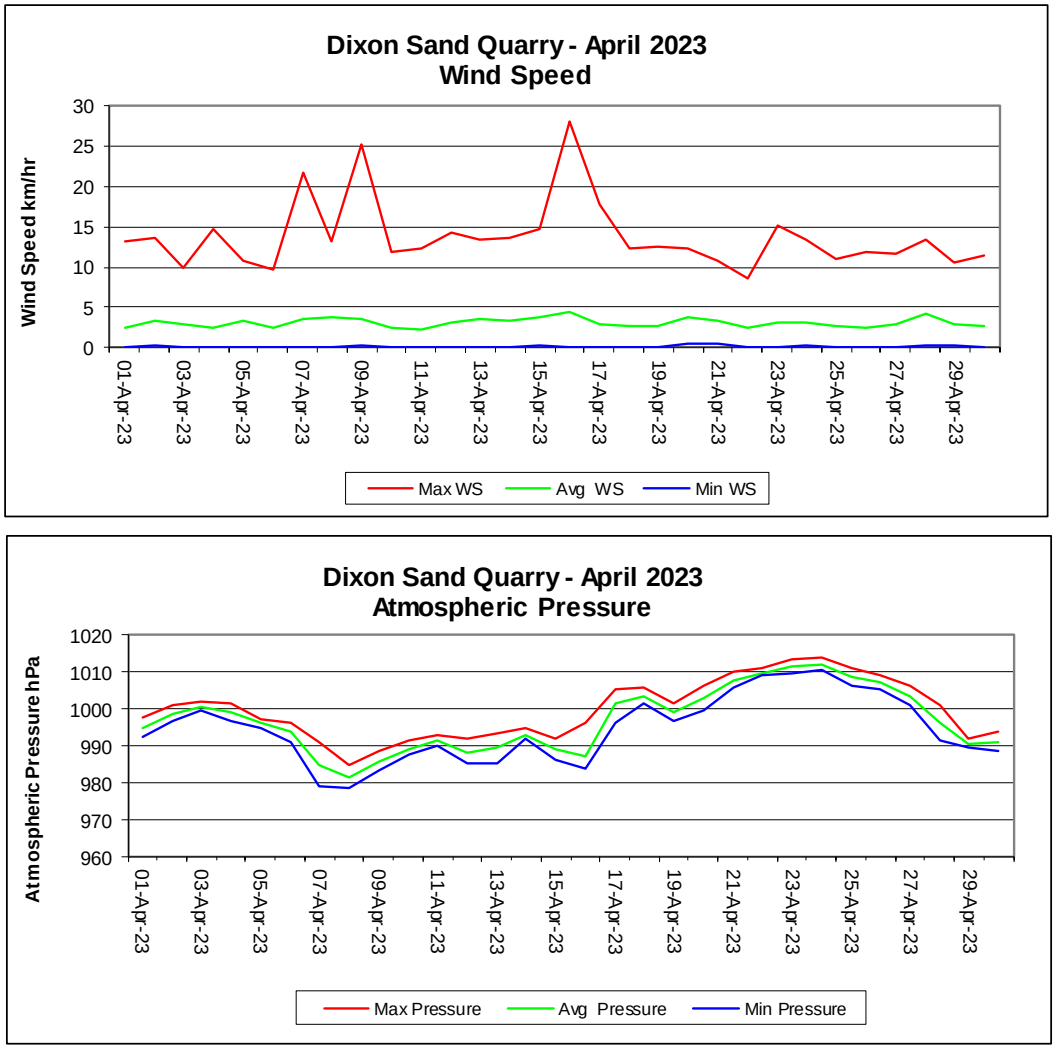


Figure 3: *Wind Speed and Atmospheric Pressure Charts*

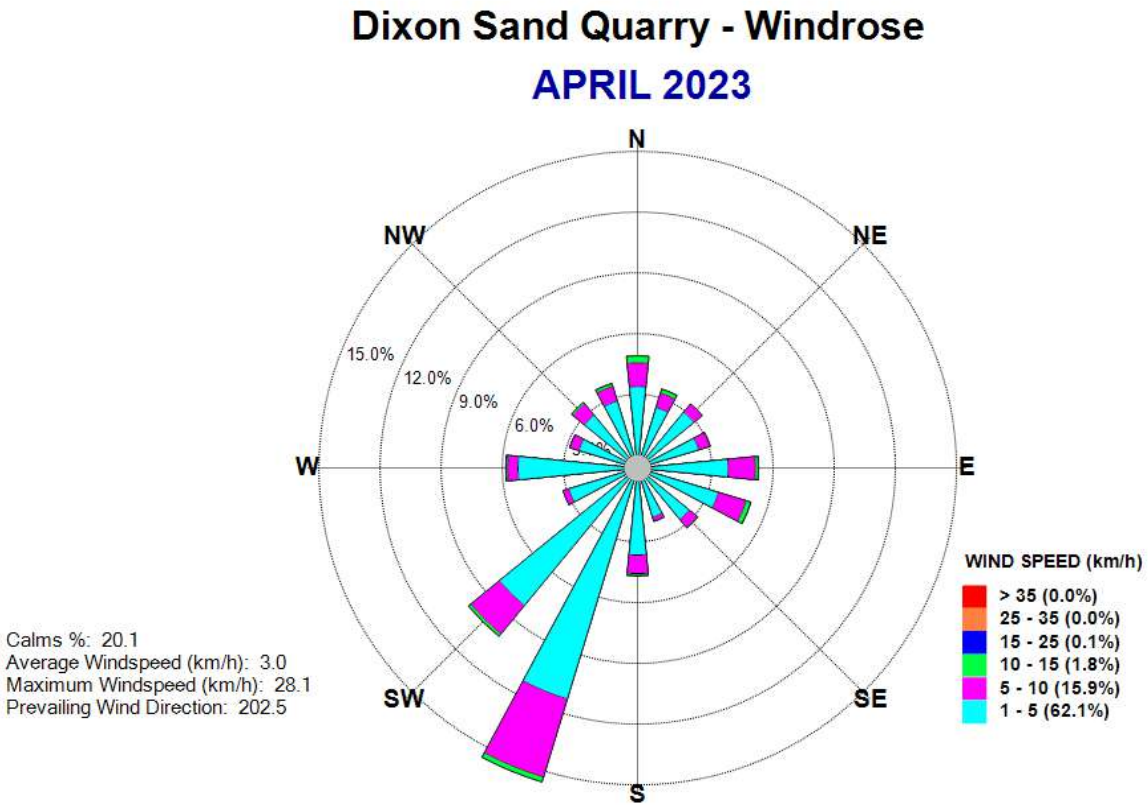


Figure 4: *Monthly Windrose*

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 2023

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 28 June 2023

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

1.0 Summary

CBased Environmental Pty Limited 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 programme includes:

- One continuous TEOM PM_{10} monitor; and
- One continuous meteorological station.

This monthly report for May 2023 was prepared by CBased Environmental and includes the following:

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

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

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/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. Year to date annual average for PM_{10} is calculated from 1 July 2022 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 100% of valid meteorological data was recorded for May 2023.

Approximately 100% of valid TEOM data was available for May 2023.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*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*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

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.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand 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 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/m3.

Approximately 100% of valid TEOM data was available for May 2023.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry 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/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2022 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted in March 2023 with the next calibration due to be completed in June 2023. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for May 2023 from AQMS and Annual Average PM_{10} calculated from the 1 July 2022.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/05/2023	8.0	12.2	20.0	30.6
2/05/2023	13.2	12.2	33.0	30.6
3/05/2023	11.0	12.2	27.5	30.6
4/05/2023	13.9	12.2	34.8	30.6
5/05/2023	12.6	12.2	31.5	30.6
6/05/2023	12.4	12.2	31.0	30.6
7/05/2023	8.9	12.2	22.3	30.6
8/05/2023	7.7	12.2	19.3	30.5
9/05/2023	13.4	12.2	33.5	30.6
10/05/2023	10.4	12.2	26.0	30.5
11/05/2023	21.7	12.3	54.3	30.6
12/05/2023	15.2	12.3	38.0	30.7
13/05/2023	15.4	12.3	38.5	30.7
14/05/2023	9.1	12.3	22.8	30.7
15/05/2023	9.0	12.2	22.5	30.6
16/05/2023	11.5	12.2	28.8	30.6
17/05/2023	11.2	12.2	28.0	30.6
18/05/2023	9.6	12.2	24.0	30.6
19/05/2023	6.8	12.2	17.0	30.5
20/05/2023	7.4	12.2	18.5	30.5
21/05/2023	6.6	12.2	16.5	30.4
22/05/2023	9.3	12.2	23.3	30.4
23/05/2023	17.5	12.2	43.8	30.5
24/05/2023	18.5	12.2	46.3	30.5
25/05/2023	12.5	12.2	31.3	30.5
26/05/2023	18.3	12.2	45.8	30.6
27/05/2023	6.9	12.2	17.3	30.5
28/05/2023	4.9	12.2	12.3	30.5
29/05/2023	6.6	12.2	16.5	30.4
30/05/2023	11.1	12.2	27.8	30.4
31/05/2023	14.5	12.2	36.3	30.4

*Calculated from PM_{10}
**Calculated from PM_{10} Annual Average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m^3 highlighted in yellow, when applicable

No Data (ND) = <18hrs hour of valid data to calculate a 24hr average

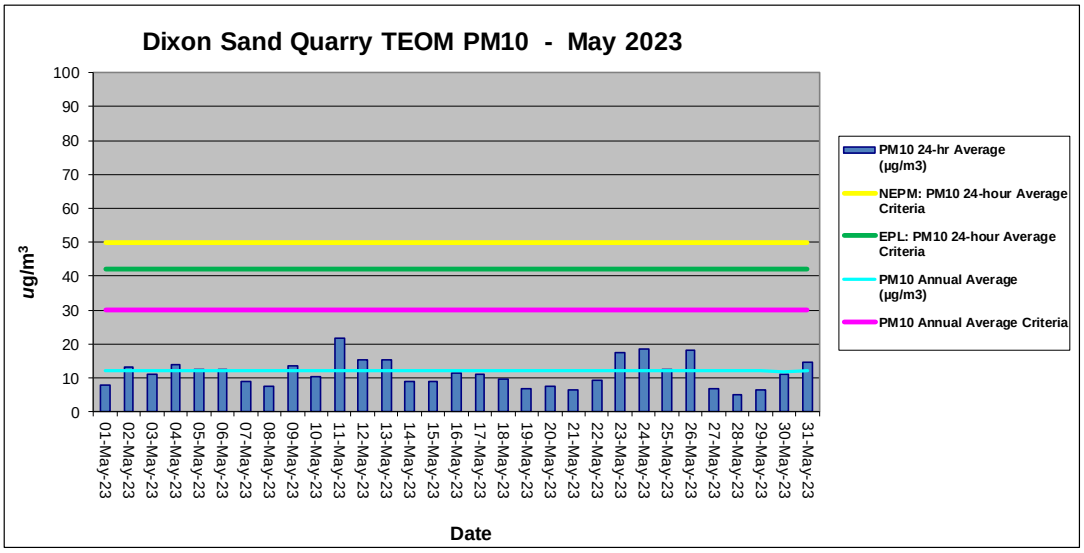


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

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.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. 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.

A 6-monthly physical screening and system check of the meteorological station was conducted in March 2023 and is next due in September 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

Approximately 100% of valid meteorological data was recorded for May 2023.

Table 3: Meteorological Data Summary for May 2023

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/05/2023	9.1	12.8	18.4	1.2	0.0	2.3	8.2	45.9	79.6	100.0	992.2	994.0	995.5
2/05/2023	10.4	15.1	20.9	0.0	0.2	2.8	14.6	46.1	66.7	80.8	993.7	995.8	997.9
3/05/2023	12.5	16.9	21.4	0.0	0.4	5.2	39.2	29.4	55.6	84.2	992.1	995.3	998.0
4/05/2023	9.2	13.8	18.5	0.0	0.0	2.3	10.7	41.3	57.1	89.4	997.1	999.0	1000.5
5/05/2023	8.7	14.2	19.8	0.0	0.1	3.1	16.8	42.7	69.3	94.6	995.4	997.9	1000.0
6/05/2023	9.0	14.3	20.1	0.0	0.1	2.4	9.2	37.6	60.7	80.4	995.7	997.2	999.4
7/05/2023	5.9	9.9	14.2	3.6	0.0	2.7	14.2	35.5	76.6	100.0	993.3	995.2	997.0
8/05/2023	6.0	10.4	15.5	0.4	0.0	4.1	20.1	35.5	57.4	99.9	992.4	995.9	999.5
9/05/2023	7.8	12.0	17.2	0.0	0.1	2.8	16.4	43.4	60.3	77.9	999.0	1001.4	1004.3
10/05/2023	7.0	12.5	18.4	0.0	0.2	2.6	11.1	39.8	69.1	92.6	1004.3	1006.2	1008.0
11/05/2023	8.5	13.5	19.4	0.0	0.1	2.3	12.8	51.7	82.9	100.0	1007.2	1008.6	1010.3
12/05/2023	10.0	15.4	22.4	0.0	0.0	2.5	10.1	35.3	81.0	100.0	1007.1	1008.8	1010.1
13/05/2023	10.0	13.4	18.6	2.8	0.0	2.1	10.0	73.1	93.6	99.9	1009.2	1010.4	1012.0
14/05/2023	10.1	13.2	18.8	7.4	0.1	1.6	8.2	72.0	96.1	100.0	1006.7	1008.6	1010.8
15/05/2023	11.3	14.4	19.7	0.2	0.0	1.8	6.7	55.6	89.7	100.0	1001.3	1004.3	1007.0
16/05/2023	10.2	13.7	19.3	0.0	0.0	2.4	10.3	45.1	80.8	100.0	997.3	999.5	1001.5
17/05/2023	8.9	11.8	16.1	1.0	0.7	4.9	13.3	56.9	78.8	99.9	1000.8	1002.4	1003.8
18/05/2023	7.5	10.8	16.3	1.0	0.0	2.9	12.2	56.0	81.6	100.0	997.4	999.9	1002.2
19/05/2023	6.0	10.8	16.8	0.2	0.0	2.0	9.2	44.5	74.9	100.0	995.1	997.4	999.2
20/05/2023	6.5	11.1	16.9	0.0	0.0	2.4	8.7	40.2	62.1	78.4	994.1	995.9	997.4
21/05/2023	9.8	12.9	17.5	0.0	0.0	3.7	19.5	42.5	55.7	74.8	993.3	996.4	1003.5
22/05/2023	7.6	12.3	18.1	0.0	0.2	2.5	9.5	32.6	57.2	78.7	1003.5	1005.1	1007.0
23/05/2023	7.7	12.3	18.9	0.0	0.0	2.3	9.0	33.0	57.4	80.1	1005.4	1006.8	1008.6
24/05/2023	7.0	13.1	20.3	0.0	0.0	2.7	8.8	33.9	61.0	87.8	1002.8	1005.1	1007.3
25/05/2023	10.3	15.8	19.9	0.0	0.5	5.3	19.9	24.9	36.8	50.5	993.3	998.4	1002.8
26/05/2023	6.8	12.6	16.4	0.4	0.1	4.7	17.2	29.8	56.0	91.2	988.6	993.5	998.3
27/05/2023	5.5	9.7	17.0	0.0	0.1	1.9	6.4	35.7	65.7	90.5	994.9	997.2	998.7
28/05/2023	5.6	9.8	15.5	0.0	0.1	2.8	10.6	46.8	61.8	73.2	993.2	995.7	997.5
29/05/2023	9.2	13.2	19.1	0.0	0.2	3.8	11.3	40.3	59.7	78.4	995.5	997.5	1001.2
30/05/2023	9.4	13.8	20.1	0.0	0.0	2.4	7.6	44.0	60.8	75.2	1000.5	1001.8	1004.0
31/05/2023	9.6	14.8	19.4	0.0	0.1	3.9	13.0	58.1	67.4	83.5	996.9	999.1	1001.6
Monthly	**5.5**	**12.9**	**22.4**	**18.2**	**0.0**	**2.9**	**39.2**	**24.9**	**68.2**	**100.0**	**988.6**	**1000.3**	**1012.0**

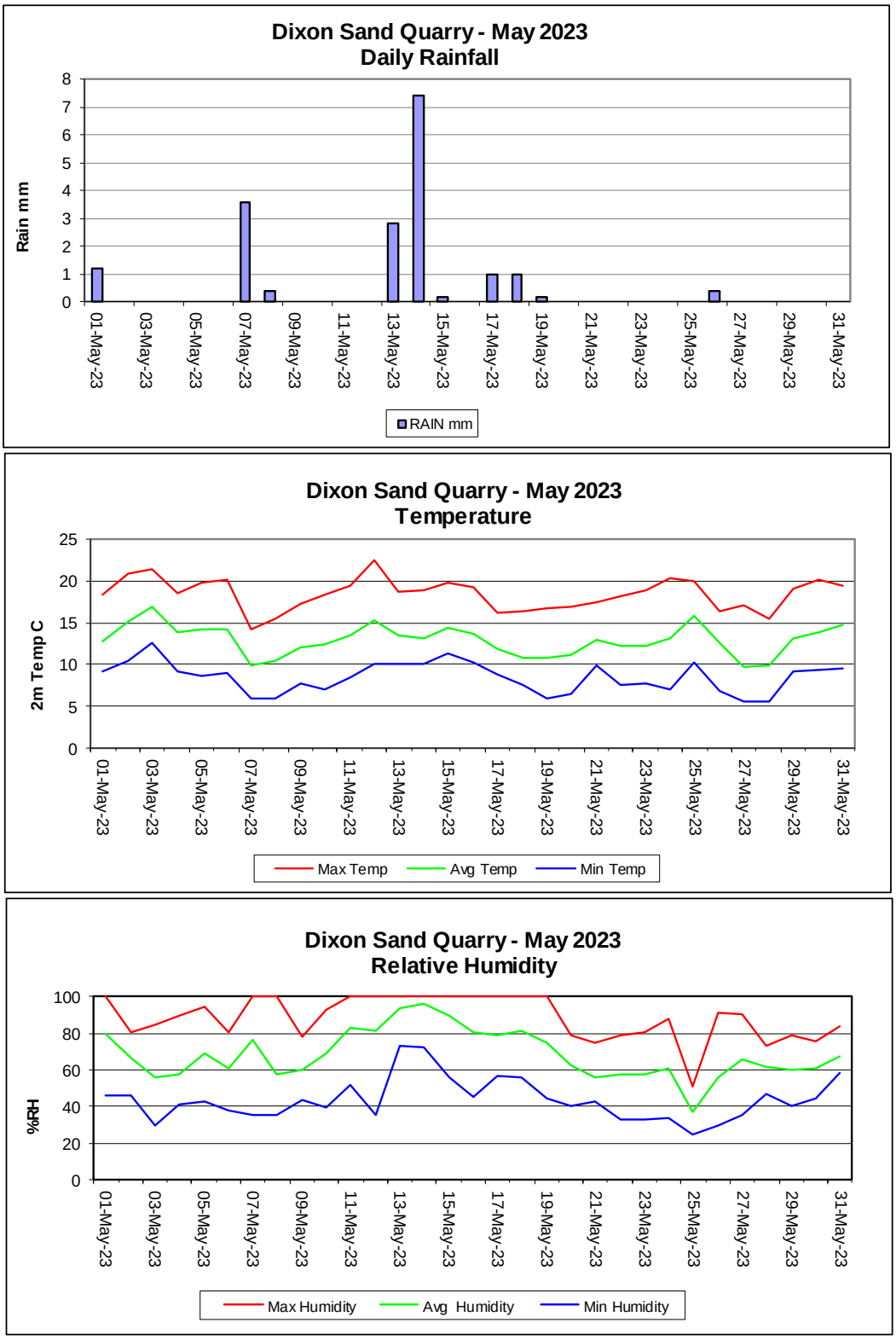


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

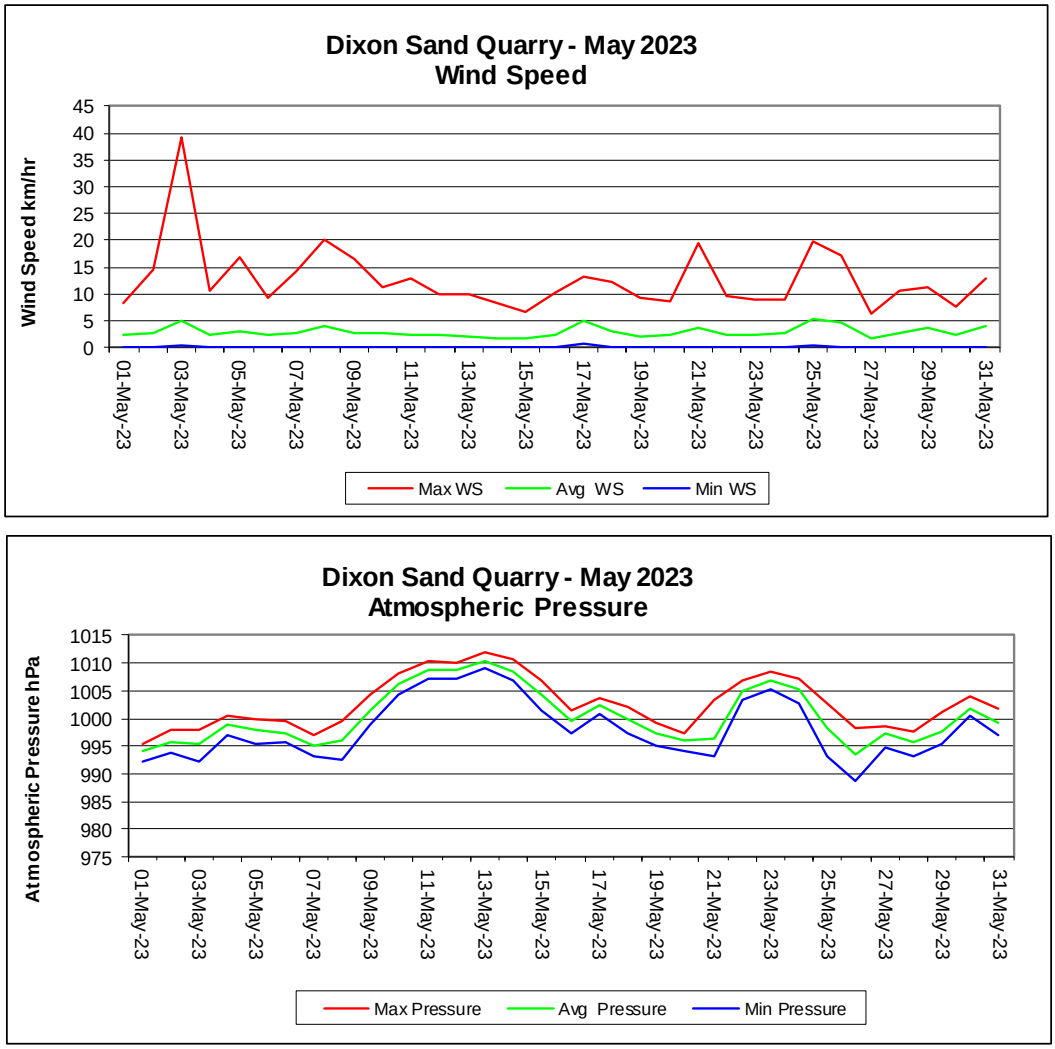


Figure 3: *Wind Speed and Atmospheric Pressure Charts*

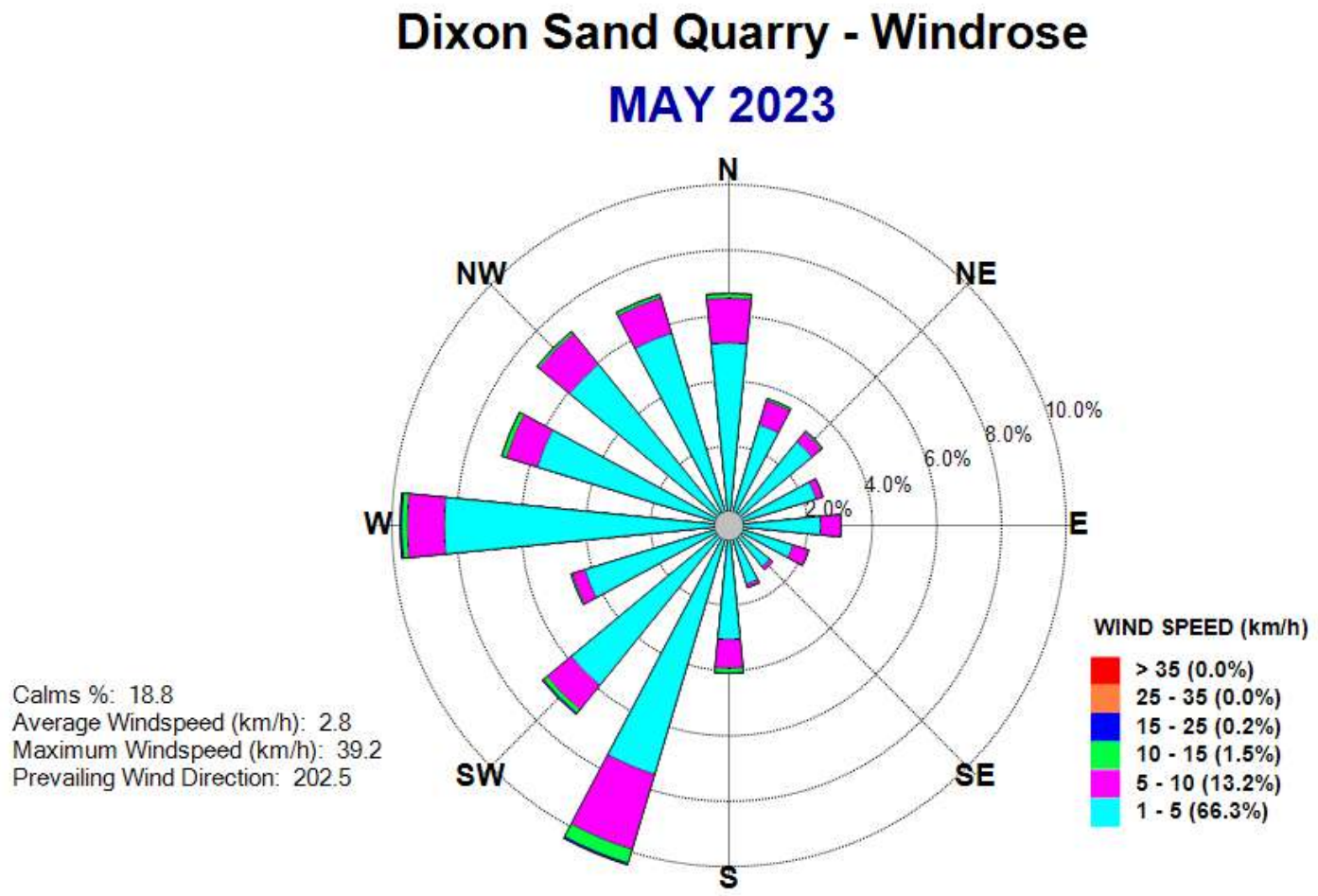


Figure 4: *Monthly Windrose*

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

JUNE 2023

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 18 July 2023

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

1.0 Summary

CBased Environmental Pty Limited 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 programme includes:

- One continuous TEOM PM_{10} monitor; and
- One continuous meteorological station.

This monthly report for June 2023 was prepared by CBased Environmental and includes the following:

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

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

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/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. Year to date annual average for PM_{10} is calculated from 1 July 2022 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has now been collected.

Approximately 100% of valid meteorological data was recorded for June 2023.

Approximately 100% of valid TEOM data was available for June 2023.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*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*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

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.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand 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 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/m3.

Approximately 100% of valid TEOM data was available for June 2023.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry 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/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2022 and therefore an annual amount of data has now been collected.

The quarterly TEOM calibration was conducted on 7 June 2023 with the next calibration due to be completed in September 2023. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for June 2023 from AQMS and Annual Average PM_{10} calculated from the 1 July 2022.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/06/2023	10.2	12.2	25.5	30.4
2/06/2023	25.7	12.2	64.3	30.5
3/06/2023	11.8	12.2	29.5	30.5
4/06/2023	12.3	12.2	30.8	30.5
5/06/2023	10.6	12.2	26.5	30.5
6/06/2023	9.9	12.2	24.8	30.5
7/06/2023	7.0	12.2	17.5	30.4
8/06/2023	6.3	12.2	15.8	30.4
9/06/2023	6.6	12.1	16.5	30.4
10/06/2023	8.0	12.1	20.0	30.3
11/06/2023	12.9	12.1	32.3	30.3
12/06/2023	11.0	12.1	27.5	30.3
13/06/2023	9.6	12.1	24.0	30.3
14/06/2023	10.1	12.1	25.3	30.3
15/06/2023	9.3	12.1	23.3	30.3
16/06/2023	11.1	12.1	27.8	30.2
17/06/2023	9.3	12.1	23.3	30.2
18/06/2023	5.7	12.1	14.3	30.2
19/06/2023	10.5	12.1	26.3	30.2
20/06/2023	9.9	12.1	24.8	30.1
21/06/2023	11.0	12.1	27.5	30.1
22/06/2023	16.9	12.1	42.3	30.2
23/06/2023	6.9	12.1	17.3	30.1
24/06/2023	5.5	12.0	13.8	30.1
25/06/2023	5.5	12.0	13.8	30.0
26/06/2023	9.2	12.0	23.0	30.0
27/06/2023	11.9	12.0	29.8	30.0
28/06/2023	11.8	12.0	29.5	30.0
29/06/2023	7.8	12.0	19.5	30.0
30/06/2023	4.6	12.0	11.5	29.9

*Calculated from PM_{10}
**Calculated from PM_{10} Annual Average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m^3 highlighted in yellow, when applicable

No Data (ND) = <18hrs hour of valid data to calculate a 24hr average

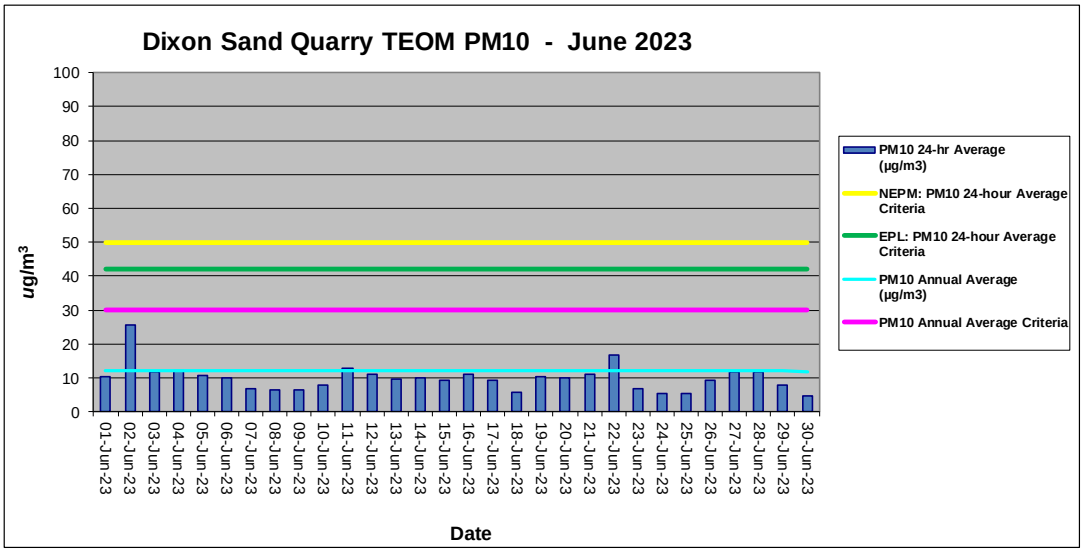


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

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.

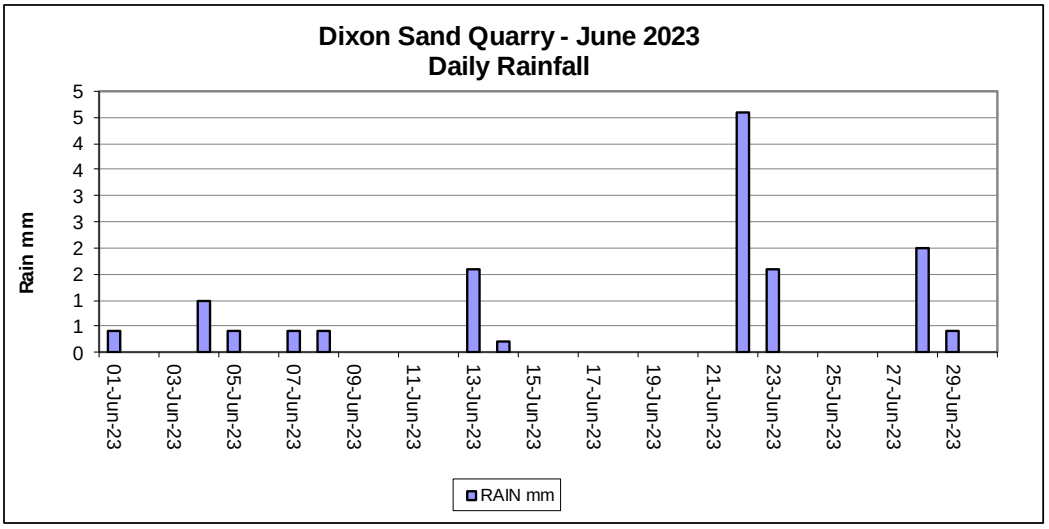
A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

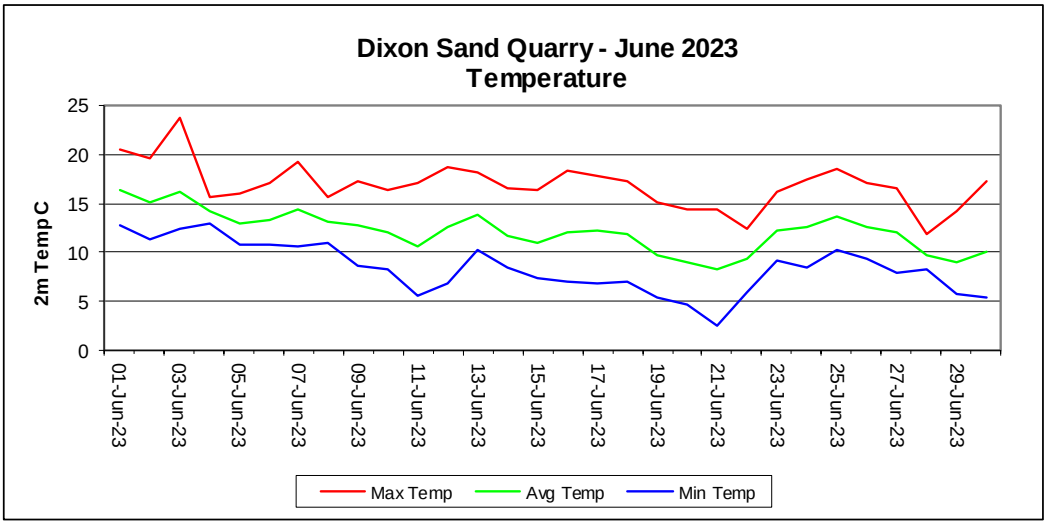
A 6-monthly physical screening and system check of the meteorological station was conducted in March 2023 and is next due in September 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

Approximately 100% of valid meteorological data was recorded for June 2023.

