CBased Environmental Pty Limited
ABN 62 611 924 264

Calga Quarry

Environmental Monitoring

Dust Deposition, Surface Water, Groundwater and Meteorological Data

August 2020

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 18 September 2020

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
- A meteorological data.

This report was prepared by CBased Environmental and includes the following results for August 2020:

- Dust deposition;
- Surface water quality;
- Bi-monthly groundwater bores; and
- Meteorological parameters.

The August 2020 dust deposition results for insoluble solids showed:

- Decreased levels when compared to July 2020 with exception to CD3 which has increased levels in comparison.
- No excessively contaminated dust gauges; and
- Rolling annual averages below the Air Quality Management Plan criteria of 3.7g/m^2.month.

Monthly surface water samples were collected at sites A, B, C1, C2, D and F. The samples were collected and 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 was not detected at sites A, B, C1, D, and F in August 2020 with exception to C2 which had oil and grease present.

The Calga Quarry weather station data recovery in August 2020 was approximately 100%. A summary of rainfall comparison is provided below.

Location	Rainfall (mm)
Calga Quarry	72.6mm
BOM Peats Ridge*	NA
BOM Gosford*	51.2mm
BOM Peats Ridge long-term mean for August*	74.0mm

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 to 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/m^2.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

The results for August 2020 and the project 12-month rolling average are provided **Table 1**.

Dust deposition charts for all dust gauge sites appear in **Figure 2** below. The field sheet, chain of custody documentation and laboratory analysis certificates are provided in **Appendix 1.**

Table 1: Dust Deposition Results: 31 July – 1 September 2020 (32 days)

Site	Monthly Insoluble Solids	Monthly Ash Residue	Monthly Combustible Matter	Monthly Ash Residue/ Insoluble Solids %	Rolling Annual Average Insoluble Solids
CD1	0.6	0.5	0.1	83	2.1
CD2c	0.5	0.4	0.1	80	1.6
CD3	1.3	0.7	0.6	54	1.8
CD4	0.3	0.1	0.2	33	1.5
CD5	0.2	0.1	0.1	50	1.5
CD6	0.3	0.1	0.2	33	1.4

Notes:
Units in g/m^2.month unless indicated
*Insoluble solid results marked with an * indicate an excessively contaminated gauge. Contamination can include bird droppings, vegetation (such as plant matter, algae, pollen and seeds) and insects*
*Results in **bold** indicate insoluble solids levels above 3.7g/m^2.month; the Development Consent's annual average amenity criteria at residential locations*
The current rolling annual average is calculated from September 2019 to August 2020

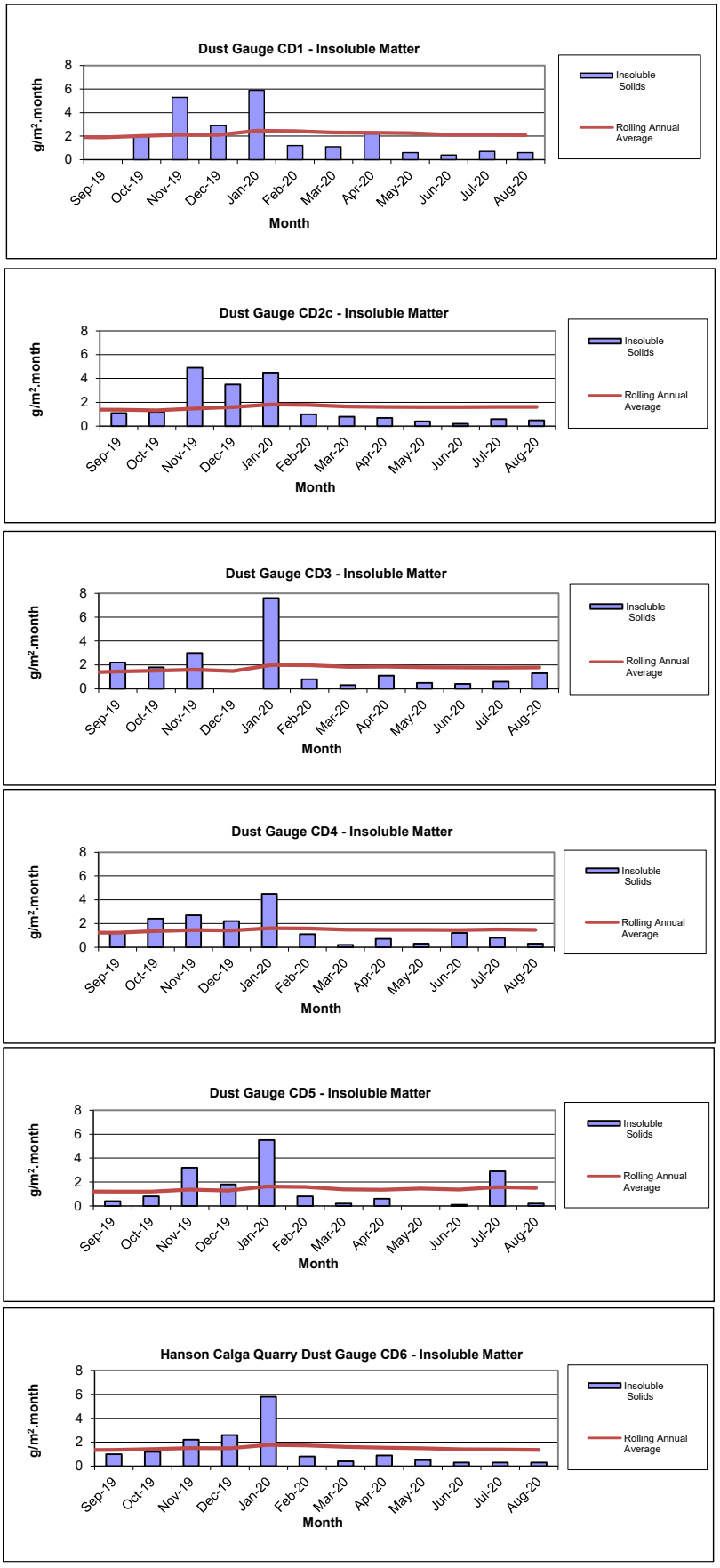


Figure 2: *Summary Monthly/Annual Dust Deposition Results for Insoluble Solids*

2.2 Surface Water (Monthly)

Monthly surface water monitoring was conducted on 7 August 2020 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, D and F.

Table 2: Monthly Surface Water Monitoring Results – August 2020

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	Still	Clear	Clear	6.21	98	69	14	<5
B	Trickle	Clear	Clear	6.48	94	78	6	<5
C1	Still	Clear	Clear	6.32	76	54	9	<5
C2	Steady	Clear	Clear	5.99	104	73	20	8
D	Trickle	Clear	Clear	5.27	76	64	<5	<5
F	Dam	Clear	Clear	7.08	95	67	48	<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 August 2020.

2.3 Groundwater (Bi-monthly)

Groundwater was sampled on 7 August 2020. Data is displayed in Table 3 and Figures 3 – 6. The field sheet, chain of custody documentation and laboratory analysis certificates are provided in Appendix 1.

Water quality tests for pH and electrical conductivity were conducted by CBased Environmental Pty Limited. For water quality purposes, water was purged from the bore until constant pH (+/- 0.1 pH units) and electrical conductivity (+/- 5%) was obtained between samples.

