CBased Environmental Pty Limited
ABN 62 611 924 264

Calga Quarry

Environmental Monitoring

Dust Deposition Gauges, Surface and Ground Waters and Meteorological Station

March 2017

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 21 April 2017

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Executive Summary

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

The monitoring includes;

- Dust Deposition Gauges;
- Surface Waters;
- Groundwaters; and
- Meteorological Station.

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

- Dust Deposition results for March 2017;
- Surface Water quality results for March 2017;
- Ground Water quality results for March 2017 and
- Meteorological report for March 2017.

The March 2017 dust deposition results for insoluble solids were generally low and free of major contamination. All sites, on a rolling annual average basis, are currently below the Air Quality Management Plan exceedance level of 3.7g/m^2.month. Results were found to be representative of dust levels as determined by the Australian Standard.

Monthly surface water samples were collected, then analysed, from sites A, B, C1, C2, D and F. 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 any sites in March 2017.

Bi-monthly groundwaters were sampled on 3 April 2017. Groundwater depth generally decreased compared to January 2017, indicating water moving towards the surface. pH at all sites is in the acidic to neutral range and generally remained slightly varied when compared to the previous results. EC levels were similar or slightly decreased at a majority of groundwater sites when compared to the January 2017 results.

The Calga Quarry weather station data recovery in March 2017 was approximately 100%. Data for March 2017 shows that rainfall recorded at the Calga Quarry was similar to the Gosford BOM mean rainfall and well below the Peats Ridge long term rainfall for March.

The rainfall comparison is provided below:

Calga Quarry	412.2 mm
BOM Peats Ridge*	NA
BOM Gosford*	399.2 mm
BOM Peats Ridge Long term mean for March*	135.9 mm

*Data sourced from Bureau of Meteorology (BOM) website (www.bom.gov.au).
Note: Differences in the daily rainfall readings between BOM and the Calga station may occur due to BOM stations reporting rainfall at 9am and the Calga station recording rainfall at midnight.

Sampling Program

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 and 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.

Surface waters are 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. Basic analysis including pH, Electrical Conductivity, Total Suspended Solids, Total Dissolved Solids and Total Oil and Grease 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.

Groundwaters are 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 stations have the following sensor configuration;

- Air temperature
- Humidity
- Rainfall
- Atmospheric pressure
- Evaporation
- Solar radiation
- Wind speed
- 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 Monthly Results

2.1 Dust Deposition Gauges

Table 1 displays the results for March 2017 and the project 12-month rolling average. Results are in g/m^2.month.

Table 1: Dust Deposition results: 2 March 2017 – 3 April 2017 (32 days)

Site	Monthly Insoluble Solids *(g/m^2.month)*	Monthly Ash Residue *(g/m^2.month)*	Monthly Combustible Matter *(g/m^2.month)*	Monthly Ash Residue/ Insoluble Solids %	Rolling Annual Average Insoluble Solids *(g/m^2.month)*
CD1	0.8	0.5	0.3	63	2.9
CD2c	0.5	0.2	0.3	40	1.0
CD3	0.4	0.2	0.2	50	1.2
CD4	0.7	0.1	0.6	14	0.6
CD5	0.2	0.1	0.1	50	0.6
CD6	0.4	0.1	0.3	25	0.9

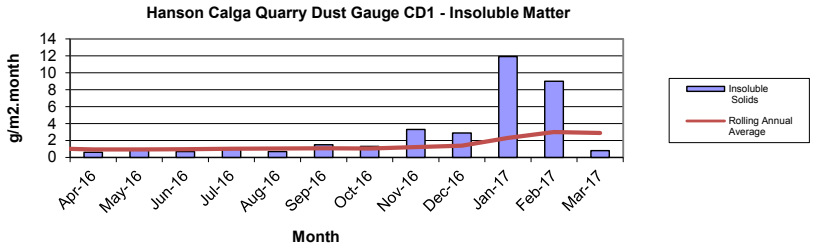
Insoluble Solids marked with an * indicate an excessively contaminated gauge. Contamination can include bird droppings, vegetation (such as plant matter, algae, pollen and seeds) and insects. Results in bold indicate insoluble solids levels above 3.7 g/m^2.month; the Development Consent's annual average amenity criteria at residential locations. The current rolling annual average is calculated from March 2016 to February 2017.

