



**CBased Environmental
Pty Limited**
ABN 62 611 924 264



Calga Quarry

Environmental Monitoring

**Dust Deposition, Surface Water,
Groundwater and Meteorological Data**

July 2021

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 24 August 2021

Executive Summary

CBased Environmental is contracted by Hanson Quarry Products to conduct environmental monitoring at the Calga Sand Quarry.

The monitoring includes:

- Dust deposition;
- Surface water; and
- Meteorological data.

This report was prepared by CBased Environmental and includes the following results for July 2021:

- Surface water quality; and
- Meteorological parameters.

There were no dust deposition results for July 2021 due to the current COVID lockdown and restrictions.

Monthly surface water samples were collected at sites A, B, C1, C2 and F. Site D was not collected due to no flow. The samples that were collected were analysed for a monthly sampling event. Results show pH within the slightly acidic range, low electrical conductivity, low total dissolved solids and low total suspended solids. Oil and grease were not detected at sites A, B, C1, C2 and F in July 2021.

The Calga Quarry weather station data recovery in July 2021 was approximately 68% due to a site wide power outage resulting in insufficient data. A summary of rainfall comparison is provided below.

Location	Rainfall (mm)
Calga Quarry	16.4mm
BOM Peats Ridge*	NA
BOM Gosford*	44.8mm
BOM Peats Ridge long-term mean for July*	62.7mm

Notes: NA = Not Available

*Data sourced from Bureau of Meteorology (BOM) website: www.bom.gov.au

BOM stations report rainfall at 9am

Calga Quarry station reports rainfall at midnight.

1.0 Sampling Programme

Hanson Calga Quarry conducts environmental monitoring in accordance with Development Consent, OEH (EPA) licence and Environmental Management Plans. CBased Environmental are contracted to undertake dust deposition gauge, surface water, groundwater and meteorological monitoring for the project. CBased Environmental commenced monitoring from the April 2006 monitoring period.

Dust deposition gauges are operated to the Australian Standard AS3580.10.1 *“Methods for sampling and analysis of ambient air method. Determination of particulates- deposited matter- gravimetric method”*. Sampling is undertaken every 30 +/- 2 days and each gauge is analysed for insoluble solids and ash residue. The results are reported as g/m².month.

Six (6) dust deposition gauges are monitored as follows:

- CD1 – installed 1 May 2006. Gauges air quality impacts to the east of site operations;
- CD2c – located on a rehabilitated section of land between the extraction area and adjacent resident. Gauges air quality impacts to the north of site operations. Replaces former gauges CD2a and CD2b;
- CD3 – installed prior to May 2006. Gauges air quality impacts to the south of site operations;
- CD4 – installed 3 October 2006. Gauges air quality impacts to the south of site operations;
- CD5 – installed 14 December 2006. Gauges air quality impacts to the south of site operations; and
- CD6 installed 14 December 2006. Gauges air quality impacts to the south of the operations.

Dust gauge CD2a was discontinued at the start of August 2006 due to quarry operations “mining out” the site of the gauge. The replacement gauge, CD2b, was located in a position adjacent to the boundary between B. Kashouli and F. & J. Gazzana in conformance with the Air Quality Management Plan. CD2b was discontinued at the end of January 2010 due to contamination of the gauge by non-quarry related vehicle movements on a track adjacent to the gauge. CD2b was replacement by dust gauge CD2c.

Surface water is sampled in accordance with Australian Standards:

- AS5667.1 *“Guidance on the design of sample programs, sampling techniques and the preservation and handling of samples”*;
- AS5667.6 *“Water quality sampling—guidance on sampling of rivers and streams”*; and
- AS5667.4 *“Water quality sampling—guidance on sampling from lakes, natural and man-made”*.

Surface water monitoring sites include local streams and dams. Laboratory analysis includes pH, electrical conductivity, total suspended solids, total dissolved solids and total oil and grease. Monitoring is conducted monthly at Sites A and F (dams) and

when Sites B, C and D are flowing. Additional samples are collected when daily rainfall exceeds 50mm.

Groundwater is sampled in accordance with Australian Standards:

- AS5667.1 *“Guidance on the design of sample programs, sampling techniques and the preservation and handling of samples”*; and
- AS5667.11 *“Water quality sampling—guidance on sampling of ground waters”*.

Groundwater monitoring sites are sampled bi-monthly for depth and water quality. Groundwater monitoring loggers continuously record water levels in a selection of bores.

Meteorological monitoring is conducted at the quarry and displayed on the site computer with a real-time display. Metrological parameters are measured according to Australian Standard AS3580.14 *“Methods for sampling and analysis of ambient air. Meteorological monitoring for ambient air quality monitoring applications”*

The weather station has the following sensor configuration:

- Air temperature;
- Humidity;
- Rainfall;
- Atmospheric pressure;
- Evaporation;
- Solar radiation;
- Wind speed; and
- Wind direction.