Table 3: Meteorological Data Summary for June 2023

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/06/2023	12.7	16.3	20.5	0.4	0.0	3.1	11.7	54.6	69.7	99.9	995.9	998.5	1002.8
2/06/2023	11.4	15.1	19.6	0.0	0.1	3.0	16.2	71.0	94.0	100.0	1002.7	1004.0	1005.9
3/06/2023	12.4	16.3	23.7	0.0	0.0	2.4	17.4	48.5	86.4	99.9	1003.2	1005.2	1009.6
4/06/2023	12.9	14.3	15.7	1.0	0.2	2.8	10.9	76.0	89.2	100.0	1009.3	1011.7	1013.7
5/06/2023	10.8	13.0	16.0	0.4	0.0	2.5	10.5	75.3	91.6	100.0	1008.0	1010.0	1012.5
6/06/2023	10.7	13.2	17.1	0.0	0.2	1.8	8.8	77.2	95.4	100.0	1006.3	1008.0	1009.7
7/06/2023	10.6	14.3	19.3	0.4	0.2	2.5	11.3	68.2	90.3	100.0	1001.3	1004.8	1007.9
8/06/2023	11.0	13.2	15.6	0.4	0.4	5.6	20.3	62.6	88.0	100.0	992.4	996.1	1001.2
9/06/2023	8.7	12.8	17.2	0.0	0.1	3.3	15.5	47.7	62.3	80.1	994.9	996.8	1000.0
10/06/2023	8.2	12.0	16.4	0.0	0.1	2.3	8.3	38.6	61.7	86.4	999.8	1002.3	1004.4
11/06/2023	5.6	10.7	17.0	0.0	0.0	2.5	10.2	48.3	78.0	99.9	1002.2	1003.9	1006.1
12/06/2023	6.9	12.6	18.7	0.0	0.0	2.9	17.6	53.7	79.1	99.9	996.8	1000.0	1003.0
13/06/2023	10.2	13.8	18.2	1.6	0.4	4.7	16.9	59.3	78.0	100.0	991.0	993.9	996.7
14/06/2023	8.4	11.8	16.6	0.2	0.2	4.4	19.6	33.3	59.0	97.2	992.4	994.1	997.1
15/06/2023	7.4	11.0	16.3	0.0	0.1	2.6	9.4	44.1	58.6	71.2	995.6	997.3	999.2
16/06/2023	7.1	12.0	18.4	0.0	0.3	2.6	7.0	41.9	62.9	81.1	999.0	1000.8	1002.5
17/06/2023	6.9	12.2	17.8	0.0	0.4	3.8	15.4	45.2	64.3	87.3	996.8	999.6	1002.5
18/06/2023	7.0	11.9	17.3	0.0	0.0	5.0	18.1	31.9	53.5	67.5	992.8	995.5	996.9
19/06/2023	5.4	9.8	15.1	0.0	0.4	4.7	19.5	29.9	52.9	71.6	991.9	994.9	996.8
20/06/2023	4.6	9.0	14.3	0.0	0.2	3.1	15.8	29.0	50.1	70.6	995.2	999.9	1003.3
21/06/2023	2.5	8.2	14.4	0.0	0.0	1.8	6.9	36.0	60.7	86.3	1001.7	1002.9	1004.9
22/06/2023	6.0	9.4	12.4	4.6	0.1	2.0	7.3	58.4	81.0	100.0	991.5	997.6	1001.8
23/06/2023	9.1	12.2	16.1	1.6	0.6	5.4	21.6	38.8	71.2	99.9	987.0	989.8	992.6
24/06/2023	8.4	12.6	17.4	0.0	0.2	5.0	19.4	30.6	50.8	72.3	991.3	993.0	995.6
25/06/2023	10.2	13.6	18.5	0.0	0.4	6.0	18.6	28.5	40.1	52.7	990.3	992.5	993.9
26/06/2023	9.4	12.7	17.0	0.0	0.0	5.2	25.1	33.8	41.1	58.8	992.8	994.8	998.7
27/06/2023	8.0	12.1	16.6	0.0	0.1	2.4	7.6	45.9	57.0	70.1	997.9	999.6	1002.3
28/06/2023	8.3	9.6	11.9	2.0	0.1	1.9	5.0	56.2	86.0	99.9	992.5	995.6	998.9
29/06/2023	5.7	9.0	14.2	0.4	0.4	2.8	10.5	44.8	71.5	99.9	993.4	996.1	997.9
30/06/2023	5.4	10.1	17.3	0.0	0.1	3.4	10.9	41.4	60.4	71.3	996.0	997.8	999.4
Monthly	**2.5**	**12.2**	**23.7**	**13.0**	**0.0**	**3.4**	**25.1**	**28.5**	**69.5**	**100.0**	**987.0**	**999.2**	**1013.7**





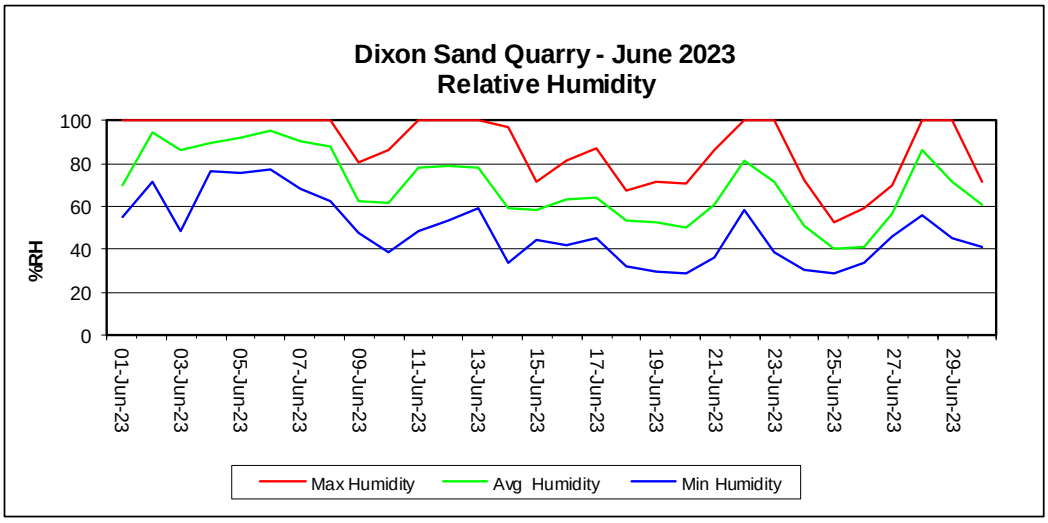


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

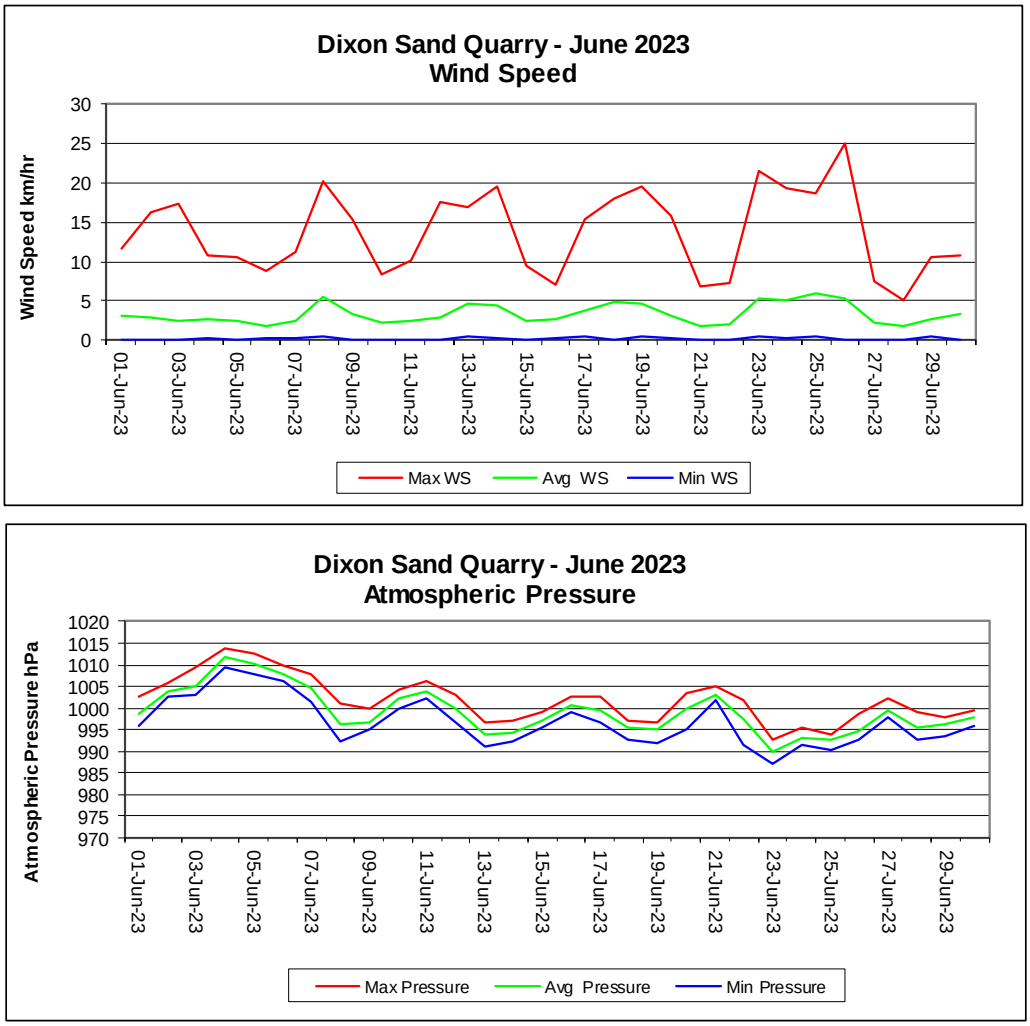


Figure 3: *Wind Speed and Atmospheric Pressure Charts*

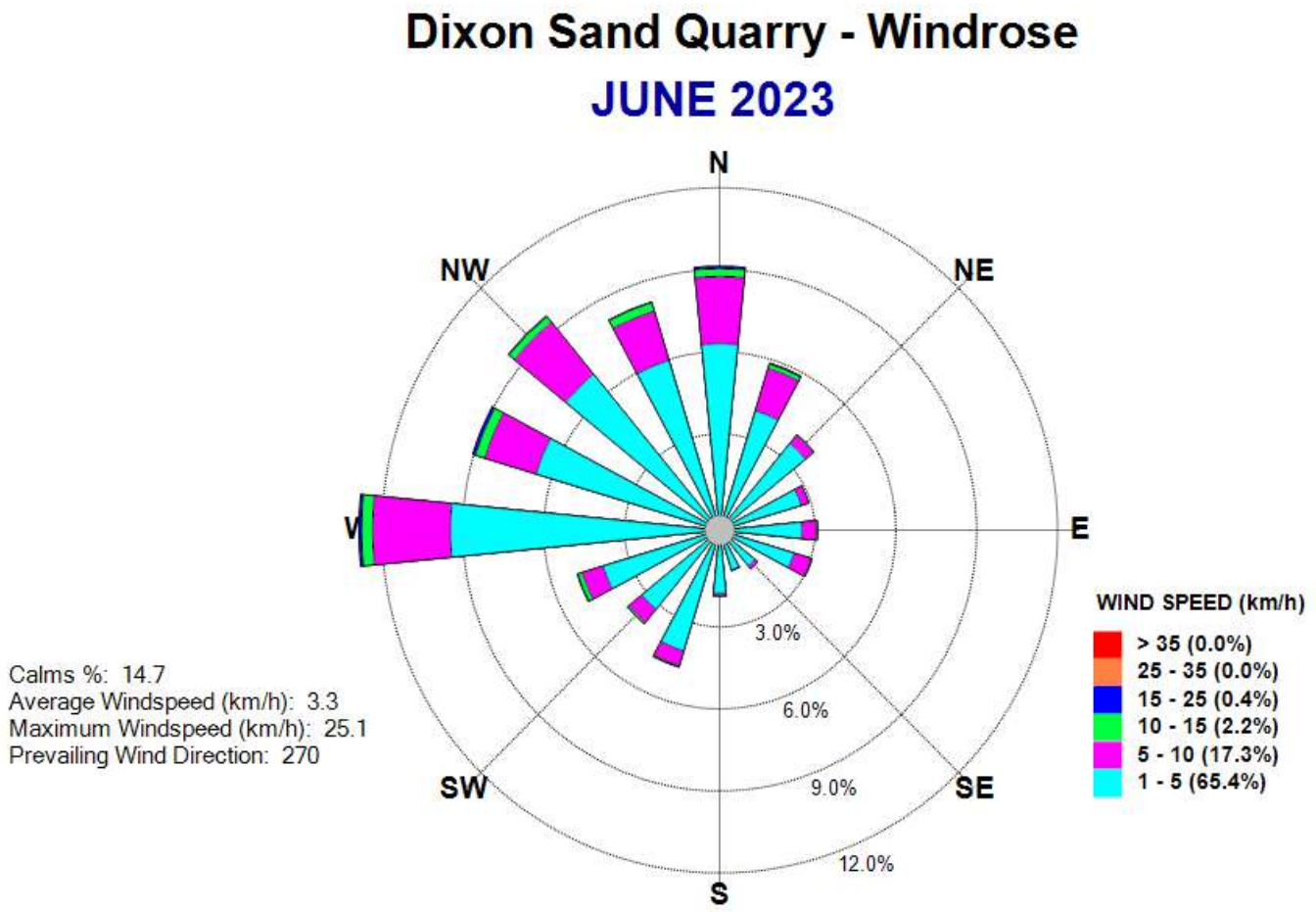


Figure 4: *Monthly Windrose*

Appendix 1

Calibration Documents (when required)

CARBON BASED ENVIRONMENTAL

Continuous Air Quality
Monthly/Quarterly/Six Monthly/Annual
TEOM Maintenance and Calibration – 1400AB

teledata

TEOM Client/Site: Dixon Sands / TEOM1 **Date:** 7.6.23

1. TEOM Data Screen **SERIAL No:** 25570 **Firmware:** MA AB

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Operating Condition	OK, Green ✓	Green - Normal	✓	
Date/time	TEOM: 7.6.23 11:08 Actual: 7.6.23 11:12	Current Date/time correct within 5 minutes	✓	
PM-10 24hr av	9.3	Positive values	✓	
Filter loading PM10	51%	<80 %	✓	
Frequency PM-10	254.08694	200-300 Hz	✓	
Noise PM-10	0.032	<0.100ug	✓	

Comment: If filter load >80% but <90% and if flows Ok then data is OK

Comments:

2. System Status

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

Comments:

Data Downloaded: YES/NO (circle)

Technician Name : COLIN DAVIS **Signed** [signature]

3. Instrument Conditions Ambient Conditions and Temperatures

Condition	Current Data	Acceptable Data	Pass (Tick)	Fail (Tick)
Ambient Temperature	24.1	-10 to 50 C	✓	
Ambient Dew Point	NA	-10 to 50 C	—	
Ambient Pressure	0.982	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:

Fadj main 1.060
Fadj aux 1.000

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	255.42131	255.42129	255.42134	255.42135 ✓ 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.

noise 0.018 ✓

4. Instrument clock verified (Refer Section 1) (YES)/NO.
If Time changed – clock reset OK YES/NO or (NA) (not changed)
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: 5 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 2.99 Error % 0.3 (allowed error <6%) (PASS)/FAIL

Bypass Flow verified Flow l/min 13.32 Error % 2.6 (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:** Fadj 1.020 final 13.68

2. Leak Check – Conducted (YES)/NO

PM10 actual 0.13 < Limit 0.15

Bypass actual 0.47 < Limit 0.60

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

* Also cleaned rain gauge – leaves debris

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:

Appendix C – Groundwater and Surface Water Monitoring Results

Groundwater Quality

VGT Laboratories Pty Ltd.
ABN 77 621 943 600
NATA Accreditation 20375
Unit 4, 30 Glenwood Drive Thornton NSW 2322|
P: (02) 4028 6412 | **E:** lab@vgt.com.au | **www.vgt.com.au**

Report Number: 13914

Date Issued: 16/12/2022 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 groundwater sample(s) were received on 9/12/2022

Client Sample Reference	Date Sampled	Lab ID	Matrix	General Comments
BH1	9/12/2022	13914/1	Water	
BH2	9/12/2022	13914/2	Water	
BH3	9/12/2022	13914/3	Water	
BH6	9/12/2022	13914/4	Water	
BH7	9/12/2022	13914/5	Water	
BH8	9/12/2022	13914/6	Water	
BH9	9/12/2022	13914/7	Water	
MW1	9/12/2022	13914/8	Water	
MW2	9/12/2022	13914/9	Water	
MW3	9/12/2022	13914/10	Water	
MW5	9/12/2022	13914/11	Water	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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

Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 16/12/2022.

Test Report Number: 13914

Date Issued: 16/12/2022 Revision No: 00

Results

Field Analysis	Method	Lab ID Sample Date Sample ID Units	13914/1 9/12/2022 BH1	13914/2 9/12/2022 BH2	13914/3 9/12/2022 BH3	13914/4 9/12/2022 BH6	13914/5 9/12/2022 BH7
Date Tested	--	--	09/12/2022	09/12/2022	09/12/2022	09/12/2022	09/12/2022
Depth to Water (TOM)	AS5667.11	m(bTOM)	58.11	34.37	31.36	29.74	20.14
Temperature	Temp	°C	20.5	19.0	19.0	18.4	19.4
pH	APHA 4500-H B	pH Units	6.2	5.8	5.8	4.7	4.8
Electrical Conductivity	APHA 2510 B	µS/cm	212	267	212	136	271

Field Analysis	Method	Lab ID Sample Date Sample ID Units	13914/6 9/12/2022 BH8	13914/7 9/12/2022 BH9	13914/8 9/12/2022 MW1	13914/9 9/12/2022 MW2	13914/10 9/12/2022 MW3
Date Tested	--	--	09/12/2022	09/12/2022	09/12/2022	09/12/2022	09/12/2022
Depth to Water (TOM)	AS5667.11	m(bTOM)	26.37	32.44	11.76	17.07	22.14
Temperature	Temp	°C	[NT]	19.2	20.6	17.6	18.7
pH	APHA 4500-H B	pH Units	[NT]	5.4	4.2	3.6	5.7
Electrical Conductivity	APHA 2510 B	µS/cm	[NT]	319	190	433	148

Field Analysis	Method	Lab ID Sample Date Sample ID Units	13914/11 9/12/2022 MW5
Date Tested	--	--	09/12/2022
Depth to Water (TOM)	AS5667.11	m(bTOM)	6.22
Temperature	Temp	°C	19.0
pH	APHA 4500-H B	pH Units	5.1
Electrical Conductivity	APHA 2510 B	µS/cm	203

Total Dissolved Solids	Method	Lab ID Sample Date Sample ID Units	13914/1 9/12/2022 BH1	13914/2 9/12/2022 BH2	13914/3 9/12/2022 BH3	13914/4 9/12/2022 BH6	13914/5 9/12/2022 BH7
Date Tested	--	--	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022
Total Dissolved Solids	AS3550.4	mg/L	150	160	140	100	160

Total Dissolved Solids	Method	Lab ID Sample Date Sample ID Units	13914/7 9/12/2022 BH9	13914/8 9/12/2022 MW1	13914/9 9/12/2022 MW2	13914/10 9/12/2022 MW3	13914/11 9/12/2022 MW5
Date Tested	--	--	14/12/2022	14/12/2022	14/12/2022	14/12/2022	15/12/2022
Total Dissolved Solids	AS3550.4	mg/L	170	110	220	94	130

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 13914

Date Issued: 16/12/2022 Revision No: 00

Sampling Conditions: Cloudy, 18°- 22°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
13914/1	BH1		T & D.Walker	9/12/2022 10:54 AM	AS5667.11, Bail	AS5667.1
13914/2	BH2		T & D.Walker	9/12/2022 12:06 PM	AS5667.11, Pump	AS5667.1
13914/3	BH3		T & D.Walker	9/12/2022 12:29 PM	AS5667.11, Pump	AS5667.1
13914/4	BH6		T & D.Walker	9/12/2022 11:46 AM	AS5667.11, Pump	AS5667.1
13914/5	BH7		T & D.Walker	9/12/2022 1:34 PM	AS5667.11, Pump	AS5667.1
13914/6	BH8		T & D.Walker	9/12/2022 2:10 PM	AS5667.11, Bail	AS5667.1
13914/7	BH9		T & D.Walker	9/12/2022 1:12 PM	AS5667.11, Pump	AS5667.1
13914/8	MW1		T & D.Walker	9/12/2022 1:58 PM	AS5667.11, Pump	AS5667.1
13914/9	MW2		T & D.Walker	9/12/2022 12:55 PM	AS5667.11, Bail	AS5667.1
13914/10	MW3		T & D.Walker	9/12/2022 11:33 AM	AS5667.11, Pump	AS5667.1
13914/11	MW5		T & D.Walker	9/12/2022 11:16 AM	AS5667.11, Bail	AS5667.1

Lab ID	Client Sample Reference	Sampling Observations
13914/1	BH1	No pump access to purge, standing water only tested
13914/2	BH2	
13914/3	BH3	
13914/4	BH6	
13914/5	BH7	
13914/6	BH8	Insufficient water for testing
13914/7	BH9	
13914/8	MW1	
13914/9	MW2	Insufficient water & recharge rate to pump
13914/10	MW3	
13914/11	MW5	No pump access to purge, standing water only tested

Sampling procedures have been approved and report finalised on 16/12/2022.
Where method is "unknown" sampling procedures are not endorsed

Well Parameters:

Client: Dixon Sand Pty Ltd

Site/Job: Old Northern Rd 6 Mnth Ground Water

Well ID	GPS-Easting	GPS-Northing	Survey Date	Surveyed AHD (m)	Depth to Screen (m)
BH1	312290	6297039			
BH2	313429	6297202			
BH3	313808	6297093			
BH6	313153	6296833			
BH7	313097	6296495			
BH8	313435	6296617			
BH9	313294	6296504			
MW1	313092	6296499			
MW2	313417	6296733			
MW3	313161	6296838			
MW5	312460	6296903			

Well ID	Date Well Measured	Monument Height (TOM) (m)	Depth to Bottom (bTOM) (m)	Recharge Rate	Approximate Volume (L)
BH1	2/12/2019	0.68	>60	Slow	unkown
BH2	2/12/2019	0.57	>60	slow	unkown
BH3	2/12/2019	0.56	>60	Slow	Unkown
BH6	2/12/2019	0.52	>60	Slow	Unkown
BH7	2/12/2019	0.53	>60	Slow	Unknown
BH8	2/12/2019	0.73	27.53	Slow	2
BH9	2/12/2019	0.64	>60	Medium	Unkown
MW1	2/12/2019	0.28	15.53	Medium	12
MW2	2/12/2019	0.45	24.53	Slow	7.5
MW3	2/12/2019	0.88	34.57	Slow	2.5
MW5	2/12/2019	0.70	21.19	Slow	28

Note: NATA accreditation does not cover information provided in this section

*Where indicated AHD from ground level (m) estimated based on handheld GPS

VGT Laboratories Pty Ltd.
ABN 77 621 943 600
NATA Accreditation 20375
Unit 4, 30 Glenwood Drive Thornton NSW 2322|
P: (02) 4028 6412 | **E:** lab@vgt.com.au | **www.vgt.com.au**

Report Number: 14680

Date Issued: 20/06/2023 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 groundwater sample(s) were received on 14/06/2023

Client Sample Reference	Date Sampled	Lab ID	Matrix	General Comments
BH1	14/06/2023	14680/1	Water	
BH2	14/06/2023	14680/2	Water	
BH3	14/06/2023	14680/3	Water	
BH6	14/06/2023	14680/4	Water	
BH7	14/06/2023	14680/5	Water	
BH8	14/06/2023	14680/6	Water	
BH9	14/06/2023	14680/7	Water	
MW1	14/06/2023	14680/8	Water	
MW2	14/06/2023	14680/9	Water	
MW3	14/06/2023	14680/10	Water	
MW5	14/06/2023	14680/11	Water	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

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

Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 20/06/2023.

Test Report Number: 14680

Date Issued: 20/06/2023 Revision No: 00

Results

Field Analysis	Method	Lab ID Sample Date Sample ID Units	14680/1 14/06/2023 BH1	14680/2 14/06/2023 BH2	14680/3 14/06/2023 BH3	14680/4 14/06/2023 BH6	14680/5 14/06/2023 BH7
Date Tested	--	--	14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Depth to Water (TOM)	AS5667.11	m(bTOM)	57.98	34.48	31.36	30.04	20.54
Temperature	Temp	°C	18.9	18.5	18.1	18.1	18.9
pH	APHA 4500-H B	pH Units	6.4	5.9	5.9	5.1	4.9
Electrical Conductivity	APHA 2510 B	µS/cm	197	272	196	130	254

Field Analysis	Method	Lab ID Sample Date Sample ID Units	14680/6 14/06/2023 BH8	14680/7 14/06/2023 BH9	14680/8 14/06/2023 MW1	14680/9 14/06/2023 MW2	14680/10 14/06/2023 MW3
Date Tested	--	--	14/06/2023	14/06/2023	14/06/2023	14/06/2023	14/06/2023
Depth to Water (TOM)	AS5667.11	m(bTOM)	26.29	32.69	12.08	16.60	22.61
Temperature	Temp	°C	[NT]	18.2	18.9	17.8	18.4
pH	APHA 4500-H B	pH Units	[NT]	5.5	4.0	3.7	5.8
Electrical Conductivity	APHA 2510 B	µS/cm	[NT]	289	185	501	115

Field Analysis	Method	Lab ID Sample Date Sample ID Units	14680/11 14/06/2023 MW5
Date Tested	--	--	14/06/2023
Depth to Water (TOM)	AS5667.11	m(bTOM)	5.87
Temperature	Temp	°C	18.2
pH	APHA 4500-H B	pH Units	4.5
Electrical Conductivity	APHA 2510 B	µS/cm	150

Total Dissolved Solids	Method	Lab ID Sample Date Sample ID Units	14680/1 14/06/2023 BH1	14680/2 14/06/2023 BH2	14680/3 14/06/2023 BH3	14680/4 14/06/2023 BH6	14680/5 14/06/2023 BH7
Date Tested	--	--	16/06/2023	16/06/2023	16/06/2023	16/06/2023	16/06/2023
Total Dissolved Solids	AS3550.4	mg/L	170	160	140	110	160

Total Dissolved Solids	Method	Lab ID Sample Date Sample ID Units	14680/6 14/06/2023 BH8	14680/7 14/06/2023 BH9	14680/8 14/06/2023 MW1	14680/9 14/06/2023 MW2	14680/10 14/06/2023 MW3
Date Tested	--	--	16/06/2023	16/06/2023	19/06/2023	19/06/2023	19/06/2023
Total Dissolved Solids	AS3550.4	mg/L	160	110	150	290	110

Total Dissolved Solids	Method	Lab ID Sample Date Sample ID Units	14680/11 14/06/2023 MW5
Date Tested	--	--	19/06/2023
Total Dissolved Solids	AS3550.4	mg/L	86

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 14680

Date Issued: 20/06/2023 Revision No: 00

Sampling Conditions: Fine, 15°- 18°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
14680/1	BH1		T & D.Walker	14/06/2023 10:49 AM	AS5667.11, Bail	AS5667.1
14680/2	BH2		T & D.Walker	14/06/2023 12:01 PM	AS5667.11, Pump	AS5667.1
14680/3	BH3		T & D.Walker	14/06/2023 11:39 AM	AS5667.11, Pump	AS5667.1
14680/4	BH6		T & D.Walker	14/06/2023 12:39 PM	AS5667.11, Bail	AS5667.1
14680/5	BH7		T & D.Walker	14/06/2023 1:47 PM	AS5667.11, Pump	AS5667.1
14680/6	BH8		T & D.Walker	14/06/2023 1:03 PM	AS5667.11, Bail	AS5667.1
14680/7	BH9		T & D.Walker	14/06/2023 1:19 PM	AS5667.11, Pump	AS5667.1
14680/8	MW1		T & D.Walker	14/06/2023 2:02 PM	AS5667.11, Bail	AS5667.1
14680/9	MW2		T & D.Walker	14/06/2023 12:53 PM	AS5667.11, Bail	AS5667.1
14680/10	MW3		T & D.Walker	14/06/2023 12:27 PM	AS5667.11, Bail	AS5667.1
14680/11	MW5		T & D.Walker	14/06/2023 11:10 AM	AS5667.11, Pump	AS5667.1

Lab ID	Client Sample Reference	Sampling Observations
14680/1	BH1	Algae
14680/2	BH2	
14680/3	BH3	
14680/4	BH6	No vehicle access - incorrectly engraved as MW3
14680/5	BH7	
14680/6	BH8	Insufficent water, roots obstructing sampling
14680/7	BH9	
14680/8	MW1	Insufficient water to pump
14680/9	MW2	
14680/10	MW3	No vehicle access - Incorrectly engraved as BH6
14680/11	MW5	

Sampling procedures have been approved and report finalised on 20/06/2023.
Where method is "unknown" sampling procedures are not endorsed

Well Parameters:

Client: Dixon Sand Pty Ltd

Site/Job: Old Northern Rd 6 Mnth Ground Water

Well ID	GPS-Easting	GPS-Northing	Survey Date	Surveyed AHD (m)	Depth to Screen (m)
BH1	312290	6297039			
BH2	313429	6297202			
BH3	313808	6297093			
BH6	313153	6296833			
BH7	313097	6296495			
BH8	313435	6296617			
BH9	313294	6296504			
MW1	313092	6296499			
MW2	313417	6296733			
MW3	313161	6296838			
MW5	312460	6296903			

Well ID	Date Well Measured	Monument Height (TOM) (m)	Depth to Bottom (bTOM) (m)	Recharge Rate	Approximate Volume (L)
BH1	2/12/2019	0.68	>60	Slow	unkown
BH2	2/12/2019	0.57	>60	slow	unkown
BH3	2/12/2019	0.56	>60	Slow	Unkown
BH6	2/12/2019	0.52	>60	Slow	Unkown
BH7	2/12/2019	0.53	>60	Slow	Unknown
BH8	2/12/2019	0.73	27.53	Slow	2
BH9	2/12/2019	0.64	>60	Medium	Unkown
MW1	2/12/2019	0.28	15.53	Medium	12
MW2	2/12/2019	0.45	24.53	Slow	7.5
MW3	2/12/2019	0.88	34.57	Slow	2.5
MW5	2/12/2019	0.70	21.19	Slow	28

Note: NATA accreditation does not cover information provided in this section

*Where indicated AHD from ground level (m) estimated based on handheld GPS

Surface Water Quality

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2234912**	Page	: 1 of 2
Client	: **DIXON SAND PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: HUNNY CHURCHER	Contact	: Customer Services ES
Address	: 4610 Old Northern Road Maroota	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	: 29-Sep-2022 14:50
Order number	: ----	Date Analysis Commenced	: 04-Oct-2022
C-O-C number	: ----	Issue Date	: 07-Oct-2022 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, unless the sampling was conducted by ALS. 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	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the 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 Contract 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**)				*Sample ID*	**SW19**	**----**	**----**	**----**	**----**
				Sampling date / time	29-Sep-2022 09:20	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**ES2234912-001**	**--------**	**--------**	**--------**	**--------**
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**6.01**	**----**	**----**	**----**	**----**
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**112**	**----**	**----**	**----**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**22**	**----**	**----**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2245901**	Page	: 1 of 2
Client	: **DIXON SAND PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: HUNNY CHURCHER	Contact	: Customer Services ES
Address	: 4610 Old Northern Road Maroota	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	: 19-Dec-2022 11:55
Order number	: ----	Date Analysis Commenced	: 19-Dec-2022
C-O-C number	: ----	Issue Date	: 23-Dec-2022 15:27
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, unless the sampling was conducted by ALS. 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*
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

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Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract 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**)			Sample ID	**SW19**	**----**	**----**	**----**	**----**
			Sampling date / time	19-Dec-2022 08:30	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2245901-001**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.96**	**----**	**----**	**----**	**----**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**127**	**----**	**----**	**----**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**18**	**----**	**----**	**----**	**----**

CERTIFICATE OF ANALYSIS

Work Order	: **ES2310765**	Page	: 1 of 2
Client	: **DIXON SAND PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: HUNNY CHURCHER	Contact	: Customer Services ES
Address	: 4610 Old Northern Road Maroota	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 4566 8348	Telephone	: +61-2-8784 8555
Project	: ONR	Date Samples Received	: 31-Mar-2023 11:25
Order number	: ----	Date Analysis Commenced	: 31-Mar-2023
C-O-C number	: ----	Issue Date	: 05-Apr-2023 12:24
Sampler	: Melissa Mass		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 1		
No. of samples analysed	: 1		

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ISO/IEC 17025 - Testing

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Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

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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**)			*Sample ID*	**SW19**	**----**	**----**	**----**	**----**
			Sampling date / time	31-Mar-2023 09:45	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2310765-001**	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.68**	**----**	**----**	**----**	**----**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**127**	**----**	**----**	**----**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**12**	**----**	**----**	**----**	**----**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**17.4**	**----**	**----**	**----**	**----**

CERTIFICATE OF ANALYSIS

Work Order	: **ES2321663**	Page	: 1 of 2
Client	: **DIXON SAND PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: HUNNY CHURCHER	Contact	: Customer Services ES
Address	: 4610 Old Northern Road Maroota	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 4566 8348	Telephone	: +61-2-8784 8555
Project	: ONR	Date Samples Received	: 29-Jun-2023 13:45
Order number	: ----	Date Analysis Commenced	: 29-Jun-2023
C-O-C number	: ----	Issue Date	: 05-Jul-2023 12:27
Sampler	: Melissa Mass		
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

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Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

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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**)			*Sample ID*	**SW19**	**----**	**----**	**----**	**----**
			Sampling date / time	29-Jun-2023 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2321663-001**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.76**	**----**	**----**	**----**	**----**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**124**	**----**	**----**	**----**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**10**	**----**	**----**	**----**	**----**

Discharge Point – Water Quality

(No planned discharge during this reporting period)

Appendix D – Noise Compliance Reports

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Dixon Sand Pty Ltd

Old Northern Road Quarry, Maroota

Noise monitoring report
December 2021

Doc no. 19020-NV-RP-6-0



Dixon Sand Pty Ltd
Old Northern Road Quarry, Maroota

Title	Noise monitoring report
Document no.	19020-NV-RP-6-0
Revision	0
Date	20 December 2021
Author	John Hutchison
Reviewer	Scott Hughes
File path	C:\Users\john.HW\Documents\Client files\Projects (local)\19020 Dixon\19020-NV-RP-6-0 Dixon Sand Old Northern Road Noise Monitoring Dec 2021.docx

Hutchison Weller Pty Ltd
ABN 37 001 024 095
13/357 Military Road
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Revision history

0	20 December 2021	Report issued to client

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2. Noise compliance criteria **3**

3. Monitoring methodology **4**

4. Monitoring results **5**

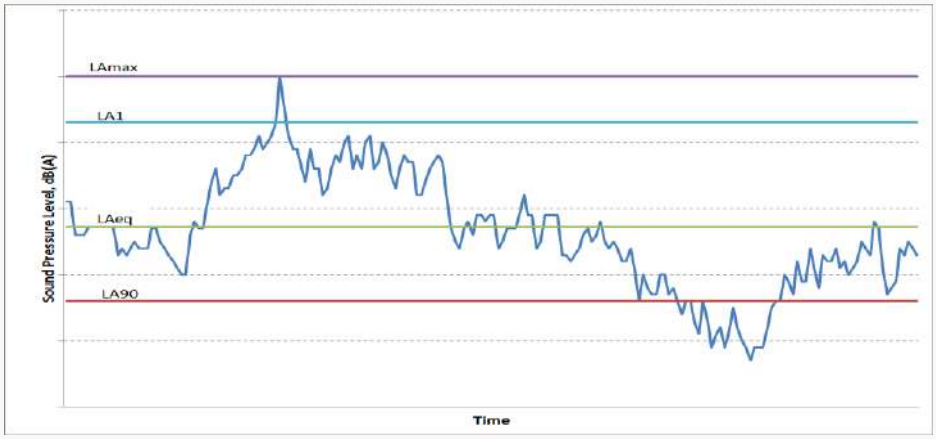
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Definition of terms

Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation.
Decibel (dB)	A measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm (to base 10) of the ratio of a given sound power to a reference power.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear.
dB(C)	Unit used to measure 'C-weighted' sound pressure levels, an adjustment made to sound level to approximate low frequency noise between 10 Hz and 200 Hz.
EPA	Environment Protection Authority
Extraneous noise	Noise resulting from activities that are not typical of the area such as construction, and traffic generated by holiday periods or special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Noise level statistics	L_{A90} – The A-weighted sound pressure level exceeded 90% of the monitoring period. This is considered to represent the background noise. L_{Aeq} – The equivalent continuous A-weighted noise level—the level of noise equivalent to the energy average of noise levels occurring over a measurement period. L_{A1} – The A-weighted sound pressure level exceeded 1% of the monitoring period. L_{Amax} – The maximum A-weighted noise level associated with the measurement period. 
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
Receiver	The land use at which noise is heard
SLM	Sound Level Meter
Sound Power Level (SWL)	The A-weighted sound power level is a logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
Sound Pressure Level (SPL)	This is the level of noise, usually expressed in dB(A), as measured by a standard sound level meter (SLM) with a pressure microphone. The sound pressure level in dB(A) gives a close indication of the subjective loudness of noise. A technical definition for the sound pressure level, in decibels, is 20 times the logarithm (base 10) of the ratio of any two quantities related to a given sound pressure to a reference pressure (typically 20 µPa equivalent to 0 dB).
Tonal noise	Noise with perceptible and definite pitch or tone

1. Introduction

Dixon Sand Pty Ltd operates the Old Northern Road Quarry in Maroota, NSW (the Quarry). The Quarry is located off Old Northern Road, as illustrated in Figure 1.