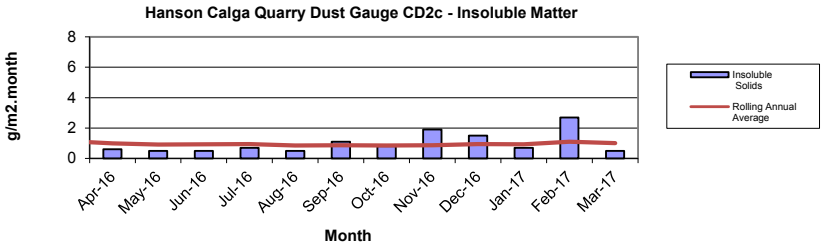
NA= Not Available.

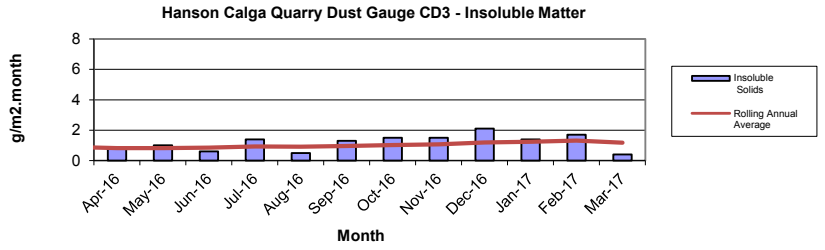
CD1 was installed on the 1 May 2006. CD2a was discontinued at the start of August 2006 due to quarry operations "mining out" the site of the gauge. The replacement gauge, Site CD2b, was located in a position adjacent to the boundary between B. Kashouli and F. & J. Gazzana in conformance with the Air Quality Management Plan. CD4 was installed on 3 October 2006, to gauge air quality impacts to the south of the site operations, as were CD5 and CD6 which were installed on the 14 December 2006. 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. The replacement gauge, CD2c, was located on a rehabilitated section of land between the extraction area and adjacent resident.

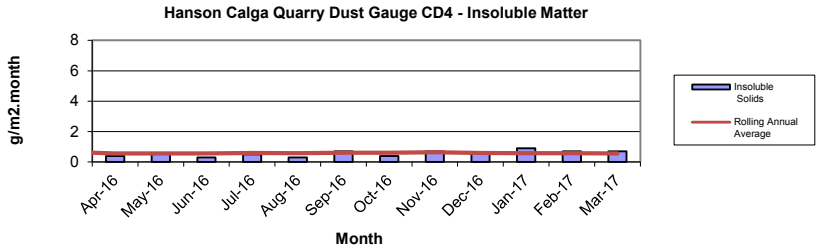
Dust deposition charts for all dust gauge sites appear in **Figure 2** below. The laboratory analysis is provided in **Appendix 1.**

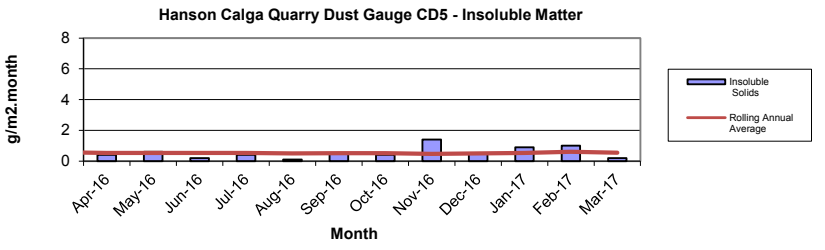
Figure 2: Dust Deposition Charts

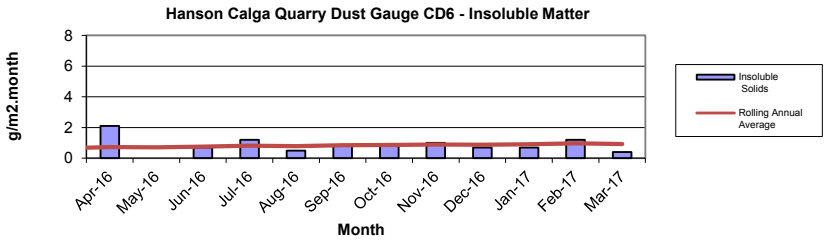












2.2 Surface Water Monitoring

Monthly surface water monitoring was conducted on the 3 April 2017 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1.**