CBased Environmental continued to operate the monitoring equipment and utilise site collections at their existing locations.

The locations of monitoring points are provided in **Figure 1**.

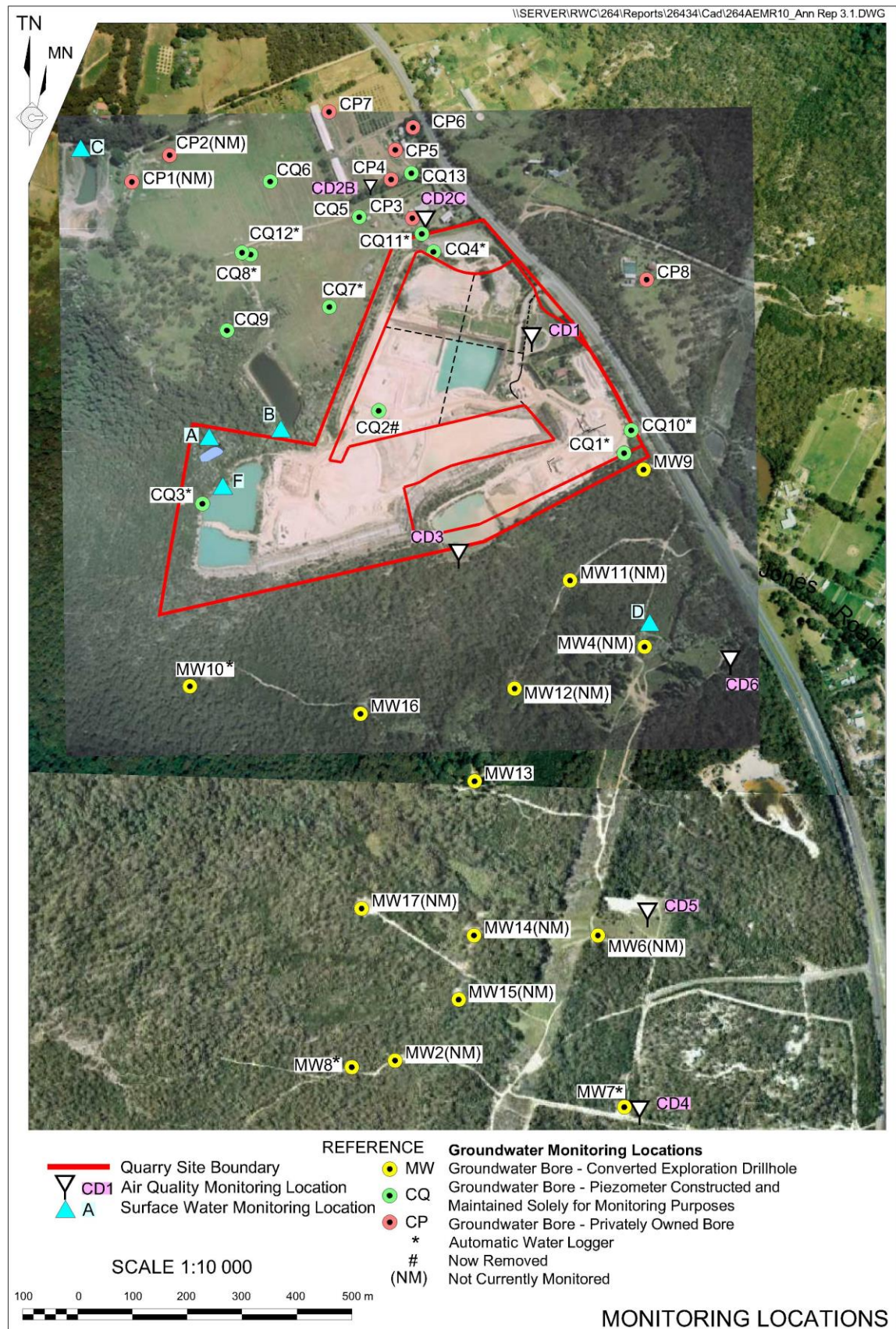


Figure 1: Hanson Calga Quarry Environmental Monitoring Locations

2.0 Results

2.1 Dust Deposition

There were no dust deposition results for July 2021 due to the current COVID lockdown and restrictions.

2.2 Surface Water (Monthly)

Monthly surface water monitoring was conducted on 1 July 2021 and results are provided in **Table 2**. The field sheet, chain of custody documentation and laboratory analysis certificates are provided in **Appendix 1**.

Samples were collected at sites A, B, C1 C2 and F.