Operations at the quarry include extraction of sand and sandstone blocks, processing by screening and grading and direct sales involving loading of trucks for shipment.

The Quarry operates under Development Consent 250-09-01 and Environment Protection Licence (EPL) 3916, which set noise limits for its operation and require noise monitoring to be completed on a six-monthly basis to ensure compliance with the conditions.

Hutchison Weller was commissioned by Dixon Sand to undertake the six-monthly noise monitoring in accordance with the conditions of consent, EPL and requirements of the Noise Management Plan.

This document outlines the consent conditions, monitoring methodology and results of the monitoring undertaken on 14 December 2021.



Figure 1 Location of the Quarry

2. Noise compliance criteria

Conditions 1 and 2 of Schedule 3 of development consent DA250-09-01 outline the Quarry operating hours and condition 3 defines the noise criteria for compliance.

1. 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

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.

3. 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	LAeq (15 minute)	37	44
Any classroom at Maroota Public School	LAeq (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.

3. Monitoring methodology

Operator-attended noise monitoring was undertaken on 14 December June 2021 by John Hutchison of Hutchison Weller, an independent acoustic specialist and Member of the Australian Acoustical Society. Monitoring locations included those described in the Quarry Noise Management Plan plus additional sensitive receivers, as illustrated in Figure 1 and summarised in Table 3.

Table 3 Monitoring locations

Receiver[1]	Address	Description
OR1	Maroota public school	Classroom closest to quarry operations
OR2	4624 Old Northern Road	Private residence
OR3	4634 Old Northern Road	Private residence
R2	4579 Old Northern Road	Private residence
R3	4567 Old Northern Road	Private residence
R4/5	4547 – 4543 Old Northern Road	Mid-point between private residence
OAS1	Lots 1 and 2 of the Quarry	At source monitoring, close to operations
OAS2	Lot 196 of the Quarry	At source monitoring, close to operations

Note 1: An agreement between Dixon Sand and receiver R1 is in place and, therefore, noise management levels defined by the development consent are not applicable.

Monitoring was conducted in accordance with procedures outlined in the Noise Policy for Industry and Section 6 of the Noise Management Plan.

At-receiver monitoring locations were within 30 metres of residential dwellings, whilst onsite measurement locations were selected for safe access and to be representative of the operations, without extraneous noise from sources such as traffic and insects.

Instrumentation included a Bruel & Kjaer Class 1 sound level meter (SLM), serial no. 3008237, field-calibrated prior to and following monitoring. The SLM was within current calibration, next due January 2022.

Monitoring was undertaken with the SLM set on a tripod at 1.5 metres above ground and measuring A-weighted sound pressure levels under fast response. Each measurement period was 15 minutes and recorded the LAeq, LA90 and LAmax statistics.

Meteorological data was recorded during each monitoring period adjacent to the Maroota public school, including wind speed, direction, temperature, relative humidity and sigma-theta (to establish the Pascall-Guifford stability category). This data was used to establish the meteorological conditions as being suitable for monitoring.

Where extraneous noise such as road traffic and fauna (insects/birds) were the dominant noise sources, making it impractical to discern the contribution of the Quarry to ambient noise levels, noise levels measured at alternative locations closer to the Quarry were utilised, in line with procedures outlines in Noise Policy for Industry (NSW EPA 2017). This involved extrapolation from the near-distance location to the sensitive receiver location, as described in Section 4.3.

4. Monitoring results

4.1 Attended measurements

Results of noise monitoring for each location are presented in Table 4.

In general, quarry operations were faintly audible from most locations, with traffic the dominant source of noise for residents on the Old Northern Road.

Quarry operations fell into four categories representing the main sources of noise. These were:

- Sand processing and truck loading (main plant, front end loaders, trucks)
- Extraction of sand (involving ripping by dozer and transport via excavator loading a moxie)
- Extraction of bulk sandstone by rock saw
- Dewatering activities with dewatering pumps

Depending on the receiver location, these sources played a varying role in contributing to the total noise level.

Measured results indicated quarry operations during the shoulder period (from 6.00am to 7.00am) were audible but complied with the noise criteria at all measurement locations.

On-site measurements were taken to determine the noise level of various noise sources without the influence of traffic noise. Measurements were undertaken over 15-minute periods to establish representative sound power levels of the operation to allow extrapolation to receiver locations where background noise was too high to discern quarry noise contributions. This is discussed further in Section 4.3.

During the day (standard hours), measurement at the school and residential receivers established traffic was the dominant source of noise in the area and heavily influenced measured LAeq, 15-minute noise levels. However, quarry noise was audible over the background level.

Estimated contributions of quarry noise on the total noise level indicated compliance with the noise limit. However, due to ambient noise (traffic, birds, breeze in trees), extrapolation from at-source measurements has been undertaken to support this assertion (See Section 4.3.)

4.2 Modifying factors

No tonal, impulsive or low frequency noise characteristics were observed during the monitoring period. Therefore, application of modifying factors is not appropriate in this instance.

Table 4 Monitoring results

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmax			
Shoulder (6.00am to 7.00am)								
5.58am	OR3	37	48.6	40.2	59.0	<37	Occasional traffic on access road ~50 – 53 (some at 57-58 dBA) for short periods (approx. 8 trucks in 15 minutes) ONR traffic intermittent ~ 50 – 53 dBA, but audible for a long distance Processing area visibly operating and faintly audible when ambient level is 40 dBA Quarry generally inaudible	Clear sky and calm to light breeze (3 km/h) Temperature 14°C Neutral conditions (C-D class).
6.18am	OR2		52.7	41.8	68.3	<37	Heavy vehicles ~ 54 – 55 dBA approximately every 2 minutes ONR dominant ambient noise source with 58 – 60 dBA pass bys – engine braking Quarry barely audible at ambient levels of 37 dBA	
6.37am	R3		60.7	37.4	82.1	<37	Traffic on ONR is dominant noise source ~77-78 for HV passbys Processing plant just audible in break in traffic at ambient level of ~38 dBA but essentially inaudible for monitoring period	
6.55am	R4/5		60.4	38.2	77.9	<37	ONR dominant ~73 – 78 dBA for HV reduced frequency compared with earlier Processing plant just audible during break in traffic at ambient levels of 37 – 41 dBA	

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmax			
Day period - (7.00am to 6.00pm)								
7:53am	OAS1	N/A	50.8	45.5	61.9	~50	Pit audible in this location – some intermittent ripping / bucket scraping at 46 dBA – no steady noise source Processing plant / moxies to stockpile dominant sources. Moxies on the mound ~ 56 dBA, processing plant ~44 dBA	Light breeze from S - SSW @ 4-5 km/h Temperature 18-19°C Clear sky unstable (A class)
9:38am	OAS2	N/A	60.0	52.4	64.0	63	Quarry noise is main source Dozer pushing up spoil at eastern end of pit – close to pit wall – 70 dBA Cliff is around 15-20 metres high around works Excavator loading moxies ~58 dBA	
10:13am	OR1	45	48.3	41.2	68.2	See Section 4.3	Quarry audible with dozer pushing up at 41 – 42 dBA Moxy audible at 50 dBA for short time ~ 5 – 10 secs Traffic on Old Northern Road fairly light ~53 – 58 intermittent School kids outside at 11am	Breeze from NNE - SSW@ 5km/h Temperature 23°C Unstable conditions (A class)
11:20am	R4/5	44	59.1	39.9	77.0	See Section 4.3	School kids in yard (voices) audible Traffic on ONR – 73 – 74 for truck passbys Birds / insects combined for 41 – 43 dBA Quarry noise intermittently audible ~39 – 41 dBA when breaks in traffic	

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmax			
11:40am	R3	44	59.0	39.5	59.0	See Section 4.3	Quarry faintly audible – 38 – 39 dBA during break in traffic Traffic noise remains dominant ~ 60 – 66 LV and 74 – 78 HV	Breeze from variable directions @ 5 - 6 km/h Temperature 25°C Unstable conditions (A class)
12:07pm	R2	44	61.2	38.3	83.8	See Section 4.3	Traffic dominant ~ 76 - 79 dBA Moxies heading to stockpile faintly audible at 39-40 dBA LAeq without traffic noise ~ 40 dBA includes faint hum of quarry, breeze in trees, birds/insects	
12:26pm	OR2	44	50.8	40.4	71.8	See Section 4.3	Old Northern Road traffic is dominant ~ 55-56 dBA Quarry intermittently audible pit noise ~38 dBA Haul road 55 – 56 dBA Moxy heading to stockpile ~47 dBA	
1:10pm	OR3	44	45.7	39.4	58.8	See Section 4.3	Quarry and pit faintly audible ~ 39 dBA Old Northern Road traffic 54 – 57 dBA Haul road traffic ~ 51 – 54 dBA	

4.3 Extrapolated measurements

A conclusive noise level attributable to the Quarry was not possible in all locations due to ambient noise levels. Therefore, measurements captured on-site without substantial influence from extraneous noise were used to calculate sound pressure levels at each receiver.

Calculations were based on ISO 9613-2:1996 *Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation,* which accounts for geometric spreading, air and ground absorption as well as barrier effects, assuming worst case meteorology of a gentle breeze from source to receiver and stable conditions.

Based on measurements described in Table 4, extrapolated noise results for each monitoring location are presented in **Error! Not a valid bookmark self-reference.**. Results are shown for equipment operating in the pit, processing plant and stockpiling area.

Extrapolated results demonstrate the Quarry as measured demonstrates a contribution to the ambient noise environment that meets the noise limit for the day period in all locations.

Table 5 Extrapolated monitoring results

Receiver	Noise criteria		Extrapolated noise level, LAeq, 15 minute	Comment
	Shoulder	Day		
OR1	-	45	41	Predicted levels correlate well with measured levels and most locations shown to meet noise limits during the day period.
OR2	37	44	43	
OR3			44	
2			42	
3			41	
4/5			43	

4.4 Compliance summary

Results of attended monitoring and extrapolated noise levels demonstrate the following.

1. Observed operations during the day period were compliant with the noise limit at each receiver under the meteorological conditions at the time.

2. Observed operations during the shoulder period were compliant with the noise criteria at all receivers under the meteorological conditions at the time.

hutchison weller

Dixon Sand Pty Ltd

Old Northern Road Quarry, Maroota

Noise monitoring report
June 2022

Doc no. 19020-NV-RP-9-0



Dixon Sand Pty Ltd
Old Northern Road Quarry, Maroota

Title	Noise monitoring report
Document no.	19020-NV-RP-9-0
Revision	0
Date	24 August 2022
Author	John Hutchison
Reviewer	Scott Hughes
File path	https://hwenvironment.sharepoint.com/sites/HutchisonWeller/PROJECTS/19020 - Dixon/02 Deliverables/021 Reports/Winter 2022/19020-NV-RP-9-0 Dixon Sand Old Northern Road Noise Monitoring June 2022.docx

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ABN 37 001 024 095
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Revision history

0	24 August 2022	Report issued to client

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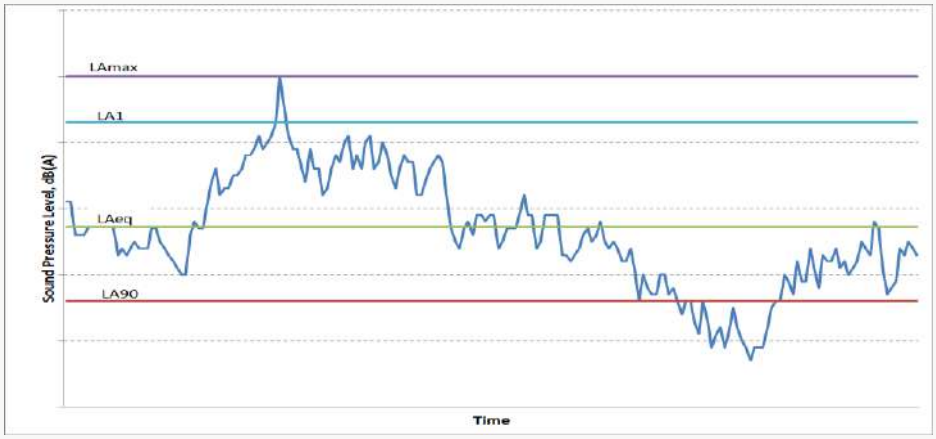
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4.4 Compliance summary 9

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Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation.
Decibel (dB)	A measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm (to base 10) of the ratio of a given sound power to a reference power.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear.
dB(C)	Unit used to measure 'C-weighted' sound pressure levels, an adjustment made to sound level to approximate low frequency noise between 10 Hz and 200 Hz.
EPA	Environment Protection Authority
Extraneous noise	Noise resulting from activities that are not typical of the area such as construction, and traffic generated by holiday periods or special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Noise level statistics	L_{A90} – The A-weighted sound pressure level exceeded 90% of the monitoring period. This is considered to represent the background noise. L_{Aeq} – The equivalent continuous A-weighted noise level—the level of noise equivalent to the energy average of noise levels occurring over a measurement period. L_{A1} – The A-weighted sound pressure level exceeded 1% of the monitoring period. L_{Amax} – The maximum A-weighted noise level associated with the measurement period. 
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
Receiver	The land use at which noise is heard
SLM	Sound Level Meter
Sound Power Level (SWL)	The A-weighted sound power level is a logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
Sound Pressure Level (SPL)	This is the level of noise, usually expressed in dB(A), as measured by a standard sound level meter (SLM) with a pressure microphone. The sound pressure level in dB(A) gives a close indication of the subjective loudness of noise. A technical definition for the sound pressure level, in decibels, is 20 times the logarithm (base 10) of the ratio of any two quantities related to a given sound pressure to a reference pressure (typically 20 µPa equivalent to 0 dB).
Tonal noise	Noise with perceptible and definite pitch or tone

1. Introduction

Dixon Sand Pty Ltd operates the Old Northern Road Quarry in Maroota, NSW (the Quarry). The Quarry is located off Old Northern Road, as illustrated in Figure 1.

Operations at the quarry include extraction of sand and sandstone blocks, processing by screening and grading and direct sales involving loading of trucks for shipment.

The Quarry operates under Development Consent 250-09-01 and Environment Protection Licence (EPL) 3916, which set noise limits for its operation and require noise monitoring to be completed on a six-monthly basis to ensure compliance with the conditions.

Hutchison Weller was commissioned by Dixon Sand to undertake the six-monthly noise monitoring in accordance with the conditions of consent, EPL and requirements of the Noise Management Plan.

This document outlines the consent conditions, monitoring methodology and results of the monitoring undertaken on 17 June 2022.



Figure 1 Location of the Quarry

2. Noise compliance criteria

Conditions 1 and 2 of Schedule 3 of development consent DA250-09-01 outline the Quarry operating hours and condition 3 defines the noise criteria for compliance.

1. 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

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.

3. 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	LAeq (15 minute)	37	44
Any classroom at Maroota Public School	LAeq (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.

3. Monitoring methodology

Operator-attended noise monitoring was undertaken by John Hutchison of Hutchison Weller, an independent acoustic specialist and Member of the Australian Acoustical Society. Monitoring locations included those described in the Quarry Noise Management Plan plus additional sensitive receivers, as illustrated in Figure 1 and summarised in Table 3.

Table 3 Monitoring locations

Receiver[1]	Address	Description
OR1	Maroota public school	Classroom closest to quarry operations
OR2	4624 Old Northern Road	Private residence
OR3	4634 Old Northern Road	Private residence
R2	4579 Old Northern Road	Private residence
R3	4567 Old Northern Road	Private residence
R4/5	4547 – 4543 Old Northern Road	Mid-point between private residence
OAS1	Lots 1 and 2 of the Quarry	At source monitoring, close to operations
OAS2	Lot 196 of the Quarry	At source monitoring, close to operations

Note 1: An agreement between Dixon Sand and receiver R1 is in place and, therefore, noise management levels defined by the development consent are not applicable.

Monitoring was conducted in accordance with procedures outlined in the Noise Policy for Industry and Section 6 of the Noise Management Plan.

At-receiver monitoring locations were within 30 metres of residential dwellings, whilst onsite measurement locations were selected for safe access and to be representative of the operations, without extraneous noise from sources such as traffic and insects.

Instrumentation included a Bruel & Kjaer Class 1 sound level meter (SLM), serial no. 3008237, field-calibrated prior to and following monitoring. The SLM was within current calibration, next due January 2022.

Monitoring was undertaken with the SLM set on a tripod at 1.5 metres above ground and measuring A-weighted sound pressure levels under fast response. Each measurement period was 15 minutes and recorded the LAeq, LA90 and LAmax statistics.

Meteorological data was recorded during each monitoring period adjacent to the Maroota public school, including wind speed, direction, temperature, relative humidity and sigma-theta (to establish the Pascall-Guifford stability category). This data was used to establish the meteorological conditions as being suitable for monitoring.

Where extraneous noise such as road traffic and fauna (insects/birds) were the dominant noise sources, making it impractical to discern the contribution of the Quarry to ambient noise levels, noise levels measured at alternative locations closer to the Quarry were utilised, in line with procedures outlines in Noise Policy for Industry (NSW EPA 2017). This involved extrapolation from the near-distance location to the sensitive receiver location, as described in Section 4.3.

4. Monitoring results

4.1 Attended measurements

Results of noise monitoring for each location are presented in Table 4.

In general, quarry operations were faintly audible from most locations, with traffic the dominant source of noise for residents on the Old Northern Road.

Quarry operations fell into four categories representing the main sources of noise. These were:

- Sand processing and truck loading (main plant, front end loaders, trucks)
- Extraction of sand (involving ripping by dozer and transport via excavator loading a moxie)
- Extraction of bulk sandstone by rock saw
- Stockpile management with screen, FEL, excavator and moxies

Depending on the receiver location, these sources played a varying role in contributing to the total noise level.

Measured results indicated quarry operations during the shoulder period (from 6.00am to 7.00am) were faintly audible during breaks in traffic noise and complied with the noise criteria at all measurement locations.

On-site measurements were taken to determine the noise level of various noise sources without the influence of traffic noise. Measurements were undertaken over 15-minute periods to establish representative sound power levels of the operation to allow extrapolation to receiver locations where background noise was too high to discern quarry noise contributions. This is discussed further in Section 4.3.

During the day (standard hours), measurement at the school and residential receivers established traffic was the dominant source of noise in the area and heavily influenced measured LAeq, 15-minute noise levels. However, quarry noise was faintly audible over the background level.

Estimated contributions of quarry noise on the total noise level indicated compliance with the noise limit. However, due to ambient noise (traffic, birds, breeze in trees), extrapolation from at-source measurements has been undertaken to support this assertion (See Section 4.3.)

4.2 Modifying factors

No tonal, impulsive or low frequency noise characteristics were observed during the monitoring period. Therefore, application of modifying factors is not appropriate in this instance.

Table 4 Monitoring results

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmax			
Shoulder (6.00am to 7.00am)								
5.58am	OR3	37	58.6	38.5	90.7	<37	Occasional traffic on access road ~49 – 52 (some at 57-58 dBA) for short periods (approx. 9 trucks in 15 minutes) ONR traffic dominant ~ 53 – 56 dBA, and audible for a long distance. Dog at property occasional barks ~ Lamax 91 dBA Pump at property operates intermittently ~ 45 dBA Processing area visibly operating and faintly audible during gaps in traffic at 36 – 3 dBA – estimate 33-34 dBA	Clear sky and calm to light breeze (1-2 km/h) from WNW Temperature 9-10°C extremely unstable conditions (A-class).
6.17am	OR2		54.1	43.7	65.0	<37	Heavy vehicles on haul road ~ 57 – 64 dBA – higher speed increases noise approximately 10 trucks in 15 minutes ONR dominant ambient noise source with 60 - 64 dBA pass bys – engine braking Quarry not audible Processing area just audible when no traffic – once in 15 minutes – inaudible at 37 dBA ambient noise – estimate 31 – 32 dBA	
6.36am	R3		59.7	38.0	82.8	<37	Traffic on ONR is dominant noise source ~71-78 for HV passbys and 63-71 for LV Processing plant just audible in break in traffic at ambient level of ~35 dBA but essentially inaudible for monitoring period	
6.54am	R4/5		60.7	45.1	79.6	<37	ONR dominant ~70 – 73 dBA for HV reduced frequency compared with earlier Quarry / Processing inaudible	

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmax			
Day period - (7.00am to 6.00pm)								
8:23am	OAS1	N/A	45.5	41.9	57.8	~45	Pit barely audible– some intermittent ripping / bucket scraping at 46 dBA – no steady noise source Processing plant / moxies to stockpile dominant sources. Moxies on the mound ~ 47 dBA, processing plant ~44 dBA Screen and excavator on stockpile ~ 42 dBA, 45 dBA with FEL operating	Clear sky and calm to light breeze (3-5 km/h) from WNW Temperature 10-11°C slightly to extremely unstable - conditions (A-C class).
9:26am	OAS2	N/A	57.3	49.8	68.2	57	Quarry noise is main source FELs loading stone ~ 55 dBA Excavator loading moxy ~ 56 dBA Second excavator working pile ~ 56 dBA Cliff is around 15-20 metres high around works	
10:31am	OR1	45	53.7	46.4	76.0	See Section 4.3	Quarry audible with engine of excavator just audible estimated 44-45 dBA Traffic intermittent ~55-60 dBA Cockatoos and Lorikeets intermittent ~ 60-62 PF's quarry dominant source for almost entire time ~ 49-54 dBA, Dixon quarry not audible over PF's. Dixon only audible when ambient noise quieter – no birds, traffic or PF's	Breeze from SW@ 4-5km/h Temperature 14-15°C Unstable conditions (A class)

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmax			
11:44am	OR3	44	49.3	45.7	62.8	See Section 4.3	Old Northern Road traffic 54 – 57 dBA - dominant Haul road traffic ~ 47 –54 dBA – speed greatly influences noise Screen on stockpile barely audible but tonal alarm prominent on excavator Pit not audible	Breeze from SW @ 5 - 6 km/h Temperature 16°C Unstable conditions (A-B class)
12:20pm	OR2	44	51.9	44.3	68.0	See Section 4.3	Old Northern Road traffic is dominant ~ up to 58 dBA Quarry intermittently audible pit noise ~42 dBA PF's quarry audible today Haul road 57 – 58 dBA Moxy heading to stockpile ~47 dBA	
12:44pm	R2	44	62.3	40.3	84.8	See Section 4.3	Traffic dominant ~ 76 - 85 dBA Without traffic noise at ~ 43-44 dBA quarry just audible, with faint engine noise Breeze in trees, birds/insects	
1:03pm	R3	44	58.5	40.7	77.9	See Section 4.3	Traffic noise remains dominant ~ 72 - 78 dBA Quarry faintly audible when traffic quiet– 41 – 42 dBA (PF's also contributes)	
1:20pm	R4/5	44	59.5	39.8	77.2	See Section 4.3	Traffic on ONR domaint– 72 – 77 for truck passbys, 62 – 65 for light vehicles Quarry noise intermittently just audible ~41 - 42 dBA when breaks in traffic, so <41 dBA	

4.3 Extrapolated measurements

A conclusive noise level attributable to the Quarry was not possible in all locations due to ambient noise levels. Therefore, measurements captured on-site without substantial influence from extraneous noise were used to calculate sound pressure levels at each receiver.

Calculations were based on ISO 9613-2:1996 *Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation,* which accounts for geometric spreading, air and ground absorption as well as barrier effects, assuming worst case meteorology of a gentle breeze from source to receiver and stable conditions.

Based on measurements described in Table 4, extrapolated noise results for each monitoring location are presented in Table 5. Results are shown for equipment operating in the pit, processing plant and stockpiling area.

Extrapolated results demonstrate the Quarry as measured demonstrates a contribution to the ambient noise environment that meets the noise limit for the day period in all locations.

Table 5 Extrapolated monitoring results

Receiver	Noise criteria		Extrapolated noise level, LAeq, 15 minute	Comment
	Shoulder	Day		
OR1	-	45	39	Predicted levels correlate well with measured levels and all locations shown to meet noise limits during the day period.
OR2	37	44	42	
OR3			42	
2			41	
3			39	
4/5			40	

4.4 Compliance summary

Results of attended monitoring and extrapolated noise levels demonstrate the following.

1. Observed operations during the day period were compliant with the noise limit at each receiver under the meteorological conditions at the time.

2. Observed operations during the shoulder period were compliant with the noise criteria at all receivers under the meteorological conditions at the time.

Appendix E – Monthly Site Inspection

OLD NORTHERN 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:	29/6/2023
Inspection by:	Melissa Mass
Measured monthly rainfall (mm)	31/05/2023 - 29/6/2023 Rainfall = 13.0mm

	Yes (✓) No (X) NA	Comments	Actions	Actions Complete (Date/Sign)
SEDIMENT CONTROLS				
Site checked for potential erosion issues or transport of sediment batters, vehicle access points, ...vations, haul roads, vegetation clearing etc.	✓	No erosion or transport of sediment noted		
Effectiveness and capacity of Erosion and Sediment controls checked (drains, basins, filters etc.)	✓	All drains, basins etc clear		
Stockpiles located and maintained correctly	✓			
Tree clearance restricted to required area	N/A			
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			
Weir: Daily volume of water discharged recorded.	N/A			
...onthly monitoring of surface water ...ity at SW19.	✓	Undertaken 29/6/2023		
...monthly monitoring of groundwater quality at six bores on Lots 1&2 and two bores on Lots 196.	✓	undertaken by VLT		
Monthly depth measurement of all groundwater bores and comparison with rainfall	✓	Depth measured 29/6/2023		
Monthly inspection of drainage & sediment controls including water storages, pumps, pipes and dams' walls	✓	All sites inspected 29/6/2023		
Any Fuel or oil spills reported and maintained	✓	No spills recorded this period		
Fuels/chemicals stored in bunded areas	✓	EPA approved bunding		
AIR QUALITY				
Continuous static dust (collected for analysis monthly)	✓	Static dust gauge managed by VLT		
On site dust suppression	✓	use of water cart when required		
Loads covered entering and leaving site	✓	In compliance with TMP		

No burning of vegetation	N/A	[redacted]		
Wind speed, direction and rainfall recorded	✓	TEOM and weather Station managed by COASED		
NOISE				
Operation only during hours of operation	✓	Comply with DA, NMP + TMP		
No complaints received from school, residences or local community members.	✓	No complaints this period		
6 monthly monitoring at Maroota PS	✓	undertaken by Hutchison + Weller		
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			
Bulldozer being used for clearing, topsoil stripping and bund construction on Lots 1 and 2 DP547255 only during wind conditions	✓			
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	✓			
Quarrying at ground level on Lot 196 not occurring during southwest to northwest winds	✓	In compliance with EPL		
Construction and rehabilitation of eastern highwall of quarry within 250 metres of Maroota Public School occurring in school holiday periods only	✓			
FLORA & FAUNA/ REHABILITATION				
Sightings of threatened species reported	N/A			
No disturbance of buffer/conservation areas	✓			
Buffer/conservation area fencing/marking intact	✓			
Rehabilitation undertaken to schedule	✓	monthly visit by Bush-it		
Success of rehabilitation of buffers, conservation areas & rehabilitation areas	✓			
Rehabilitation near school during holidays	✓			
Flora and fauna monitoring program undertaken to schedule	✓			
ARCHAEOLOGY				
Stop work if sites located – OEH notified	✓	None this period		
WASTE AND SITE CONDITION				
No rubbish visible or buried on site	✓			
Recyclables removed by licensed Contractors	✓	By council and local contractors		
Putrescible waste covered and regularly removed	✓	By council contractors		

EXTRACTION PROGRAM				
Extraction depths from monthly checked control points in accordance with extraction program.	✓			
ROADS AND TRANSPORT				
Weekly inspection of Old Northern Rd/Crown Rd intersection and sand/clay removed as necessary.	✓			
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.	✓	Refer to Hunny to check.		
Weighbridge/log book records forwarded to Council monthly	✓	Refer to truck records		
REPORTING				
Complaints register maintained	✓	Updated monthly		
ronmental incidents reported to A and DPIE	✓	None this period		
PIRMP / SPILL KIT				
Spill kits inspected and used items replaced	✓			
A copy of PIRMP flowchart available in each Spill Kit	✓			

Signed: M. M ..... (Environmental Officer or Delegate)

Appendix F – Truck Movement Data

Dixon Sand - Maroota Quarry Morning Trucks

AUGUST	2022	6.00am - 7.00am		Daily Morning Truck No.
Date	Time in	Docket No.	Tonnes	
1/08/2022	6.00	315069	19.38	
1/08/2022	6.02	315068	32.64	
1/08/2022	6.04	315070	43	
1/08/2022	6.08	315071	38.56	
1/08/2022	6.23	315072	39.28	
1/08/2022	6.30	315073	34.58	
1/08/2022	6.32	315074	14.7	
1/08/2022	6.40	315075	37.68	
1/08/2022	6.57	315076	39.4	9
2/08/2022	6.00	315110	19.7	
2/08/2022	6.03	315111	32.48	
2/08/2022	6.05	315112	32.06	
2/08/2022	6.08	315113	37.82	
2/08/2022	6.10	315114	20.30	
2/08/2022	6.30	315115	38.50	
2/08/2022	6.45	315116	43.46	
2/08/2022	6.57	315117	19.28	8
3/08/2022	6.00	315159	19.70	
3/08/2022	6.02	315160	32.34	
3/08/2022	6.05	315161	38.36	
3/08/2022	6.07	315162	38.56	
3/08/2022	6.09	315163	46.36	
3/08/2022	6.11	315164	19.48	
3/08/2022	6.14	315165	32.30	
3/08/2022	6.17	315166	34.64	
3/08/2022	6.27	315167	39.02	
3/08/2022	6.30	315168	16.36	
3/08/2022	6.58	315169	18.74	11
4/08/2022	6.00	315216	31.68	
4/08/2022	6.02	315217	31.94	
4/08/2022	6.04	315218	19.48	
4/08/2022	6.06	315219	38.56	
4/08/2022	6.08	315220	32.40	
4/08/2022	6.12	315221	46.42	
4/08/2022	6.32	315222	18.92	
4/08/2022	6.45	315223	43.46	
4/08/2022	6.58	315224	28.86	9
5/08/2022	6.00	315269	19.90	
5/08/2022	6.02	315270	31.84	
5/08/2022	6.04	315271	14.74	
5/08/2022	6.06	315272	32.34	
5/08/2022	6.09	315273	31.80	
5/08/2022	6.12	315274	38.56	
5/08/2022	6.14	315275	18.68	
5/08/2022	6.16	315276	36.88	
5/08/2022	6.20	315277	14.46	
5/08/2022	6.22	315278	17.44	
5/08/2022	6.23	315279	38.00	
5/08/2022	6.24	315280	19.70	
5/08/2022	6.25	315281	14.30	
5/08/2022	6.30	315282	16.64	
5/08/2022	6.40	315283	33.86	15
6/08/2022	6.00	315325/315326	32.16	
6/08/2022	6.05	315327	34.96	
6/08/2022	6.18	315328	38.50	
6/08/2022	6.26	315329	38.06	
6/08/2022	6.44	315330	19.40	5
8/08/2022	6.00	315339	19.70	
8/08/2022	6.02	315340	32.48	
8/08/2022	6.04	315341	14.80	
8/08/2022	6.07	315342	38.04	
8/08/2022	6.09	315343	32.28	
8/08/2022	6.11	315344	19.54	
8/08/2022	6.13	315345	36.46	
8/08/2022	6.15	315346	17.52	
8/08/2022	6.18	315347	19.52	
8/08/2022	6.20	315348	29.06	
8/08/2022	6.23	315349	38.46	
8/08/2022	6.28	315350	19.76	
8/08/2022	6.34	315352	38.40	
8/08/2022	6.40	315353	38.92	
8/08/2022	6.46	315354	33.36	
8/08/2022	6.52	315355	34.76	
8/08/2022	6.58	315356	32.80	17
9/08/2022	6.00	315402	32.44	
9/08/2022	6.02	315403	38.94	
9/08/2022	6.04	315404	20.00	
9/08/2022	6.06	315405	14.58	
9/08/2022	6.10	315406	14.46	
9/08/2022	6.12	315407	32.90	
9/08/2022	6.14	315408	46.36	
9/08/2022	6.16	315409	12.24	
9/08/2022	6.20	315410	32.56	
9/08/2022	6.26	315411	39.32	
9/08/2022	6.35	315412	37.55	
9/08/2022	6.51	315413	38.00	12
10/08/2022	6.00	315455	39.04	
10/08/2022	6.02	315456	32.64	
10/08/2022	6.04	315457	32.40	

Dixon Sand - Maroota Quarry Morning Trucks				
AUGUST	**2022**	**6.00am - 7.00am**		**Daily Morning Truck No.**
Date	**Time in**	**Docket No.**	**Tonnes**	
10/08/2022	6.07	315458	19.80	
10/08/2022	6.09	315459	43.12	
10/08/2022	6.12	315460	20.16	
10/08/2022	6.14	315461	37.10	
10/08/2022	6.17	315462	14.12	
10/08/2022	6.20	315463	28.30	
10/08/2022	6.25	315464	31.52	
10/08/2022	6.42	315465	35.04	
10/08/2022	6.47	315466	19.76	
10/08/2022	6.58	315467	32.90	13
11/08/2022	6.00	315505	39.04	
11/08/2022	6.02	315506	32.64	
11/08/2022	6.04	315507	19.84	
11/08/2022	6.08	315508	38.64	
11/08/2022	6.17	315509	39.46	
11/08/2022	6.20	315510	19.00	
11/08/2022	6.23	315511	17.22	
11/08/2022	6.28	315512	32.36	
11/08/2022	6.35	315513	39.00	
11/08/2022	6.38	315514	20.02	
11/08/2022	6.46	315515	37.74	11
12/08/2022	6.00	315558	39.00	
12/08/2022	6.02	315559	31.74	
12/08/2022	6.04	315560	19.70	
12/08/2022	6.06	315561	36.72	
12/08/2022	6.08	315562	37.45	
12/08/2022	6.11	315563	38.78	
12/08/2022	6.13	315564	20.06	
12/08/2022	6.15	315565	31.90	
12/08/2022	6.17	315566	47.16	
12/08/2022	6.21	315567	37.04	
12/08/2022	6.23	315568	39.00	
12/08/2022	6.30	315569	11.14	
12/08/2022	6.33	315570	37.20	
12/08/2022	6.35	315571	16.62	
12/08/2022	6.41	315572	38.80	
12/08/2022	6.44	315573	31.24	
12/08/2022	6.47	315574	37.88	
12/08/2022	6.49	315575	14.20	
12/08/2022	6.54	315576	34.30	
12/08/2022	6.56	315577	18.48	20
13/08/2022	6.00	315613	32.14	
13/08/2022	6.04	315614	38.56	
13/08/2022	6.10	315615	38.44	
13/08/2022	6.17	315616	37.44	
13/08/2022	6.28	315617	37.76	
13/08/2022	6.36	315618	31.40	
13/08/2022	6.47	315619	37.92	
13/08/2022	6.52	315620	31.50	
13/08/2022	6.56	315621	19.68	9
15/08/2022	6.00	315639	39.04	
15/08/2022	6.02	315640	31.84	
15/08/2022	6.04	315641	38.30	
15/08/2022	6.07	315642	38.94	
15/08/2022	6.09	315643	38.30	
15/08/2022	6.11	315644	18.78	
15/08/2022	6.14	315645	38.00	
15/08/2022	6.33	315646	16.48	
15/08/2022	6.38	315647	19.58	
15/08/2022	6.56	315648	42.82	
15/08/2022	6.59	315649	32.80	11
16/08/2022	6.00	315712	39.04	
16/08/2022	6.02	315713	32.14	
16/08/2022	6.04	315714	38.54	
16/08/2022	6.06	315715	28.68	
16/08/2022	6.08	315716	32.30	
16/08/2022	6.10	315717	14.46	
16/08/2022	6.13	315718	38.56	
16/08/2022	6.15	315719	38.94	
16/08/2022	6.17	315720	17.50	
16/08/2022	6.19	315721	18.68	
16/08/2022	6.21	315722	37.06	
16/08/2022	6.23	315723	32.04	
16/08/2022	6.25	315724	38.50	
16/08/2022	6.27	315725	13.08	
16/08/2022	6.32	315726	38.34	
16/08/2022	6.34	315727	18.00	
16/08/2022	6.42	315728	38.32	
16/08/2022	6.50	315729	30.94	
16/08/2022	6.55	315730	28.50	
16/08/2022	6.59	315731	32.80	20
17/08/2022	6.00	315789	39.04	
17/08/2022	6.02	315790	32.38	
17/08/2022	6.04	315791	36.50	
17/08/2022	6.06	315792	19.78	
17/08/2022	6.08	315793	39.06	
17/08/2022	6.12	315794	43.24	
17/08/2022	6.14	315795	32.30	
17/08/2022	6.21	315796	41.90	