Table 2: Monthly surface water monitoring – March grab sample results

Site	Observed Flow Rate	Water Colour	Turbidity	pH	EC *(µS/cm)*	TDS *(mg/L)*	TSS *(mg/L)*	Oil and Grease *(mg/L)*
A	Dam	Brown	Slight	5.95	60	55	16	<5
B	Trickle	Brown	Turbid	6.66	96	198	74	<5
C1	Dam	Brown	Slight	6.38	104	64	<5	<5
C2	Fast	Brown	Slight	6.22	132	84	<5	<5
D	Trickle	Brown	Slight	5.48	68	48	<5	<5
F	Dam	Brown	Turbid	6.31	63	118	115	<5

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 any sites in March 2017.

2.2.1 Non-Routine Surface Water Sampling

The following non-routine sampling was undertaken during March 2017;

- Rainfall events sampled by site on the 14 and 16 March 2017.

Laboratory analysis certificates are provided in **Appendix 1.**

2.3 Groundwater Monitoring

Bi-monthly groundwaters were sampled on 3 April 2017. 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. Data is displayed in **Table 3** and **Figures 3 to 6.**

Groundwater depth generally decreased compared to January 2017, indicating water moving towards the surface. pH at all sites is in the acidic to neutral range and generally remained slightly varied when compared to the previous results. EC levels were similar or slightly decreased at a majority of groundwater sites when compared to the January 2017 results.

Table 3: Groundwater Quality Data

Reference	Bore	Type	Depth to water TOC *(m)* April 2006	Depth to water TOC *(m)* This report	pH This report	Electrical Conductivity *(µS/cm)* This report
CQ1	Voutos	* Monitor	20.59	Removed		
CQ3	Voutos	* Monitor	10.53	10.41	6.1	164
CQ4	Voutos	* Monitor	8.78	10.46	5.4	105
CQ5	Gazzana	DIP Only	8.69	5.57	4.9	135
CQ6	Gazzana	DIP Only	16.00	Removed		
CQ7	Gazzana	* Monitor	6.89	5.62	4.7	89
CQ8	Gazzana	* Monitor	11.03	5.26	5.8	130
CQ9	Gazzana	DIP Only	10.10	Unable to sample - pipe bent		
CQ10	Voutos	* Monitor	NI	25.37	4.5	129
CQ11S	Gazzana	* Monitor	NI	10.38	5.3	136
CQ11D	Gazzana	* Monitor	NI	11.48	4.8	142
CQ12	Gazzana	* Monitor	NI	2.61	4.4	114
CQ13	Kashouli	* Monitor	NI	12.61	4.5	174
CP3	Gazzana	Domestic	10.40	Destroyed		
CP4	Kashouli	Domestic	13.63	NM		
CP5	Kashouli	Domestic	16.61	5.42	4.5	117
CP6	Kashouli	Domestic	16.27	8.46	4.6	151
CP7	Kashouli	Production	8.56	0.92	5.7	76
CP8	Rozmanec	Domestic	22.17	20.8	4.4	114
MW7	Rocla Bore	* Monitor	15.76	14.48	4.5	100
MW8	Rocla Bore	* Monitor	9.82	7.16	4.7	66
MW9	Rocla Bore	* Monitor	22.44	23.57	4.6	78
MW10	Rocla Bore	* Monitor	15.41	No Access - track eroded		
MW13	Rocla Bore	DIP Only	NI	No Access - track eroded		
MW16	Rocla Bore	DIP Only	NI	No Access - tree across track		
MW17	Rocla Bore	DIP Only		No Access - tree across track		