Table 2: Monthly Surface Water Monitoring Results – July 2021

Site	Observed Flow Rate* (visual)	Water Colour* (visual)	Turbidity* (visual)	pH	EC (µS/cm)	TDS (mg/L)	TSS (mg/L)	Oil and Grease (mg/L)
A	Dam	Clear	Clear	6.00	62	41	<5	<5
B	Trickle	Clear	Clear	6.60	80	51	<5	<5
C1	Dam	Clear	Clear	6.16	88	55	<5	<5
C2	Steady	Clear	Clear	6.33	89	52	<5	<5
D	No flow							
F	Dam	Clear	Clear	6.19	56	42	7	<5

* Indicates field measurements. All other results are laboratory analysed

EC = Electrical conductivity

TDS = Total dissolved solids

TSS = Total suspended solids

2.2.1 Non-Routine Surface Water Sampling

No non-routine surface water sampling was completed in July 2021.

2.3 Meteorological Data

The Calga Quarry weather station data recovery for July 2021 was approximately 68% due to a site wide power outage resulting in insufficient data .

The weather station data follows and includes:

- Monthly rainfall comparison between quarry data and BOM data. Refer to **Table 3**;
- Monthly data summary. Refer to **Table 4**;
- Weather charts of air temperature, humidity, heat index and wind chill, atmospheric pressure, solar radiation, evapotranspiration, rain, wind speed and data reception. Refer to **Figures 7 – 10**; and
- Wind rose (frequency distribution diagram of wind speed and direction). Refer to **Figure 10**.

A summary of rainfall comparison is provided in **Table 3**.

Table 3: Comparison of Local Rainfall – July 2021

Location	Rainfall (mm)
Calga Quarry	16.4mm
BOM Peats Ridge*	NA
BOM Gosford*	44.8mm
BOM Peats Ridge long-term mean for July*	62.7mm

Notes: NA = Not Available

*Data sourced from Bureau of Meteorology (BOM) website: www.bom.gov.au

BOM stations report rainfall at 9am

Calga Quarry station reports rainfall at midnight.