Dixon Sand - Maroota Quarry Morning Trucks

AUGUST	2022	6.00am - 7.00am		Daily Morning Truck No.
Date	Time in	Docket No.	Tonnes	
17/08/2022	6.23	315797	37.18	
17/08/2022	6.26	315798	37.50	
17/08/2022	6.30	315799	37.70	
17/08/2022	6.52	315800	39.32	12
18/08/2022	6.00	315848	39.04	
18/08/2022	6.02	315849	32.16	
18/08/2022	6.04	315850	43.16	
18/08/2022	6.06	315851	37.42	
18/08/2022	6.08	315852/315853	32.80	
18/08/2022	6.12	315854	38.94	
18/08/2022	6.15	315855	17.30	
18/08/2022	6.22	315856	38.56	
18/08/2022	6.38	315857	38.26	
18/08/2022	6.40	315858	38.62	10
19/08/2022	6.00	315908	38.84	
19/08/2022	6.02	315909	32.24	
19/08/2022	6.04	315910	19.90	
19/08/2022	6.06	315911	28.90	
19/08/2022	6.09	315912	38.94	
19/08/2022	6.12	315913	37.24	
19/08/2022	6.15	315914	20.16	
19/08/2022	6.17	315915	38.06	
19/08/2022	6.20	315916	43.36	
19/08/2022	6.22	315917	34.62	
19/08/2022	6.24	315918	38.00	
19/08/2022	6.26	315919	38.30	
19/08/2022	6.28	315920	16.50	
19/08/2022	6.30	315921	31.06	
19/08/2022	6.32	315922	19.30	
19/08/2022	6.34	315923	38.56	
19/08/2022	6.56	315924	32.80	17
20/08/2022	6.00	315976	39.04	
20/08/2022	6.02	315977/315978	32.64	
20/08/2022	6.06	315979	38.70	
20/08/2022	6.15	315980	39.46	
20/08/2022	6.22	315981	38.50	
20/08/2022	6.38	315982	43.40	
20/08/2022	6.42	315983	38.52	
20/08/2022	6.50	315984	38.50	
20/08/2022	6.57	315985	32.70	9
22/08/2022	6.00	316011	39.04	
22/08/2022	6.02	316012	32.64	
22/08/2022	6.04	316013	20.00	
22/08/2022	6.06	316014	20.20	
22/08/2022	6.10	316015	43.18	
22/08/2022	6.12	316016	19.80	
22/08/2022	6.14	316017	16.76	
22/08/2022	6.16	316018	39.00	
22/08/2022	6.18	316019	28.50	
22/08/2022	6.20	316020	32.10	
22/08/2022	6.24	316021	14.46	
22/08/2022	6.27	316022	19.44	
22/08/2022	6.36	316023	32.74	
22/08/2022	6.56	316024	32.90	14
23/08/2022	6.00	316076	38.94	
23/08/2022	6.02	316077	32.19	
23/08/2022	6.04	316078	19.90	
23/08/2022	6.06	316079	19.94	
23/08/2022	6.08	316080	20.28	
23/08/2022	6.11	316081	32.50	
23/08/2022	6.13	316082	14.58	
23/08/2022	6.15	316083	32.50	
23/08/2022	6.17	316084	38.84	
23/08/2022	6.19	316085	14.60	
23/08/2022	6.20	316086	17.56	
23/08/2022	6.22	316087	20.36	
23/08/2022	6.24	316088	38.42	
23/08/2022	6.26	316089	17.00	
23/08/2022	6.29	316090	19.32	
23/08/2022	6.32	316091	28.70	
23/08/2022	6.37	316092	37.74	
23/08/2022	6.39	316093	16.90	18
24/08/2022	6.00	316154	39.46	
24/08/2022	6.02	316155	39.04	
24/08/2022	6.04	316156	38.94	
24/08/2022	6.07	316157	32.24	
24/08/2022	6.09	316158	14.50	
24/08/2022	6.11	316159	19.80	
24/08/2022	6.13	316160	20.10	
24/08/2022	6.15	316161	17.08	
24/08/2022	6.17	316162	14.72	
24/08/2022	6.20	316163	38.46	
24/08/2022	6.25	316164	32.50	
24/08/2022	6.27	316165	37.92	
24/08/2022	6.29	316166	18.00	
24/08/2022	6.40	316167	46.82	
24/08/2022	6.45	316168	38.58	
24/08/2022	6.50	316169	14.20	15
25/08/2022	6.00	316233	39.04	

Dixon Sand - Maroota Quarry Morning Trucks				
AUGUST	**2022**	**6.00am - 7.00am**		**Daily Morning Truck No.**
Date	**Time in**	**Docket No.**	**Tonnes**	
25/08/2022	6.03	316234	32.60	
25/08/2022	6.05	316235	19.70	
25/08/2022	6.09	316236	20.46	
25/08/2022	6.12	316237	46.26	
25/08/2022	6.15	316238	38.56	
25/08/2022	6.18	316239	42.86	
25/08/2022	6.20	316240	17.96	
25/08/2022	6.26	316241	38.64	
25/08/2022	6.30	316242	19.70	10
26/08/2022	6.00	316300	39.04	
26/08/2022	6.02	316301	32.64	
26/08/2022	6.04	316302	19.80	
26/08/2022	6.06	316303	32.56	
26/08/2022	6.08	316304	43.46	
26/08/2022	6.10	316305	38.84	
26/08/2022	6.13	316306	46.58	
26/08/2022	6.16	316307	31.70	
26/08/2022	6.17	316308	39.04	
26/08/2022	6.21	316309	38.00	
26/08/2022	6.24	316310	37.84	
26/08/2022	6.30	316311	13.90	
26/08/2022	6.33	316312	17.86	13
27/08/2022	6.00	316361	32.14	
27/08/2022	6.02	316362	37.78	
27/08/2022	6.06	316363	38.86	
27/08/2022	6.15	316364	43.42	
27/08/2022	6.22	316365	38.56	
27/08/2022	6.44	316366	19.42	
27/08/2022	6.59	316367/316368	37.54	7
29/08/2022	6.00	316378	20.40	
29/08/2022	6.02	316379	39.04	
29/08/2022	6.04	316380	33.00	
29/08/2022	6.06	316381	11.38	
29/08/2022	6.09	316382	20.06	
29/08/2022	6.11	316383	14.56	
29/08/2022	6.20	316384	39.16	
29/08/2022	6.22	316385	17.00	
29/08/2022	6.31	316386	38.14	
29/08/2022	6.50	316387	32.90	10
30/08/2022	6.00	316449	39.04	
30/08/2022	6.02	316450	19.90	
30/08/2022	6.04	316451	38.70	
30/08/2022	6.07	316452	12.50	
30/08/2022	6.09	316453	38.24	
30/08/2022	6.11	316454	35.66	
30/08/2022	6.13	316455	17.56	
30/08/2022	6.15	316456	43.14	
30/08/2022	6.18	316457	14.34	
30/08/2022	6.20	316458	20.52	
30/08/2022	6.22	316459	36.44	
30/08/2022	6.28	316460	38.82	
30/08/2022	6.34	316461	19.34	13
31/08/2022	6.00	316507	39.04	
31/08/2022	6.02	316508	19.84	
31/08/2022	6.04	316509	38.86	
31/08/2022	6.07	316510	20.50	
31/08/2022	6.09	316511	36.98	
31/08/2022	6.11	316512	19.56	
31/08/2022	6.13	316513	14.62	
31/08/2022	6.15	316514	20.12	
31/08/2022	6.17	316515	19.08	
31/08/2022	6.19	316516	35.84	
31/08/2022	6.21	316517	16.96	
31/08/2022	6.23	316518	18.34	
31/08/2022	6.26	316519	37.56	
31/08/2022	6.30	316520	29.00	
31/08/2022	6.32	316521	43.24	
31/08/2022	6.41	316522	31.04	
31/08/2022	6.53	316523	32.90	17
				Max Daily Morning Truck No. (outbound)
				20
				Max Daily Morning Truck No. (in and outbound)
				40

Appendix G – Bush Regeneration Report

Dixon Sand Pty Ltd

Old Northern Road Quarry

(Development Consent DA 250-09-01).



Annual Report

July 2022 – June 2023

Assisted bush regeneration and rehabilitation works

Author: Zoe Ridgway

Date finalised: 18/07/2023 edited v1.1: 10/8/2023

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INTRODUCTION

This report summarises the assisted bush regeneration work undertaken by Bush-it Pty Ltd for Dixon Sand Pty Ltd between July 2022 and June 2023 as part of the Old Northern Development Consent DA 250-09-01.
A total of 279 hours ($16,692.57 excluding GST) were worked throughout the financial year with an average team size of four per visit, not including the preparation of this report. The distribution of hours over the financial year are not uniform, as resources are focused on undertaking primary/planting works in the cooler months and targeting exotic grasses from seeding and spreading at the tail end of summer.

Dixon Sand Pty Ltd operate a mineral sand quarry on the Old Northern Road at Maroota, NSW. On their behalf Bush-it manages the native vegetation of roughly 8.4 hectares at the Old Northern Road (ONR) quarry as illustrated in Figure 1. The area managed by Bush-it at the ONR quarry is comprised of a mix of remnant native vegetation; rehabilitated quarry sand and abandoned agricultural land.

The vegetation at the ONR quarry site is managed according to the operating requirements of the quarry. As the quarry expands its area of extraction, existing native vegetation will be cleared, and the soil translocated to rehabilitate other areas.

In carrying out our work for Dixon Sand, Bush-it:

- Practices low impact weed management techniques such as manual removal in plant communities containing threatened species.

- Regularly identifies and maps the density and extent of weed infestations especially those covering an area of greater than 25 m^2

- Undertakes appropriate, targeted weed control activities to ensure minimum disturbance to natives and minimum off-target damage.

- Conducts site specific induction training for staff working at the quarry, including field identification of all threatened species.

- Routinely assesses the effectiveness of the control programs and in response makes necessary modifications.

- We undertake monthly inspections noting the presence of weeds in drainage lines, and along access tracks.

- And we follow industry standard protocols for bushland hygiene by ensuring all our tools, boots and equipment are clean before entering the work site.

OVERVIEW OF MANAGEMENT ZONES AND WORK AREAS



Figure 1a. – Aerial photo showing the areas worked in 2022-23.

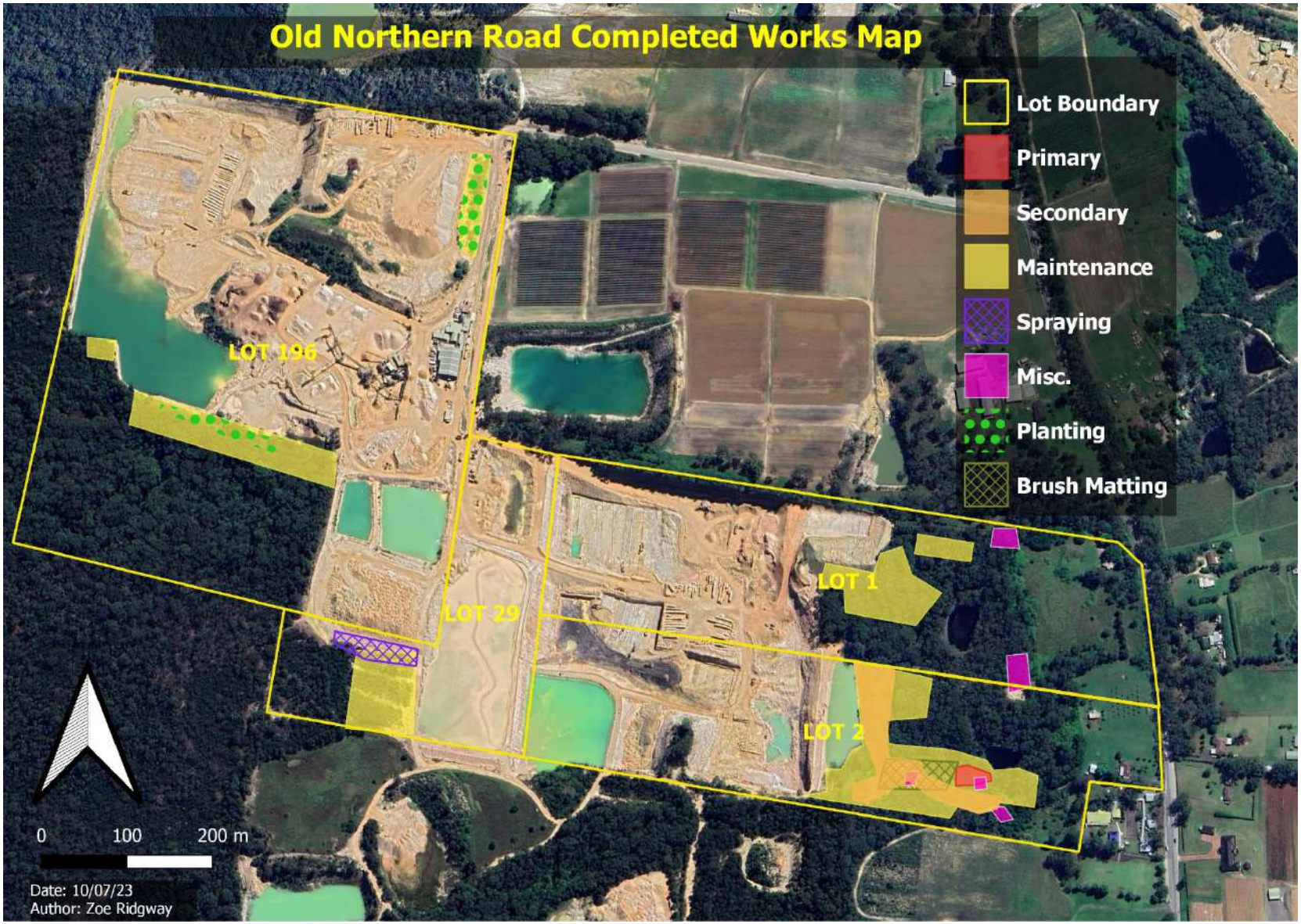


Figure 1b – Aerial photo highlighting the areas where different works activities were undertaken this year.

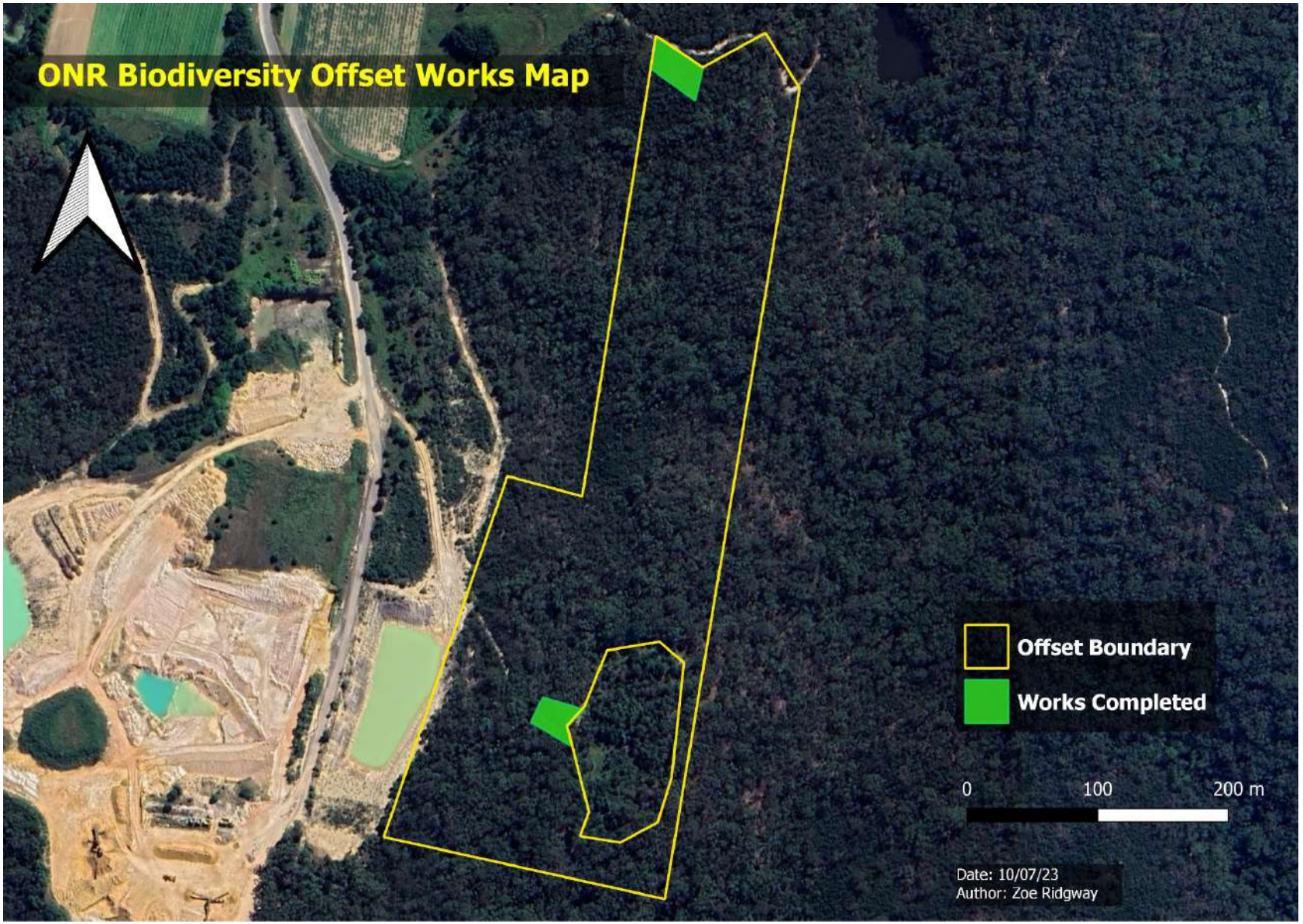


Figure 2a - ONR Biodiversity Offset Area

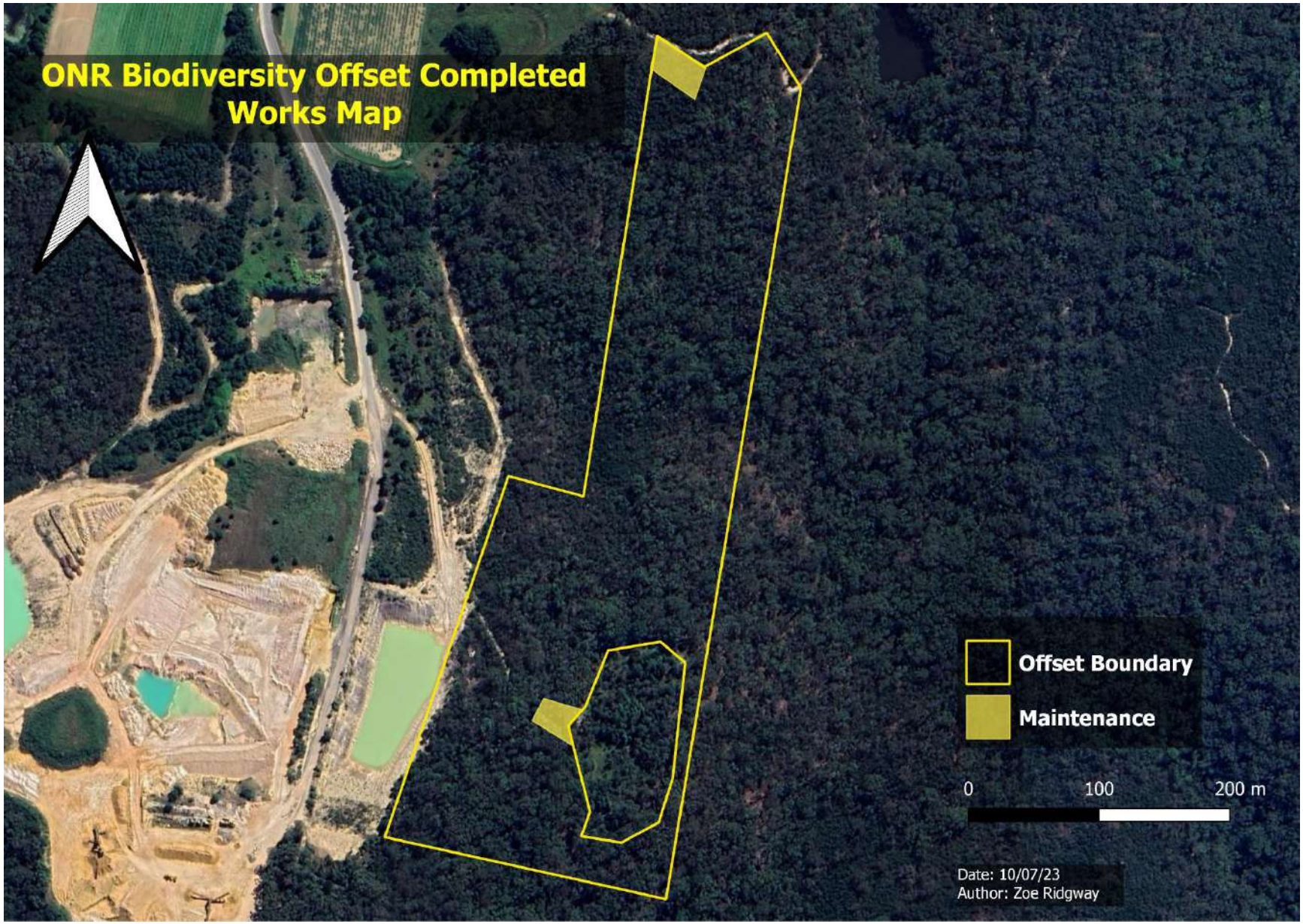


Figure 2b - ONR Biodiversity Offset Area at Haerses Rd - Completed Work 2022-2023

OLD NORTHERN ROAD QUARRY

EMBANKMENT AT FRONT GATE

SCOPE

The embankment at the front gate is an exposed area of the quarry located between the roadway and an area used to stockpile quarry products and machinery. The embankment is roughly 100m long and 20 m wide. A mix of native shrubs have been planted to stabilise the soil and improve the appearance of the mound.

RESOURCES – 17.5 HOURS

During the last twelve months we have routinely monitored the area from the road checking for obvious infestations of exotic grass and have and treated these with herbicide and/or manually removed them.

Approximately 40 native trees, shrubs and groundcovers were planted and watered into thinner areas of vegetation at the front gate. Two *Melaleuca deanei* specimens were planted into the embankment, with guards installed around them for their protection.

RECOMMENDATIONS

In remaining sparse areas, planting remnant canopy species and competitive native groundcovers such as *Hardenbergia sp.and Kennedia* sp. would provide competition for exotic grasses and prevent them spreading throughout the quarry.

Direct seeding of a native grasses and shrubs gathered locally may also enhance the regeneration along this edge.

Ongoing maintenance of exotic grassed via brush cut and spot spraying before they set seed.

LOT 1 AND 2

SCOPE

Lot 1 is a 1.4ha bush block located on the eastern side of the extraction site. It is an example of Shale-Sandstone Forest with a dry sclerophyll understorey. The canopy consists of red bloodwood (*Corymbia gummifera*) and smooth-barked apple (*Angophora costata*). There are also species here, such as the woody pear (*Xylomellum pyraform*) and the Graceful Bush Pea (*Pultenea gracilis)* that favour residual shale or laterite soils.

As Dixon Sand expands its quarry operations, Lot 1 will be cleared of vegetation and the topsoil will be stored for future rehabilitation or direct along the designated native vegetation corridor to form a connection between existing areas of bushland roughly 6.8ha in size. *Old Northern Road Quarry BRMP* (2020)

In the meantime, the vegetation on Lot 1 is conserved in its current natural state. The work undertaken by Bush-it ensures that the biodiversity of the vegetation remains intact and free from invasive species. Bush-it also works to preserve important habitat elements on the site by minimising soil disturbance or the relocation of deadwood or other plant material.

In the previous financial year, Lot 1 has been inundated with sand eroded from mining overburden, stockpiled along the Northern boundary. We estimate several tonnes of sediment have washed into Lot 1 and many of the canopy trees along the leading edge are exhibiting signs of stress consistent with a change in soil level. This area lies within the designated future extraction area.

Lot 2 is a 3.4 ha block also located on the eastern side of the excavation area. The canopy here is composed of grey gums (*Eucalyptus punctata*) and peppermint gums (*Eucalyptus piperita*) intergrading with black she oak (*Allocasuarina littoralis*) and *Acacia parramattensis.*

There are two water storage dams located in Lot 2 and a service trail connecting the quarry and the Old Northern Road runs along the southern side. The core areas of Lot 2 are to be conserved in their current natural state. The abandoned farm and orchards that currently harbors *Lantana camara* and various exotic grass will be steadily revegetated. Areas to be conserved and restored in some places are within the 250m buffer of the school.

Since April this year, works in Lots 1 and 2 have ceased until further advised, as the quarry is planning on constructing a noise bund at the 250m buffer from the local school. This will result in vegetation disturbance and an increase in weed density due to there now being no pedestrian access to conduct maintenance works to the site until further notice.



Figure 3 – Regeneration of Native Shrubs and Grasses in NVC Lot 2



Figure 4 - Waterlogged Soils and the Loss of Mature Trees in Lot 2

RESOURCES – 165 HRS

Works in Lot 1 involved regular scans and treatment of perennial herbaceous woody weeds, in particular those species introduced by weed-infested mounds on the northern zone boundary. These included ongoing regular treatments of *Ricinus communis* and *Phytolacca octandra* in and around mounds, as well as manual removal of exotic grasses (*Eragrostis curvula, Paspalum urvillei* and *Andropogon virginicus).* Through the interior of Lot 1 we routinely surveyed for the emergence of bird dispersed brush weeds such as *Lantana camara* and *Ochna serrulata.*

The bulk of the works in Lot 2 involved the continued clearing of Lantana from more resilient areas of the site, as an effort to reduce Bell Miner habitat and the associated Lerp dieback in native canopy structures. In resulting bare areas, soil was disturbed and raked in efforts to stimulate the dormant native seed bank. Areas within the lantana thicket were also inoculated with mulched leaf material gathered from intact remnant vegetation in the zone. Less resilient areas were also brush matted with cut branches.

Exotic grasses such as *Eragrostis curvula, Andropogon virginicus* and *Paspalum dilitatum* were routinely brush-cut. A new treatment method for Paspalum was also introduced to the area and proved to be effective, applying glyphosate to the foliage with tongs. A spot spray of the above exotic grass was also conducted on the edges of lot 2 with 50:1 glyphosate. Other occurring annuals such as Crofton and Thistle were removed manually or with cut-paint method.

RECOMMENDATIONS

Revegetation of Lot 2 with indigenous trees and shrubs should begin as soon as practicable. These will serve to shade out exotic grasses and provide much needed structure to a community that has recently lost mature standing trees to waterlogged soils as can be seen in Figure 4.

Translocation of soil-laden seed from Lot 1 with the aid of machinery may also assist the rehabilitation of Lot 2.

Areas of lantana should continue to be treated in Lot 2 only where there are positive signs of native regeneration as shown in Figure 3.

The Northern boundary of Lot 1 will need to be closely monitored for annuals following the inflows of sediment that have buried shrubs and groundcovers.

A thick layer of eroded silt has also raised the soil level around mature canopy trees.

LOT 196

SCOPE

The vegetation at Lot 196 resembles Coastal Enriched Sandstone Dry Forest intergrading with Sandstone Gully Forest containing *Angophora costata Corymbia gummifera*, *Eucalyptus piperita* with scattered *Eucalyptus haemastoma*. The understory is comprised *of Ceratapetalum gummiferum* and *Banksia serata*, and a grove of *Kunzea ambigua* has established itself on the old nursery site.

Plantings on the embankment have done little to prevent the emergence of exotic grass along this strip. Most of the maintenance hours spent here, are used to brush cut and spot spray exotic grasses before they set seed.



Figure 5 – Compacted area along the southern border of Lot 196 with September plantings in the background Photo taken in May 2022

RESOURCES – 33.5 HOURS

From November 2022, Bush-it has been regularly slashing and brush cutting exotic grass, namely *Andropogon virginicus* along the embankment adjoining Lot 196. Acacia seeds were collected from nearby and distributed in enrichment nodes, as well as continued works of selective brush-matting with *Allocasaurina littoralis* and *Leptospermum polygalifolium.* Thistles and Crofton was also manually removed when required.

In June, nine of the remaining Melaleuca deanei specimens were planted, guarded and watered into resilient edges of this zone. The planting locations have been documented along with photographs for future reference.

RECOMMENDATIONS

The long-term goal is to revegetate the compact and exposed areas of the site. Bush-it recommends that further plantings of remnant canopy species and competitive native grasses such as *Imperata cylindrica* be established along the strip adjoining Lot 196. Such a plantings provide competition for exotic grasses and prevent them spreading into the better areas.

Likewise, the ongoing select felling of branches along the front edge of Lot 196 and there use as brush matting will also suppress exotic grass. The proposal for 2023-24 is to revegetate the compact soil with hardy pioneer species and dense competitive grasses.

Direct seeding of a native grasses and shrubs gathered locally may also enhance the regeneration along this edge, especially if the seed can be pre-treated.

NATIVE VEGETATION CORRIDOR (NVC)

SCOPE

The native heath in the rehabilitation area continues to flourish and the soil translocation in this area has been very successful. The locally threatened *Darwinia fascicularis subsp. oligantha* has established itself well and the *Melaleuca deanei* cuttings that were planted in 2017 have also put on new growth following above average rainfall in certain times of the year.
.

RESOURCES – 43 HOURS

Bush-it has continued targeting whisky and pampas grass in the rehabilitation area. The proliferation of whisky and pampas on the neighbouring presents an ever-present source of wind-driven seed that blows in and establishes itself.
So, while the total eradication of pampas and whisky remains a long-term goal, we have successfully prevented any new infestations in the NVC.

Likewise, Bush-it has contained the spread of common couch, especially in the overburden piles to the North of the translocation site where three spot sprays were conducted. We have also deseeded and sprayed the roadside grasses growing outside the fence and regular careful hand weeding throughout the translocation has prevented the spread of flat weeds.

RECOMMENDATIONS

Continue to monitor and manage competitive native shrubs and trees in the translocation, especially where they overshadow and/or encroach on the threatened species. Bush-it will selectively cull or cut back growth to encourage the most diverse assemblage of plants possible.

Establish a buffer planting on the southern boundary that catches wind-driven seed before it reaches the site. Bush-it has regularly picked invasive grasses out of the embankment and brush cut tussocks before they can ripen but, a dense row of *Imperata cylindrica* along this fence line would be ideal.



Figure 6 – Emergent Canopy Species – NVC

HAERSES ROAD BIODIVERSITY OFFSET AREA (HRBOA)

SCOPE

The vegetation communities represented at Haerses Road Biodiversity Offset Area (HRBOA) include Sydney Sandstone Ridgetop Woodland, Sydney Sandstone Gully Forest, and Sydney Sandstone Heath.

The dominant canopy species include *Corymbia gummifera* and *Eucalyptus racemosa*. While on the lower portions of the site, A*ngophora costata* and *Eucalyptus piperita* overshadow an understorey of *Syncarpia glomulifera* and *Ceratopetalum gummiferum*. The sandstone heath is prominent throughout the areas close to Haerses Road. The dominant species here include A*ngophora hispida, Banksia ericifolia and, Leptospermusm trinervium.*

The HRBOA is an example healthy of remnant native vegetation. It connected to an area of natural bushland and evidence suggests the trophic complexity and abundance of characteristic native species is high.

The threats to the HRBOA are well managed. On casual observation the soils on site are undisturbed and capable of supporting a diverse range of plants at various life stages. There is also evidence of colonisation of native plants around the perimeter of the HRBOA in areas that have been previously cleared of vegetation.

Given the protection it receives from the HR offset, the number of non-native invasive or undesirable species is low.

RESOURCES – 6 HOURS

In the last twelve months Bush-it has undertaken semi-regular inspections of the HRBOA from the perimeter of the HR offset and along the drainage line that bisects the site. These surveys have targeted known infestations of crofton weed and exotic grass and have been timed to coincide with flowering and seeding events.

By limiting the frequency and intensity of these visits, we have sought to limit the physical damage caused by trampling or inadvertent contaminating the HRBOA with invasive seed that might be carried on our clothing etc.

RECOMMENDATIONS

Continued work in the HRBOA would be assisted by identifying the successional stages of the floristic community and the habitat needs of resident fauna conducive to an ecological burn. A burn would need to be undertaken in accordance with EHG's guidelines with RFS support.