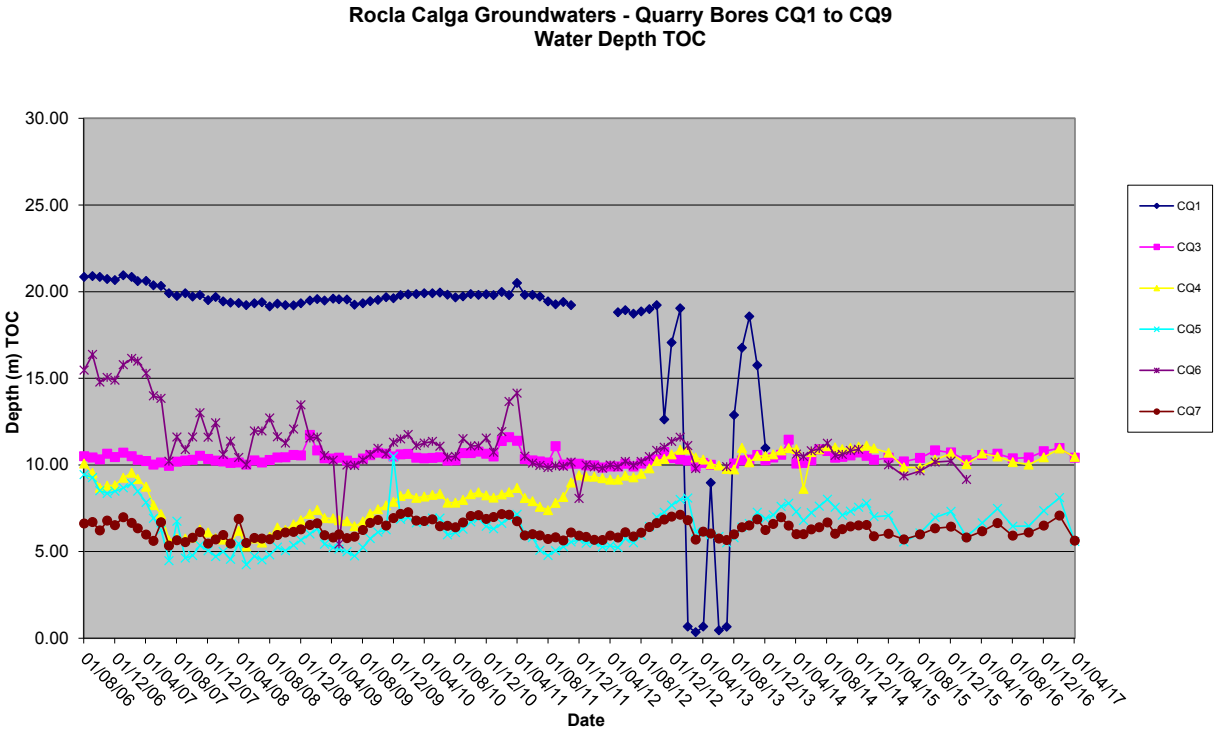
Notes:
TOC = Water level measured from top of bore case to water.
NM = Not Monitored – unable to sample water due to non-operational pump.
NR = Not Required by resident.
* = Logger Installed.
NI = These bores were not installed in April 2006 but are now operational. April 2006 was the first set of measurements taken by Carbon Based Environmental Pty Limited.

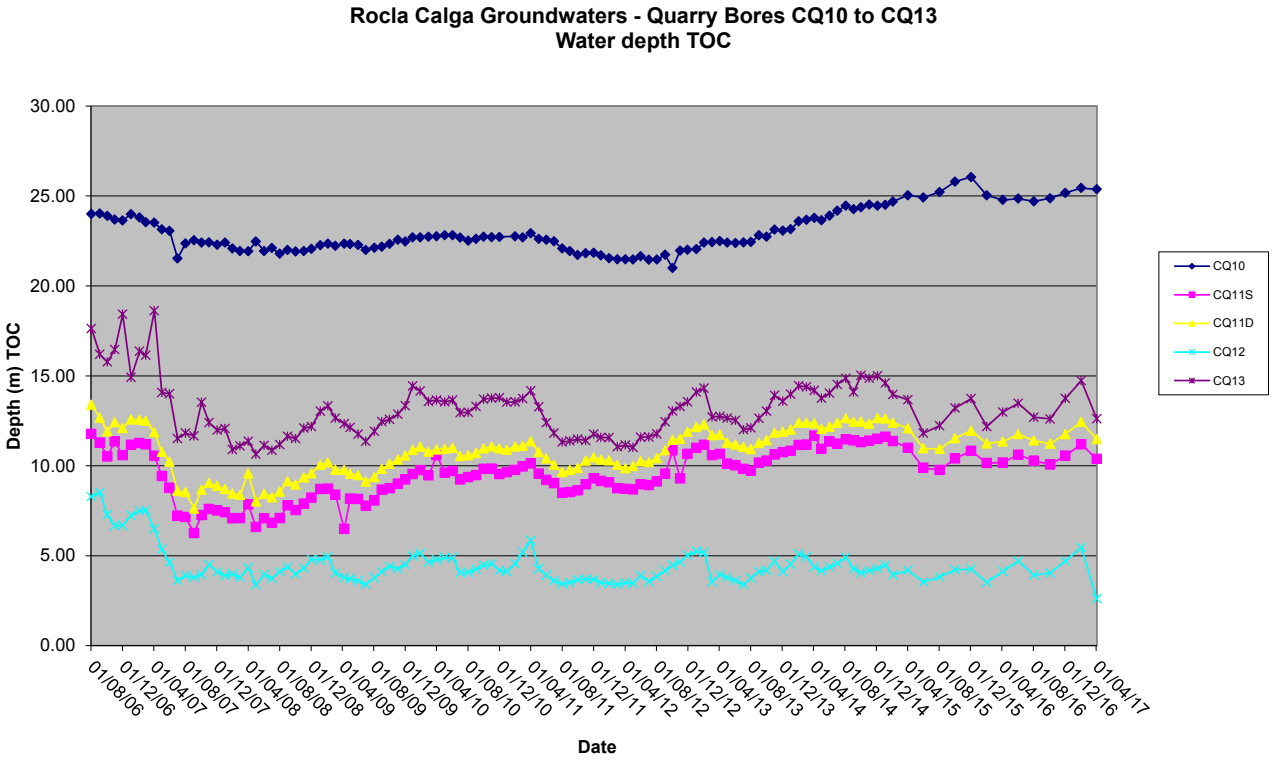
Shading is used to indicate the following trends in water depth (compared to the last reading):