Table 5: Summary of Monthly Meteorological Data – July 2021

Date	Temperature Min	Temperature Avg	Temperature Max	Relative Humidity Min	Relative Humidity Avg	Relative Humidity Max	Rain	Evapotranspiration	Wind Speed Min	Wind Speed Avg	Wind Speed Max	Wind Chill Min	Heat Index Max	Atmospheric Pressure Min	Atmospheric Pressure Avg	Atmospheric Pressure Max	Solar Radiation Min	Solar Radiation Avg	Solar Radiation Max	Data Min	Data Avg	Data Max
1/07/2021	8.7	12.2	16.3	86.0	95.6	99.0	1.8	0.8	0.0	0.3	4.9	8.7	16.4	1015.4	1020.1	1023.7	0.0	67.8	551.0	0.0	31.8	52.4
2/07/2021	11.3	14.1	18.8	73.0	86.3	97.0	1.6	1.8	0.0	1.2	7.6	11.1	18.8	1012.9	1014.6	1015.9	0.0	118.2	579.0	0.0	35.1	55.2
3/07/2021	7.7	12.2	18.7	54.0	81.0	94.0	0.0	1.9	0.0	0.7	4.9	7.7	18.3	1012.6	1014.6	1016.4	0.0	131.2	550.0	15.5	38.9	90.9
4/07/2021	4.0	9.1	14.0	56.0	73.3	91.0	0.0	2.2	0.0	1.6	6.7	2.4	13.1	1015.7	1018.0	1020.2	0.0	135.9	562.0	38.5	46.8	56.2
5/07/2021	3.1	8.0	15.4	55.0	77.2	92.0	0.0	1.3	0.0	0.8	5.8	3.2	14.5	1015.3	1017.2	1018.5	0.0	98.2	555.0	0.0	49.1	96.2
6/07/2021	2.2	7.9	14.9	58.0	80.2	94.0	0.0	1.7	0.0	0.4	4.0	2.2	14.0	1016.4	1018.3	1020.3	0.0	124.6	565.0	19.2	64.2	92.1
7/07/2021	3.1	8.4	15.8	61.0	84.3	95.0	0.0	1.6	0.0	0.3	3.1	3.2	14.9	1020.1	1021.3	1023.4	0.0	114.1	565.0	43.8	75.6	91.2
8/07/2021	3.7	9.3	16.2	73.0	87.5	97.0	0.0	1.3	0.0	0.4	4.0	3.8	15.8	1015.6	1019.1	1021.8	0.0	100.1	497.0	28.7	71.2	92.1
9/07/2021	7.6	9.4	10.8	90.0	95.9	97.0	8.6	0.3	0.0	1.2	8.9	7.4	11.0	1008.4	1010.9	1015.6	0.0	21.5	131.0	16.1	51.8	78.2
10/07/2021	9.8	11.3	13.1	80.0	86.4	96.0	3.2	1.1	1.3	4.0	13.4	7.6	12.8	1008.9	1014.8	1020.9	0.0	45.0	250.0	57.4	79.3	92.7
11/07/2021	8.3	10.5	15.9	76.0	91.3	96.0	0.8	1.1	0.0	0.9	7.6	8.1	15.4	1020.8	1022.2	1024.3	0.0	88.9	633.0	56.2	77.5	90.9
12/07/2021	4.7	10.3	17.3	70.0	88.7	98.0	0.2	1.8	0.0	0.9	6.3	4.8	17.1	1016.4	1019.3	1021.9	0.0	125.8	695.0	34.4	71.1	95.9
13/07/2021	7.4	12.3	18.4	60.0	79.4	93.0	0.0	2.1	0.0	1.1	6.3	7.4	17.9	1012.8	1014.8	1016.8	0.0	130.0	602.0	57.7	82.8	100.0
14/07/2021	10.2	12.8	15.4	70.0	76.1	85.0	0.2	0.9	0.0	1.1	6.7	10.3	15.1	1004.7	1009.2	1013.1	0.0	27.4	178.0	0.0	55.3	83.0
15/07/2021																						
16/07/2021																						
17/07/2021																						
18/07/2021																						
19/07/2021																						
20/07/2021																						
21/07/2021																						
22/07/2021																						
23/07/2021																						
24/07/2021																						
25/07/2021	9.4	11.2	13.9	43.0	57.4	72.0	0.0	4.2	3.1	5.9	16.5	5.7	12.6	998.0	1004.6	1011.4	0.0	144.1	738.0	60.3	70.5	81.1
26/07/2021	8.3	13.0	18.8	47.0	64.1	75.0	0.0	3.8	2.2	4.4	16.1	5.7	17.8	1010.4	1012.5	1014.9	0.0	154.0	628.0	36.3	65.4	87.1
27/07/2021	11.3	14.4	19.4	50.0	66.0	79.0	0.0	3.0	0.4	2.4	10.7	10.1	18.4	1009.8	1013.9	1017.0	0.0	152.5	656.0	31.9	58.6	73.5
28/07/2021	12.9	16.4	23.8	37.0	55.5	71.0	0.0	4.5	0.0	4.5	16.1	11.6	23.1	1000.8	1004.6	1010.0	0.0	134.3	600.0	0.0	55.3	80.8
29/07/2021	8.2	12.2	17.8	28.0	57.0	71.0	0.0	2.1	0.0	1.8	9.8	8.0	15.9	1004.0	1010.4	1015.9	0.0	101.2	617.0	0.0	38.4	66.9
30/07/2021	3.8	11.1	19.9	34.0	58.8	85.0	0.0	2.8	0.0	0.7	4.5	3.9	18.4	1013.9	1015.9	1018.2	0.0	163.2	643.0	12.9	46.2	70.0
31/07/2021	7.6	15.2	22.5	43.0	54.0	68.0	0.0	2.9	0.0	1.2	8.9	7.7	21.7	1005.5	1009.7	1014.2	0.0	129.0	663.0	42.6	54.7	72.2
Monthly	2.2	11.5	23.8	28	76	99	16.4	43.0	0.0	1.7	16.5	2.2	23.1	998.0	1014.6	1024.3	0.0	109.9	738.0	0.0	58.1	100.0
Unit	Degrees Celcius (°C)			Percentage Relative Humidity			mm	mm	Metres per second (m/s)			°C	°C	Hector Pascals (hPa)			Watts per square metre (W/m ²)			Percentage (%)		