APPENDIX

WEED SPECIES CONTROLLED

Common name	Scientific name
Crofton	Ageratina adenophora
Whiskey Grass	Andropogon virginicus
Moth vine	Araujia sericifera
Asparagus	Asparagus aethiopicus
Bridal creeper	Asparagus asparagoides
Cobblers Pegs	Bidens pilosa var. pilosa
Italian Thistle	Carduus pycnocephalus
Kikuyu Grass	Cenchrus clandestinus
Pampus Grass	Cortaderia selloana
Common Couch	Cynodon dactylon var. dactylon
Fleabane	Conyza sp.
African Lovegrass	Eragrostis curvula
Flatweed	Hypochaeris radicata
Lantana	Lantana camara
Scotch Thistle	Onopordum acanthium
Dallas Grass	Paspalum dilatatum
Vasey's Grass	Paspalum urvillei
Green Cliff Brake	Pellaea viridis
Inkweed	Phytolacca octandra
Castor Oil Plant	Ricinus communis
Blackberry	Rubus fruticosus
Turkey Rhubarb	Rumex sagittatus
Paddy'ss Lucerne	Sida rhombifolia
Wild Tobacco	Solanum mauritianum
Sand Couch	Sporobolus virginicus var. virginicus
Greater Periwinkle	Vinca major

DISTRIBUTION OF HOURS ACROSS MANAGEMENT ZONES AND MONTHLY RAINFALL

Zone	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
Admin	0	1.5	1	1.5	1	0	0	1	2.5	0	0.5	5	**14**
ONR - Biodiversity Offset at Haerses Rd site	0	0	0	6	0	0	0	0	0	0	0	0	**6**
ONR - Embankment at front gate	0		0	0	0	0	0	0	0	0	10	7.5	**17.5**
ONR - Lot 196	0	0	0	0	10	0	0	10	8.5	0	0	5	**33.5**
ONR - Lots 1 & 2	8	45.5	35	27	9	0	0	24	16.5	0	0	0	**165**
ONR - Native Vegetation Corridor - Lot 29	0	0	1	0	4	0	0	22	7	0	0	9	**43**
TOTAL	**8**	**47**	**37**	**34.5**	**24**	**0**	**0**	**57**	**34.5**	**0**	**10.5**	**26.5**	**279**
Monthly Rainfall													
Median	*27.4*	*23.1*	*41.2*	*51.8*	*70.2*	*76.6*	*70.9*	*83.2*	*88.5*	*55.3*	*43.7*	*52*	***906***
Highest	*250.6*	*497.4*	*174*	*220.3*	*208.3*	*375*	*395.5*	*464.9*	*581.2*	*467.2*	*370.1*	*445.4*	***1773.6***

REGISTER OF HERBICIDE RECORDS

Date	Operator name	Herbicide name	Wind speed (km/h)	Direction	Notes	Application method	Qty (ml/g)	Volume (L)	Start time	End time
14/02/2023	Zoe Ridgway	Glyphosate 360g/L	9.3	NNE	Josh was also second operator, 6L ea. Sprayed couch in mounds adj. to translocation in native vegetation corridor	Spray	24	12	10:30:00	12:30:00
14/02/2023	Tim Baker	Glyphosate 360g/L	9.3	NNE	Spot sprayed annual grasses in lot 2	Spray	16	8	13:30:00	14:30:00
22/03/2023	Zoe Ridgway	Glyphosate 360g/L	11.1	NE	Target weeding couch in ONR translocation, round up 50:1	Spray	6	3	7:30:00	8:30:00
26/06/2023	Zoe Ridgway	Glyphosate 360g/L	13	WNW	Target weeding couch 50:1 mix	Spray	30	1.5	7:30:00	8:30:00

Appendix H - Annual Biodiversity & Rehabilitation Management Report

ANNUAL BIODIVERSITY & REHABILITATION MANAGEMENT REPORT Old Northern Road 2023

Prepared for Dixon Sand Pty Ltd

August 2023 V.1

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Annual Biodiversity

&

Rehabilitation Management

Report

Old Northern Road

2023

Dixon Sand Pty Ltd

This assessment has been prepared by

Melissa Mass

August 2023 V.1

Date

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Abbreviations

Abbreviation	Description
BC Act	*Biodiversity Conservation Act 2016*
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
HRBOA	Haerses Road Biodiversity Offset Area
HTW	High Threat Weed
KPI	Key Performance Indicators
KTP	Key Threatening Process
LEP	Local Environmental Plan
Mod 4	Modification 4
Mod 5	Modification 5
NSW OEH	New South Wales Office of Environment and Heritage
NVC	Native Vegetation Corridor
ONR	Old Northern Road
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
THSC	The Hills Shire Council
VIS	Vegetation Information System
WoNS	Weed of National Significance

1 INTRODUCTION

This report presents the findings of the annual monitoring of the biodiversity value and rehabilitation effort within the Dixon Sand operation at Old Northern Road Maroota and the biodiversity value of the offset vegetation at Haerses Road Maroota.

1.1 BACKGROUND

Dixon Sand Pty Ltd operates a sand extraction and processing operation across 58.4 hectares on Lot 29 DP752025, Lot 196 DP752025, Lot 1 DP547255 and Lot 2 DP547255 Old Northern Road Maroota. The quarry operates in compliance to Development Consent 250-09-01 issued by the Land and Environment Court in 2004.

Several modifications have been made to the Development Consent, the most recent being described as Modification 5. The previous modification, known as Mod 4, involved the clearing of native vegetation for continued sand extraction resulting in consent conditions requiring the management of biodiversity values and impacts. Thus a Biodiversity Offset Strategy for the Old Northern Road quarry site was established which includes a Native Vegetation Corridor (NVC) and the Haerses Road Biodiversity Offset Area (HRBOA).

1.2 OBJECTIVES

The objectives of this Annual Biodiversity and Rehabilitation Management Report is to describe the current condition of the NVC and the HRBOA and to advise Dixon Sand on the appropriate management measures required to be implemented in order to meet the expectations of the Old Northern Road Quarry Biodiversity and Rehabilitation Management Plan (2018) prepared by Umwelt (Australia) Pty Ltd.

This report will:

- identify native flora and fauna species, populations and ecological communities known to or likely to occur within the NVC and HRBOA;
- describe the native vegetation and habitats within the NVC and HRBOA;
- describe the current condition of the threatened flora and its habitat found outside of the NVC at Old Northern Road;
- discuss the ongoing monitoring of threatened flora and fauna previously recorded at both ONR and HRBOA;
- determine the legislative and conservation significance of species, populations and ecological communities known or likely to occur within the NVC and HRBOA with reference to the Commonwealth *EPBC Act 1999* and the *NSW BC Act 2016*;
- recommend appropriate biodiversity and environmental management measures that should be implemented to reach criteria for monitoring success set by the Old Northern Road Quarry Biodiversity and Rehabilitation Management Plan (2018);
- provide an independent monitoring report for inclusion as part of the external reporting for the quarry Annual Review.

2 METHODOLOGY

2.1 SITE HISTORY

2.1.1 Old Northern Road Native Vegetation Corridor

The NVC on the Old Northern Road quarry site is 6.83 hectares, approximately 100m wide and 650m in length in an east-west direction. Approximately half the area of the NVC has been, or is currently, disturbed for sand extraction and areas dedicated as silt ponds. Approximately 0.8 hectares is currently under active rehabilitation as will be discussed further in this report.

The remaining vegetation within the NVC is disturbed and modified. Livestock grazing, timber removal and fruit orchards in the immediate and adjacent lands have contributed to the ongoing disturbance over many years within this area. As a result, exotic weed species are prolific and at times dominate the landscape. Farm dams have been dug which once provided irrigation to the fruit orchards and watered livestock. They now provide a water source for native and exotic species which occur in the immediate area.

Unsealed tracks are found throughout the NVC which currently provide easy access for vehicles or pedestrians.

2.1.2 Haerses Road Biodiversity Offset Area

The HRBOA is relatively undisturbed native vegetation which covers an area of 8.7 hectares. Four vegetation communities have been identified within the offset which includes habitat for threatened species known to occur in the area. Old vehicle tracks occur within the site although over time, with very little use, the tracks are now suitable for pedestrian access only.

2.1.3 Threatened flora habitat

An area to the west of the Old Northern Road NVC contains threatened flora habitat which has previously been identified and monitored. This area has had very little disturbance due to its location and unsuitability for grazing, farming or logging. A haul road had previously been constructed adjacent to the site however this road is no longer in use and most likely had very minimal impact upon the threatened flora habitat.

2.2 FIELD SURVEY

Botanical surveys of the study area were conducted over several days spread throughout July and August 2023. Fixed quadrat locations from previous annual surveys were revisited for annual flora comparison. Quadrat locations in the HRBOA were each marked with a permanent steel post and a yellow cap in the centre location along the western edge of the quadrat. The Old Northern Road NVC quadrats were marked with flagging tape given that some vegetation within the NVC is still subject to disturbance by sand extraction.

Each quadrat was 20m x 50m which included a subplot of 20m x 20m and 5 line plots of 1m x 1m. A random meander was conducted through most other areas of native vegetation within the study area, to search for threatened flora species, and to record information on habitat condition.

All flora species recorded are listed in Appendix A, B and C of this report.

Vegetation communities were identified and described with reference to the vegetation maps developed by THSC, the NSW Vegetation Information System (VIS), the descriptions in Tozer et al

(2010), and with reference to vegetation descriptions included by the Scientific Committee final determinations to list threatened communities under the *BC Act 2016 and* the *EPBC Act 1999.*

An assessment of fauna habitat was conducted within each survey quadrat to identify suitability for potential threatened fauna species known to occur in the local area.

The habitat assessment included the suitability of landscape features, hollow-bearing trees, stags, fallen timber and logs, rocky outcrops and boulders, flowering Eucalypts, specific feed trees for Glossy Black Cockatoo's, Swift Parrot, Koalas, Grey-headed Flying Fox, site connectivity, vegetation structure and vegetation types.

Searches were also undertaken for indirect evidence of native fauna, including scratches, scats, nests, hollows in use, camps, roosts, den sites etc. Opportunistic sightings of all fauna species were recorded throughout the survey period.

The following fauna survey methods were performed to target threatened species known to occur or likely to occur in the local area:

- General search with direct observation of any fauna species present within the study area, including diurnal and nocturnal call identifications;
- Early morning dedicated bird surveys;
- Unbaited motion detection infra-red digital camera left within the NVC and HRBOA for a total of 30 survey nights;
- Anabat recording device left within the NVC and HRBOA for a total of 30 survey nights.

A list of fauna species recorded across all sites is provided in appendix D and E.

Within each 50m x 20m quadrat the following information was recorded:

- centre of western edge GPS location
- aspect and slope of midline
- photograph of midline from western centre edge
- IBRA region
- vegetation class
- Plant Community Type (PCT)
- stem class including recruitment
- standing hollow count
- overall length of logs

The quadrats 20m x 20m recorded:

- every flora species identified
- abundance of each species recorded
- count of stratum richness
- percentage of High Threat Weed (HTW) cover

From within the five 1m x 1m plots the following information was recorded:

- litter cover
- native overstorey foliage cover
- native midstorey foliage cover
- native groundcover foliage cover
- cryptogam cover
- rock cover

- bare ground

Results collected from the 1m x 1m plots at each site is displayed as an average.

2.3 CRITERIA TO MONITOR SUCCESS OF REHABILITATION

The Key Performance Indicators (KPI) to measure success of the biodiversity and rehabilitation effort of the Old Northern Road NVC and the vegetation management within the HRBOA have been outlined by Umwelt (Australia) Pty Ltd 2018. The following tables depict the performance and completion criteria for both locations.

Table 1. Performance and completion criteria for Old Northern Road NVC (taken from Umwelt Pty Ltd 2018)

Rehabilitation Performance and Completion Criteria	
Native Vegetation	Revegetation areas contain flora species assemblages characteristic of the desired native vegetation communities
	Second generation tree seedlings are present or likely to be, based on monitoring in comparable older rehabilitation sites (i.e. evidence of fruiting of native species observed)
	More than 75 percent of trees are healthy and growing as indicated by long term monitoring
	More than 50 percent of translocated or propagated threatened flora species survive as indicated by long term monitoring
	There is no significant weed infestation such that weeds do not comprise a significant proportion of species in any stratum
Weeds and Pests	Regular inspections indicate a decline in weed diversity, density and abundance and a decline in signs of feral animal activity
	There is no significant weed infestation such that weeds do not comprise a significant proportion of species in any stratum
	There is no evidence of significant damage resulting from feral animal activity

Table 2. Performance and measurable indicators for HRBOA (taken from Cumberland Ecology 2016)

Performance and measurable indicators	
Native Vegetation	Maintenance of current level of native species diversity and abundance
	Maintenance of current level of canopy regeneration
	Measurable increase in habitat features
	Measurable decrease in impacts from feral fauna activity
Weeds	Measurable decline in weed density and distribution
	Measurable decline in weed diversity
	Limited recruitment of new weed species
Feral Animals	Observable reduction in decline of native fauna populations due to either predation by feral species, habitat degradation caused by feral fauna or competition with feral fauna
	Limited recruitment of new feral species
General	Measurable increase in the condition of vegetation

Observable reduction in signs of erosion (if any)
Evidence of restrictions to site access
Observable decrease in bushfire risk

Furthermore, threatened flora species KPI for the translocated individuals and the flora species in-situ are to maintain or increase resident species population from the baseline levels which will be determined from this report.

Threatened fauna species previously identified at the Old Northern Road site and HRBOA are to be maintained or increase in population size based on a presence or absence survey each year following the baseline information within the Biodiversity Rehabilitation Management Plan (Umwelt Pty Ltd 2018).

2.4 SURVEY LIMITATIONS

The flora survey was conducted within a short timeframe during winter. Therefore some plant species may not have been identified due to the survey being performed when not in flower, or when dormant. It is noted that some flora species are seasonal, and may not have been visible at the time of the surveys. Increased rainfall during 2020-2022 has resulted in an increase of opportunistic species, such as annual weeds, while the return to average rainfall conditions in 2023 have shown a stabilisation of perennial species which were demonstrating stress from over watering throughout the past two years. Overall there has been an increase in native abundance and diversity over time, particularly ground cover species such as forbs, grasses and ferns.

The survey limitations have been addressed through:

- consideration of flora and fauna species known to occur in the locality (including number of records from Bionet);
- consideration of habitat suitability present within the study areas and connectivity to other areas of habitat in the local landscape;
- consideration of current weather conditions;
- a conservative approach in assuming the presence of a species that could potentially be present in the study areas.

Where the study area contains potential habitat for threatened fauna species known to occur in the locality, and where survey areas support a likelihood of occurrence, it has been assumed on a conservative approach that such species may occur in the study area.

3 RESULTS

Results from the field surveys conducted over July and August 2023 have been separated into four distinct areas to enable quantification of condition for each specific location and its monitoring objectives.

3.1 OLD NORTHERN ROAD

The Old Northern Road NVC is currently in the mid stage of its rehabilitation strategy. Rehabilitation has begun within Lot 29 while extraction continues in Lot 1 and 2. Collection of propagation material from threatened flora species, *Melaleuca deanei* and *Darwinia fascicularis subsp oligantha*, has taken place with enough successful clone individuals been successfully raised to meet the approved quota. The *M. deanei* individuals were required to be established and actively growing in the ground before the removal of the parent plant could be undertaken. This was achieved in May 2022 with a total of 52 closed *M. deanei* successfully transplanted into the rehabilitation area showing signs of active growth. An attempt to translocate the parent plant into the active rehabilitation area was undertaken in June 2022.

Dedicated rehabilitation of native vegetation on Lot 29 begun in late 2017. An area of approximately 0.8 hectares was selected and prepared for three rehabilitation methods to use as a comparison for future reference. The larger area (approximately 0.4 hectares) has been planted out using local provenance stock and plants derived from material collected from threatened species onsite. In total 47 species have been planted within the rehabilitation area, including two threatened species. Artificial habitat structures such as rock, logs and plant debris have been placed around the rehabilitation site to provide habitat for small birds and reptiles.

Two adjacent areas, of approximately similar sizes, have undergone rehabilitation in conjunction with the planted rehabilitation. The area to the immediate south of the planted rehabilitation has undergone translocation of plant material, including root balls of several species together. This is a particularly successful conservation tool when used for threatened species which have little chance of survival in their current location. This approach has been used here to relocate *Darwinia fascicularis subsp*. *oligantha* along with flora species found within immediate and close proximity of each cluster of the threatened plants. Habitat features such as rocks, logs and plant debris have also been placed around the site to provide habitat for small birds, reptiles and to create microhabitats for dependant flora species.

The far western area of the NVC rehabilitation area has been spread with soil containing native seed bank and supplementary planting of threatened flora species. Habitat features have also been provided in this location.

Monitoring of vegetation condition has begun in other areas of the NVC, including areas which will be subjected to disturbance from sand extraction. The information gained from the pre-disturbance monitoring will provide Dixon Sand with quantitative data which can be used to rehabilitate the NVC back to, or close to, its pre-disturbance state.

Other areas of vegetation monitoring outside of the established rehabilitation corridor has also taken place to determine the effects of the sand extraction project on retained vegetation.

3.1.1 Rehabilitation area – Planted

The planted rehabilitation area is approximately 0.4 hectares in size and has been planted with 47 native species including 2 species listed on the *BC Act 2016* as being species of significance, *Melaleuca deanei* (vulnerable) and *Darwinia fascicularis subsp. Oligantha* (endangered population). In addition to the revegetation planting several species have emerged from seed bank storage from the sub-soil which was spread over the rehabilitation site before planting commenced or from seed migration into the site from wind, birds, ants or mammal carriers. In total 65 native species which were not recorded as planted within the rehabilitation site were identified during the 2023 survey period including the vulnerable species *Tetratheca glandulosa*. This is an increase of 14 additional species since last year which could be attributed to ideal weather conditions, species in adjacent bushland and rehabilitation areas having an abundance of seed to disperse from recent weather conditions and the thinning of native species by the Bush Regenerators which were crowding out the site and limiting light availability to the ground stratum. There was one weed species identified within the planted revegetation area in very low density, Whiskey Grass *Andropogon virginicus*.

There were 22 live specimens of *Melaleuca deanei,* 12 live specimens of *Darwinia fascicularis subsp. Oligantha* and 9 live specimens of *Tetratheca glandulosa* located within the planted rehabilitation area. There were no *Acacia bynoeana* identified during the survey period of 2023 suggesting that the wet conditions throughout 2020-2022 may not have been favourable for the species to persist. The *Pimelea curviflora var. curviflora* identified during the 2022 survey was not located again this year. This could suggest the species responded to the abundance of moisture present over the 2020-2022 period and was short lived, or it may have been preyed upon by herbivores which are present within the rehabilitation area.

The overall condition of the planted rehabilitation area is very good. The canopy trees have reached reproductive maturity with flowering buds present during the July survey period. Species diversity has continued to increase with shrub and ground cover species. Native mammal species which have been recorded this year as being present including macropods, bandicoots and possums. Bird diversity is increasing with 10 species recorded within the rehabilitation site during vegetation surveys in the middle of the day.



Image 1. View of planted rehabilitation area from north-west corner looking east 2021



Image 2. Comparison view of planted rehabilitation area from north-west corner looking east 2023

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Image 3. View of planted rehabilitation area from south-east corner looking west 2021



Image 4. Comparison view of planted rehabilitation area from south-east corner looking west 2023

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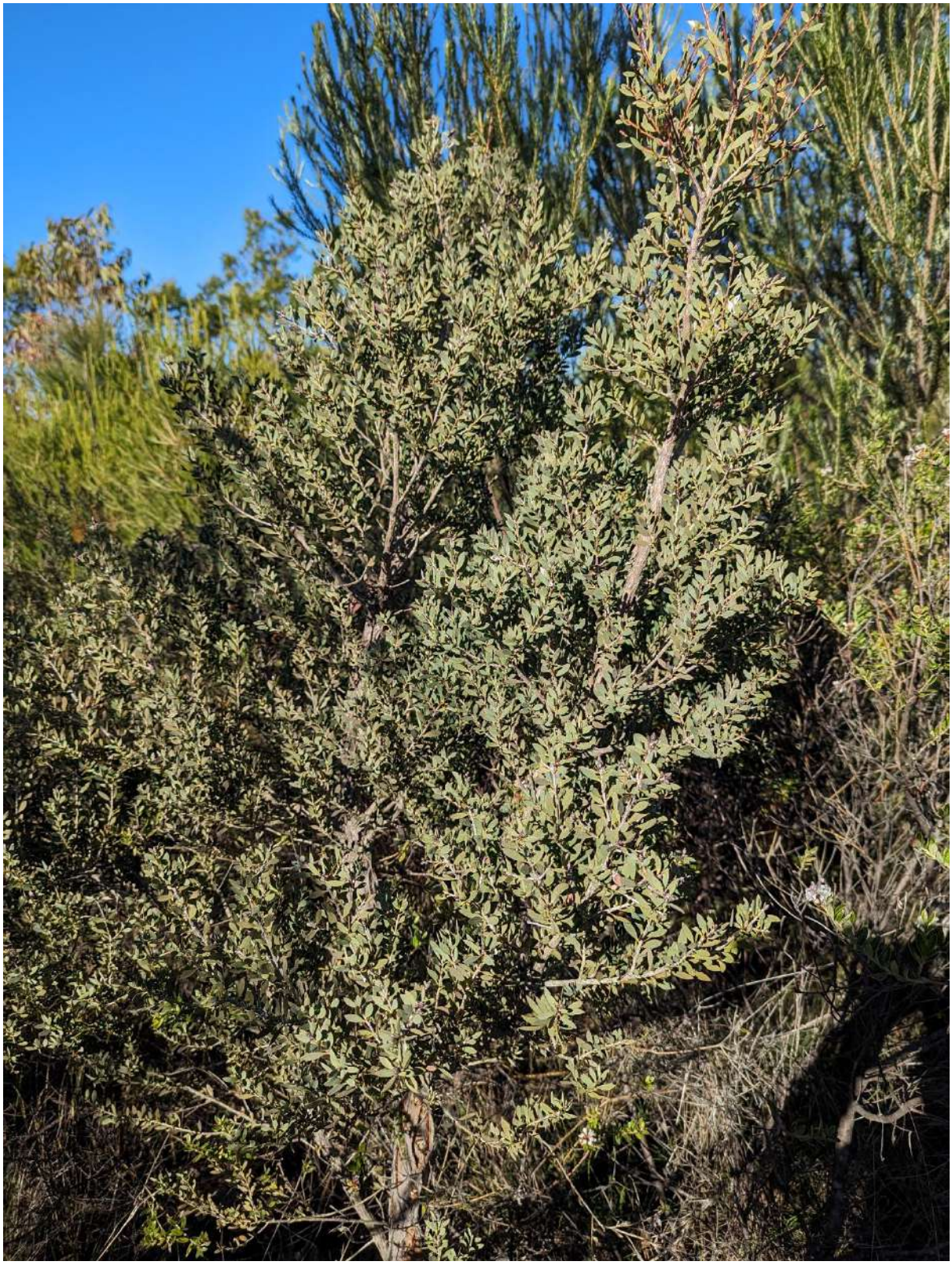


Image 5. *Melaleuca deanei* planted in 2017 within the planted rehabilitation area 2023



Image 6. *Darwinia fascicularis subsp. Oligantha* planted in 2017 within the planted rehabilitation area 2023

South East Environmental



Image 7. *Tetratheca glandulosa* within the planted rehabilitation area 2023

3.1.2 Rehabilitation area – Translocated

The translocated rehabilitation area was not subjected to a flora survey as per the vegetation survey site locations suggested in the Biodiversity Rehabilitation Management Plan 2018. However a random meander through the area recording flora species was undertaken. Species identified and recorded can be found in Appendix B. Photo monitoring should, over time, be sufficient to determine the rehabilitation success of this area.

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

A single *Tetratheca glandulosa* which was translocated during the previous reporting period appears in a healthy state with flowers present during July suggesting flowering will continue to occur over the coming months. A further individual was located within the translocation area which has grown from seed bank within the soil.

Three *Melaleuca deanei* which were planted within this area in 2017 are still present and appear healthy. A further twenty six *M. deanei* have been planted within this area during 2020-2021. All plants appear to be doing well with most showing signs of active growth. These plants will continue to be closely monitored. The parent plant was translocated into this area following the quota of replacement plants being met. The plant was translocated using a loader with a large bucket picking up as much soil and root ball as possible. Unfortunately the main tap root was broken during this

process and the plant material died back. The two soil mounds which remain each have a single seedling emerging which appear to be *M. deanei*. Close monitoring of these seedlings will continue over the coming months.

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 abundant throughout the area.



Image 8. Translocated *Tetratheca glandulosa* flowering within the translocation area 2023



Image 9. *Melaleuca deanei* planted in 2021 within the translocation area 2023 – Note the *Darwinia fasicularis subsp oligantha* to the right



Image 10. *Darwinia fascicularis subsp. oligantha* within the translocation area



Image 11. *Melaleuca deanei* seedling emerging from parent plant root ball

3.1.3 Rehabilitation area – Soil seed bank

The soil seed bank rehabilitation area was not subjected to a flora survey as per the vegetation survey site locations suggested in the Biodiversity Rehabilitation Management Plan 2018. A random meander through the area recording flora species was undertaken and a count of living planted threatened species was recorded. Photo monitoring of the area will determine rehabilitation success.

Ample natural recruitment of native species is occurring across the site with recruitment of *Darwinia fascicularis subsp. Oligantha* evident. Canopy stratum is beginning to emerge with *Eucalyptus sp* and *Corymbia sp.* observed. *Banksia ericifolia* dominates the recovering shrub layer with *Grevillea buxifolia* and *Acacia suaveolens* also widespread. Previously *Acacia suaveolens* had dominated this area however the Banksia has outgrown most of the other species present. Ground cover species are present throughout although due to the density of the shrub layer the ground cover is sporadically distributed.

There were 23 *Darwinia fascicularis subsp. oligantha* identified scattered throughout the site, some of which are new recruits. A single planted *Melaleuca deanei* was located during the survey period. The density of the shrub regrowth is suspected of hampering the efforts to locate other individuals. All the surviving threatened species which were located as present appear to be healthy.

3.1.4 Front gate rehabilitation

The front gate rehabilitation was initially planted in 2017. The hot dry conditions between 2017 and 2020 resulted in a number of losses and slow growth to the surviving plants despite regular watering and maintenance. Since the return to regular rainfall the front gate rehabilitation area has thrived with many shrubs flowering well and new recruitments evident, although weed density has also increased. Gaps are still present however it is expected these will fill in with time via natural recruitment. Two *Melaleuca deanei* have been planted in this area and will be closely monitored over the coming months to ensure their successful establishment.



Image 12. View of translocated rehabilitation area from south-west looking east 2021

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Image 13. Comparison view of translocated rehabilitation area from south-west looking east 2023

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Image 14. View of soil seed bank rehabilitation area from north looking south 2021

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Image 15. Comparison view of soil seed bank rehabilitation area from north looking south 2023

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Image 16. View of soil seed bank rehabilitation area from south looking north 2021

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Image 17. Comparison view of soil seed bank rehabilitation area from south looking north 2023

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Image 18. *Melaleuca deanei* planted in 2017 within the seed bank rehabilitation area 2023



Image 19. Front gate rehabilitation area

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3.1.5 Vegetation monitoring within NVC

The Biodiversity Rehabilitation Management Plan 2018 indicates that nine vegetation monitoring sites should be established across the Old Northern Road site. Five of these sites occur within the NVC including one site within the planted rehabilitation area discussed in 3.1.1 of this report.

From the remaining four sites only one could be safely accessed for monitoring as the other three monitoring sites are currently under sand and sandstone extraction operations.

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.* Information collected during the survey period has been summarised in Table 3 while a full list of flora recorded can be found in Appendix A.

The overall health of the vegetation and biodiversity within the remaining NVC is moderate. There has been historic disturbance in the area most likely from livestock grazing and timber removal. Recent continued rainfall in the local area has assisted in the recovery of vegetation from the previous drought conditions across all affected stratums with ground cover species showing good signs of recovery.

The remaining areas throughout the NVC continue to be severely impacted from the presence of *Lantana camara*. An effort to remove and control the species has been ongoing for several years however due to the distribution and density it will require further long term management to completely remove the species across the entire site.

During the 2022 reporting period it was determined that the required ratio of clone *Melaleuca deanei* had been successfully transplanted into the rehabilitation area allowing for the removal of the parent plant(s). An attempt was made to translocate the parent plant into the rehabilitation area via digging around the root ball and carrying the plant with the root ball attached in a loader bucket. The root system for the parent plant was extensive and had coiled around large sandstone boulders and through the cracks of others. Therefore during retrieval of the plant much of the root system was unfortunately damaged. The parent plant was placed within the rehabilitation area with the root ball and immediate surrounding soil.

Table 3. Survey summary from NVC survey site location ONR quadrat 2.

1328 - Yellow Bloodwood - Narrow-leaved Apple heathy woodland on hinterland plateaux of the Central Coast, Sydney Basin Bioregion				
AGD Zone 56 Easting – 0313182 Northing – 06296257 Midline - 89°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	15 – 20m	*Corymbia gummifera, Eucalyptus punctata, Eucalyptus haemastoma, Angophora bakeri, Allocasuarina littoralis*		
Shrubs	0.5 – 2m	*Acacia linifolia, Grevillea buxifolia, Hakea sericea, Pimelea linifolia, Bossiaea obcordata, Jacksonia scoparia*		
Groundcover	0.1 – 0.5m	*Pratia purpurascens, Lomandra longifolia, Entolasia stricta, Themeda australis,*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm	✓		1	2
30-49cm	✓		2	
20-29cm	✓			
10-19cm	✓			
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**	**Structure cover %**	
Trees		6	60	
Shrubs		24	50	
Grasses etc		11	50	
Forbs		3	10	
Ferns		0	0	
Other		3	4	
High Threat Weeds		1	1	
Ecosystem Functions				
Length of habitat logs	46 m			
Litter cover	40%			
Bare ground cover	0%			
Cryptogam cover	20%			
Rock cover	5%			
Overstorey foliage cover	45%			
Mid-storey foliage cover	40%			
Groundcover foliage cover	50%			



Image 20. Midline view of NVC survey quadrat 2 2023

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3.1.6 Vegetation monitoring outside NVC

There were four monitoring sites identified outside of the NVC which were proposed to be surveyed. Two 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*. The remaining monitoring site and an additional monitoring site were selected for surveying to provide baseline data for ongoing assessment over the site.

The vegetation within Plot 1 was 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*. This survey location is outside of the NVC although 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 additional survey site, Plot 4, was undertaken within an area of vegetation determined to also 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*. This survey location is just within the 250m buffer to the Maroota Public School in the centre of the site and will not be subject to clearing for quarry activities. It is therefore likely to provide good baseline data for rehabilitation of the vegetation community for future reference. The vegetation within the survey plot appears to have very little disturbance and contains no exotic weed species.

The remaining vegetation within the 250m buffer area appeared to have some impacts from the spread and growth of Lantana camara therefore a third survey quadrat within the recommended survey area was not undertaken. Efforts have been made to reduce the impacts from the invasive species however the progress is slow and favourable weather conditions for growth have made control difficult. It is expected that as the Lantana thickets are removed or reduced in density a further survey plot will be added to the annual monitoring to ensure ample recovery of the area.

Table 4. Survey summary for area outside NVC Survey site location ONR quadrat 1

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				
AGD Zone 56 Easting – 0313250 Northing – 06296390 Midline - 230°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	20 – 30m	*Eucalyptus piperita, Eucalyptus punctata, Angophora costata, Allocasuarina littoralis, Ceratopetalum gummiferum*		
Shrubs	0.5 – 2m	*Leptospermum polygalifolium, Kunzea ambugia, Banksia spinulosa, Acacia ulicifolia, Epacris pulchella*		
Groundcover	0.1 – 0.5m	*Lomandra filiformis, Xanthosia pilosa, Lomandra longifolia, Themeda australis, Entolasia stricta, Microleana stipoides*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm				
30-49cm	✓		1	
20-29cm	✓			
10-19cm	✓			
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**	**Structure cover %**	
Trees		6	80	
Shrubs		22	50	
Grasses etc		10	50	
Forbs		3	5	
Ferns		2	5	
Other		3	3	
High Threat Weeds		0	0	
Ecosystem Functions				
Length of habitat logs	13.1m			
Litter cover	50%			
Bare ground cover	0%			
Cryptogam cover	30%			
Rock cover	5%			
Overstorey foliage cover	70%			
Mid-storey foliage cover	40%			
Groundcover foliage cover	40%			

Table 5. Survey summary for area outside NVC Survey site location ONR quadrat 4

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				
AGD Zone 56 Easting – 0313263 Northing – 06296592 Midline - 90°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	20 – 30m	*Eucalyptus piperita, Eucalyptus pilularis, Angophora costata, Allocasuarina littoralis, Ceratopetalum gummiferum, Corymbia gummifera*		
Shrubs	0.5 – 2m	*Banksia spinulosa, Persoonia linearis, Acacia ulicifolia, Bossieaea obcordata, Hakea sericea, Leucopogon parviflorus*		
Groundcover	0.1 – 0.5m	*Pteridium esculentum, Lomandra multiflora, Themeda australis, Entolasia stricta, Smilax glyciphylla*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm	✓		2	2
30-49cm	✓		3	
20-29cm	✓			
10-19cm	✓	✓		
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**	**Structure cover %**	
Trees		8	70	
Shrubs		23	60	
Grasses etc		9	30	
Forbs		3	5	
Ferns		2	2	
Other		4	2	
High Threat Weeds		0	0	
Ecosystem Functions				
Length of habitat logs	32m			
Litter cover	40%			
Bare ground cover	0%			
Cryptogam cover	20%			
Rock cover	20%			
Overstorey foliage cover	60%			
Mid-storey foliage cover	50%			
Groundcover foliage cover	25%			



Image 21. Midline view of ONR quadrat 1 2023

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Image 22. Midline view of ONR quadrat 4 2023

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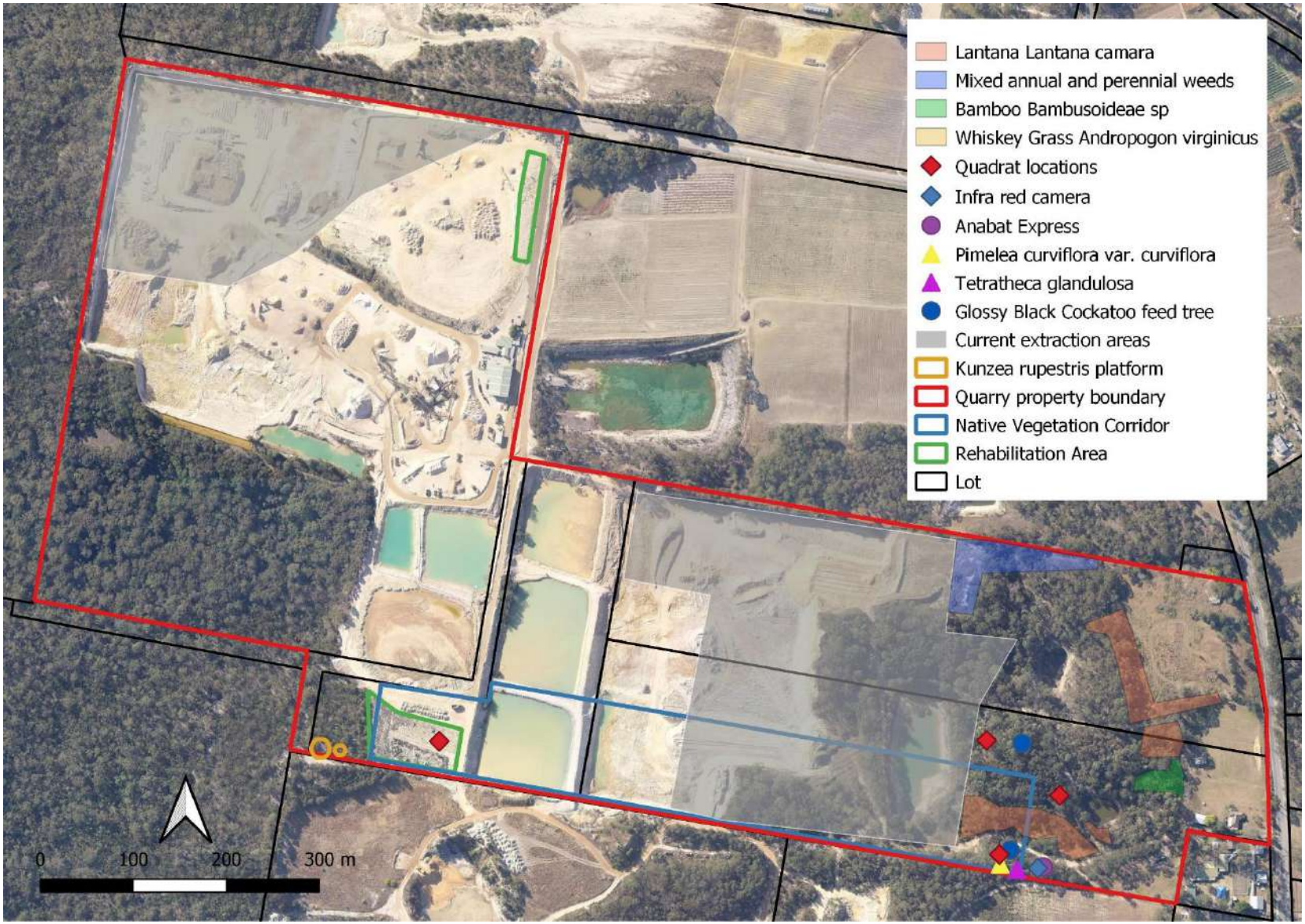


Image 23. ONR survey site locations 2023

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3.2 HAERSES ROAD BIODIVERSITY OFFSET AREA

The HRBOA has a total of five monitoring sites specifically to provide benchmark values for the vegetation communities found within the site. Baseline data collected and discussed within this report will enable a measurable value of success for management actions which may be implemented over the life of the offset.

It is expected over time there will be an increase in biodiversity, habitat features, ongoing evidence of natural recruitment and a decrease in exotic fauna and flora presence.

Each of the survey locations has been permanently marked with a steel post and yellow cap indicating the plot identification number.