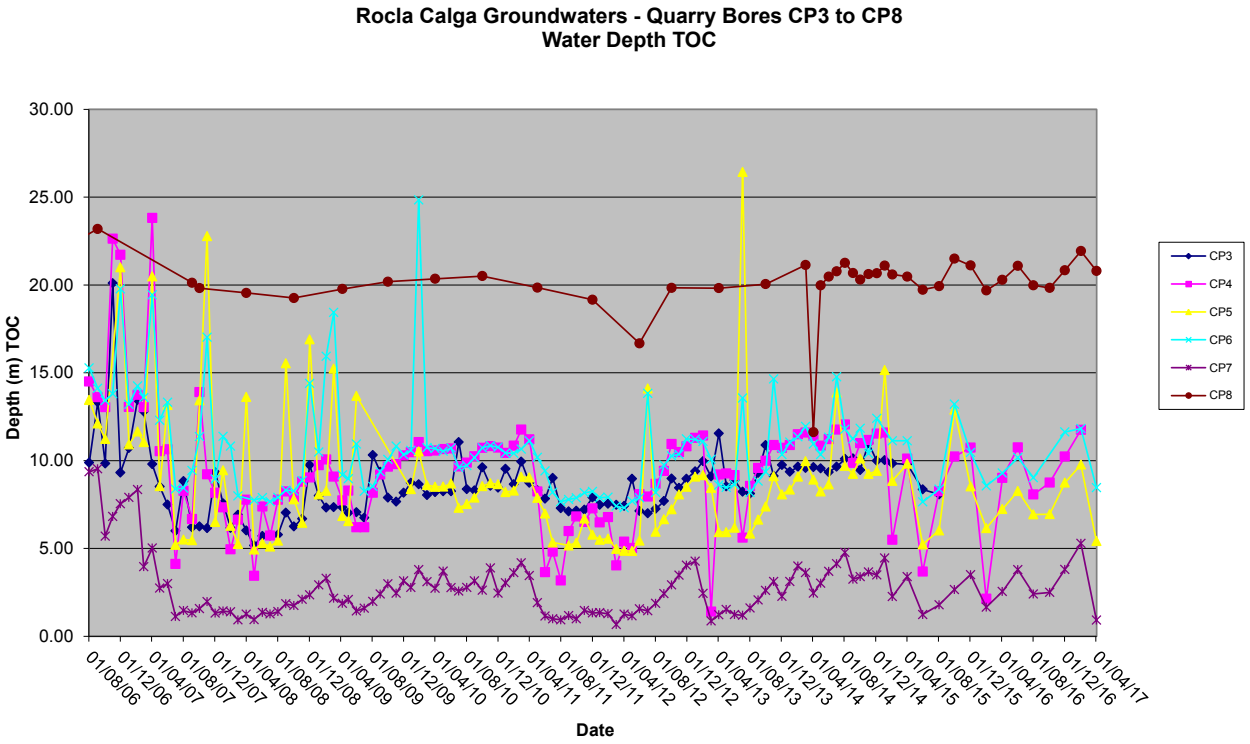
	Increase to ground water depth (water moved away from surface)
	Decrease to ground water depth (water moved towards surface)
	Stable water depth (+/- 0.01m)