Table 3: Groundwater Quality Data

Site	Bore	Type	Depth to Water April 2006	Depth to Water (this report)	pH (this report)	Electrical Conductivity (this report)
CQ3	Voutos	* Monitor	10.53	10.76	6.12	100.2
CQ4	Voutos	* Monitor	8.78	10.20	4.88	118.1
CQ5	Gazzana	Dip only	8.69	6.22	4.71	209.5
CQ6	Gazzana	Dip only	16.00	Removed		
CQ7	Gazzana	* Monitor	6.89	6.10	5.58	160.8
CQ8	Gazzana	* Monitor	11.03	5.47	4.4	124.2
CQ9	Gazzana	Dip only	10.10	Removed		
CQ10	Voutos	* Monitor	NI	24.86	4.52	121.4
CQ11S	Gazzana	* Monitor	NI	11.30	5.84	130.3
CQ11D	Gazzana	* Monitor	NI	12.45	5.15	130.7
CQ12	Gazzana	* Monitor	NI	3.77	Bore Damaged	
CQ13	Kashouli	* Monitor	NI	13.00	4.72	141.2
CP3	Gazzana	Domestic	10.40	Removed		
CP4	Kashouli	Domestic	13.63	4.12	Damaged	
CP5	Kashouli	Domestic	16.61	6.38	6.31	102.5
CP6	Kashouli	Domestic	16.27	9.08	4.96	125.9
CP7	Kashouli	Production	8.56	1.47	6.08	122.7
CP8	Rozmanec	Domestic	22.17	21.11	5.02	108.5
CP13	W P White	Domestic	NI	10.86	5.07	130.4
CP15	32 Polins Road, Calga	Domestic	NI	2.05	5.1	116.1
MW7	Rocla Bore	* Monitor	15.76	14.22	5.62	112.2
MW8	Rocla Bore	* Monitor	9.82	7.23	4.45	154
MW9	Rocla Bore	* Monitor	22.44	24.47	4.50	76.4
MW10	Rocla Bore	* Monitor	15.41	4.05	4.56	100.7
MW13	Rocla Bore	Dip only	NI	7.53	4.37	93.0
MW16	Rocla Bore	Dip only	NI	8.10	4.38	105.6
MW17	Rocla Bore	Dip only	NI	9.97	6.94	113.5

Notes:
Water level measured from top of bore case (TOC) to water
pH measured in pH units / electrical conductivity measured in µS/cm
Blank cells = no data available
** = Logger Installed*
NI = Bores installed after April 2006. April 2006 was the first set of measurements taken by CBased Environmental Pty Limited
Yellow shading indicates increase to groundwater depth (water moved away from surface) since last sampling event
Green shading indicates decrease to groundwater depth (water moved towards surface) since last sampling event
Pink shading indicates stable groundwater depth (+/- 0.01m) since last sampling event