Cumberland Ecology (2016) had previously identified four vegetation communities onsite as Sydney sandstone Ridgetop Woodland, Sydney Hinterland Transition Woodland, Sydney Sandstone Gully Forest and Sydney Sandstone Heath (Heath/Woodland Complex). Each survey location surveyed was given a best fit PCT based on the classification of the VIS which was determined by the native species most abundant throughout the quadrat. Therefore the following PCT's were identified:

- Plot 1 - *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*
- Plot 2 – *1641 – Dwarf Apple – Scribbly Gum heathy low woodland on sandstone ranged of the Central Coast*
- Plot 3 - *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*
- Plot 4 – *1627 – Smooth-barked Apple – Turpentine – Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast*
- Plot 5 – *1643 – Red Bloodwood – Smooth-barked Apple – Scribbly Gum – Old Man Banksia heathy woodland on sandstone ranges of the Central Coast*

These PCT's are in line with the broader definition given in the Cumberland Ecology Biodiversity Management Plan 2016, although the location of the Sydney Hinterland Transition Forest was not surveyed.

Plot 2 had an abundance of the threatened flora species *Darwinia biflora* present. This shrub was noted to be very well represented throughout the entire area of the PCT 1641.

Overall there was a stabilisation to foliage cover and structure cover in most stratums at most survey sites. Grass and ground cover species appear to have decreased slightly in density following a return to average conditions. Forbs were noticeably less abundant this reporting year which is likely to suggest much of the new growth in the previous reporting period was likely to be a response to abundant rainfall. Extensive Long-nosed Bandicoot digs were again noted in an area close to Quadrat 1. Bird presence and density has remained consistent from last survey period, likely due to the favourable weather conditions.

The following tables (7 – 11) are a summary of the survey results at each of the plot locations across HRBOA.

Table 6. Survey summary for survey site location HRBOA quadrat 1

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				
AGD Zone 56 Easting – 0312740 Northing – 06293489 Midline - 130°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	20 – 30m	*Angophora costata, Corymbia gummifera, Allocasuarina littoralis, Ceratopetalum gummiferum, Banksia Serrata*		
Shrubs	0.5 – 2m	*Leptospermum trinervium, Persoonia pinifolia, Lambertia Formosa, Boronia floribunda, Grevillea speciosa, Acacia ulicifolia*		
Groundcover	0.1 – 0.5m	*Caustis flexosa, Pteridium esculentum, Lomandra brevis, Entolasia stricta, Smilax glyciphylla, Xanthorrhoea media*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm	✓		1	1
30-49cm	✓		1	
20-29cm	✓	✓		
10-19cm	✓	✓		
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**	**Structure cover %**	
Trees		7	50	
Shrubs		18	60	
Grasses etc		9	25	
Forbs		3	5	
Ferns		1	10	
Other		3	5	
High Threat Weeds		0	0	
Ecosystem Functions				
Length of habitat logs	26.5m			
Litter cover	50%			
Bare ground cover	0%			
Cryptogam cover	2%			
Rock cover	30%			
Overstorey foliage cover	50%			
Mid-storey foliage cover	50%			
Groundcover foliage cover	25%			



Image 24. Midline view of HRBOA quadrat 1 2023

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Table 7. Survey summary for survey site location HRBOA quadrat 2

1641 – Dwarf Apple – Scribbly Gum heathy low woodland on sandstone ranged of the Central Coast				
AGD Zone 56 Easting – 0312750 Northing – 06293649 Midline - 100°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	2 – 10m	*Angophora hispida, Eucalyptus haemastoma. Banksia serrata*		
Shrubs	0.5 – 2m	*Banksia ericifolia, Hakea sericea, Leptospermum trinervium, Dillwynia floribunda, Lambertia Formosa, Calytrix tetragona, Grevillea speciosa, Boronia ledifolia, Persoonia pinifolia*		
Groundcover	0.1 – 0.5m	*Caustis pentandra, Actinotus minor, Austrostipa pubescens, Mirbelia speciosa, Lepidosperma laterale, Cassytha glabella, Entolasia stricta, Lomandra obliqua*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm	✓		1	
30-49cm		✓		
20-29cm	✓			
10-19cm	✓	✓		
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**	**Structure cover %**	
Trees		3	20	
Shrubs		31	100	
Grasses etc		4	60	
Forbs		1	5	
Ferns		1	5	
Other		2	4	
High Threat Weeds		0	0	
Ecosystem Functions				
Length of habitat logs	9.3m			
Litter cover	20%			
Bare ground cover	0%			
Cryptogam cover	10%			
Rock cover	5%			
Overstorey foliage cover	15%			
Mid-storey foliage cover	50%			
Groundcover foliage cover	60%			



Image 25. Midline view of HRBOA quadrat 2 2023

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Image 26. Flowering *Darwinia biflora* located within HRBOA quadrat 2

Table 8. Survey Summary of survey location HRBOA quadrat 3

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				
AGD Zone 56 Easting – 0312877 Northing – 06293628 Midline - 110°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	20 – 30m	*Corymbia gummifera, Eucalyptus piperita, Eucalyptus punctata, Banksia serrata, Ceratopetalum gummiferum, Allocasuarina littoralis*		
Shrubs	0.5 – 2m	*Leptospermum trinervium, Persoonia levis, Persoonia pinifolia, Bossiaea lenticularis, Epacris pulchella*		
Groundcover	0.1 – 0.5m	*Dianella caerulea, Pteridium esculentum, Lindsaea microphylla, Lomandra filliformis, Entolasia stricta, Caustis flexosa*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm	✓		3	
30-49cm	✓		1	
20-29cm	✓			
10-19cm	✓			
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**		**Structure cover %**
Trees		5		75
Shrubs		22		40
Grasses etc		9		20
Forbs		3		5
Ferns		2		10
Other		3		3
High Threat Weeds		0		0
Ecosystem Functions				
Length of habitat logs	10.1m			
Litter cover	30%			
Bare ground cover	0%			
Cryptogam cover	15%			
Rock cover	20%			
Overstorey foliage cover	50%			
Mid-storey foliage cover	30%			
Groundcover foliage cover	20%			



Figure 27. View of midline HRBOA quadrat 3 2023

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Table 9. Survey Summary of survey location HRBOA quadrat 4

1627 – Smooth-barked Apple – Turpentine – Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast				
AGD Zone 56 Easting – 0312847 Northing – 06293808 Midline - 100°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	20 – 30m	*Corymbia gummifera, Eucalyptus resinifera, Angophora costata, Callicoma serratifolia, Ceratopetalum gummiferum, Allocasuarina littoralis*		
Shrubs	0.5 – 2m	*Leptospermum trinervium, Telopea speciossima, Persoonia pinifolia, Bossiaea lenticularis, Lambertia formosa, Banksia spinulosa, Acacia linifolia*		
Groundcover	0.1 – 0.5m	*Pteridium esculentum, Gahnia sieberiana, Lomandra filliformis, Lomandra multiflora, Stylidium lineare, Entolasia stricta, Caustis flexosa*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+	2		2	1
50-79cm	✓		2	3
30-49cm	✓		2	
20-29cm	✓			
10-19cm	✓			
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**	**Structure cover %**	
Trees		7	80	
Shrubs		15	50	
Grasses etc		11	20	
Forbs		3	5	
Ferns		2	10	
Other		3	3	
High Threat Weeds		0	0	
Ecosystem Functions				
Length of habitat logs	47.8m			
Litter cover	30%			
Bare ground cover	10%			
Cryptogam cover	40%			
Rock cover	5%			
Overstorey foliage cover	40%			
Mid-storey foliage cover	40%			
Groundcover foliage cover	20%			



Image 28. View of midline HRBOA quadrat 4 2023

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Table 10. Survey Summary of survey location HRBOA quadrat 5

1643 – Red Bloodwood – Smooth-barked Apple – Scribbly Gum – Old Man Banksia heathy woodland on sandstone ranges of the Central Coast				
AGD Zone 56 Easting – 0312938 Northing – 06293983 Midline - 130°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	20 – 30m	*Eucalyptus punctata, Eucalyptus haemastoma, Angophora hispida, Banksia serrata, Allocasuarina littoralis*		
Shrubs	0.5 – 2m	*Lambertia formosa, Persoonia pinifolia, Bossiaea scolopendra, Woollsia pungens, Banksia ericifolia, Boronia floribunda, Epacris pulchella, Petrophile pulchella, Platysace linearifolia*		
Groundcover	0.1 – 0.5m	*Actinotus minor, Xanthosia pilosa, Lomandra multiflora, Austrostipa pubescens, Entolasia stricta, Xanthorrhoea resinosa*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm				
30-49cm	✓		3	
20-29cm	✓			
10-19cm	✓	✓		
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**		**Structure cover %**
Trees		5		20
Shrubs		27		65
Grasses etc		11		20
Forbs		2		5
Ferns		1		2
Other		3		2
High Threat Weeds		0		0

Ecosystem Functions	
Length of habitat logs	18.9m
Litter cover	30%
Bare ground cover	1%
Cryptogam cover	20%
Rock cover	30%
Overstorey foliage cover	20%
Mid-storey foliage cover	40%
Groundcover foliage cover	20%



Image 29. View of midline HRBOA quadrat 5 2023

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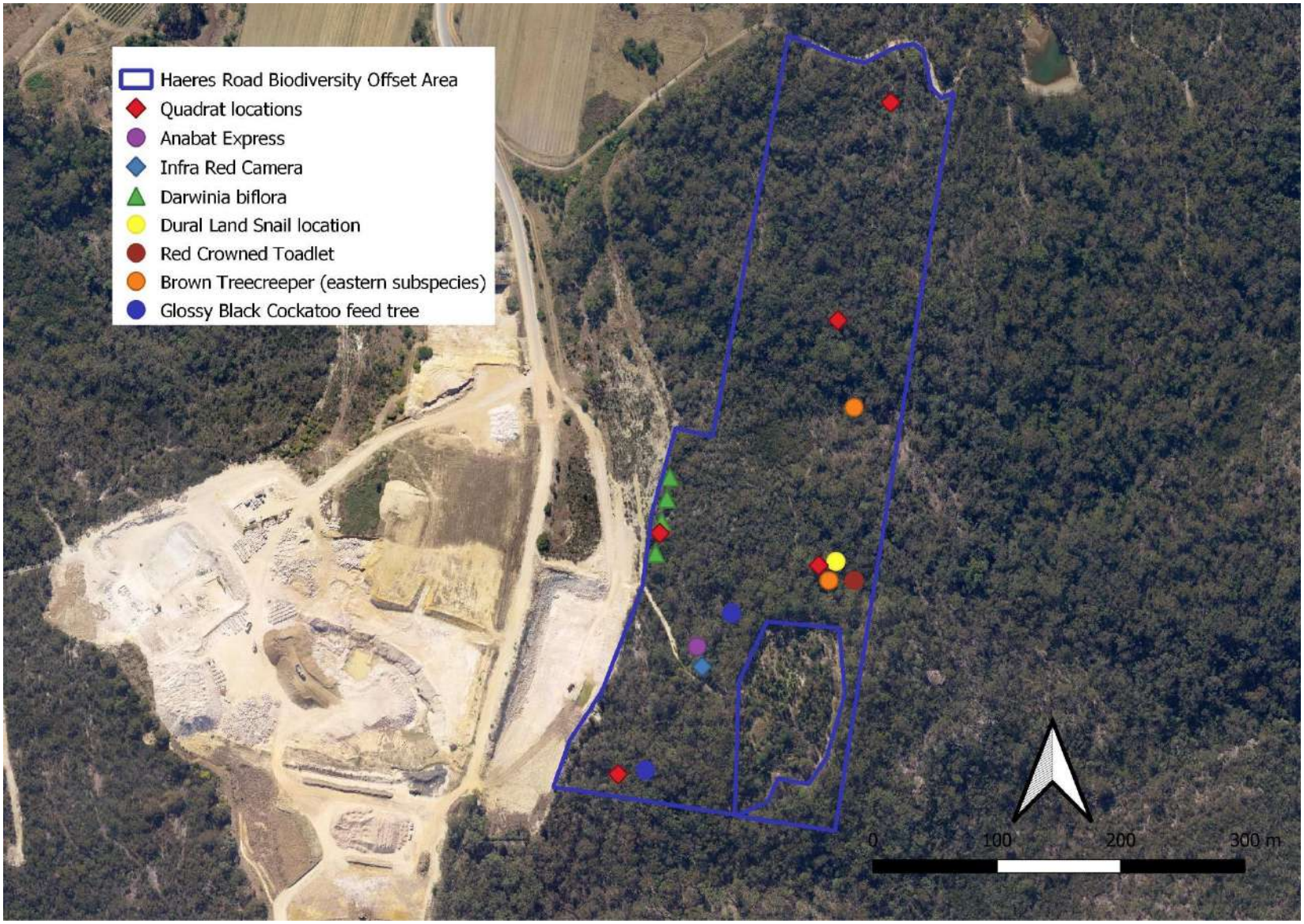


Image 30. HRBOA site location 2023 (note no change to the previous reporting period)

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3.3 Threatened Flora Monitoring

The threatened flora monitoring details the current condition of the four threatened flora species and their immediate habitat which has been previously recorded onsite. The far western area of Lot 29 contains a significant rock platform which supports *Kunzea rupestris* and *Darwinia fascicularis subsp oligantha*. Lot 2 contains *Pimelea curviflora var curviflora* and *Tetratheca glandulosa*.

The overall health of the *Kunzea rupestris* population is good following the ideal weather conditions in the local area over the past 12 months. During the 2017-2019 drought some dieback and plant loss was observed however the remaining plants appear to be in good health and new recruitment is evident, particularly on the western rock platform where vacant soil is available. New growth on most plants was once again observed during the survey period with flower buds present on much of the population. Mosses and lichens were present in each patch on both platforms.

The eastern rock platform has been divided into four individual patches. Much of the surrounding vegetation has suffered die back including the *Banksia ericifolia* and *Calytrix tetragona*. This may be attributed to the dry conditions during the 2017-2019 drought followed by extreme wet conditions from 2020-2022. Some new seedlings from various species are emerging in available soil.

Patch one had previously identified twenty six individual plants. During the July 2023 survey period twenty two individuals were counted. The dry conditions over 2017 and 2019, and in particular the extreme heat days which were experienced during the summer months throughout that time, is the expected cause for loss of plant density. The remaining patch is in relatively good health with flower buds present on mature growth. *Darwinia fascicularis subsp oligantha* is also present within this patch.

Patch two is much smaller with only three plants present. All had flower buds present. Within patch three the two persistent plants also have flower buds present. In patch four the five *Kunzea rupestris* appear to be in good health with two having flower buds present at the time of surveying.

The western rock platform has been divided into five individual patches which are much more widely distributed than the patches on the eastern rock platform. Within this section the *Kunzea rupestris* grows within a vegetation community with far more flora diversity than what is present on the eastern rock platform. Some of the shrubs are therefore much larger as soil depth and protection from external influences (such as wind and radiant heat) is more readily available.

Patch one has six plants present. *Calytrix tetragona* and *Darwinia fascicularis subsp oligantha* were also present within this patch. Patch two is a long patch which runs down the length of the rock platform. There appears to have been very little change to this patch from last year although new recruits are abundant particularly on the edge of the soil profile. In total thirty eight individual plants were identified within this patch. All plants in this location are low growing and all appear in good health with some flower bud present. Additional species identified within this patch included *Calytrix tetragona*, *Acacia hispidula*, *Grevillea buxifolia, Caustis flexuosa* and *Darwinia fascicularis subsp oligantha.* Some outlying small patches were noted which appear to be newly created from soil run off during heavy rainfall periods. New recruits were noted to be growing in these patches although due to the very shallow soil profile they are not expected to survive should dry weather return.

Patch three does not contain any *Kunzea rupestris* plants. The patch is considered for monitoring over time with the hope that new recruits will eventually appear. A single *Leucopogon parviflorus* is currently the only species within this patch.

Patch four currently has twenty nine *Kunzea rupestris* plants with several of those being juvenile recruits. Mature plants have flower buds present. Other flora species identified within the patch were *Calytrix tetragona*, *Grevillea buxifolia, Caustis flexuosa*, *Darwinia fascicularis subsp oligantha, Banksia ericifolia, Isopogon anethifolius, Bossiaea scolopendria* and *Petrophile pulchella.*

Patch five had twenty five *Kunzea rupestris* growing within a diverse mix of shrub species. Several of the counted individuals appear to be new recruits close to the old haul track. It was noted that some *Banksia ericifolia, Isopogon anethifolius* and *Calytrix tetragona* had died. Other species within this patch include *Acacia ulicifolia, Corymbia eximia, Dianella revolute, Grevillea buxifolia, Grevillea speciosa, Leucopogon parviflorus, Angophora hispidula, Caustis flexuosa*, *Persoonia levis*, *Isopogon anethifolius* and *Petrophile pulchella.*

Other threatened species located onsite were observed and inspected for current health and condition. As previously mentioned an attempt was made to translocate the original parent plant of the *Melaleuca deanei*. Prior to translocation the plant health was checked and it appeared to not have suffered any ill effects from previous multiple small branch removal during clone recruitment. No flowers were observed throughout the 2021-2022 period before translocation. In total there were 31 stems in 18 clumps covering an area of 25m². The highest peak of the shrub was approximately 2.5m tall. Once removed it appeared that the plant was one individual connected by a single root system, not multiple plants as once thought. New recruits have been observed growing from the translocated root stock bringing the total number of *Melaleuca deanei* individuals being monitored throughout the Dixon Sand ONR site to 63.

Darwinia fascicularis subsp oligantha was observed as being plentiful in the location of the *Kunzea rupestris* population and surrounding area. Plants were flowering well and new recruits were evident throughout the area. They were also very well represented throughout the rehabilitation areas. There were several *Tetratheca glandulosa* plants identified within Quadrat 2 during the 2022 flora survey period. In addition to this an abundance of flowering *Pimelea curviflora var curviflora* was also identified within the same quadrat site. The threatened species within this location will continue to be monitored each year they remain present onsite.



Image 31. *Kunzea rupestris* monitoring eastern rock platform photo location 1 2023

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Image 32. *Kunzea rupestris* monitoring eastern rock platform photo location 2 2023

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Image 33. 2023 eastern rock platform patch number 1-3, top 1 - bottom 3

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Image 34. *Kunzea rupestris* monitoring western rock platform photo location 1 2023

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Image 35. *Kunzea rupestris* monitoring western rock platform photo location 2 2023

South East Environmental



Image 36. *Kunzea rupestris* monitoring western rock platform photo location 3 2023

South East Environmental



Image 37. 2023 western rock platform patch number 1-5, top left 1 top right 2 middle left 3 middle right 4 bottom 5

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Image 38. *Kunzea rupestris* flower buds forming on eastern rock platform July 2023



Image 39. *Darwinia fascicularis subsp. oligantha* in flower on western rock platform July 2023

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Image 40. *Tetratheca glandulosa* with flower buds within Quadrat 2 2023



Image 41. *Pimelea curviflora var curviflora* with flowers within Quadrat 2 2023

3.4 Threatened Fauna Monitoring

Threatened fauna previously located within the Old Northern Road site included four species of microchiropteran bat and a Glossy Black Cockatoo.

A search was undertaken for Glossy Black Cockatoo feed trees throughout the site. Feed tree location was confirmed within transect 2 of the NVR and within the 250m buffer from Maroota Public School in the same locations as previous years. It is common for this species to return to the same stand of feed trees repeatatively. There were no birds observed feeding in trees within the 250n buffer from Maroota Public School during this reporting period.

An AnaBat Express sound recorder was left in place over 30 survey nights. The results were sent to Dr Anna McConville from Echo Ecology and Surveying for analysis. Unfortunately the AnaBat Express sound recorder had failed for the entire 30 survey nights deeming the survey unsuccessful. The timing of this feedback from Dr McConville was following the suitable season for bat surveying therefore it was too late to survey the site again within the reporting period. Bat surveys will again be conducted during the summer surveying season as part of the Dixon Sand ongoing commitment to threatened species monitoring on the site.

No other threatened fauna were observed within or immediately surrounding the Old Northern Road site during the survey period. The resident pair of Wedged-tailed Eagles were observed flying over the site several times throughout the year. A White Breasted Sea Eagle was also observed flying over the site during the reporting period.

The HRBOA previously had two threatened fauna species recorded on the property, although outside of the offset area. A historic Bionet record of a Koala and Glossy Black Cockatoo sighting to the north of the property towards Hitchcock Road was not investigated any further for the purpose of this report. Koala sightings in the area, particularly around Glenorie, have increased since the Wollemi/Yengo mega-bushfire over the spring/summer of 2019/2020. A search for Koala scat under *Eucalyptus punctata* within all survey quadrats at the HRBOA was undertaken. No scats were found.

Glossy Black Cockatoo feed trees were observed within quadrat 1. Several Brown Treecreepers were observed foraging again during the 2023 survey period within the site at various locations indicating these are permanent residents within the site. A survey for microchiropteran bat species using an AnaBat Express sound recorder was undertaken during February 2023. The Eastern Free-tailed Bat *Mormopterus norfolkensis* was identified on one out of sixteen nights by Dr Anna McConville. In addition to this the Large-eared Pied bat *Chalinolobus dwyeri*, Eastern Falsistrelle *Falsistrellus tasmaniensis,* Greater Broad-nosed Bat *Scoteanax rueppellii*, Little Bent-winged Bat *Miniopterus australis,* Eastern cave bat *Vespadelus troughtoni* and Southern Myotis *Myotis Macropus* potentially occurred within the site however the recorded calls could not be confidently identified. The survey fauna results can be seen in Appendix D and E.

3.5 Exotic Species

Exotic flora species were identified within the NVC and 250m buffer area at the Old Northern Road site. Six species considered as High Threat Weeds (HTW) under the *Biosecurity Act 2015* occur on the property, Crofton Weed *Ageratina adenophora*, Whiskey Grass *Andropogon virginicus,* Cobblers Pegs *Bidens pilosa,* Paspalum Grass *Paspalum dilatatum,* Fireweed *Senecio madagascariensis* and the most widespread on the property Lantana *Lantana camara.* Two of those weed species, Fireweed and Lantana, are also listed as Weeds of National Significance (WoNS) as determined by the Commonwealth Government. A weed management program is currently in place and will continue throughout the life of the rehabilitation plan. There was one HTW identified within the HRBOA,

Whiskey Grass *Andropogon virginicus*, which occurs in the rehabilitation area located in the south east area of the site. It is likely seed has been spread to the walking trails of the site via the clothing and shoes of the bush regenerators undertaking weed management in the rehabilitation area. Annual sweeps of the property are recommended to ensure any outbreaks are managed and controlled before species become established.

A weed distribution map has been developed which will be updated yearly to allow for annual comparison. The weed management contractor should aim to reduce the size of these areas on an annual basis with the ultimate goal of eradication, particularly of WoNS and HTW. The weed distribution map has not changed from the previous reporting period. This is due to the wet conditions making it difficult for the weed management contractor to gain access to the site and the wet conditions providing ideal growing conditions for weed species.

Exotic fauna species were identified within the NVC at the Old Northern Road site. Infra-red cameras were left in place for 16 survey nights although no images of fauna were recorded within the survey period this year. Fauna prints were recorded at several locations where sand and mud were present within the site. Foxes, dog, macropods and bandicoot were confidently recorded with various bird prints also identified.

European Rabbit scats were observed in several locations within the NVC in low density. It could then be assumed that carnivore scats also observed onsite were most likely from the European Red Fox. As no Rabbits were observed feeding during the day, scats were not in high density and large warrens were not observed the population can be considered to be low and likely to be kept under control by biological means such as predation from foxes, dogs, cats and birds of prey such as the Wedge-tailed Eagle observed flying nearby. Should the number of rabbits become problematic then it may be necessary to engage in a control program to reduce or eliminate the population.

The Noisy Minor, *Manorina melanocephala*, was also observed within the NVC and 250m buffer area at the Old Northern Road Site. Although this bird is a native species to eastern Australia it is worth mentioning here as the species is considered a pest in high density and a Key Threatening Process to many threatened species of small bird including the Brown Treecreeper, which was identified at HRBOA. The population of Noisy Minor appeared to be small and a variety of small birds were observed on site during the survey period. The population should be monitored over time to ensure the species does not become dominant and eliminate other bird species from the vegetation.

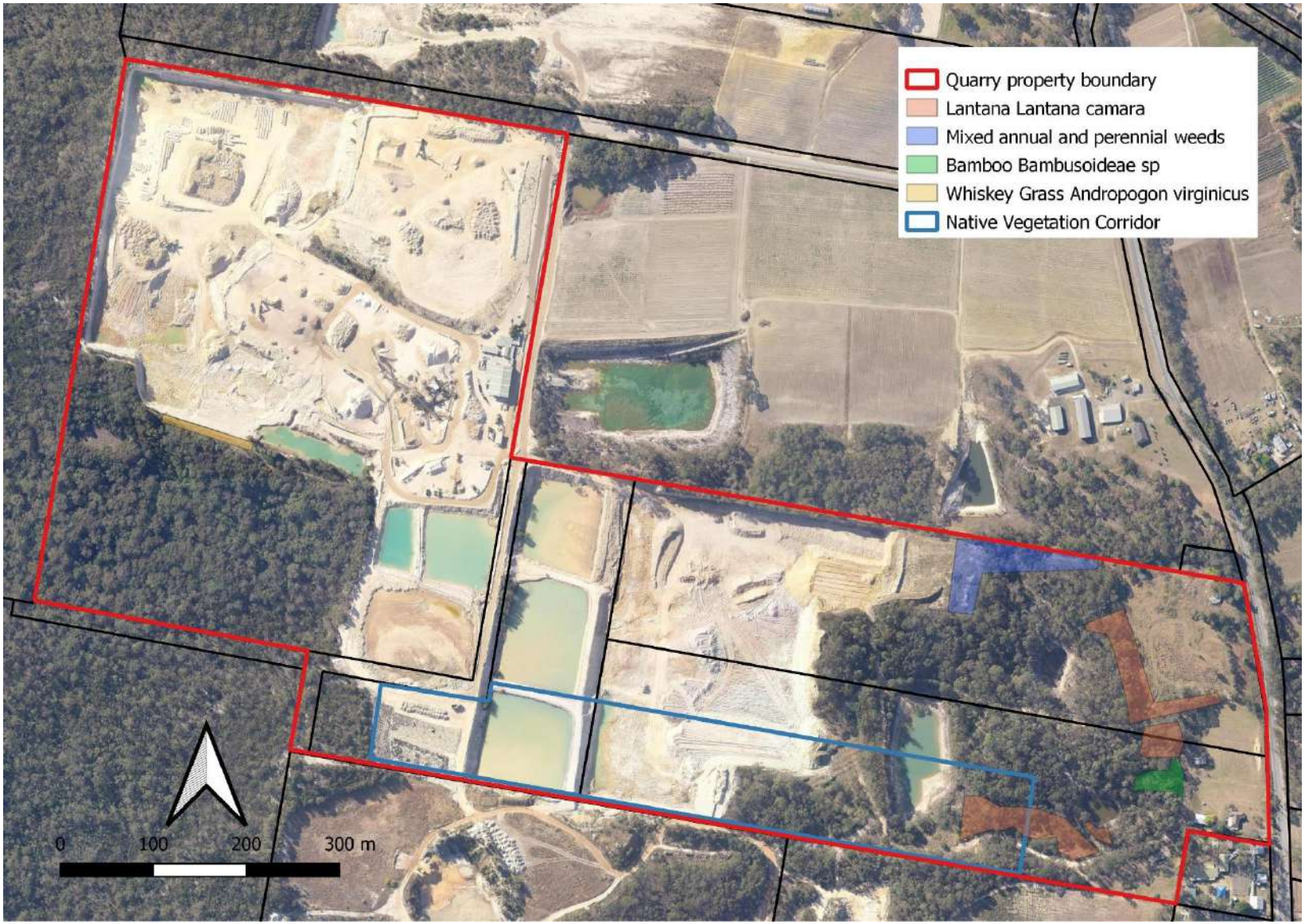


Figure 42. Annual weed distribution map ONR 2023

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3.6 Assessment Against Criteria

The results of the field survey were assessed against the criteria for successful rehabilitation (Table 12).

Table 11. Assessment against criteria to monitor success of rehabilitation

Category	Performance Criteria	Target Achieved	Comments
Native Vegetation	More than 75% of trees are healthy and growing as indicated by long term monitoring	YES	More than 75% of the native vegetation within the active rehabilitation area is healthy and is growing as expected for long term survival. All shrub and ground cover species have reached maturity with flowering and seed production observed. Some species have begun self-propagation within rehabilitation sites. *Eucalyptus, Angophora* and *Corymbia* species have not yet reached maturity.
	More than 50% of translocated or propagated threatened flora species survive as indicated by long term monitoring	YES	More than 50% of translocated and planted propagated threatened flora species has survived despite the extreme weather conditions of the past reporting periods. To date at least 45 propagated *Darwinia fascicularis subsp. Oligantha* and 52 propagated *Melaleuca deanei* have survived transplanting in the rehabilitation area. A complete count of translocated *Darwinia fascicularis subsp. Oligantha* was not undertaken at the time of relocation however it appears that any losses that may have occurred were minimal and new recruits are now visible throughout much of the area.
Vegetation Structure	Revegetation areas contain flora species assemblages characteristic of the desired native vegetation communities	N/A	At this stage it is too early in the rehabilitation process to determine if the desired vegetation community is being established. Species planted have been specifically chosen to recreate a Banksia Heath community.
Ecosystem Function	Second generation tree seedlings are present or likely to be, based on monitoring comparable older rehabilitation sides (evidence of fruiting of native species observed)	N/A	It is too early in the rehabilitation process for second generation tree seedlings. Fruiting of tree species is has only just commenced therefore this KPI is likely to be achieved within the next 2-3 years.
	Habitat values retained or beginning to develop and improve over time (leaf litter, fallen timber etc)	YES	Habitat values have been added to the rehabilitation site in the form of logs and vegetation debris. The site is not yet at the age where it will begin to form its own habitat value. This is expected

			to begin between 5-10 years following the original planting. That being said, leaf litter is beginning to form.
Weeds and Pests	Regular inspections indicate a decline weed diversity, density and abundance and a decline in signs of feral animal activity	YES	There were very few weed species identified within the rehabilitation area. There are no signs of feral animal activity.
	There is no significant weed infestation such that weeds do not comprise a significant proportion of the species in the stratum	YES	There is no significant weed infestation within the rehabilitation area. Significant weed infestations are located within the NVC outside of the rehabilitation area. These areas are being actively addressed by weed management contractors.
	There is no evidence of significant damage resulting from feral animal activity	YES	There is no evidence of significant damage caused from feral animal activity within the rehabilitation area.

4 DISCUSSION AND RECOMMENDATIONS

This is the sixth Annual Biodiversity and Rehabilitation Management Report produced for Dixon Sand Modification 4. Rehabilitation work is in the mid to early stages and will increase with both intensity and measurable criteria in the years that follow.

This report provides information which will allow for measurable and quantifiable data to be compared over time as the rehabilitation and monitoring continues.

The average rainfall over this reporting period has provided ideal growing conditions for the rehabilitation areas of the NVC. Flora within all stratums have increased in size, maturity and density during the past twelve month period. New juvenile recruits are evident from shrub and ground cover species while an increase in species diversity was also recorded. Canopy species are growing well and have reached reproductive maturity during this reporting period.

The remaining vegetation areas within the ONR site have recovered well from the drought conditions of 2017-2019. The average rainfall over the past 12 month period has provided ideal growing conditions for ground cover species, particularly forbs, grasses and ferns. The native vegetation areas with no weedy growth have demonstrated their resilience with no new weed growth or establishment evident following the return to regular rainfall events.

Vegetation within the HRBOA has once again had very little vegetation changes observed throughout the site demonstrating the hardiness of native vegetation stands with minimal historic disturbances. Shrub and forb species density and diversity has slightly decreased likely due to average weather conditions returning following an over abundance of rainfall during the past two reporting periods.

Threatened species located within the NVC have persisted despite the drought conditions of 2017-2019. The *Kunzea rupestris* was adversely impacted by the drought, particularly from radiant heat reflection from the surrounding sandstone. Although the species is well suited to enduring dry seasons and limited water resources some losses did occur to individuals within the population. New juvenile recruitment is evident thanks to the continuation of regular rainfall. All other threatened species previously recorded onsite were located and appear healthy.

Weed species, particularly *Lantana camara*, within the NVC and 250m school buffer area of the Old Northern Road site should remain a priority management species for removal and control over the next twelve month period. Management of the species has commenced by the bush regeneration contractors however the average rainfall has provided the species with ideal growing conditions. Without management this species is likely to spread over a larger area, in turn supporting habitat for exotic fauna species such as the European Rabbit and the European Red Fox. Suitable techniques for removal have been provided in appendix F.

Rehabilitation efforts have continued in earnest with native plant relocation, propagation and planting taking place throughout the reporting period. Continued supplementary planting within the rehabilitation area and locations within the NVC and 250m school buffer where Lantana is removed will continue over the next reporting period.

A silt pond is currently being rested immediately to the east of the rehabilitation area within the NVC. This silt pond was expected to be ready for rehabilitation during this reporting period however continued rainfall has resulted in the pond not drying to a suitable standard. It is expected commencement of rehabilitation of the NVC in the location of the silt pond with occur during the next

twelve month period. During the next twelve months native rehabilitation work will continue along the western embankment at the front entrance to the quarry site and weed treatment and control will continue throughout the site.

5 LIMITATIONS AND ASSUMPTIONS

This study was limited by the timing and frequency of the survey. There may be flora and/or fauna species present at the site that were not recorded due to their seasonal, territorial or cryptic nature.

It can never be proven that threatened species have not, do not or will not use the site as habitat. The conclusions drawn in this report are a result of testing, observation and experience.

This report describes the habitat and vegetation of the site at the time of the field survey. Vegetation and habitat will change over time and therefore the findings of this report are only relevant for the current proposal and for the duration of the application.

6 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR AND FIELD ECOLOGIST

The Author and Field Ecologist, Melissa Mass, has formal qualifications including a Bachelor of Applied Science (B. App. Sc.), majoring in Ecology, and a Certificate 3 in Horticulture. Her current Scientific Licence number issued from the NSW OEH is SL101441 with expiry date 31st Oct 2023. Furthermore an Animal Research Authority issued by the NSW Animal Care and Ethics Committee is current to undertake general survey work in THSC local government area with expiry 23rd Mar 2023. Melissa is an accredited Biodiversity Assessor conforming to the requirements as imposed by OEH with Accreditation number being BAAS18053.

Melissa has been working as an Ecologist for 14 years. Her work has included targeted threatened species assessment and management, reviews of environmental factors, bush regeneration, environmental impact assessments, and environmental survey and monitoring.

Melissa has a strong focus on threatened species ecology and has actively contributed to the Long-nosed Potoroo National Recovery Plan.

7 BIBLIOGRAPHY

Australian Government Com Law. 2014. *Environment Protection and Biodiversity Conservation Act 1999*. [ONLINE] Available at: http://www.comlaw.gov.au/Details/C2014C00506 [Accessed 5th July 2021].

Australian Government Com Law. 2018. *Biosecurity Act 2015*. [ONLINE] Available at: https://www.legislation.gov.au/Details/C2018C00363 [Accessed 6th September 2021].

Australian National Herbarium. 2012. Australia's Virtual Herbarium. [ONLINE] Available at: http://avh.chah.org.au/ [Accessed on 6th August 2021].

CRC Weed Management 2003. *Lantana (Lantana camara), Weeds of National Significance, Weed Management Guide*. Commonwealth Department of the Environment and Heritage.

Cumberland Ecology 2016. *Biodiversity Management Plan for Dixon Sand (Penrith) Pty Ltd June 2016*. Unpublished report for Haerses Road Biodiversity Offset Area.

Cumberland Ecology 2016. *Flora and Fauna Monitoring Program for Dixon Sand (Penrith) Pty Ltd June 2016*. Unpublished report for Dixon Sand Maroota.

Department of Environment and Climate Change NSW. 2008. Recovery Plan for the Koala (*Phascolarctos cinereus*). [ONLINE] Available at: http://www.environment.nsw.gov.au/resources/threatenedspecies/08450krp.pdf [Accessed 6th July 2021].

Department of Lands Spatial Information Exchange. 2018. SIX Maps. [ONLINE] Available at: http://maps.six.nsw.gov.au/ [Accessed 6th September 2021].

Department of Natural Resources and Environment. 1999. Parks, Flora and Fauna Division. Regent Honeyeater Recovery Plan 1999-2003. [ONLINE] Available at: http://www.environment.gov.au/system/files/resources/91aed8af-670d-4f56-9ef8-20bd4141ac76/files/regent-h-eater.pdf [Accessed 6th September 2021].