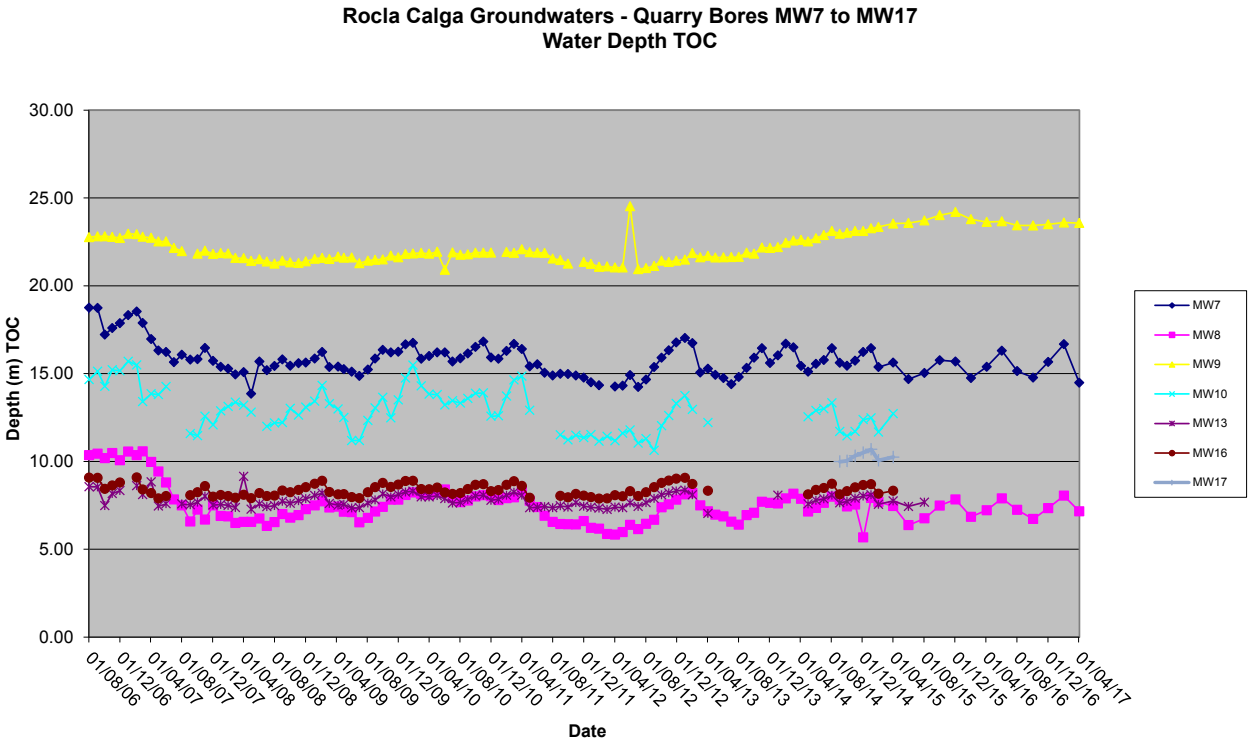
Available groundwater loggers were downloaded and will be forwarded to the Hanson Calga Quarry groundwater consultant.

Figures 3 to 6: Groundwater Depth Charts.






Rocla Calga Groundwaters - Quarry Bores CP3 to CP8
Water Depth TOC
Depth (m) TOC
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Date
CP3
CP4
CP5
CP6
CP7
CP8


Rocla Calga Groundwaters - Quarry Bores MW7 to MW17
Water Depth TOC
Depth (m) TOC
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Date
MW7
MW8
MW9
MW10
MW13
MW16
MW17

2.4 Meteorological Monitoring

The Calga Quarry weather station data recovery in March 2017 was approximately 100%.