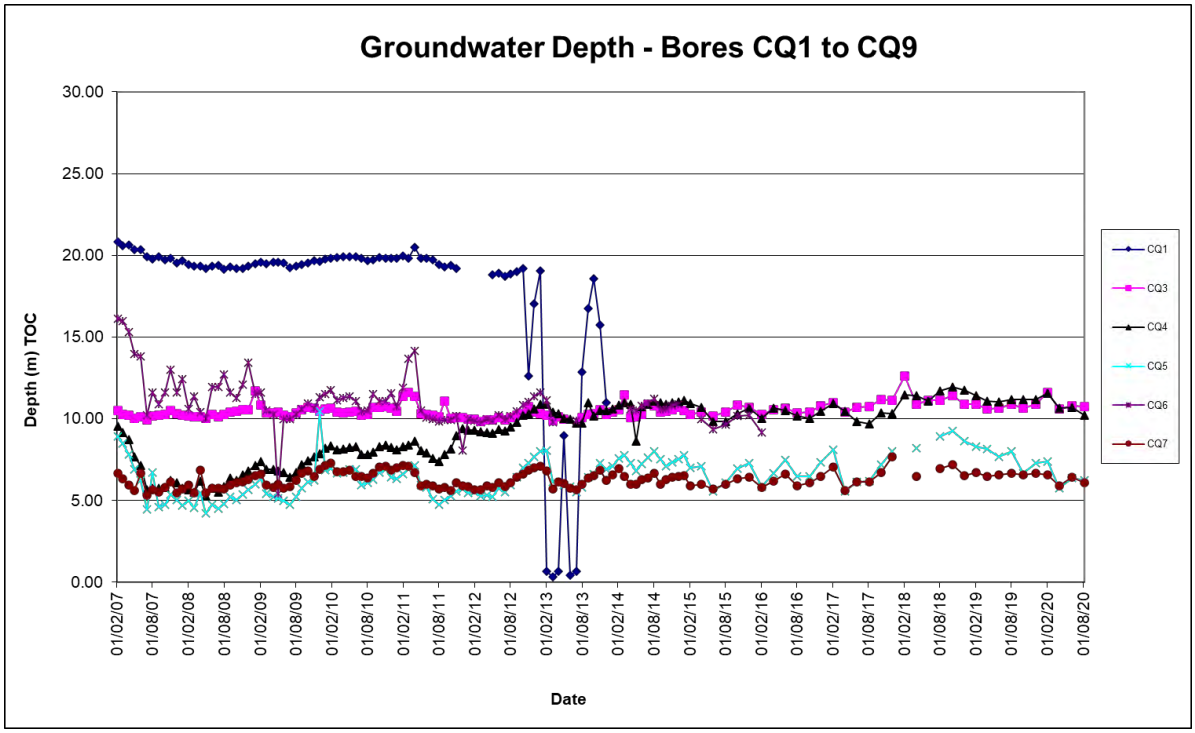


Figure 3: *Groundwater Depth – Bores CQ1 to CQ9*

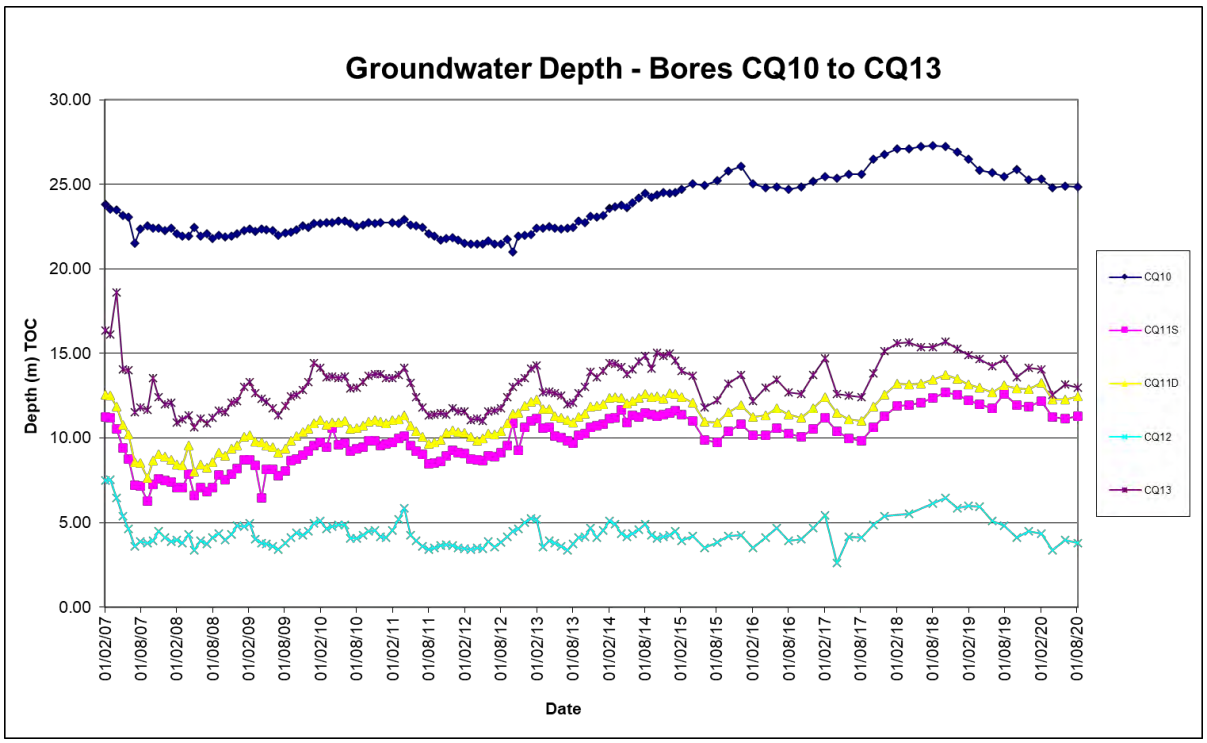


Figure 4: *Groundwater Depth – Bores CQ10 to CQ13*

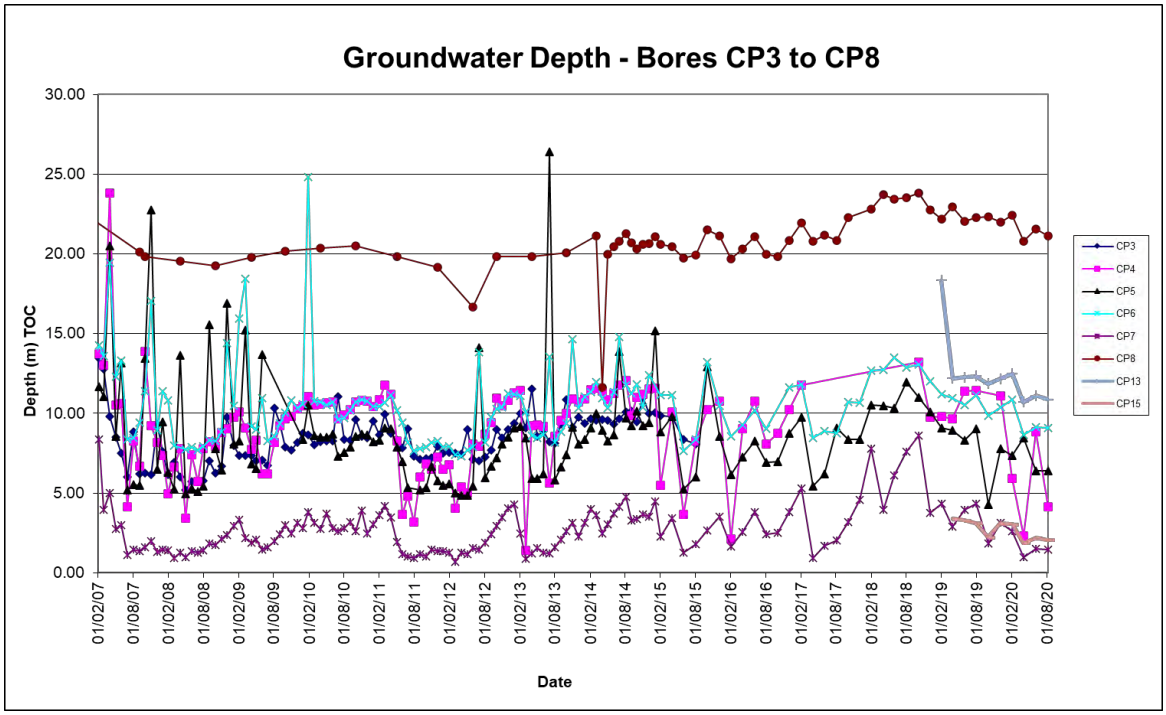


Figure 5: *Groundwater Depth – Bores CP3 to CP8*

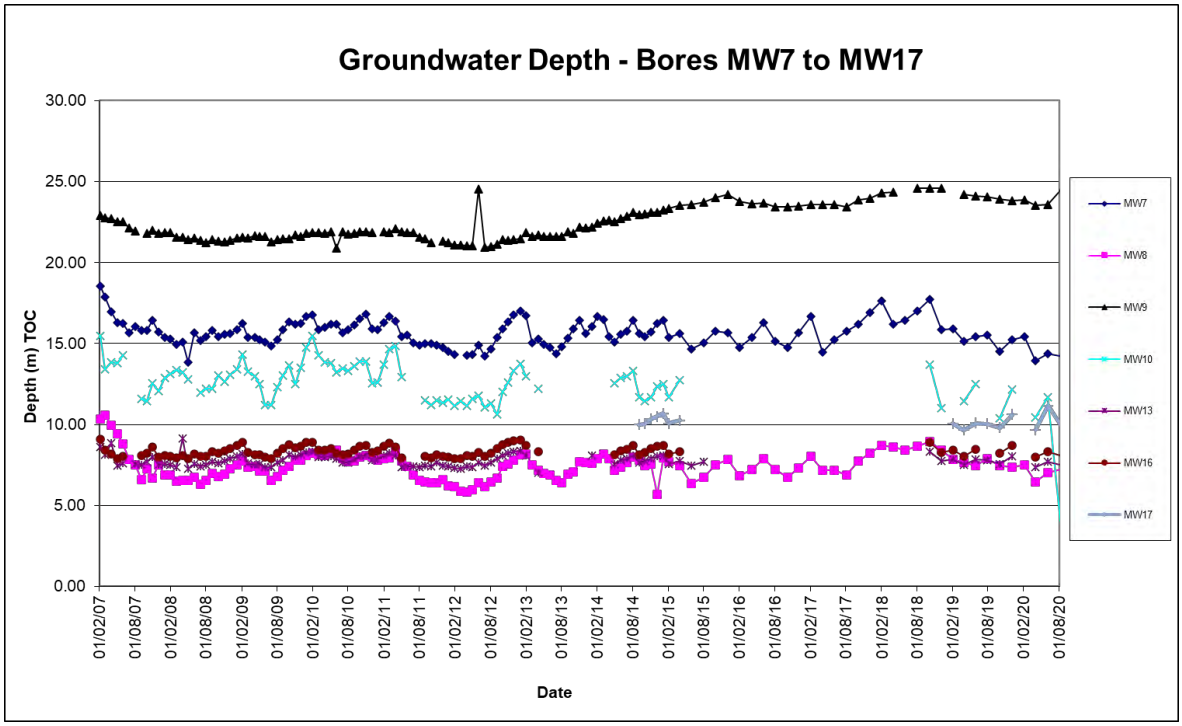


Figure 6: *Groundwater Depth – Bores MW7 to MW17*

2.4 Meteorological Data

The Calga Quarry weather station data recovery for August 2020 was approximately 100%.

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 6 – 9**; 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 – August 2020

Location	Rainfall (mm)
Calga Quarry	72.6mm
BOM Peats Ridge*	NA
BOM Gosford*	51.2mm
BOM Peats Ridge long-term mean for May*	74.0mm

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.

An annual calibration was undertaken on the weather station during April 2020 and is next due in March 2021. Please refer to **Appendix 1**.