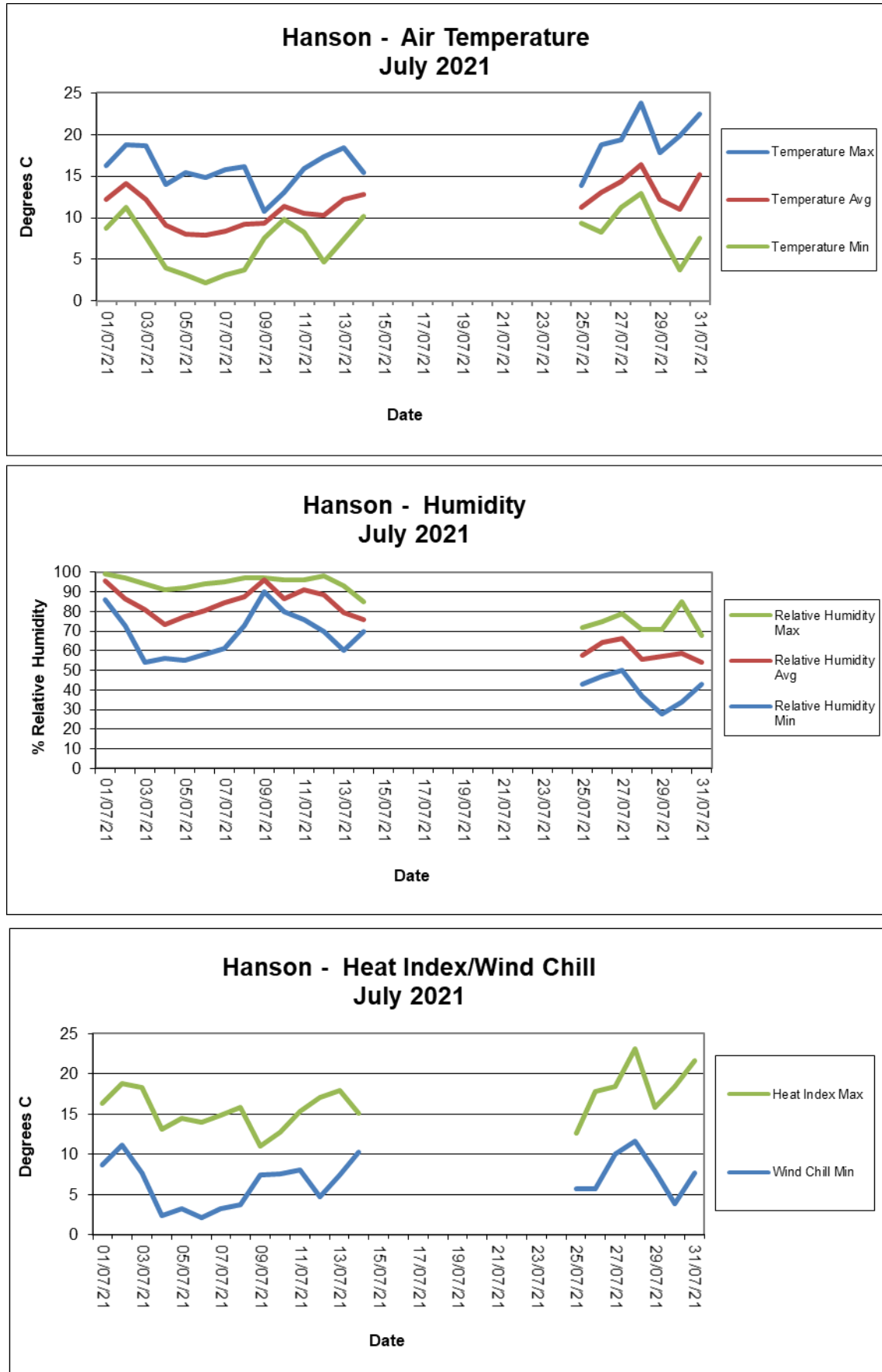


Figure 7 Summary of Monthly Temperature, Humidity and Heat Index Results