The weather station data follows and includes;

- Monthly data numerical summary;
- Weather charts of air temperature, humidity, heat index and wind chill, atmospheric pressure, solar radiation, evapotranspiration, rain, wind speed and data reception; and
- Wind rose (frequency distribution diagram of wind speed and direction).

Monthly weather statistics from the nearby Bureau of Meteorology (BOM) at Peats Ridge station are no longer available. However, the long-term rainfall mean is available via a link on the Gosford BOM Daily Weather Observation page.

Data for March 2017 shows that rainfall recorded at the Calga Quarry was similar to the the Gosford BOM mean rainfall and well below the Peats Ridge long term rainfall for March.

The rainfall comparison is provided below:

Calga Quarry	412.2 mm
BOM Peats Ridge*	NA
BOM Gosford*	399.2 mm
BOM Peats Ridge Long term mean for March*	135.9 mm

NA = Not Available
^Rain data not based on a full set of data.
*Data sourced from Bureau of Meteorology (BOM) website (www.bom.gov.au).

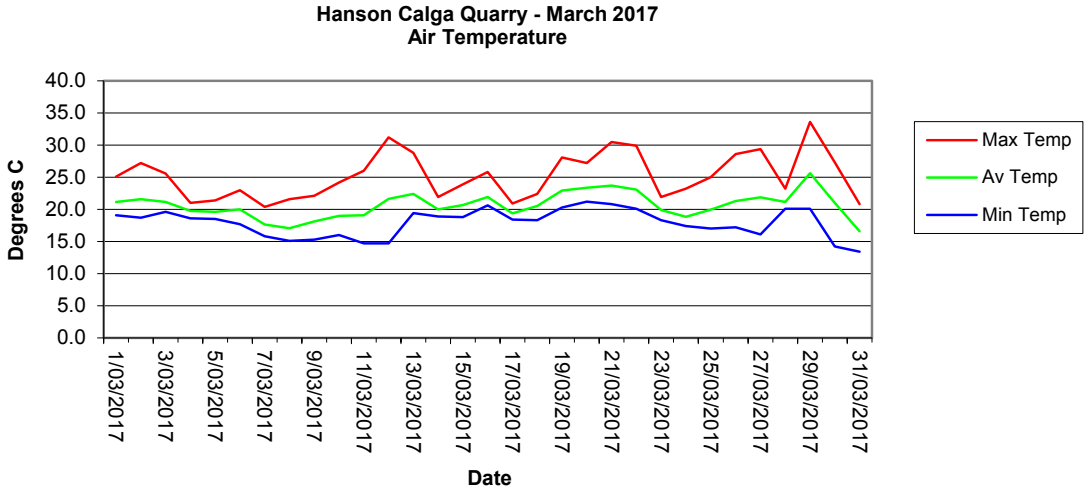
2.4.1 Monthly Meteorological Data Summary