Table 4: Summary of Monthly Meteorological Data – August 2020

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
1/08/2020	4.1	10.7	19.5	55.0	83.9	97.0	0.4	2.2	0.0	0.4	5.8	4.2	18.9	1019.9	1022.5	1024.8	0.0	160.8	629.0	95.0	99.0	100.0
2/08/2020	4.9	11.6	21.5	38.0	80.4	97.0	0.2	2.3	0.0	0.5	4.5	4.9	20.0	1019.1	1020.7	1023.2	0.0	162.8	642.0	95.9	99.6	100.0
3/08/2020	5.2	12.7	21.1	38.0	71.3	97.0	0.4	2.5	0.0	0.8	5.4	5.3	19.7	1011.7	1014.9	1018.8	0.0	154.6	664.0	90.5	96.6	100.0
4/08/2020	9.3	14.7	20.8	37.0	56.2	73.0	0.0	3.7	0.4	3.0	10.7	7.3	19.3	1004.8	1008.4	1011.7	0.0	149.9	639.0	91.8	98.3	100.0
5/08/2020	5.6	10.4	16.7	32.0	47.6	62.0	0.0	4.2	2.2	3.9	10.7	2.8	14.8	1008.7	1010.6	1013.1	0.0	169.2	653.0	93.4	98.9	100.0
6/08/2020	4.6	9.1	15.5	37.0	61.6	81.0	0.0	2.8	0.0	1.3	8.0	3.2	13.9	1012.6	1015.9	1020.0	0.0	166.4	664.0	92.7	98.0	100.0
7/08/2020	6.7	8.7	10.0	78.0	90.5	97.0	13.2	0.3	0.0	0.1	5.8	6.7	10.3	1012.1	1016.6	1019.6	0.0	16.9	88.0	75.7	90.1	100.0
8/08/2020	8.8	11.5	15.8	80.0	92.6	98.0	0.4	0.9	0.0	1.2	7.2	8.8	15.7	1007.5	1010.0	1012.2	0.0	63.2	411.0	83.6	93.3	100.0
9/08/2020	7.4	9.9	14.9	63.0	81.6	97.0	15.2	2.2	0.0	3.3	11.6	4.6	14.1	1000.5	1006.2	1009.0	0.0	127.3	693.0	83.0	95.5	100.0
10/08/2020	8.4	11.7	15.2	67.0	87.1	97.0	34.0	1.5	0.0	3.2	15.2	8.2	14.4	1005.9	1012.6	1017.7	0.0	73.9	654.0	84.2	96.6	100.0
11/08/2020	9.0	12.0	16.9	60.0	83.5	95.0	0.2	1.6	0.0	1.1	4.9	8.2	16.1	1014.9	1016.8	1019.0	0.0	111.8	667.0	76.3	95.3	100.0
12/08/2020	8.8	12.5	16.7	72.0	88.0	97.0	2.0	1.2	0.0	0.7	8.5	8.8	16.4	1008.8	1011.8	1015.4	0.0	77.2	440.0	91.2	97.8	100.0
13/08/2020	9.6	15.0	22.1	54.0	77.8	96.0	0.2	2.6	0.0	1.0	9.4	8.6	21.7	1008.8	1010.7	1013.2	0.0	167.2	669.0	89.3	95.2	100.0
14/08/2020	8.9	12.0	14.7	84.0	92.1	97.0	6.2	0.7	0.0	0.2	3.1	8.9	14.6	1006.3	1010.9	1013.3	0.0	52.6	285.0	83.9	92.0	100.0
15/08/2020	11.3	14.0	18.0	59.0	79.9	98.0	0.0	2.2	0.0	2.6	9.8	10.7	17.3	1001.7	1003.9	1006.0	0.0	110.4	748.0	82.6	94.7	100.0
16/08/2020	12.0	14.3	18.2	47.0	62.9	78.0	0.0	4.4	2.7	4.7	13.4	10.2	17.2	1001.7	1003.3	1004.7	0.0	182.6	688.0	94.6	98.1	100.0
17/08/2020	9.5	13.9	19.6	44.0	61.4	79.0	0.0	4.0	0.4	3.4	10.3	9.2	18.4	1002.6	1004.6	1006.4	0.0	183.8	689.0	83.0	94.1	100.0
18/08/2020	11.3	14.5	20.2	51.0	65.3	72.0	0.0	3.0	0.4	2.5	9.8	9.3	19.5	997.8	1001.6	1005.4	0.0	138.5	810.0	84.5	93.2	99.4
19/08/2020	10.9	15.0	19.9	32.0	57.6	79.0	0.0	4.8	0.4	4.4	17.9	7.7	18.2	989.1	993.7	997.6	0.0	180.6	780.0	77.0	92.8	100.0
20/08/2020	10.2	12.9	17.1	42.0	56.2	70.0	0.0	5.0	2.2	5.4	16.5	7.8	15.5	994.0	999.2	1004.5	0.0	192.6	766.0	79.8	97.3	100.0
21/08/2020	9.3	12.9	17.6	44.0	59.8	72.0	0.0	4.0	1.8	4.0	13.9	7.4	15.9	1001.0	1003.2	1005.4	0.0	173.0	821.0	99.7	100.0	100.0
22/08/2020	7.8	10.7	14.6	38.0	59.1	81.0	0.0	4.4	1.3	5.2	15.2	4.6	13.0	999.7	1002.0	1003.4	0.0	188.6	756.0	100.0	100.0	100.0
23/08/2020	8.9	11.5	15.9	37.0	53.2	62.0	0.0	5.2	3.1	6.0	16.1	5.4	14.3	1000.9	1005.0	1010.7	0.0	196.4	730.0	100.0	100.0	100.0
24/08/2020	8.2	11.5	17.7	32.0	58.1	80.0	0.0	3.7	0.0	2.3	11.2	6.2	15.9	1010.5	1015.7	1021.0	0.0	199.9	739.0	76.3	93.3	100.0
25/08/2020	4.3	9.6	16.2	42.0	68.6	89.0	0.0	3.1	0.0	0.7	5.8	4.4	14.8	1021.0	1023.3	1025.9	0.0	204.1	812.0	69.1	89.0	98.1
26/08/2020	3.8	10.6	19.7	34.0	71.6	95.0	0.2	3.0	0.0	0.9	6.3	3.9	18.0	1023.0	1025.3	1027.9	0.0	201.9	745.0	71.9	92.0	99.4
27/08/2020	3.9	12.8	21.6	24.0	55.7	94.0	0.0	3.6	0.0	1.0	8.5	4.0	19.6	1016.5	1020.8	1024.5	0.0	208.9	762.0	82.6	93.6	98.7
28/08/2020	8.3	13.3	18.9	28.0	51.2	79.0	0.0	4.2	0.0	1.9	8.5	8.3	17.3	1015.4	1021.0	1026.0	0.0	206.7	757.0	66.9	92.1	99.7
29/08/2020	5.0	12.9	22.8	31.0	66.5	90.0	0.0	3.4	0.0	1.1	5.8	5.0	22.2	1023.4	1025.6	1027.9	0.0	209.1	763.0	84.2	93.8	99.4
30/08/2020	6.9	16.4	24.6	33.0	59.9	91.0	0.0	4.1	0.0	1.4	8.5	6.9	23.7	1014.6	1019.2	1024.1	0.0	208.7	762.0	88.0	93.8	98.7
31/08/2020	12.4	16.1	22.2	39.0	64.1	76.0	0.0	3.5	0.0	2.1	10.3	12.4	21.1	1011.9	1015.3	1020.4	0.0	162.7	779.0	74.8	91.9	98.4
Monthly	3.8	12.4	24.6	24	69	98	72.6	94.4	0.0	2.3	17.9	2.8	23.7	989.1	1012.0	1027.9	0.0	154.9	821.0	66.9	95.4	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 (%)*		