Menkhorst P. & Knight F. 2004. A Field Guide to the Mammals of Australia, 2nd Edition. Oxford University Press, South Melbourne Vic.

New South Wales Consolidated Acts. 2017. *Biodiversity Conservation Act 2016*. [ONLINE] Available at: https://www.legislation.nsw.gov.au/~/view/act/2016/63 [Accessed 6th September 2021].

NSW Office of Environment and Heritage. 2018. *NSW BioNet*. [ONLINE] Available at: http://www.bionet.nsw.gov.au/ [Accessed 6th September 2021].

NSW Office of Environment and Heritage. 2018. *NSW BioNet Vegetation Classification*. [ONLINE] Available at: https://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx [Accessed 6th September 2021].

New South Wales Office of Environment and Heritage 2018. *NSW Threatened Species Profiles*. [ONLINE] Available at: http://www.environment.nsw.gov.au/threatenedspecies/ [Last accessed 6th September 2021].

South East Environmental

New South Wales National Parks and Wildlife Service (2002) Interpretation Guidelines for the Native Vegetation Maps of the Cumberland Plain, Western Sydney, Final Edition NSW NPWS, Hurstville.

Onsite Environmental Management. 2016. *Dixon Sand Annual Threatened Species Management Report October 2016*. Unpublished report by Onsite Environmental Management.

PlantNet. 2018. Royal Botanic Gardens and Domain Trust, Sydney. [ONLINE] Available at: http://plantnet.rbgsyd.nsw.gov.au [Last accessed 6th September 2021].

Readers Digest. 1998. Readers Digest Complete Book of Australian Birds, 2nd Edition. Readers Digest, Surry Hills NSW.

Simpson K., Day N. & Trusler P. 2004. Field Guide to the Birds of Australia, 7th Edition. Penguin Group, Camberwell Vic.

South East Environmental. 2019. Annual Biodiversity & Rehabilitation Management Report 2020 Dixon Sand Pty Ltd. Unpublished report by South East Environmental, Sackville North.

Strahan R. 1996. A Photographic Guide to Mammals of Australia. New Holland Publishers, Frenchs Forest NSW

The Hills Shire Council (2019) *The Hills Local Environmental Plan 2019*. [ONLINE] Available at https://www.legislation.nsw.gov.au/view/html/inforce/current/epi-2019-0596 [Last accessed 6th September 2021].

Tozer MG, Turner K, Keith DA, Tindall D, Pennay C, Simpson C, MacKenzie B, Beukers P, and Cox S. 2010. *Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands*. Cunninghamia (2010) 11(3): 359-406

Umwelt (Australia) Pty Ltd 2019. *Haerses Road Biodiversity and Rehabilition Management Plan May 2019.* Unpublished report by Umwelt Teralba.

Umwelt (Australia) Pty Ltd 2018. *Old Northern Road Quarry Biodiversity and Rehabilitation Management Plan March 2018*. Unpublished report by Umwelt Teralba.

8 APPENDIX

APPENDIX A – FLORA SPECIES IDENTIFIED WITHIN THE ONR STUDY AREA

Status	Botanical Name	Common Name	Plot 1	Plot 2	Plot 4 - NVC
	Acacia brownii	Heath Wattle			
	Acacia linifolia	White Wattle		3	1
	Acacia myrtifolia	Red-stemmed Wattle			1
	Acacia parramattensis	Parramatta Wattle	1		1
	Acacia suaveolens	Sweet Wattle			1
	Acacia ulicifolia	Prickly Moses		1	
	Actinotus minor	Lesser Flannel Flower	1	1	
	Allocasuarina littoralis	Black She-oak	3	1	1
	Allocasuarina torulosa	Forest She-oak	1		
	Angophora bakeri	Narrow-leaved Apple		1	1
	Angophora costata	Smooth Barked Apple	1	1	
	Austrostipa pubescens	Spear Grass	1	1	2
	Banksia spinulosa	Hairpin Banksia	1	2	1
	Billardiera scandens	Hairy Apple Berry	1	1	1
	Boronia ledifolia	Sydney Boronia			1
	Bossiaea heterophylla	Variable Bossiaea	1		1
	Bossiaea obcordata	Spiny Bossiaea		2	2
	Breynia oblongifolia	Coffee Bush			
	Cassytha glabella	Slender Devils Twine	1		1
	Ceratopetalum gummiferum	NSW Christmas Bush	2	1	
	Cheilanthes sieberi	Mulga Fern	1		
	Corymbia eximia	Yellow Bloodwood		1	1
	Corymbia gummifera	Red Bloodwood		2	1
	Cyathochaeta diandra	Sheath Rush	1		
	Desmodium varians	Slender Tock-trefoil		1	
	Dianella caerulea	Blue Flax Lily	1	1	1
	Dianella prunina	Native Flax Lily			
	Dillwynia retorta	Heathy Parrot Pea	1	1	1
	Drosera peltata	Sundew			
	Einadia hastata	Berry Saltbush			
	Entolasia marginata	Bordered Panic	2		
	Entolasia stricta	Wiry Panic	1	2	3
	Epacris pulchella	Wallum Heath	1		
	Eragrostis brownii	Brown's Lovegrass	1		2
	Eucalyptus haemastoma	Scribbly Gum			1
	Eucalyptus pilularis	Blackbutt		1	
	Eucalyptus piperita	Sydney Peppermint	3	1	
	Eucalyptus punctata	Grey Gum	1		1
	Exocarpos cupressiformis	Cherry Ballart		1	1
	Gompholobium grandiflorum	Large Wedge Pea	1	1	1

	Gonocarpus teucrioides	Raspwort	1		1
	Goodenia bellidifolia	Daisy-leaved Goodenia	1		
	Grevillea buxifolia	Grey Spider Flower			1
	Grevillea mucronulata	Green Spider Flower			
	Hakea sericea	Needlebush		2	2
	Hardenbergia violacea	False Sarsaparilla		1	
	Hovea linearis	Common Hovea		1	
	Imperata cylindrica	Blady Grass			
	Isopogon anemonifolius	Broad-leaved Drumsticks	1		
	Jacksonia scoparia	Dogwood			1
	Juncus usitatus	Common Rush			
	Kunzea ambigua	Tickbush	3		
	Lambertia formosa	Mountain Devil		1	1
WoNS HTW	*Lantana camara*	Lantana			
	Leptospermum polygalifolium	Tantoon	1		
	Leucopogon parviflorus	Coastal Beard-heath		1	2
	Lindsaea microphylla	Lacy Wedge Fern		1	
	Lomandra brevis	Tufted Mat-rush	1		
	Lomandra filiformis	Wattle Mat-rush	1	1	
	Lomandra gracilis	Lomandra gracilis		1	
	Lomandra longifolia	Spiny-headed Mat-rush	1	1	1
	Lomandra multiflora	Many Flowered Mat-rush	1	1	1
	Lomandra obliqua	Fish Bones	1	1	1
	Lomatia silaifolia	Crinkle Bush		1	
	Microlaena stipoides	Weeping Grass			
W	*Nephrolepis cordifolia*	Fishbone Fern			
	Ozothamnus diosmifolius	Rice Flower	1	1	1
W	Paspalum	Paspalum			
	Persoonia levis	Broad Leaved Geebung		1	
	Persoonia linearis	Narrow Leaved Geebung		1	2
	Persoonia pinifolia	Pine-leaved Geebung	1	1	1
	Petrophile pulchella	Conesticks		1	1
	Phyllanthus hirtellus	Thyme Spurge	1	1	1
W	*Phytolacca octandra*	Inkweed			
V	*Pimelea curviflora var. Curviflora*	Pimelea curviflora var. curviflora			1
	Pimelea linifolia	Slender Rice Flower		1	1
W	*Plantago lanceolata*	Plantain			
	Platysace linearifolia	Carrot Tops		1	
	Pomax umbellata	Pomax			
	Pratia purpurascens	Whiteroot			1
	Pteridium esculentum	Bracken Fern	1	1	1
	Rytidosperma racemosum	Wallaby Grass			1
	Scaevola ramosissima	Purple Fan-flower		1	1

	Smilax glyciphylla	Sweet Sarsaparilla	1	1	1
	Sporobolus elongatus	Slender Rats Tailed Grass			
	Stylidum lineare	Slender Trigger Grass			1
V	*Tetratheca glandulosa*	Glandular Pink Bells			1
	Tetratheca thymifolia	Black-eyed Susan		1	
	Themeda australis	Kangaroo Grass	2	2	2
	Trema tomentosa var. aspera	Native Peach			
	Xanthorrhoea resinosa	Grass Tree		1	1
	Xanthosia pilosa	Woolly Xanthosia	2	1	1
	Xanthosia tridentata	Rock Xanthosia	2		
	Xylomelum pyriforme	Woody Pear		1	

V – Vulnerable Species , **W** – Weed , **WoNS** – Weed of National Significance , **HTW** – High Threat Weed

Key
Braun-Blanquet scale.
1 <5% cover & 3 or less individuals
2 <5% cover & more than 3 individuals sparsely scattered
3 <5% cover common and consistent
4a <5% cover & very abundant many individuals
4b 5 – 25% cover
5 25 – 50% cover
6 50 – 75% cover
7 75% - 100% cover

APPENDIX B – FLORA SPECIES IDENTIFIED WITHIN ONR REHABILITATION AREA

Status	Botanical Name	Common Name	Rehab 1	Translocate	Soil seedbank
	Acacia linifolia	White Wattle	Seed bank	*	*
	Acacia myrtifolia	Red-stemmed Wattle	Seed bank	*	
	Acacia parramattensis	Parramatta Wattle	Seed bank		*
	Acacia suaveolens	Sweet Wattle	Planted	*	*
	Acacia ulicifolia	Prickly Moses	Planted	*	*
	Actinotus minor	Lesser Flannel Flower	Seed bank	*	*
	Allocasuarina littoralis	Black She-oak	Planted	*	*
HTW	*Andropogon virginicus*	Whiskey Grass	Seed bank	*	
	Angophora bakeri	Narrow-leaf Apple	Seed bank	*	
	Angophora costata	Smooth Barked Apple	Planted		
	Angophora hispida	Dwarf Apple	Planted	*	*
	Anisopogon avenaceus	Oat Spear Grass	Seed bank	*	*
	Aristida vagans	Threeawn Speargrass	Planted	*	*
	Aristida warburgii	Fine-leafed Wire Grass	Seed bank	*	
	Asplenium trichomanes	Common Spleenwort	Seed bank		*
	Austrostipa pubescens	Spear Grass	Seed bank	*	*
	Banksia ericifolia	Heath-leaved Banksia	Planted	*	*
	Banksia serrata	Old Man Banksia	Planted	*	*
	Banksia spinulosa	Hairpin Banksia	Planted	*	
	Billardiera scandens	Hairy Apple Berry	Seed bank	*	*
	Boronia floribunda	Pale Pink Boronia	Seed bank	*	*
	Boronia ledifolia	Sydney Boronia	Seed bank	*	*
	Bossiaea heterophylla	Variable Bossiaea	Seed bank	*	*
	Bossiaea lenticularis	Bossiaea	Seed bank		
	Bossiaea obcordata	Spiny Bossiaea	Planted	*	
	Calytrix tetragona	Common Fringe Myrtle	Planted	*	*
	Cassytha glabella	Slender Devils Twine	Seed bank	*	
	Caustis pentandra	Curly Wig	Seed bank	*	
	Cheilanthes seiberi	Mulga Fern	Seed bank	*	
	Corymbia eximia	Yellow Bloodwood	Planted		
	Corymbia gummifera	Red Bloodwood		*	
	Cyanthochaeta diandra	Sheath Rush	Seed bank	*	
EnP	*Darwinia fascicularis subsp. oligantha*		Planted	Planted	Planted
	Desmodium varians	Slender Tock-trefoil	Seed bank	*	
	Dianella caerulea	Blue-flax Lily	Seed bank	*	
	Dianella prunina	Native Flax Lily	Planted	*	
	Dichelachne inaequiglumis	Short-hair Plume Grass		*	
	Dillwynia floribunda	Showy Parrot Pea	Seed bank	*	
	Dillwynia retorta	Parrot Pea	Seed bank	*	
	Drosera pelata	Sundew	Seed bank	*	
	Echinopogon caespitosus	Bushy Hedgehog Grass	Planted	*	
	Entolasia marginata	Bordered Panic	Planted		
	Entolasia stricta	Wiry Panic	Seed bank	*	*
	Epacris microphylla	Coral Heath		*	
	Epacris pulchella	Wallum Heath	Seed bank	*	*

	Eragrostis brownii	Brown's Lovegrass	Seed bank	*	*
	Eucalyptus haemastoma	Scribbly Gum	Planted	*	*
	Eucalyptus punctata	Grey Gum	Seed bank		
	Eucalyptus tereticornis	Forest Redgum	Planted		
	Exocarpos cupressiformis	Cherry Ballart		*	
	Gahnia sieberiana	Red-fruit Saw-sedge		*	*
	Gompholobium grandiflorum	Large Wedge Pea	Seed bank	*	*
	Gonocarpus teucrioides	Raspwort	Planted	*	*
	Goodenia bellidifolia	Daisy-leaved Goodenia		*	
	Goodenia hederacea	Forest Goodenia	Planted	*	
	Goodenia rotundifolia	Star Goodenia	Seed bank		
	Grevillea buxifolia	Grey Spider Flower	Planted	*	*
	Grevillea mucronulata	Green Spider Flower	Planted		*
	Grevillea sericea	Pink Spider Flower	Planted		
	Grevillea speciosa	Red Spider Flower	Planted	*	*
	Hakea dactyloides	Broad-leaved Hakea	Seed bank	*	
	Hakea sericea	Needlebush	Planted	*	*
	Hardenbergia violacea	False Sarsparilla	Seed bank	*	
	Hibbertia aspera	Rough Guinea Flower	Planted	*	
	Hibbertia diffusa	Wedge Guinea Flower	Planted	*	*
	Hovea linearis	Common Hovea	Seed bank	*	
	Imperata cylindrica	Blady Grass	Seed bank	*	*
	Isopogon anemonifolius	Broad-leaved Drumsticks	Planted	*	*
	Jacksonia scoparia	Dogwood		*	
	Juncus usitatus	Common Rush	Seed bank	*	
	Kunzea ambigua	Tick Bush	Seed bank	*	*
	Kunzea capitata	Pink Kunzea	Planted		
	Lambertia Formosa	Mountain Devil		*	
	Laxmannia gracilis	Slender Wire Lily	Seed bank	*	*
	Lepidosperma neesii	Stiff Rapier-sedge	Seed bank	*	
	Leptospermum polygalifolium	Tantoon		*	*
	Leptospermum trinervium	Flaky-barked Tea-tree	Planted	*	*
	Leucopogon juniperinus	Prickly-beard Heath	Planted	*	
	Leucopogon microphyllus	Small-leaved White Beard	Seed bank	*	*
	Lindsaea microphylla	Lacy Wedge Fern	Seed bank		
	Lomandra brevis	Tufted Mat-rush	Seed bank		
	Lomandra glauca	Pale Mat-rush	Seed bank	*	*
	Lomandra longifolia	Spiny-headed Mat-rush	Planted	*	*
	Lomandra multiflora	Many Flowered Mat-rush	Seed bank	*	*
	Lomandra obliqua	Fishbones	Seed bank	*	*
	Lomatia silaifolia	Crinkle Bush	Seed bank	*	
V	*Melaleuca deanei*	Deane's Paperbark	Planted	Planted	Planted
	Microlaena stipoides	Weeping Grass	Seed bank	*	*
	Micromyrtus ciliata	Fringed Heath Myrtle		*	
	Mirbelia rubiifolia	Heath Mirbelia	Seed bank	*	*
	Mirbelia speciosa	Mirbelia	Seed bank	*	

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	Ozothamenus diosmidfolius	Rice Flower	Seed bank	*	
	Patersonia sericea	Purple Flag Flower	Seed bank	*	
	Persoonia lancelota	Lance-leaved Geebung	Seed bank	*	*
	Persoonia levis	Broad-leaved Geebung	Seed bank	*	
	Persoonia pinifolia	Pine-leaved Geebung	Seed bank	*	*
	Petrophile pulchella	Conesticks		*	
	Petrophile sessilis	Prickly Conesticks	Planted		
	Phyllanthus hirtellus	Thyme Spurge	Planted	*	*
	Phyllota phylicoides	Heath Phyllota		*	*
V	*Pimelea curviflora var. curviflora*			*	
	Pimelea linifolia	Slender Rice Flower	Seed bank	*	
	Platysace linearifolia	Carrot Tops	Seed bank	*	*
	Pomax umbellate	Pomax	Seed bank	*	
	Poranthera microphylla	Small Poranthera	Seed bank	*	
	Pratia purpurascens	White Root	Seed bank	*	
	Pteridium esculentum	Bracken Fern		*	
	Pultenaea flexilis	Graceful Bush Pea		*	
	Rytidosperma racemosum	Wallaby Grass	Seed bank	*	
	Scaevola ramosissima	Purple Fan Flower	Seed bank	*	
	Schoenus ericetorum	Heath Bog Rush	Seed bank	*	*
	Stylidium graminifolium	Grass Trigger Plant		*	
V	*Tetratheca glandulosa*	Glandular Pink Bells	Seedbank	Translocated	
	Themeda australis	Kangaroo Grass	Seedbank	*	
	Trema tomentose	Native Peach	Seed bank	*	*
	Xanthosia Pilosa	Woolly Xanthosia	Seed bank	*	

EnP – Endangered Population
V – Vulnerable species
HTW – High Threat Weed

APPENDIX C – FLORA SPECIES IDENTIFIED AT HRBOA

Status	Botanical Name	Common Name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
	Acacia hispidula	Little Harsh Acacia	1		1		
	Acacia linearifolia	Narrow-leaved Wattle				1	
	Acacia linifolia	White Wattle	1		1	1	1
	Acacia suaveolens	Sweet Wattle		1	1		1
	Acacia ulicifolia	Prickly Moses	2				
	Actinotus helianthi	Flannel Flower					2
	Actinotus minor	Lesser Flannel Flower	1	2		1	2
	Allocasuarina distyla	Scrub She-oak		1			1
	Allocasuarina littoralis	Black She-oak	2			1	1
	Angophora costata	Smooth Barked Apple	2			1	
	Angophora hispida	Dwarf Apple	1	2			1
	Aristida vagans	Threeawn Speargrass	1	1			
	Aristida warburgii	Fine-leafed Wire Grass	1	1	1	1	
	Asplenium trichomanes	Common Spleenwort				1	
	Austrostipa pubescens	Spear Grass	1	2	1	1	1
	Banksia ericifolia	Heath-leaved Banksia		2	1	1	1
	Banksia oblongifolia	Fern-leaved Banksia		1			1
	Banksia serrata	Old Man Banksia	2	1	2		2
	Banksia spinulosa	Hairpin Banksia		1		2	
	Billardiera scandens	Hairy Apple Berry	1		1	1	
	Boronia floribunda	Pale Pink Boronia	2	1			1
	Boronia ledifolia	Sydney Boronia	1		1		2
	Bossiaea hetrophylla	Variable Bossiaea	1				2
	Bossiaea lenticularis	Bossiaea				2	
	Bossiaea scolopendra	Sword Bossiaea	1				1
	Breynia oblongifolia	Coffee Bush					
	Callicoma serratifolia	Black Wattle				3	
	Calochlaena dubia	Soft Braken Fern			1	1	
	Calytrix tetragona	Common Fringe Myrtle		3			
	Carex inversa	Knob Sedge					
	Cassytha glabella	Slender Devils Twine		2	1		1
	Caustis flexuosa	Curly Wig	2		2	1	1
	Caustis pentandra	Thick Twist Rush					
	Ceratopetalum gummiferum	NSW Christmas Bush	1		2	2	
	Cheilanthes seiberi	Mulga Fern		2		1	1
	Corymbia eximia	Yellow Bloodwood			1		1
	Corymbia gummifera	Red Bloodwood	1		2	2	1
	Cyathochaeta diandra	Sheath Rush	1	1	1	1	1
	Cymbidium sp	Orchid				1	
V	*Darwinia biflora*			1			
	Dianella caerulea var. producta	Blue Flax Lily			1	1	1
	Dianella prunina	Native Flax Lily					1
	Dillwynia floribunda	Showy Parrot Pea		2			1
	Dillwynia retorta	Parrot Pea	1	1			1
	Dodonaea viscosa	Sticky Hop Bush			1		
	Dracophyllum secundum	Dracophyllum			1	1	

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	Drosera auriculata	Sundew					1
	Elaeocarpus reticulatus	Blueberry Ash			1	1	
	Entolasia stricta	Wiry Panic	2	3	2	1	1
	Epacris microphylla	Coral Heath					
	Epacris pulchella	Wallum Heath	1	2	1	1	1
	Eragrostis brownii	Brown's Lovegrass					
	Eucalyptus haemastoma	Scribbly Gum		1			1
	Eucalyptus pilularis	Blackbutt	1		1		
	Eucalyptus piperita	Sydney Peppermint			1		
	Eucalyptus punctata	Grey Gum			1		1
	Eucalyptus resinifera	Red Mahogony				1	
	Gahnia sieberiana	Red-fruit Saw-sedge				2	
	Glochidion ferdinandi	Cheese Tree				1	
	Gompholobium glabratum	Dainty Wedge Pea		1	1		1
	Gonocarpus teucrioides	Raspwort					
	Grevillea buxifolia	Grey Spider Flower	1	1			1
	Grevillea mucronulata	Green Spider Flower			1		
	Grevillea speciosa	Red Spider-flower	1	1			
	Hakea dactyloides	Broad-leaved Hakea		1			1
	Hakea propinqua	Large Fruit Hakea		1			
	Hakea sericea	Needlebush		1	1	1	
	Hibbertia aspera	Rough Guinea Flower			1		
	Hibbertia diffusa	Wedge Guinea Flower					1
	Hovea linearis	Common Hovea		1	1		1
	Imperata cylindrica	Blady Grass					1
	Isopogon anemonifolius	Broad-leaved Drumsticks	1	1			1
	Lambertia formosa	Mountain Devil	2	1	1		2
	Lepidosperma laterale	Variable Swordsedge		2		1	1
	Leptospermum polygalifolium	Tantoon		1	1	1	
	Leptospermum trinervium	Flaky-barked Tea-tree	3	3	2	2	1
	Leucopogon juniperinus	Prickly-beard Heath					1
	Leucopogon microphyllus	Small Leaved White Beard		1			1
	Leucopogon parviflorus	Coastal Beard-heath	1		1	1	
	Lindsaea microphylla	Lacy Wedge Fern					
	Lomandra brevis	Tufted Mat-rush	1				1
	Lomandra filiformis	Wattle Mat-rush			1	1	
	Lomandra glauca	Pale Mat-rush	1		1	1	1
	Lomandra gracilis	Small Lomandra					
	Lomandra longifolia	Spiny-headed Mat-rush				1	
	Lomandra multiflora	Many Flowered Mat-rush		2		2	1
	Lomandra obliqua	Fish Bones	1		1		1
	Lomatia silaifolia	Crinkle Bush	1		1	1	1
	Micrantheum ericoides			2			
	Micromyrtus ciliata	Fringed Heath-myrtle		2			1

	Mirbelia rubiifolia	Heath Mirbelia		2			1
	Patersonia sericea	Purple Flag Flower					
	Persoonia lanceolate	Lance Leaf Geebung		1			1
	Persoonia levis	Broad Leaved Geebung	1		2	1	1
	Persoonia pinifolia	Pine-leaved Geebung	2	2	3	1	2
	Petrophile pulchella	Conesticks		2			2
	Phyllanthus hirtellus	Thyme Spurge		2	1	1	
	Phyllota phylicoides	Heath Phyllota					
	Pimelea linifolia	Slender Rice Flower			1	1	
	Platysace linearifolia	Carrot Tops	2		1		2
	Pomax umbellata	Pomax					
	Pratia purpurascens	Whiteroot					
	Pteridium esculentum	Bracken Fern	1		1	2	
	Rytidosperma racemosum	Wallaby Grass					1
	Scaevola ramosissima	Purple Fan-flower	1		1		
	Schoenus melanostachys	Black Bog Rush					1
	Smilax glyciphylla	Sweet Sarsaparilla	1		1	1	
	Stylidium graminifolium	Grass Trigger Plant	1		1	2	
	Telopea speciosissima	NSW Waratah				2	
	Tetratheca thymifolia	Black Eyed Susan				1	
	Themeda australis	Kangaroo Grass			1		1
	Woollsia pungens	Snow Heath		1			3
	Xanthorrhoea resinosa	Grass Tree	1	1	1	1	1
	Xanthosia pilosa	Woolly Xanthosia		1		1	1
	Xanthosia tridentata	Rock Xanthosia		2	1		1
	Xylomelum pyriforme	Woody Pear				1	

V – Vulnerable species

Key
Braun-Blanquet scale.

1 <5% cover & 3 or less individuals
2 <5% cover & more than 3 individuals sparsely scattered
3 <5% cover common and consistent
4a <5% cover & very abundant many individuals
4b 5 – 25% cover
5 25 – 50% cover
6 50 – 75% cover
7 75% - 100% cover

APPENDIX D – FAUNA SPECIES IDENTIFIED WITHIN ONR SURVEY AREA

	Scientific Name	Common name	Method of observation
BIRDS			
	Acanthorhynchus tenuirostis	Eastern Spinebill	On site observation
	Anthochaera chrysoptera	Little Wattlebird	On site observation
	Aquila audax	Wedge-tailed Eagle	Flying above
V	*Calyptorhynchus lathami*	Glossy Black Cockatoo	On site observation
	Chenonetta jubata	Australian Wood Duck	On site observation
	Colluricincla harmonica	Grey Shrike-thrush	On site observation
	Cracticus tibicen	Australian Magpie	On site observation
	Cracticus torquatus	Grey Butcherbird	On site observation
	Dacelo novaeguineae	Laughing Kookaburra	On site observation
	Elseyornis melanops	Black-fronted Dotterel	On site observation
	Eopsaltria australis	Eastern Yellow Robin	On site observation
	Falco cenchroides	Nankeen Kestrel	Flying above
	Haliaeetus leucogaster	White-breasted Sea Eagle	Flying above
	Hirundo neoxena	Welcome Swallow	On site observation
	Lichenostomus leucotis	White-eared Honeyeater	On site observation
	Malurus cyaneus	Superb Fairy Wren	On site observation
	Manorina melanocephala	Noisy Minor	On site observation
	Meliphaga lewinii	Lewin's Honeyeater	On site observation
	Neochmia temporalis	Red-browed Finch	On site observation
	Ocyphaps lophotes	Crested Pigeon	On site observation
	Phylidonyris novaehollandiae	New Holland Honeyeater	On Site observation
	Platycerus elegans	Crimson Rosella	On site observation
	Rhipidura albiscapa	Grey Fantail	On site observation
	Rhipidura leucophrys	Willie Wagtail	On site observation
	Sericornis frontalis	White-browed Scrubwren	On site observation
	Strepera graculina	Pied Currawong	On site observation
	Trichoglossus moluccanus	Rainbow Lorikeet	On site observation
MAMMALS			
P	*Canis lupus familiaris*	Dog	Scat and prints
P	*Felis catus*	Cat	Prints
	Perameles nasuta	Long-nosed Bandicoot	Digs
P	*Oryctolagus cuniculus*	European Rabbit	Scat/digs
	Trichosurus vulpecula	Brush-tailed Possum	Scat
P	*Vulpes vulpes*	European Red Fox	Scat and prints
	Wallabia bicolor	Swamp Wallaby	On site observation/scat/ Sand pad
AMPHIBIANS			
	Crinia signifera	Common Eastern Froglet	Heard at farm dam
	Litoria peronei	Peron's Tree Frog	Heard in distance
REPTILES			
	Lampropholis guichenoti	Common Garden Skink	On site observation
	Pseudechis porphyriacus	Red-bellied Black Snake	On site observation

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	Tiliqua scincoides	Eastern Blue Tongue Lizard	On site observation
	Varanus varius	Lace Monitor	On site observation

V – Vulnerable species
P – Pest species

APPENDIX E – FAUNA SPECIES IDENTIFIED WITHIN HRBOA SURVEY AREA

	Scientific Name	Common name	Method of observation
BIRDS			
	Acanthorhynchus tenuirostris	Eastern Spinebill	On site observation
	Alisterus scapularis	King Parrot	On site observation
	Anthochaera chrysoptera	Little Wattlebird	On site observation
V	*Calyptorhynchus lathami*	Glossy Black Cockatoo	On site observation
V	*Climacteris picumnus*	Brown Treecreeper	On site observation
	Colluricincla harmonica	Grey Shrike-thrush	On site observation
	Cracticus tibicen	Australian Magpie	On site observation
	Cracticus torquatus	Grey Butcherbird	On site observation
	Dacelo novaeguineae	Laughing Kookaburra	On site observation
	Eopsaltria australis	Eastern Yellow Robin	On site observation
	Falco cenchroides	Nankeen Kestrel	On site observation
	Lichenostomus chrysops	Yellow-faced Honeyeater	On site observation
	Lichenostomus leucotis	White-eared Honeyeater	On site observation
	Leucosarcia melanoleuca	Wonga Pigeon	On site observation
	Macropygia Phasianella	Brown Cuckoo-Dove	On site observation
	Malurus cyaneus	Superb Fairy Wren	On site observation
	Meliphaga lewinii	Lewin's Honeyeater	On site observation
	Neochmia temporalis	Red-browed Finch	On site observation
	Pardalotus punctatus	Spotted Pardalote	On site observation
	Phylidonyris novaehollandiae	New Holland Honeyeater	On site observation
	Platycercus elegans	Crimson Rosella	On site observation
	Platycercus eximius	Eastern Rosella	On site observation
	Ptilonorhynchus violaceus	Satin Bowerbird	On site observation
	Rhipidura albiscapa	Grey Fantail	On site observation
	Rhipidura leucophrys	Willie Wagtail	On site observation
	Rhipidura rufifrons	Rufus Fantail	On site observation
	Sericornis frontalis	White-browed Scrubwren	On site observation
	Strepera graculina	Pied Currawong	On site observation
MAMMALS			
	Austronomus australis	White-striped Free-tailed Bat	AnaBat Express
P	*Canis lupus familiaris*	Dog	Print
V	*Chalinolobus dwyeri*	Large-eared Pied Bat	AnaBat Express
	Chalinolobus gouldii	Gould's Wattled Bat	AnaBat Express
	Macropus giganteus	Eastern Grey Kangaroo	Print
V	*Micronomus norfolkensis*	Eastern Coastal Free-tailed Bat	AnaBat Express
	Ozimops ridei	Ride's Free-tailed Bat	AnaBat Express
	Perameles nasuta	Long-nosed Bandicoot	Digs/scats
	Rhinolophus megaphyllus	Eastern Horseshoe Bat	AnaBat Express
	Trichosurus vulpecula	Brush-tailed Possum	Scat
P	*Vulpes vulpes*	European Red Fox	Scat
	Wallabia bicolor	Swamp Wallaby	Scat/prints/Infrared camera
AMPHIBIANS			

	Crinia signifera	Common Eastern Froglet	Heard in distance
	Litoria peronei	Peron's Tree Frog	Heard in distance
REPTILES			
	Morelia spilota	Diamond Python	On site observation
	Lampropholis guichenoti	Common Garden Skink	On site observation

V – Vulnerable species
P – Pest species

APPENDIX F – MELALUECA DEANEI IN REHABILITATION AREA

ID number	Easting	Northing	Condition	Height	Width
Planted Rehabilitation					
1	312588	6296396	Healthy	1.2m	0.8m
2	312592	6296403	Healthy	1.2m	0.7m
3	312589	6296408	Healthy	0.8m	0.3m
4	312580	6296412	Healthy	1m	0.4m
5	312563	6296403	Healthy	1m	0.4m
6	312560	6296413	Healthy	1m	0.5m
7	312556	6296404	Healthy	0.8m	0.3m
8	312584	6296410	Healthy	1m	0.5m
9	312558	6296418	Healthy	1.5m	0.7m
10	312502	6296414	Healthy	0.9m	0.4m
11	312556	6296422	Healthy	1.2m	0.5m
12	312567	6296416	Healthy	1.2m	0.4m
13	312574	6296396	Healthy	1.4m	0.5m
14	312221	6296241	Healthy	1m	0.3m
Translocated Rehabilitation					
1b	312539	6296391	Planted 2017 Healthy	1.2m	0.4m
2b	312587	6296378	Planted May 2021	<30cm	<20cm
3b	312582	6296376	Planted May 2021	<30cm	<20cm
4b	312581	6296382	Planted May 2021	<30cm	<20cm
5b	312576	6296379	Planted May 2021	<30cm	<20cm
6b	312575	6296376	Planted May 2021	<30cm	<20cm
7b	312573	6296377	Planted May 2021	<30cm	<20cm
8b	312571	6296385	Planted May 2021	<30cm	<20cm
9b	312564	6296387	Planted May 2021	<30cm	<20cm
10b	312564	6296385	Planted 2017 Healthy	1.3m	0.5m
11b	312562	6296380	Planted May 2021	<30cm	<20cm
12b	312565	6296378	Planted May 2021	<30cm	<20cm
13b	312561	6296383	Planted May 2021	<30cm	<20cm
14b	312549	6296390	Planted May 2021	<30cm	<20cm
15b	312555	6296381	Planted May 2021	<30cm	<20cm
16b	312549	6296385	Planted May 2021	<30cm	<20cm

17b	312545	6296379	Planted May 2021	<30cm	<20cm
18b	312535	6296387	Planted May 2021	<30cm	<20cm
19b	312541	6296392	Planted May 2021	<30cm	<20cm
20b	312547	6296393	Planted May 2021	<30cm	<20cm
21b	312525	6296400	Planted May 2021	<30cm	<20cm
22b	312531	6296408	Planted May 2021	<30cm	<20cm
23b	312537	6296405	Planted May 2021	<30cm	<20cm
24b	312540	6296406	Planted May 2021	<30cm	<20cm
25b	312543	6296406	Planted May 2021	<30cm	<20cm
26b	312586	6296367	Planted Oct 2021	<30cm	<20cm
27b	312580	6296386	Planted Oct 2021	<30cm	<20cm
28b	312527	6296405	Planted Oct 2021	<30cm	<20cm
29b	312529	6296414	Planted Oct 2021	<30cm	<20cm
30b	312536	6296422	Planted Oct 2021	<30cm	<20cm
31b	312553	6296421	Planted Oct 2021	<30cm	<20cm
32b	312562	6296418	Planted Oct 2021	<30cm	<20cm
33b	312574	6296415	Planted Oct 2021	<30cm	<20cm
34b	312574	6296438	Planted Oct 2021	<30cm	<20cm
35b	312567	6296406	Planted Oct 2021	<30cm	<20cm
Seedbank Rehabilitation					
17	312510	6296389	Healthy	2m	0.9m
Front Gate Rehabilitation					
1	312751	6297182	Planted July 2023	<30cm	<20cm
2	312769	6297150	Planted July 2023	<30cm	<20cm
Lot 196 Rehabilitation					
3	312550	6296867	Planted July 2023	<30cm	<20cm
4	312528	6296865	Planted July 2023	<30cm	<20cm

South East Environmental

5	312531	6296882	Planted July 2023	<30cm	<20cm
6	312505	6296873	Planted July 2023	<30cm	<20cm
7	312481	6296885	Planted July 2023	<30cm	<20cm
8	312470	6296892	Planted July 2023	<30cm	<20cm
9	312457	6296880	Planted July 2023	<30cm	<20cm
10	312445	6296889	Planted July 2023	<30cm	<20cm
11	312415	6296903	Planted July 2023	<30cm	<20cm

APPENDIX G – LANTANA CAMARA MANAGEMENT GUIDE



How to control lantana

Quick reference guide

Lantana – Lantana camara

Minimise spread and future impacts

Although lantana is widespread on the east coast of Australia, it is still absent from parts of its potential range. These areas should be protected by:

- preventing the importation of further varieties and species of lantana
- stopping more planting of lantana in gardens
- strategically controlling infestations which threaten uninfested areas.