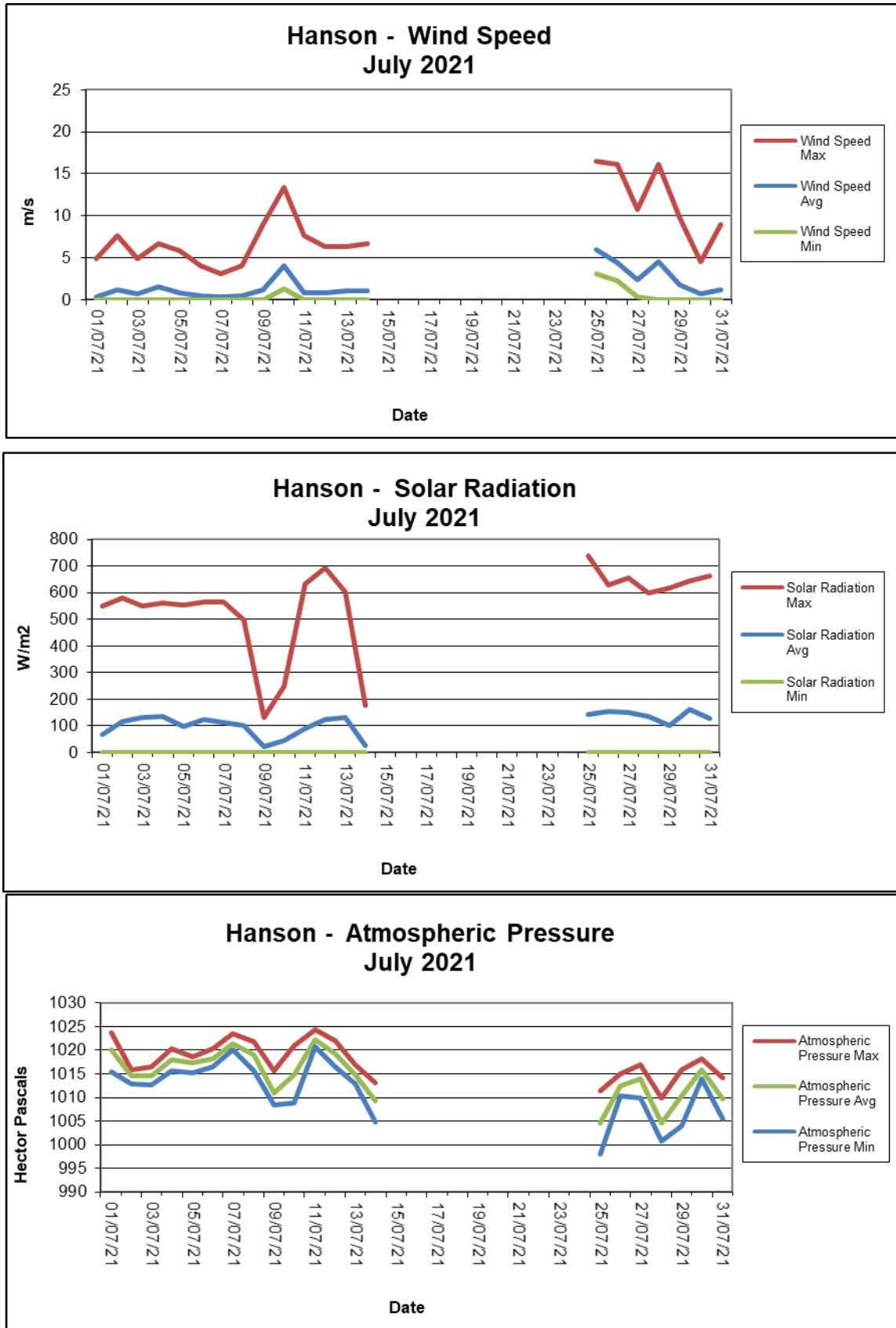


Figure 8 Summary of Monthly Wind Speed, Solar Radiation and Atmospheric Pressure Results