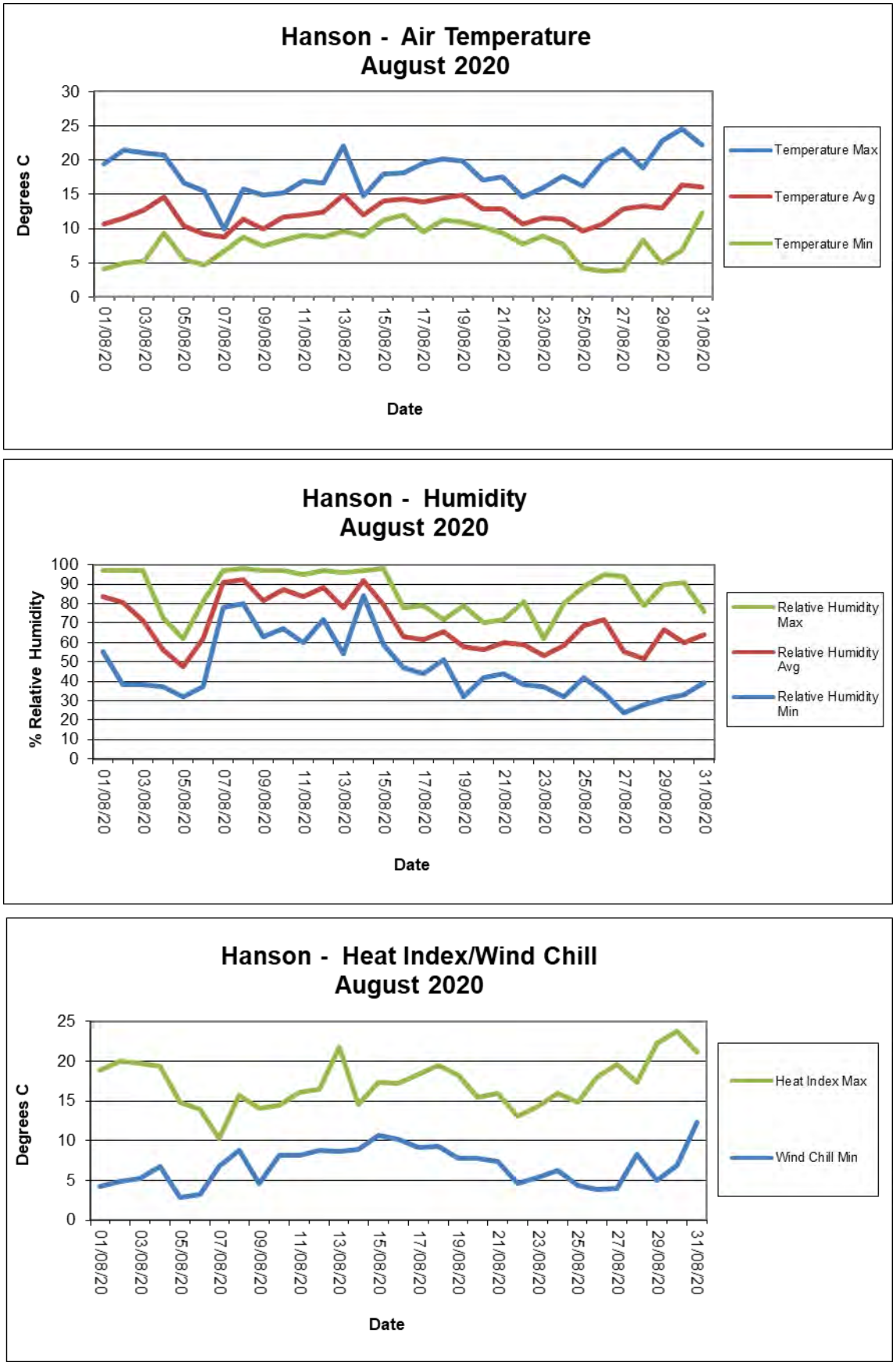


Figure 7 *Summary of Monthly Temperature, Humidity and Heat Index Results*

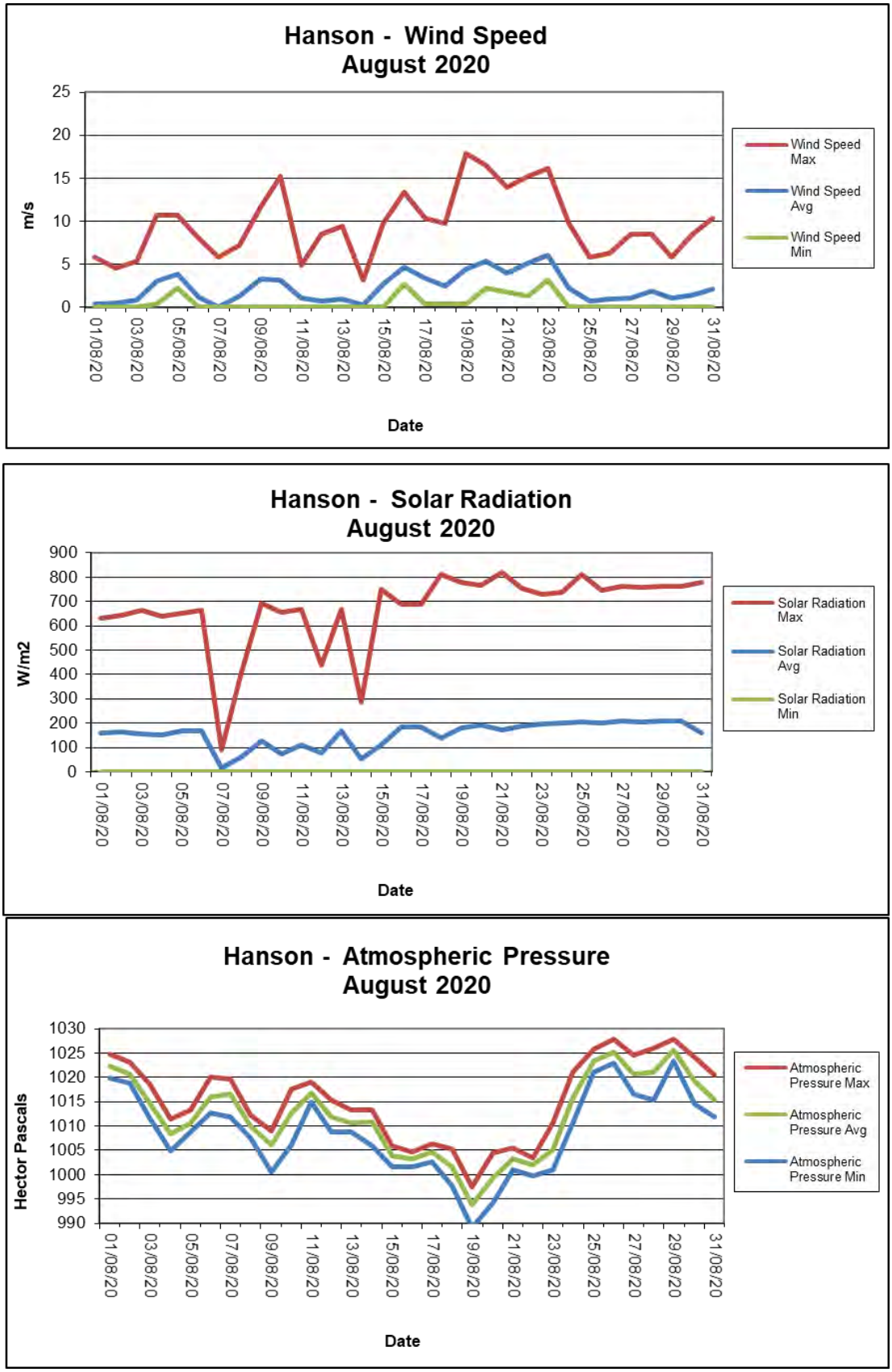
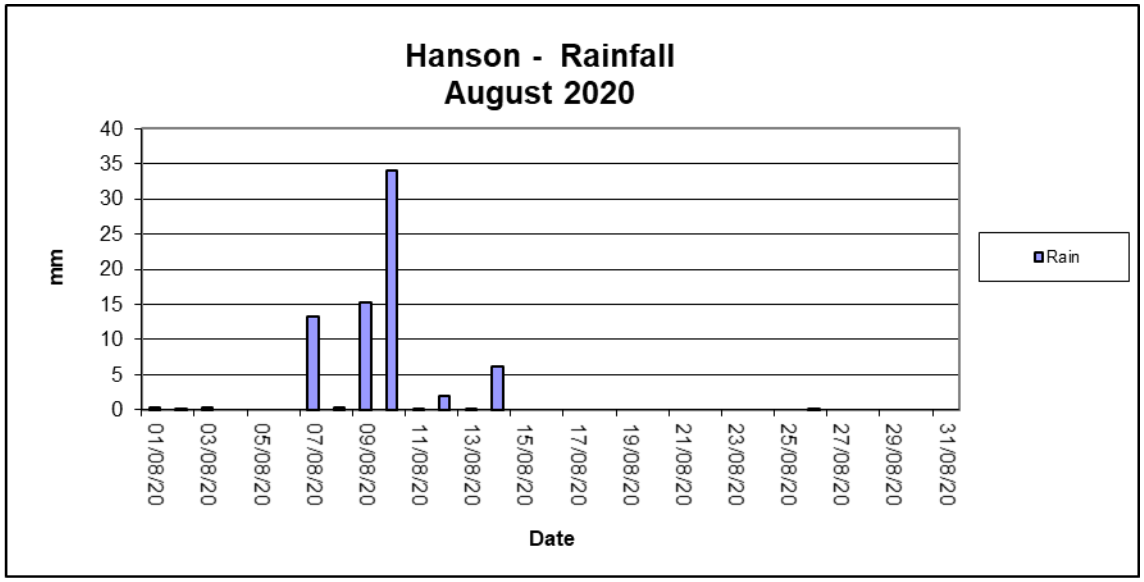
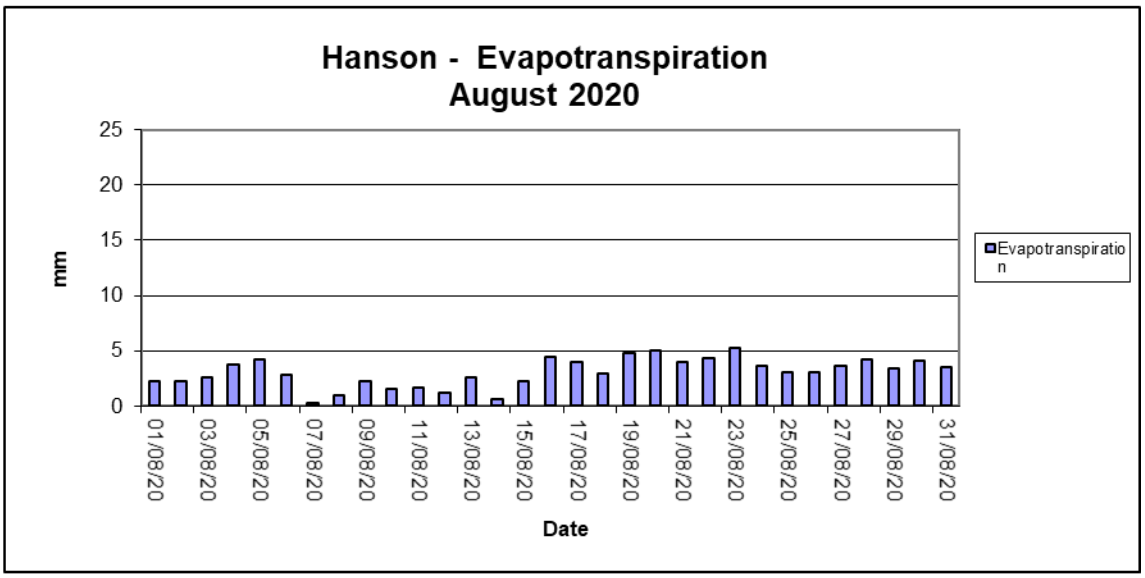