A control program for dense infestations in pastures

The Queensland Department of Natural Resources and Mines has produced a pest series fact sheet on lantana (PP#34). They advise that herbicides are too expensive to treat large lantana infestations.

A combination of fire and mechanical control makes spot treatment of small patches with herbicides more cost-effective. The following suggested control program for dense infestations in pastures is based on the fact sheet:

1. Exclude stock to allow a fuel load to build up.
2. Bulldoze, stickrake or plough the infestation to add to the fuel load.
3. Burn the infestation after obtaining a permit. Summer burns are more effective than winter burns.
4. Sow an improved pasture. Seek advice of local council or state/territory government agencies for selection of non-weedy pasture species.
5. Continue stock exclusion until pasture has established and set seed.
6. Burn the infestation again after obtaining a permit.
7. Spot spray or grub out any regrowth or seedlings. Spraying is most effective between summer and autumn.
8. Follow-up burning, spraying and/or grubbing will be required for several years.

Lantana can escape from garden plantings into surrounding bushland.
Photo: Tim Schultz

Control options

Type of infestation	Physical	Mechanical	Chemical	Fire	Biological
Small (few plants, small area)	Hand grubbing only suitable for seedlings. Wear gloves for protection from thorns.	Not suitable.	Spot spray plants less than 2 m in height between summer and autumn with a registered herbicide.	Not suitable.	There are four useful biological control agents. They are already distributed throughout their potential range.
Medium (medium density, medium total area)		Bulldoze, plough, stick-rake or slash infestations. Soil disturbance will lead to mass seed germination, so follow up with further controls. Do not use mechanical control in areas susceptible to erosion. A permit may be required.	Spraying is uneconomical for medium or large infestations. Helicopter spraying is used when there is no access for mechanical control, eg very steep slopes.	Under permit, burn in summer with good fuel load of grass and/or mechanically cleared lantana. Also use as follow-up. Do not burn in rainforests.	
Large (many plants, many ha)					

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CRC Weed management

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South East Environmental

End

Of

Report

South East Environmental

Appendix I – S94 Contribution

DIXON SAND

SECTION 94 CONTRIBUTION

SAND & SANDSTONE SALES
AUGUST 2022

1	1,725.61
2	1,606.39
3	1,790.26
4	1,663.57
5	1,733.71
6	581.97
8	2,078.24
9	1,698.26
10	1,657.56
11	1,827.03
12	1,823.64
13	957.50
15	419.50
16	2,506.27
17	1,941.39
18	2,188.58
19	2,383.56
20	1,235.62
22	2,269.08
23	2,360.60
24	2,461.92
25	2,225.82
26	1,766.26
27	581.72
29	2,149.18
30	1,880.21
31	2,057.30

47,570.75 Tonnes @ $1.10

$52,327.83

Dixon Sand Pty Ltd ABN 80 002 278 686
Quarry: 4610 Old Northern Road, Maroota, NSW 2756. Ph. (02) 4566 8348
Postal Address: P.O. Box 4019, Pitt Town NSW 2756
Website: www.dixonsand.com.au

Appendix J – Community Engagement and CCC Meeting Minutes

DIXON SAND

MINUTES OF THE BI-ANNUAL COMMUNITY CONSULTATIVE COMMITTEE WEDNESDAY 9 NOVEMBER 2022 GLENORIE RSL CLUB

	NAME	ORGANISATION
PRESENT	Lisa Andrews (LA)	Independent Chairperson
	Kristine McKenzie (KM)	The Hills Shire Council Representative
	Daniel Giffney (DG)	The Hills Shire Council Representative
	Pat Schwartz (PS)	Community Representative
	Lisa Aylward (LAy)	Maroota Public School Representative
	Hunny Churcher (HC)	Environmental Officer, Dixon Sand
	Mark Dixon (MD)	Dixon Sand
	Melissa Mass (MM)	Dixon Sand - Ecologist
	David Dixon (DD)	General Manager, Dixon Sand
	Timothy Baker (TB)	Bush Regeneration Contractor (Bush-It)
	Farley Roberts (FR)	Community Representative
	Jamie Baker (JB)	Dixon Sand - Business Development Manager *[observer]*
	Tiarna Schinella (TS)	The Hills Council (Trainee EHO) *[observer]*
	Zoe Ridgway (ZR)	Bush-It alternate representative *[observer]*
APOLOGIES	Jemma Roberts (JR)	Community Representative (alternate)
	Robert Buckham (RB)	The Hills Shire Council Representative

WELCOME & INTRODUCTION	LA opened the meeting at 1pm following a light luncheon. All members were welcomed and LA acknowledged that HC was attending the meeting in person. LA introduced Zoe Ridgway, Jamie Baker and Tiarna Schinella as observers.	
DECLARATIONS OF INTEREST	LA declared that she is approved by the Department of Planning and Environment to chair the meeting and engaged by Dixon Sand.	**No changes to previous declarations by members.**
BUSINESS ARISING FROM PREVIOUS MEETING (12/5/21)		

Item	Issue	Responsibility
1	Follow-up response from Robyn Preston MP regarding the school zone (held over) – Nothing received back yet.	LA
	KM to provide further information to MD on the diesel pump noise complaint. Following	

	investigation it was determined that the complaint referred to an adjoining property. Dixon Sand passed on to the relevant person. Complete. No other business arising.	
CORRESPONDENCE (as emailed with Meeting Notice on 13/10/22 with 1 additional item)	• 17/5/22 – Email from Robyn Preston MP's office stating that they are continuing to follow up The Hills Council for a response. • 1/6/22- Draft minutes sent to members for review • 14/6/22 – Email to members with the finalised minutes • 8/7/22 – Email from HC advising that the Haerses Road Quarry - DA Modification 5 has been approved by DPE. • 21/7/22 – Email from HC advising about the Haerses Road Quarry - EPBC 2015/7608 Variation of Conditions. • 13/9/22 – Email from RWCorkery Co, appointed consultants, asking for input from CCC members on the IEA process. Forwarded to CCC members for feedback. • 5/10/22 – Email to RWCorkery Co advising that no comments had been received from CCC members for inclusion in the Independent Audit. • 5/10/22 – Email from HC advising that the Dixon Sand Quarries - Annual Review 2021-2022 are available on the project website. • 13/10/22 – Email to CCC members with the Meeting Notice, Agenda, and Correspondence Report for this meeting and seeking interest in a site inspection. Responses received. • 17/10/22 – Email to CCC members confirming that site inspection will proceed following the CCC. • 7/11/22 – Email to members with the reminder for this meeting.	
PROJECT REPORT, INCLUDING PRODUCTION/SALES	DD advised that ONR's current operations are slowly shifting some products to Haerses Rd. Trying to balance out between the two sites to have a good run to Christmas. Haerses Rd is shifting some product from ONR site for future expansion for brickies sand, sand stone cutting and building blocks. Currently in the initial stages with sales very strong; mainly with sporting fields and golf courses. The building industry is also going strong. Credits have been retired (2A & 3B), waiting on things to dry out as it is too wet to get machinery in. Pre-clearance surveys will need to be redone prior.	**Questions asked and answered throughout the presentation.**
HAERSES ROAD QUARRY (DEVELOPMENT CONSENT – MOD 5)	MOD 5 was approved in June. ○ Relocation of the approved site office, maintenance shed and weighbridge to the Tertiary Sand extraction area in Stage 2 ○ Minor increase in footprint of the site infrastructure envelope ○ New extraction method within Sandstone Extraction Areas A and B using an excavator with	**See – Slides 9-10 (map)**

	an enclosed (less noise) hydraulic circular saw attachment to produce large blocks of sandstone to supplement the approved dozer ripping method. ○ Designated Sandstone cutting workshop	
ONR – Mod 6 Extraction within Crown Land – Old Northern Rd Quarry Lot 196	ONR - Mod 6 proposal - Extraction within existing cells to maximise resource. • Dixon Sand currently extracting within Crown Lands under Mod 3 approval "Cons Hills" to within 2m of active groundwater level. • Dixon Sand holds current agreement with Crown Lands to extract remaining resource within Lot 196 in Crown Land subject to approval by consent authority. Resource >5 mill tonne • Proposal is for further extraction of sand and sandstone materials within the existing previously extracted cells to greater depth utilsing existing site infrastructure/existing movements • maximise resource of existing extraction cells within groundwater limits • no changes to development outputs (truck movements, plant processing rates) • Cells to be rehabilitated using tailings and importation of clean fill for rehab (VENM/ENM) • Update Noise and Air Quality assessments for compliance with latest legislation DD explained that Lot 196 is leased but the first 15.24m of land is free hold, then the rest is Crown Land, which holds about 6-8Mt of resource. PS asked what the overburden was. MD responded that it was silt, no trees, with sandstone below 5-6m. DD commented that works need to stay above the aquifer.	**See – Sides 11(map) -12**
ENVIRONMENTAL MONITORING RESULTS	Maps and explanation of points for environmental monitoring.	**See Maps in Slides: 13-18**
TEOM DATA	○ TEOM and Meteorological station records PM10 levels and weather data such as rain, temperature, wind etc. ○ Monitoring Criteria – • Long term: Annual PM10 average (light blue line) should not exceed the annual average criteria (pink line – 30µg/m3) – • Short term: 24hr PM10 average (blue bars) should not exceed the 24hr PM10 NEPM Criteria (yellow line – 50µg/m3) – • Short term: If the 24hr PM10 EPL Criteria Level (green line – 42µg/m3) is exceeded by the 24hr PM10	**See Slides 19-20 (map)**

<table>
<tr><td></td><td>average (blue bars), and the prevailing wind is from the specific quadrant Dixon Sand is required to:
• Notify EPA
• Take immediate action to reduce PM10 levels
• Stop works if levels do not fall below 42µg/m3 within 1 hour
o TEOM station represent the EPL Points 1 & 3</td><td></td></tr>
<tr><td>DEPOSITIONAL DUST DATA</td><td>Dust data for this monitoring period: Jul – Oct 2022
<table><tr><th>Location</th><th>Dust Gauge</th></tr><tr><td rowspan="4">Old Northern Road</td><td>D1A Access road</td></tr><tr><td>D4 Rehab area</td></tr><tr><td>D5 Bundwall</td></tr><tr><td>D7 Mullock Heap</td></tr><tr><td rowspan="4">Haerses Road</td><td>D8 Olive Grove</td></tr><tr><td>D10 Haerses Road (EPL Point 3)</td></tr><tr><td>D11 Receiver R6</td></tr><tr><td>D12 Receiver R8</td></tr></table></td><td>See Slides 20-30 (maps)</td></tr>
<tr><td>NOISE MONITORING</td><td>ONR & Haerses Rd:

Tables of noise monitoring locations indicating: Receivers, property addresses, descriptions and extrapolated monitoring results.</td><td>See Slides 31-36 For location of monitoring sites and summary of data.</td></tr>
<tr><td>GROUND WATER MONITORING</td><td>GW Monitoring wells
• ONR 11 x BH
• HR 9 x BH (original extraction in Tertiary Sand)
• HR 13 x BH (100 MTSGS Buffer zone for Mod 1 extraction cells)
GW levels:
• Monthly + continuous data loggers
GW quality sampling & lab analysis:
• 6 monthly sampling and testing</td><td>Graphs explained - See Slides 37-51 (maps)</td></tr>
<tr><td>SURFACE WATER MONITORING</td><td>ONR
• SW19 = Surface water monitoring at creek on Lot 196
• LDP1 = EPL 3916 Licenced Discharge Point at Weir of Main Water Channel
HR
• SW1 = Surface water monitoring at creek east of extraction Stage 2 East (inside the Biodiversity Offset Area)
• SW2 = Surface water monitoring at creek west of extraction Cell 1A (Mod 1)
• Basin 1</td><td>Graphs/Tables explained - See Slides 52-55</td></tr>
<tr><td>BUSH REGENERATION WORKS</td><td>TB provided the following presentation:

<u>Old Northern Rd Works Areas:</u>
<u>Rehabilitation of Lot 196</u>
Challenges
• Machinery-compacted soils on North-facing aspect • Extensive infestations of exotic tussock grass</td><td>See photographs in Slides 57-65</td></tr>
</table>

	Achievements: • Treatment of exotic grass to prevent seed-set and spread. • Revegetation with shrubs and grasses. **Future Works** • Continued revegetation with locally endemic shrubs and grasses • Brush matting bare areas • Preparation of areas for small scale translocation of soil and leaf litter gathered in remnant bush adjacent to the site. **<u>Assisted Regeneration - Native Vegetation Corridor (NVC)</u>** **Challenges** • Minimal microbial and mycorrhizal fungi • Infestation of exotic grasses **Achievements** • Treatment of exotic grass has prevented seed-set and spread. • Propagation of brush-matted material **Future Work** • Continue to cull assertive shrub species to promote diversity • 25 Melaleuca deanii to be planted soon **<u>Assisted Regeneration - Native Vegetation Corridor</u>** The 6 months to November has seen: • Outstanding new growth of native species • Encouraging growth of Melaleuca deanii plantings • Excellent natural recruitment from the seed bank. • Selective dieback of certain species due to excessive moisture levels • Due to the wet conditions we have stayed off this area **<u>Rehabilitation of Lot 2</u>** **Challenges** • Excess nutrients, herbivory and BMAD • Extensive infestation of Bamboo, Lantana and exotic grass **Achievements** • Treatment of exotic grass to prevent seed-set and spread. • Control of Lantana in order to address BMAD • Bulk of the work has been undertaken here in the last 6 months due to access issues **Future Work** • Continued revegetation of disturbed grassy areas • 200 native canopy trees to be planted soon?	**TB commented that it was the "best translocation site in Australia".**

	Assisted Regeneration - Haerses Road Biodiversity Offset **Challenges** • Encroachment of invasive species along an extended edge and along drainage lines **Achievements** • Treatment of Crofton Weed along edge and down drainage lines • Manual treatment and minimal herbicide use has resulted in a dense buffer of native shrubs and canopy species. **Future Work** • Continued monitoring for incursions along the leading edge **Haerses Rd - Translocation** **Challenges** • Dominance of assertive native canopy species – Kunzea, Melaleuca and Acacia spp. • Infestation by invasive exotic grasses **Achievements** • Treatment of exotic grass to prevent seed-set and spread. • Select thinning of assertive native canopy species has promoted understorey natives. • Control of Crofton weed throughout **Future Work** • Continued treatment of grasses • Thinning of assertive native canopy PS enquired if there were any yellow belly gliders? TB advised that he has heard them, but not seem them. FR advised that he has had some in his house. Discussions ensued regarding possible species. MD asked TB if they were every asked to undertake controlled burns. TB stated that sometimes they work with RFS. DG recalled the 2019 bush fires and the impact that the smoke had on the seed banks causing regeneration.	
BIODIVERSITY AND REHABILITATION (Threatened Species Update)	MM provided the following presentation: **Biodiversity and Rehabilitation Annual Report 2022** • The Biodiversity and Rehabilitation Annual Report for ONR identifies native flora and fauna within the Native Vegetation Corridor and the Haerses Road Biodiversity Offset Area, it monitors the success of the rehabilitation area within the NVC and describes the current condition of threatened flora and fauna and their habitats within the Old Northern Road site and the HRBOA.	**See Slides 65 – 77 (see photographs)**

	➢ The HR Biodiversity and Rehabilitation Annual Report identifies native flora and fauna onsite and monitors rehabilitation which is beginning to occur within the site. ➢ Both Biodiversity and Rehabilitation Annual Reports for 2022 were completed in September and submitted with the Annual Review on the 30th September. ➢ The results found the rehabilitation areas are thriving and increasing in diversity and density. Ideal growing conditions with favourable temperatures and regular rainfall has improved the overall biodiversity of the NVC and HRBOA sites. Discussions regarding the Melaleuca deanii. There are 25 plants ready to go in the ground now, which will put the site up to 86 plants in the ground. MM commented that Dixon Sand were under no obligation to transport the Melaleuca deanii (old mother plant) and they should be commended for attempting to do this. DG commented on the genetic diversity of the plants as they may have a limited life span. DD informed the CCC that this is the bench mark site, compared to others.	
INSPECTION AND ADMINISTRATIVE MATTERS	Independent Environmental Audit – October 2019 to October 2022 – Site Inspection on 18th October 2022.	**Slide 77**
GENERAL BUSINESS	○ LAy asked if representations to Robyn Preston MP could include bigger signs (60km) as you come into Maroota where Sunrise Nursery is (corner Wisemans Ferry Rd & Old Northern Rd). Signs should be placed further back	
MEETING SCHEDULE FOR 2023	It was agreed that the CCC would continue to meet bi-annually (May and November), accordingly, LA proposed the following dates: ➢ Wednesday 3 May 2023; and ➢ Wednesday 8 November 2023 Glenorie RSL - 12.30pm with a light lunch, followed by the CCC commencing at 1pm.	**Agreed.**

The meeting was closed at 2:32pm with the chair thanking all members for their attendance and as it was the last meeting for 2022, acknowledging their contribution throughout the year. Members were invited to drive to Haerses Rd Quarry to undertake the site inspection.

ACTION ITEMS.

Item	Issue	Responsibility
1	Follow-up response from Robyn Preston MP regarding the school zone (held over) and include request for larger 60kph signs (near corner of Wisemans Ferry Rd and Old Northern Rd)	LA

DIXON SAND

MINUTES OF THE BI-ANNUAL
COMMUNITY CONSULTATIVE COMMITTEE
WEDNESDAY 3 MAY 2023
GLENORIE RSL CLUB

	NAME	ORGANISATION
PRESENT	Lisa Andrews (LA)	Independent Chairperson
	Lisa Aylward (LAy)	Maroota Public School Representative
	Hunny Churcher (HC)	Environmental Officer, Dixon Sand
	Mark Dixon (MD)	Dixon Sand
	Melissa Mass (MM)	Dixon Sand - Ecologist
	Farley Roberts (FR)	Community Representative
	Robert Buckham (RB)	The Hills Shire Council Representative
APOLOGIES	Jemma Roberts (JR)	Community Representative (alternate)
	Kristine McKenzie (KM)	The Hills Shire Council Representative
	Pat Schwartz (PS)	Community Representative
	David Dixon (DD)	General Manager, Dixon Sand
	Timothy Baker (TB)	Bush Regeneration Contractor (Bush-It)

WELCOME & INTRODUCTION	LA opened the meeting at 1.05pm following a light luncheon. All members were welcomed.	
APOLOGIES	As listed above.	
DECLARATIONS OF INTEREST	LA declared that she is approved by the Department of Planning and Environment to chair the meeting and engaged by Dixon Sand.	**No changes to previous declarations by members.**
BUSINESS ARISING FROM PREVIOUS MEETING (9/11/22)	<table><tr><th>Item</th><th>Issue</th><th>Responsibility</th></tr><tr><td>1</td><td>Follow-up response from Robyn Preston MP regarding the school zone (held over) and include request for larger 60kph signs (near corner of Wisemans Ferry Rd and Old Northern Rd). – LA advised that she has contacted Ms Preston's office twice since the last meeting and has received no response to date, noting that the original contact was made 3 years ago.</td><td>LA</td></tr></table> No other business arising.	**LAy advised that she had lodged a request through Fulton Hogan who have cleared some of the vegetation around the signs and agreed to change them.** **Complete.**

CORRESPONDENCE (as emailed with Meeting Notice on 5/4/23 with 3 additional items)	• 18/1/23 – Email from HC advising that the Dixon Sand Quarries has submitted its 2022 Independent Environmental Audit Reports and Proposed Actions to DPIE which are available on the project website. • 21/11/22- Draft minutes sent to members for review • 30/11/22 – Email to members with the finalised minutes. • 18/1/23 – Email to Robyn Preston MP following up previous representations and asking for larger 60kph signs to be erected on the corner (near corner of Wisemans Ferry Rd and Old Northern Rd). • 5/4/23 – Email to CCC members with the Meeting Notice, Agenda, and Correspondence Report for this meeting. • 28/4/23 – Email from HC with the information and letter to DPE regarding Modification 6 for DA 165-7-2005 for Haerses Road Quarry. • 1/5/23 – Email to Robyn Preston MP, following up again. We are now at the 3 year anniversary. • 2/5/23 – Email to members with the reminder for this meeting.	
PROJECT REPORT, INCLUDING PRODUCTION/SALES	MD advised that activities have been very busy on site with the building industry doing well. Sandstone blocks are coming out of Haerses Rd with the ones from ONR taken to Haerses Rd to finish off. Following approval of the Wash/Dry Plant in 2018 Stage 1 has now reached practical completion. The plant was designed and built by Rhomberg Sersa Australia under turnkey project with project permits and certification from Hills Shire Council and Urban City Group respectively. Will now be able to wash sand at Haerses Rd so each site will be stand alone. HC stated that Jamie advised that sandstone sales have increased due to regaining access to extraction pit areas which were flooded following the wet weather periods. Sales have therefore increased. In December 2022, Dixon Sand adopted the "Clearway" software which is recommended by the EPA and used extensively in the haulage and material tracking industry. The software tracks truck movements etc and provides live data. Information can go straight from the weighbridge to accounts, streamlining the system. Will soon update to include number plate recognition. MD advised that the consent has the ability to use clean VENM/ENM to assist with rehabilitation. HC stated that extraction at ONR is restricted to the same areas and increasing in depth. Extraction at	**Questions asked and answered throughout the presentation.**

	Haerses Road currently occur in Stages 1 and 2 (Tertiary sand, original DA) and Cells 1A, 1B, 2B and 3B (Friable sandstone, Mod 1 extraction area) Dixon Sand has retired enough biodiversity credits for Extraction Cells 1A, 1B, 2A, 2B & 3B, and looking to purchase 4B next.	
ONR – Proposed DA Mod 6 - Extraction within existing cells to maximise resource	• Increase the depth of extraction within Lot 196 DP752025 to within 2m of the highest recorded regional wet weather groundwater level; • Import up to 250,000 tonnes per annum of virgin excavated natural material (VENM) and excavated natural material (ENM) within existing incoming trucks; and • Extend the quarry life by 11 years until 2053. **Timeline** o 17 January 2023 - Scoping letter lodged with DPE o 21 March 2023 - DPE confirms pathway of modifying consent under section 4.56 of the EP&A Act. DPE requests in addition to the matters identified in the scoping letter for the Modification Report to include: o A traffic assessment that considers the growth in background traffic over the period of the proposed extension; and o An updated rehabilitation and final landform assessment that takes into account the proposed increase in extraction depth.	**Sides: 9 & 10**
Haerses Rd Quarry – Proposed Mod 6.	Dixon Sand has signed the lease agreement with Crown Lands extending the life of the activities and resource. Proposed Modification: • Relocate the Site Building Envelope from the current approved location on Lot 177 (as per Mod 5) approximately 90m north within Lot 176 • Relocate the Site Office to the existing residence on Lot A DP 407341 The Proposed Modification is sought under section 4.55(1A) of the EP&A Act on the basis that the proposed modification is of minimal environmental impact. CCC notified on 28 April 2023. Modification Report and Application lodged with DPE on 1 May 2023.	**Slides: 11 & 12**

<table>
<tr><td>ENVIRONMENTAL MONITORING RESULTS</td><td>HC commenced by explaining the locations of all the monitoring points and the schedule for conducting the monitoring.</td><td>Slides: 13-18</td></tr>
<tr><td>TEOM DATA</td><td>HC explained the TEOM data and measurement criteria.
○ TEOM and Meteorological station records PM10 levels and weather data such as rain, temperature, wind etc.
○ Monitoring Criteria –
• Long term:
Annual PM10 average (light blue line) should not exceed the annual average criteria (pink line – 30µg/m3) –
• Short term:
24hr PM10 average (blue bars) should not exceed the 24hr PM10 NEPM Criteria (yellow line – 50µg/m3) –
• Short term:
If the 24hr PM10 EPL Criteria Level (green line – 42µg/m3) is exceeded by the 24hr PM10 average (blue bars), and the prevailing wind is from the specific quadrant Dixon Sand is required to:
• Notify EPA
• Take immediate action to reduce PM10 levels
• Stop works if levels do not fall below 42µg/m3 within 1 hour
○ TEOM station represent the EPL Points 1 & 3</td><td>Slides: 19-20</td></tr>
<tr><td>DEPOSITIONAL DUST DATA</td><td>Dust data for this monitoring period: Jul 2022 – April 2023:
<table><tr><th>Location</th><th>Dust Gauge</th></tr><tr><td rowspan="4">Old Northern Road</td><td>D1A Access road</td></tr><tr><td>D4 Rehab area</td></tr><tr><td>D5 Bundwall</td></tr><tr><td>D7 Mullock Heap</td></tr><tr><td rowspan="4">Haerses Road</td><td>D8 Olive Grove</td></tr><tr><td>D10 Haerses Road (EPL Point 3)</td></tr><tr><td>D11 Receiver R6</td></tr><tr><td>D12 Receiver R8</td></tr></table></td><td>See graphs for results.
Slides: 21-30 (maps)</td></tr>
<tr><td>NOISE MONITORING</td><td>ONR & Haerses Rd:

Tables of noise monitoring locations indicating: Receivers, property addresses, descriptions and extrapolated monitoring results.</td><td>See Slides 31-35 For location of monitoring sites and summary of data.</td></tr>
<tr><td>GROUND WATER MONITORING</td><td>GW Monitoring wells
• ONR 11 x BH
• HR 22 x BH
GW levels:
• Monthly + continuous data loggers
GW quality sampling & lab analysis:
• 6 monthly sampling and testing</td><td>Graphs explained - See Slides 36-50 (maps)</td></tr>
</table>

<table>
<tr><td></td><td>MD advised that DPE & DPI-Water agreed on the locations. Golder WSP have been engaged to review the groundwater levels and revise the Maximum Extraction Depth Maps for both quarries, following the Independent Environmental Audit which are carried out every 3 years.</td><td></td></tr>
<tr><td>SURFACE WATER MONITORING</td><td>ONR
SW19 = Surface water monitoring at creek on Lot 196
LDP1 = EPL 3916 Licenced Discharge Point at Weir of Main Water Channel
HR
SW1 = Surface water monitoring at creek east of extraction Stage 2 East (inside the Biodiversity Offset Area)
SW2 = Surface water monitoring at creek west of extraction Cell 1A (Mod 1)
Basin 1.
No discharges have been carried out. All within criteria.</td><td>Graphs/Tables explained - See Slides 51-54</td></tr>
<tr><td></td><td>ONR – Licensed Discharge Point on the EPL 3916 (Main Water Channel)<table><tr><th colspan="2">EPL 3916 water quality criteria</th></tr><tr><td>pH</td><td>TSS (mg/L)</td></tr><tr><td>4.5 – 6.5</td><td>50</td></tr></table>No planned discharge of water during period: November 2022 – May 2023.</td><td></td></tr>
<tr><td>BUSH REGENERATION WORKS</td><td>Presented by HC & MM:

<u>Old Northern Rd Works Areas:
Rehabilitation of Lot 196</u>

Challenges:
Machinery-compacted soils on North-facing aspect
Missing all native vegetation strata
Achievements:
Treatment of exotic grass (mostly Whiskey Grass) to prevent seed-set and spread.
Revegetation with shrubs and trees (plus couple of Melalueca deanei) to be undertaken in May this year.
Future Works:
Continued revegetation with locally endemic trees, shrubs and grasses (creating dense enrichment nodes)
Further weed control works.
<u>Assisted Regeneration - Native Vegetation Corridor (NVC)</u></td><td>See photographs in Slides 55-64</td></tr>
</table>

	Challenges • Minimal microbial and mycorrhizal fungi • Infestation of exotic grasses **Achievements** • Treatment of exotic grass has prevented seed-set and spread. • Propagation of brush-matted material **Future Work** • Continue to cull assertive shrub species to promote diversity • Melaleuca deanii to be planted in May **<u>Assisted Regeneration - Native Vegetation Corridor</u>** The 6 months to November has seen: • Outstanding new growth of native species • Encouraging growth of Melaleuca deanii plantings • Excellent natural recruitment from the seed bank. **<u>Rehabilitation of Lot 2</u>** **Challenges** • Excessive surface water flows and waterlogged soils. • Extensive infestation of Bamboo, Lantana and exotic grass. **Achievements** • Treatment of exotic grass to prevent seed-set and spread. • Removal of Lantana and recovery of native species. **Future Work** • Continued revegetation of disturbed grassy areas • Follow-up work on Lantana needed asap. **Assisted Regeneration - Haerses Road Biodiversity Offset** **Challenges** • Encroachment of invasive species along an extended edge and along drainage lines **Achievements** • Treatment of exotic grass/Crofton Weed to prevent seed-set and spread. • Manual treatment and minimal herbicide use has resulted in a dense buffer of native shrubs and canopy species. **Future Work** • Continued monitoring for incursions along the leading edge **Haerses Rd - Translocation** **Challenges** • Dominance of assertive native canopy species – Kunzea, Melaleuca and Acacia spp.	

	• Infestation by invasive exotic grasses (Common Couch in particular). **Achievements** • Treatment of exotic grass to prevent seed-set and spread. • Select thinning of assertive native canopy species has promoted understorey natives. • Control of Crofton weed throughout **Future Work** • Continued treatment of grasses • Thinning of assertive native canopy. **Haerses Rd – Visual buffer along Wisemans Ferry Rd (30m)** **Challenges** • Exposed to surrounding impacts and fairly degraded soil • Weed density relatively high **Achievements** • Treatment of exotic vines and Blackberry mostly. • Outstanding clearing/capping works by some skilful operator • Planted ~240 trees, shrubs and groundcovers **Future Work** • Continued monitoring and maintenance weed control work.	
BIODIVERSITY AND REHABILITATION (Threatened Species Update)	MM provided the following presentation: **Biodiversity and Rehabilitation Annual Report 2022** • The Biodiversity and Rehabilitation Annual Report for ONR identifies native flora and fauna within the Native Vegetation Corridor and the Haerses Road Biodiversity Offset Area, it monitors the success of the rehabilitation area within the NVC and describes the current condition of threatened flora and fauna and their habitats within the Old Northern Road site and the HRBOA. • The 2022 Biodiversity and Rehabilitation Annual Report was completed in September and submitted with the Annual Review of 30th September 2022. • The results found the rehabilitation areas are thriving and increasing in diversity and density. Ideal growing conditions with favourable temperatures and regular rainfall over the past 2 years has improved the overall biodiversity of the NVC and HRBOA sites. • Survey works have begun for the preparation of the 2023 report. **BCT Reporting** The Annual Management Report for year 4 was completed in March - Passive Management at Haerses Road and Porters Road Biobank sites.	**See Slides 65 – 73 (see photographs)**

GENERAL BUSINESS	○ FR advised that trucks are still travelling too fast along Wisemans Ferry Rd, but not the sand trucks. Usually the single cab trucks (demolition, etc). ○ LAy thanked DD for the retaining wall at the school. The landscaping logs were installed by Cameron from CameX Contractors who did a great job.	
NEXT MEETING	Wednesday 8 November 2023. Glenorie RSL - 12.30pm with a light lunch, followed by the CCC commencing at 1pm.	**Agreed.**

The meeting was closed at 2:39pm with the chair thanking all members for their attendance.

NO ACTION ITEMS.

Appendix K – Complaints Register

Dixon Sand Pty Ltd

Old Northern Road Quarry

Complaints Register - Summary

Period	Number of Complaints received	Complaint Register / Summary Published on Website
July 2022	0	30 August 2022
August 2022	0	13 September 2022
September 2022	0	5 October 2022
October 2022	0	10 November 2022
November 2022	0	27 December 2022
December 2022	0	17 January 2023
January 2023	0	8 February 2023
February 2023	0	14 March 2023
March 2023	0	04 April 2023
April 2023	0	05 May 2023
May 2023	0	02 June 2023
June 2023	0	03 July 2023
Total No. of Complaints	**0**	

Appendix L – Waste Register

Old Northern Road
Waste Tracking Register 2022-2023

Date	Waste Type	Amount	Measurement	Contractor	Disposal / Recycle	Receipt No
25/07/2022	Scrap Metal	10.06	tonne	Westland Metals	Recycle	WM-25074
18/08/2022	Scrap Metal	11.36	tonne	Westland Metals	Recycle	WM-25074
5/07/2022	Hydrocarbon waste	300	litres	Greaseaters	Treatment	92873
2/08/2022	Hydrocarbon waste	45	litres	Greaseaters	Treatment	93110
2/08/2022	Hydrocarbon waste	300	litres	Greaseaters	Treatment	93111
13/08/2023	Non-Putrescible	4	m3	Asquith Mini Skips	Disposal / Recycle	9386
31/08/2022	Hydrocarbon waste	300	litres	Greaseaters	Treatment	93401
1/09/2023	Non-Putrescible	4	m3	Asquith Mini Skips	Disposal / Recycle	9400
2/09/2023	Non-Putrescible	2	m3	Asquith Mini Skips	Disposal / Recycle	9401
27/09/2022	Hydrocarbon waste	45	litres	Greaseaters	Treatment	93654
27/09/2022	Hydrocarbon waste	300	litres	Greaseaters	Treatment	93655
4/10/2023	Non-Putrescible	4	m3	Asquith Mini Skips	Disposal / Recycle	9419
17/10/2023	Non-Putrescible	4	m3	Asquith Mini Skips	Disposal / Recycle	9429
20/10/2022	Liquid Waste	3000	litres	ABC Waste Oil Collection	Treatment	1533
21/10/2022	Scrap Metal	8.46	tonne	Westland Metals	Recycle	WM-25241
26/10/2022	Hydrocarbon waste	300	litres	Greaseaters	Treatment	93913
1/11/2023	Non-Putrescible	2	m3	Asquith Mini Skips	Disposal / Recycle	9440
4/11/2023	Non-Putrescible	4	m3	Asquith Mini Skips	Disposal / Recycle	9443
22/11/2022	Hydrocarbon waste	300	litres	Greaseaters	Treatment	94180
22/11/2022	Hydrocarbon waste	45	litres	Greaseaters	Treatment	94179
1/12/2023	Non-Putrescible	4	m3	Asquith Mini Skips	Disposal / Recycle	9507
19/12/2022	Hydrocarbon waste	300	litres	Greaseaters	Treatment	94472
30/01/2023	Scrap Metal	12.42	tonne	Westland Metals	Recycle	WM-25241
19/01/2023	Non-Putrescible	4	m3	Asquith Mini Skips	Disposal / Recycle	9532
19/01/2023	Hydrocarbon waste	45	litres	Greaseaters	Treatment	94712
19/01/2023	Hydrocarbon waste	300	litres	Greaseaters	Treatment	94715
2/02/2023	Non-Putrescible	2	m3	Asquith Mini Skips	Disposal / Recycle	9539
9/02/2023	Non-Putrescible	4	m3	Asquith Mini Skips	Disposal / Recycle	9545
14/02/2023	Hydrocarbon waste	300	litres	Greaseaters	Treatment	94957
14/02/2023	Hydrocarbon waste	300	litres	Greaseaters	Treatment	94957
9/02/2023	Non-Putrescible	4	m3	Asquith Mini Skips	Disposal / Recycle	9571
28/02/2023	Non-Putrescible	4	m3	Asquith Mini Skips	Disposal / Recycle	9556
6/03/2023	Non-Putrescible	4	m3	Asquith Mini Skips	Disposal / Recycle	9564
13/03/2023	Hydrocarbon waste	45	litres	Greaseaters	Treatment	95172
13/03/2023	Hydrocarbon waste	300	litres	Greaseaters	Treatment	95171
11/04/2023	Hydrocarbon waste	300	litres	Greaseaters	Treatment	85464
10/05/2023	Hydrocarbon waste	300	litres	Greaseaters	Treatment	95668
6/06/2023	Hydrocarbon waste	300	litres	Greaseaters	Treatment	95941
01/07/21 - 30/06/22	General Solid Waste - recyclable	52	cubic metre	Council Waste Contractor	Recycle	Council Rate
01/07/21 - 30/06/22	Genral Solid Waste - putrescible	78	cubic metre	Council Waste Contractor	Disposal	Council Rate
01/07/21 - 30/06/22	Printer Ink Catridge	0.1	cubic metre	Post Office	Disposal	N/A

Total	Scrap Metal	42.3	tonnes
	Non-Putrescible	50	m3
	Hydrocarbon waste	4425	litres
	Council Putrescible	78	m3
	Council Recycle	52	m3
	Printer Ink Catridge	0.1	m3
	Liquid Waste	3000	litres

End of document