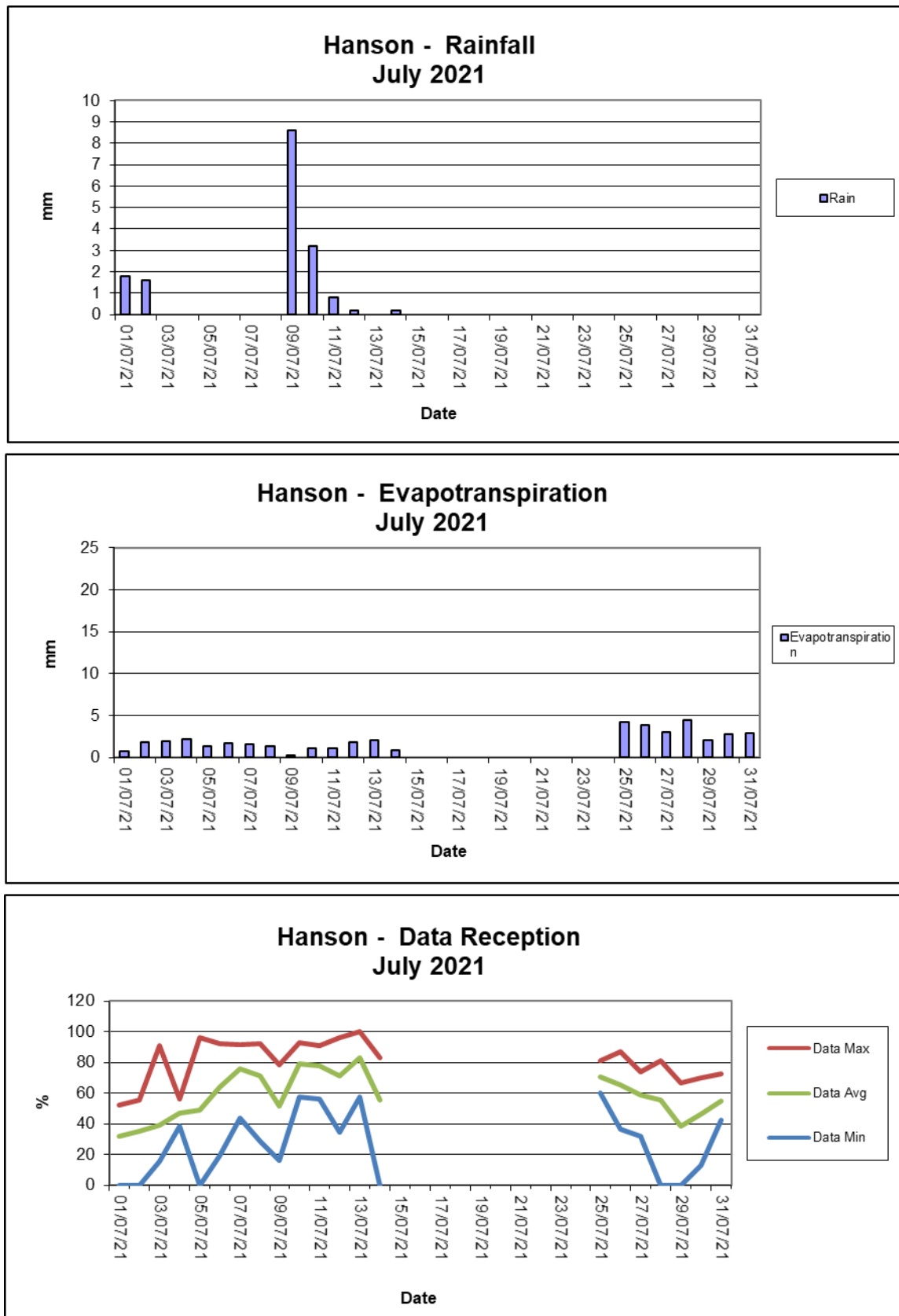


Figure 9 Summary of Monthly Rainfall, Evapotranspiration and Data Reception Results

Frequency plot of the average wind speed and average direction over each 15-minute sampling period. Wind is considered to be calm when at less than a 15-minute average of 1m/s.

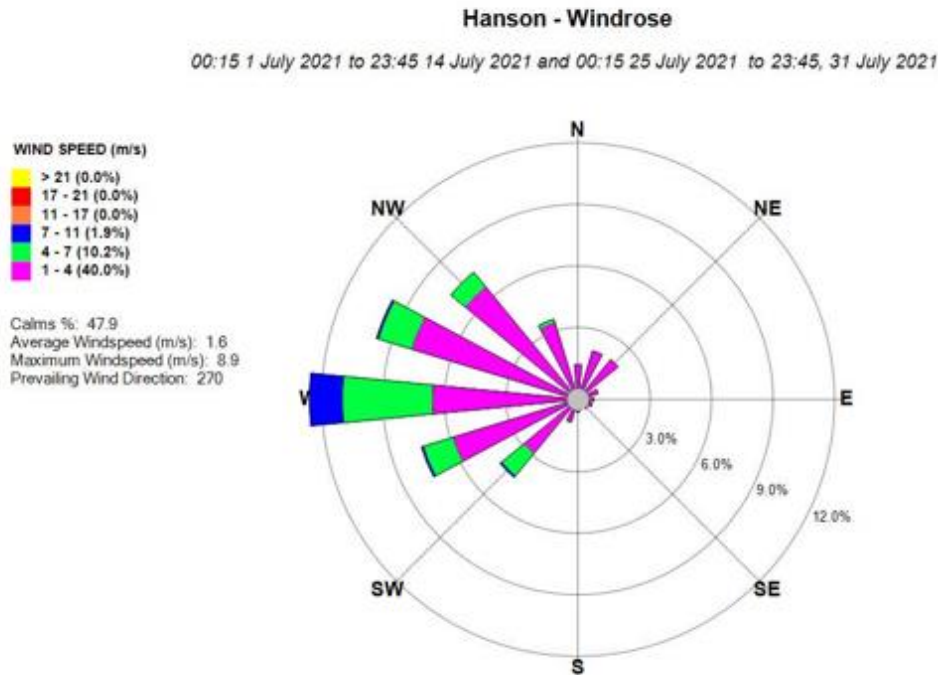


Figure 10: Monthly Windrose Plot – July 2021

The predominant wind for July was from the West with most frequent, strongest winds from the West. The maximum wind speed was 16.5 m/s from the West.

Appendix 1

Field Sheets

Chain of Custody Documentation

Laboratory Analysis Certificates



CBASED ENVIRONMENTAL PTY LIMITED

Date: 1.7.21

Client :
Project :

Hanson Calga

SURFACE WATERS

Site	Flow Rate	Odour	Sampling Time	Bottles	Water Turbidity	Water Colour	Comments
A	Dam	NO	9:00	1x 250ml GP, 1x 500mL GP, 1x PG	CST	CLOOBG	
B	Trickle	NO	9:16	1x 250ml GP, 1x 500mL GP, 1x PG	CST	CLOOBG	
C1	Dam	NO	10:50	1x 250ml GP, 1x 500mL GP, 1x PG	CST	CLOOBG	
C2	Steady	NO	11:00	1x 250ml GP, 1x 500mL GP, 1x PG	CST	CLOOBG	
D	No flow			1x 250ml GP, 1x 500mL GP, 1x PG	CST	CLOOBG	
F	Dam	NO	8:50	1x 250ml GP, 1x 500mL GP, 1x PG	CST	CLOOBG	