Figure 8 *Summary of Monthly Wind Speed, Solar Radiation and Atmospheric Pressure Results*





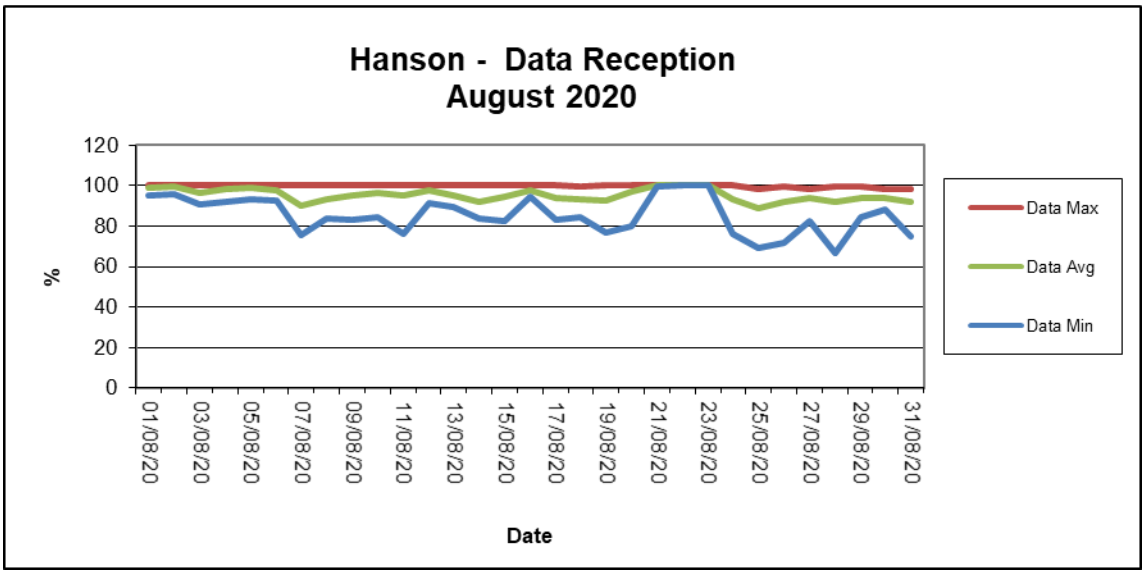


Figure 9 *Summary of Monthly Rainfall, Evapotranspiration and Data Reception Results*

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.

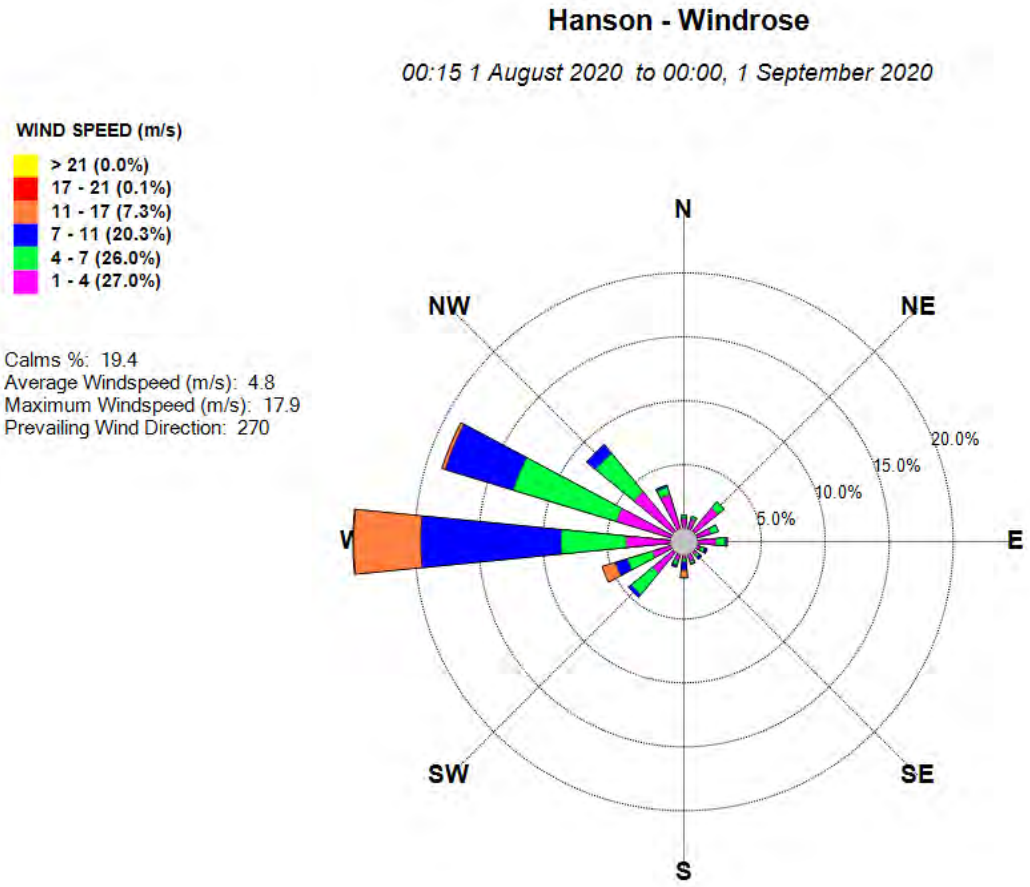


Figure 10: *Monthly Windrose Plot – August 2020*

The predominant wind for August was from the West, with most frequent, strongest winds from the West. The maximum wind speed was 17.9 m/s from the West.

Appendix 1

Field Sheets

Chain of Custody Documentation

Laboratory Analysis Certificates

DEPOSITIONAL DUST MONITORING

Client: ..... **Hanson Calga Quarry** .....

Date Installed: 31.7.20

Date Collected: 1.9.20

Sampled By: Maddie & Alex

Site	Time Collected	Water Level (mL)	Insoluble Material (✔ = slight, ✔ ✔ = mod etc)				Water Turbidity	Water Colour	Stand Level (Y/N)	Funnel Level (Y/N)	New Funnel Diameter (mm)	Comments
			Insects	Bird droppings	Vegetation	Dust						
CD1	11:50	1700	✔		✔	✔	(C) S T	(C) O Bn Gn Gy	Y	Y	—	
CD2C	12:50	1400	✔		✔	✔	(C) S T	(C) O Bn Gn Gy	Y	Y	—	
CD3	11:40	1700	✔		✔✔	✔	(C) S T	(C) O Bn Gn Gy	Y	Y	—	
CD4	12:30	1500	✔		✔	✔	(C) S T	(C) O Bn Gn Gy	Y	Y	—	
CD5	12:20	1700	✔			✔	(C) S T	(C) O Bn Gn Gy	Y	Y	—	
CD6	12:10	1600	✔			✔	(C) S T	(C) O Bn Gn Gy	Y	Y	—	

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

Colour: C=Colourless, O=Orange, Bn=Brown, Gn=Green, Gy = Grey (CIRCLE)

Report broken funnels and replacement diameters

Signed: _____

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT: CBased Environmental Pty Ltd

POSTAL ADDRESS: 47 Boomerang St CESSNOCK NSW 2325

SEND REPORT TO: monitoringresults@cbased.com.au

SEND INVOICE TO: accounts@cbased.com.au, renae.mikka@cbased.com.au

DATA NEEDED BY: 7 working days

REPORT NEEDED BY: 7 working days

PROJECT ID: Hanson Calga Dusts

QUOTE NO.: SYBQ 403-18

P.O. NO.:

COMMENTS/SPECIAL HANDLING/STORAGE OR DIPOSAL:

FOR LAB USE ONLY

COOLER SEAL (TQe)

Yes ..... No ..... /

Broken ..... Intact ....

COOLER TEMP: 8 - 5 deg.C

Total unless specified

LABORATORY BATCH NO.:

SAMPLERS: MBF AS.

PHONE: 0265713334 E-MAIL: monitoringresults@cbased.com.au

REPORT FORMAT: HARD: Yes FAX: DISK: BULLETIN BOARD: E-MAIL: Yes

QC LEVEL: QCS1: QCS2: QCS3: Yes QCS4:

ANALYSIS REQUIRED

SAMPLE DATA				CONTAINER DATA		Insoluable Solids	Ash Residue	Combustable Matte	NOTES
SAMPLE ID	MATRIX	DATE ON	DATE OFF	TYPE & PRESERVATIVE	NO.				
CD1	Dust	31.7.20	1.9.20			x	x	x	
CD2c	Dust	"	"			x	x	x	
CD3	Dust	"	"			x	x	x	
CD4	Dust	"	"			x	x	x	
CD5	Dust	"	"			x	x	x	
CD6	Dust	"	"			x	x	x	

RELINQUISHED BY:

NAME: A. SMITH DATE: 1.9.20

OF: CBased Environmental TIME: 14:45

NAME: DATE:

OF: TIME:

RECEIVED BY

NAME: DATE: 1/9/20

OF: ALS TIME: 14:50

NAME: DATE:

OF: TIME:

METHOD OF SHIPMENT

CONSIGNMENT NOTE NO.

TRANSPORT CO. NAME.

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced 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

Environmental Division
Newcastle
Work Order Reference
EN2005923

elephone : + 61 2 4014 2500

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN2005923**	Page	: 1 of 4
Client	: **CBASED ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: All Deliverables	Contact	:
Address	: Unit 3 2 Enterprise Cres Singleton NSW 2330	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: +61 02 6571 3334	Telephone	: +61 2 4014 2500
Project	: Hanson Calga Dusts	Date Samples Received	: 01-Sep-2020 14:50
Order number	: ----	Date Analysis Commenced	: 02-Sep-2020
C-O-C number	: ----	Issue Date	: 08-Sep-2020 13:37
Sampler	: MB + AS		
Site	:		
Quote number	: SYBQ/403/18 - COMPASS		
No. of samples received	: 6		
No. of samples analysed	: 6		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Joel Mullarvey	Laboratory Technician	Newcastle - Inorganics, Mayfield 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.

- Analysis as per AS3580.10.1-2016. Samples passed through a 1mm sieve prior to analysis. NATA accreditation does not apply for results reported in g/m².mth as sampling data was provided by the client.

Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST** (Matrix: **AIR**)				Client sample ID	CD1 31/07/20 - 01/09/20	CD2c 31/07/20 - 01/09/20	CD3 31/07/20 - 01/09/20	CD4 31/07/20 - 01/09/20	CD5 31/07/20 - 01/09/20
				Client sampling date / time	01-Sep-2020 00:00	01-Sep-2020 00:00	01-Sep-2020 00:00	01-Sep-2020 00:00	01-Sep-2020 00:00
Compound	CAS Number	LOR	Unit		EN2005923-001	EN2005923-002	EN2005923-003	EN2005923-004	EN2005923-005
					Result	Result	Result	Result	Result
EA120: Ash Content									
Ash Content	----	0.1	g/m².month		**0.5**	**0.4**	**0.7**	**0.1**	**0.1**
Ash Content (mg)	----	1	mg		**10**	**7**	**14**	**2**	**1**
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month		**0.1**	**0.1**	**0.6**	**0.2**	**0.1**
Combustible Matter (mg)	----	1	mg		**2**	**3**	**11**	**3**	**2**
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month		**0.6**	**0.5**	**1.3**	**0.3**	**0.2**
Total Insoluble Matter (mg)	----	1	mg		**12**	**10**	**25**	**5**	**3**

Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST** (Matrix: **AIR**)				Client sample ID	**CD6 31/07/20 - 01/09/20**	**----**	**----**	**----**	**----**
				Client sampling date / time	01-Sep-2020 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EN2005923-006**	**--------**	**--------**	**--------**	**--------**
					Result	----	----	----	----
EA120: Ash Content									
Ash Content	----	0.1	g/m².month		**0.1**	**----**	**----**	**----**	**----**
Ash Content (mg)	----	1	mg		**1**	**----**	**----**	**----**	**----**
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month		**0.2**	**----**	**----**	**----**	**----**
Combustible Matter (mg)	----	1	mg		**4**	**----**	**----**	**----**	**----**
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month		**0.3**	**----**	**----**	**----**	**----**
Total Insoluble Matter (mg)	----	1	mg		**5**	**----**	**----**	**----**	**----**

CBASED ENVIRONMENTAL PTY LIMITED

Date: 7.8.20

Client : Hanson Calga

Project :

SURFACE WATERS

Site	Flow Rate	Odour	Sampling Time	Bottles	Water Turbidity	Water Colour	Comments
A	SLW	NIL	8.45	1x 250ml GP, 1x 500mL GP, 1x PG	(C) S T	(C) LO O B G	
B	Trickle	NIL	9.15	1x 250ml GP, 1x 500mL GP, 1x PG	(C) S T	(C) LO O B G	
C1	SLW	NIL	12.10	1x 250ml GP, 1x 500mL GP, 1x PG	(C) S T	(C) LO O B G	
C2	Steady	NIL	12.15	1x 250ml GP, 1x 500mL GP, 1x PG	(C) S T	(C) LO O B G	
D	Trickle	NIL	11.40	1x 250ml GP, 1x 500mL GP, 1x PG	(C) S T	(C) LO O B G	
F	Dam	NIL	8.30	1x 250ml GP, 1x 500mL GP, 1x PG	(C) S T	(C) LO O B G	

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

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

Signed: J Peterson

Sampled by: Jill & Leesa.