Turbidity: C=Clear, S= Slight, T=Turbid (CIRCLE)

Colour: C=Clear, LO=Light Orange, O=Orange, B=Brown, G=Green (CIRCLE)

Signed:

Sampled by: Maddie + Leesa

CHAIN OF CUSTODY DOCUMENTATION

CLIENT: CBased Environmental Pty Ltd				LABORATORY BATCH NO.:				Australian Laboratory Services Pty Ltd			
POSTAL ADDRESS: PO Box 245 CESSNOCK NSW 2325				SAMPLERS: CBased Environmental Pty Ltd <i>Leesa + Maddie</i>							
SEND REPORT TO: monitoringresults@cbased.com.au				SEND INVOICE TO: renae.mikka@cbased.com.au; accounts@cbased.com.au				PHONE: 0265713334 E-MAIL: monitoringresults@cbased.com.au			
DATA NEEDED BY: 5 working days				REPORT NEEDED BY: 5 working days				REPORT FORMAT: HARD: Yes FAX: DISK: BULLETIN BOARD: E-MAIL: Yes			
PROJECT ID: Hanson Quarry SW				QUOTE NO.: SYBQ-403-18				QC LEVEL: QCS1: QCS2: QCS3: Yes QCS4:			
P.O. NO.:				COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:				ANALYSIS REQUIRED			
FOR LAB USE ONLY COOLER SEAL: <i>C-9</i> Yes No Broken Intact COOLER TEMP: deg.C				pH EC TSS TDS O + G				NOTES			
SAMPLE DATA				CONTAINER DATA							
SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	NO.						
A	Water	1-7-21	9-00	1x 250mlGP, 1x 500mLGP, 1xPG		x	x	x	x	x	
B	Water		9-10	1x 250mlGP, 1x 500mLGP, 1xPG		x	x	x	x	x	
C1	Water		10-50	1x 250mlGP, 1x 500mLGP, 1xPG		x	x	x	x	x	
C2	Water		11-00	1x 250mlGP, 1x 500mLGP, 1xPG		x	x	x	x	x	
D	Water			1x 250mlGP, 1x 500mLGP, 1xPG		x	x	x	x	x	
F	Water		8-50	1x 250mlGP, 1x 500mLGP, 1xPG		x	x	x	x	x	
TOTAL BOTTLES:											
RELINQUISHED BY:						RECEIVED BY					
NAME: <i>Leesa King</i>		DATE: <i>2-7-21</i>		NAME: <i>LES</i>		DATE: <i>2-7-21</i>		METHOD OF SHIPMENT			
OF: CBased Environmental		TIME: <i>11-30</i>		OF: <i>LES</i>		TIME: <i>11-30</i>		CONSIGNMENT NOTE NO.			
NAME:		DATE:		NAME:		DATE:		TRANSPORT CO. NAME.			
OF:		TIME:		OF:		TIME:					

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinsed Jar; S = Solvent Washed Acid Rinsed Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

AUSTRALIAN LABORATORY SERVICES P/L

CERTIFICATE OF ANALYSIS

Work Order : **ES2124529**
Client : **CBASED ENVIRONMENTAL PTY LTD**
Contact : All Deliverables
Address : Unit 3 2 Enterprise Cres
Singleton NSW 2330
Telephone : +61 02 6571 3334
Project : Hanson Quarry SW
Order number : ----
C-O-C number : ----
Sampler : CBased Environmnetal Pty LTD Leesa + Maddie
Site :
Quote number : SYBQ/403/18 - COMPASS
No. of samples received : 5
No. of samples analysed : 5

Page : 1 of 2
Laboratory : Environmental Division Sydney
Contact : Helen Simpson
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61 2 8784 8555
Date Samples Received : 02-Jul-2021 11:30
Date Analysis Commenced : 02-Jul-2021
Issue Date : 08-Jul-2021 15:56



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Neil Martin	Team Leader - Chemistry	Chemistry, Newcastle West, 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 Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 ^ = This result is computed from individual analyte detections at or above the level of reporting
 Ø = ALS is not NATA accredited for these tests.
 ~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID				A	B	C1	C2	F
Sampling date / time				01-Jul-2021 09:00	01-Jul-2021 09:10	01-Jul-2021 10:50	01-Jul-2021 11:10	01-Jul-2021 08:50
Compound	CAS Number	LOR	Unit	ES2124529-001	ES2124529-002	ES2124529-003	ES2124529-004	ES2124529-005
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	6.00	6.60	6.16	6.33	6.19
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	62	80	88	89	56
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	41	51	55	52	42
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	7
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	<5

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle - Water, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(WATER) EA005: pH