CHAIN OF CUSTODY DOCUMENTATION

CLIENT: CBased Environmental Pty Ltd

POSTAL ADDRESS: PO Box 245 CESSNOCK NSW 2325

SEND REPORT TO: monitoringresults@cbased.com.au

SEND INVOICE TO: renae.mikka@cbased.com.au; accounts@cbased.com.au

DATA NEEDED BY: 5 working days

REPORT NEEDED BY: 5 working days

PROJECT ID: Hanson Quarry SW

QUOTE NO.: SYBQ-403-18

P.O. NO.:

COMMENTS/SPECIAL HANDLING/STORAGE OR DIPOSAL:

FOR LAB USE ONLY
COOLER SEAL 11.4°C
Yes ..... No .....
Broken ..... Intact ...
COOLER TEMP: deg.C

Total unless specified

LABORATORY BATCH NO.:

SAMPLERS:CBased Environmental Pty Ltd

PHONE: 0265713334 E-MAIL: monitoringresults@cbased.com.au

REPORT FORMAT: HARD: Yes FAX: DISK: BULLETIN BOARD: E-MAIL: Yes

QC LEVEL: QCS1: QCS2: QCS3: Yes QCS4:

Australian Laboratory Services Pty Ltd

ANALYSIS REQUIRED

SAMPLE DATA				CONTAINER DATA		pH	EC	TSS	TDS	O+G	NOTES
SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	NO.						
A	Water	7.8.20	8.45	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x	
B	Water		9.15	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x	
C1	Water		12.10	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x	
C2	Water		12.15	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x	
D	Water		1.40	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x	
F	Water		8.30.	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x	
				TOTAL BOTTLES:							

RELINQUISHED BY:

NAME : J. Peterson DATE: 7.8.20.

OF: CBased Environmental TIME: 4.50.

NAME : DATE:

OF: TIME:

RECEIVED BY

NAME : AL DATE: 7/8/2020

OF: ALS TIME: 4:53pm.

NAME : DATE:

OF: TIME:

METHOD OF SHIPMENT

CONSIGNMENT NOTE NO.

TRANSPORT CO. NAME.

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced 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

Environmental Division
Sydney
Work Order Reference
ES2027545

Telephone : + 61-2-8784 8555

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2027545**	Page	: 1 of 4
Client	: **CBASED ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: All Deliverables	Contact	: Customer Services ES
Address	: Unit 3 2 Enterprise Cres Singleton NSW 2330	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6571 3334	Telephone	: +61-2-8784 8555
Project	: Hanson Quarry SW	Date Samples Received	: 07-Aug-2020 16:53
Order number	: ----	Date Analysis Commenced	: 07-Aug-2020
C-O-C number	: ----	Issue Date	: 14-Aug-2020 15:43
Sampler	: CBased Environmental Pty Ltd		
Site	:		
Quote number	: SYBQ/403/18 - COMPASS		
No. of samples received	: 6		
No. of samples analysed	: 6		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
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.

- EA016: Calculated TDS is determined from Electrical Conductivity using a conversion factor of 0.67.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	A	B	C1	C2	D
			Client sampling date / time	07-Aug-2020 08:45	07-Aug-2020 09:15	07-Aug-2020 12:10	07-Aug-2020 12:15	07-Aug-2020 11:40
Compound	CAS Number	LOR	Unit	ES2027545-001	ES2027545-002	ES2027545-003	ES2027545-004	ES2027545-005
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**6.21**	**6.48**	**6.32**	**5.99**	**5.27**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**98**	**94**	**76**	**104**	**76**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**69**	**78**	**54**	**73**	**64**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**14**	**6**	**9**	**20**	<5
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	<5	<5	**8**	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**F**	**----**	**----**	**----**	**----**
			Client sampling date / time	07-Aug-2020 08:30	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2027545-006**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EA005: pH								
pH Value	----	0.01	pH Unit	**7.08**	**----**	**----**	**----**	**----**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**95**	**----**	**----**	**----**	**----**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**67**	**----**	**----**	**----**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**48**	**----**	**----**	**----**	**----**
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	**----**	**----**	**----**	**----**

C BASED ENVIRONMENTAL PTY LIMITED

Date: 7.8.20

GROUNDWATERS

Client : Hanson Calga
Project : Bi-Monthly Bores

Site	Time	DEPTH	Typical Depth (m)	Odour	Water Turbidity	Water Colour	1		2		Downloaded Logger? (Y/N)*	Comments
							pH	EC	pH	EC		
CQ3	8.55	10.76	10.74	NIL	C S T	C LO O B G	6.12	101.8	6.12	100.2	Y	
CQ4	1.00	19.20	11.19	NO	C S T	C LO O B G	4.84	107.7	4.88	118.1	Y	
CQ5	2.00	8.22	8.04	NO	C S T	C LO O B G	4.70	206.3	4.71	209.5		
CQ7	1.50	6.10	6.61	NO	C S T	C LO O B G	5.57	161.5	5.58	160.4	Y	
CQ8	1.15	5.47	6.93	NO	C S T	C LO O B G	4.39	124.3	4.40	124.2	N	no logger
CQ10	9.45	24.86	25.86	NO	C S T	C LO O B G	4.47	123.7	4.52	121.4	Y	
CQ11S	12.45	11.30	12.1	YES	C S T	C LO O B G	5.85	135.6	5.84	130.3	Y	
CQ11D	12.40	12.45	12.98	YES	C S T	C LO O B G	5.17	129.2	5.15	130.7	Y	
CQ12	1.20	3.77	5.46	NO	C S T	C LO O B G					Y	bore damaged
CQ13	2.05	13.00	14.42	NO	C S T	C LO O B G	4.90	147.0	4.72	141.2	Y	
CP4	2.10	4.12	10.56	NO	C S T	C LO O B G						Damaged.
CP5	2.30	6.38	7.95	NO	C S T	C LO O B G	6.22	101.9	6.31	102.5		
CP6	2.20	9.08	10.73	NO	C S T	C LO O B G	4.94	123.9	4.96	125.9		
CP7	2.40	1.47	3.47	YES	C S T	C LO O B G	6.14	127.5	6.08	122.7		dead animal in bore, very smelly
CP8	3.00	21.1	22.36	NO.	C S T	C LO O B G	5.00	104.3	5.02	108.5		
CP13	2.55	10.86	13.4	NO	C S T	C LO O B G	5.05	128.9	5.07	130.4		
CP15	12.25	2.05	3.01	NO	C S T	C LO O B G	5.16	115.5	5.10	116.1		
MW7	11.25	14.22	15.3	NO	C S T	C LO O B G	5.37	115.1	5.62	122.2	N	Slight + grey - cloudy. no logger
MW8	11.15	7.23	7.66	NO	C S T	C LO O B G	5.50	154.5	4.45	154.0	Y	
MW9	9.55	24.47	24.09	NO	C S T	C LO O B G	4.49	75.5	4.56	76.4	Y	
MW10	10.30	4.05	11.44	NO	C S T	C LO O B G	4.53	101.1	4.56	100.7	Y	
MW13	10.10	7.53	7.71	NO	C S T	C LO O B G	4.40	92.3	4.37	93.0		
MW16	10.20	8.10	8.29	NO	C S T	C LO O B G	4.37	109.2	4.38	105.6		
MW17	11.00	9.97	9.93	NO	C S T	C LO O B G	6.99	111.3	6.94	113.5		

*If unable to download logger please provide comment/ explanation above

Turbidity: C=Clear, S= Slight, T=Turbid (CIRCLE)
pH/EC meter #:

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

Signed:

Sampled by: Jill Leesa.

CQ12 bore damaged Cannot get bailer down (photo taken)