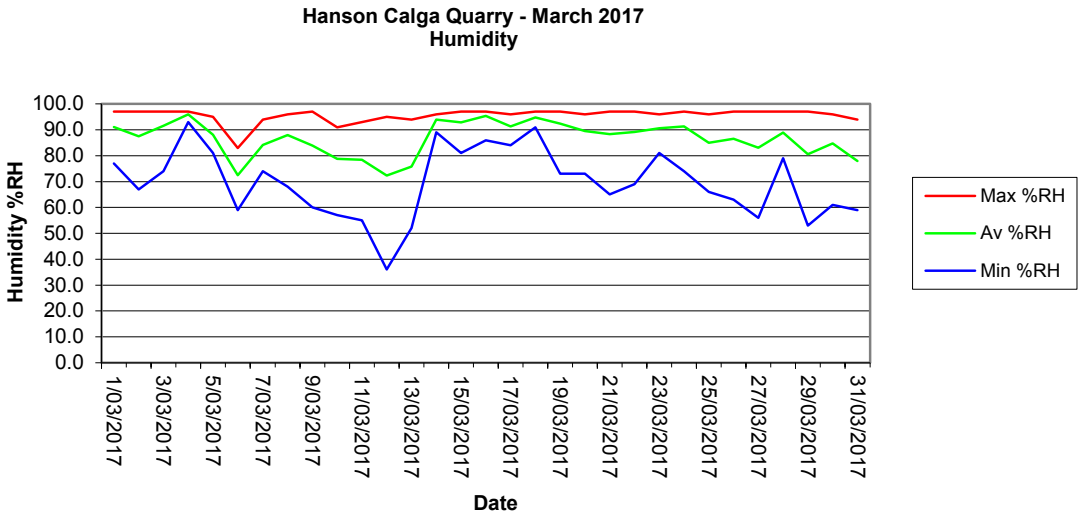
Summary **Mar-17** **Hanson - Calga**

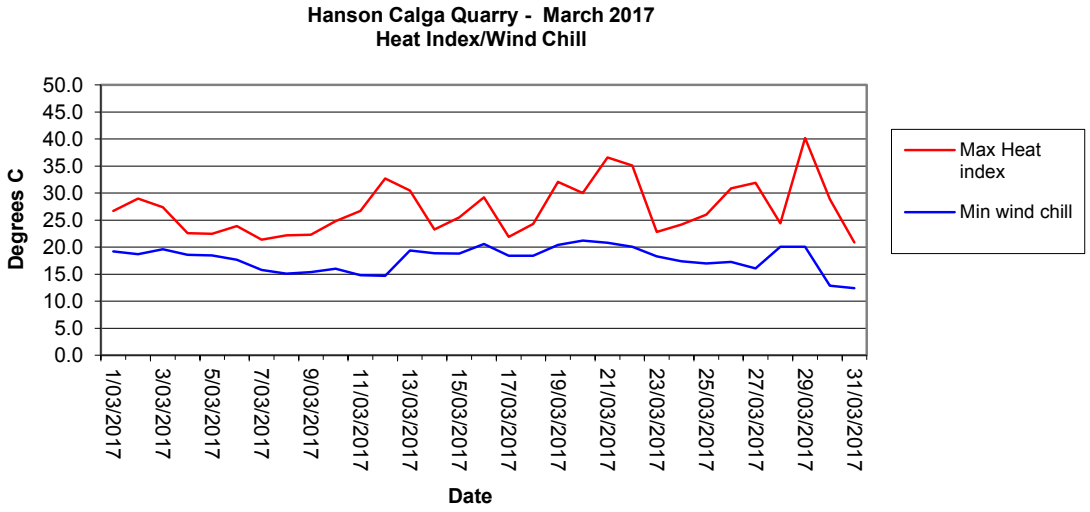
Date	Min Temp	Av Temp	Max Temp	Min %RH	Av %RH	Max %RH	RAIN mm	Min WS	Av WS	Max WS	Min wind chill	Max Heat index	Min Atm P	Av Atm P	Max Atm P	Min Data %	Av data %	Max Data %
1/03/2017	19.1	21.1	25.1	77.0	91.1	97.0	6.0	0.0	0.7	7.2	19.2	26.7	1015.1	1016.5	1017.9	92.6	99.7	100.0
2/03/2017	18.7	21.6	27.2	67.0	87.5	97.0	1.0	0.0	0.5	6.3	18.7	29.0	1012.0	1014.0	1016.0	86.2	98.8	100.0
3/03/2017	19.6	21.2	25.6	74.0	91.6	97.0	39.0	0.0	0.7	9.4	19.6	27.4	1011.6	1012.8	1014.1	70.8	94.7	100.0
4/03/2017	18.6	19.8	21.0	93.0	96.0	97.0	17.4	0.0	0.8	9.4	18.6	22.6	1008.9	1010.7	1013.2	72.6	97.4	100.0
5/03/2017	18.5	19.6	21.4	81.0	88.0	95.0	4.6	0.0	1.2	10.3	18.5	22.5	1006.2	1007.3	1008.6	100.0	100.0	100.0
6/03/2017	17.7	20.0	23.0	59.0	72.5	83.0	0.0	0.4	2.4	12.5	17.7	23.9	1007.5	1010.0	1013.4	84.6	97.9	100.0
7/03/2017	15.8	17.6	20.4	74.0	84.2	94.0	2.0	0.0	1.2	10.3	15.8	21.4	1012.6	1014.5	1016.3	74.5	94.0	100.0
8/03/2017	15.1	17.1	21.6	68.0	87.9	96.0	6.4	0.0	0.5	9.4	15.1	22.2	1014.0	1015.0	1016.0	68.6	94.7	100.0
9/03/2017	15.3	18.1	22.1	60.0	84.0	97.0	5.6	0.0	0.5	7.2	15.4	22.3	1012.5	1013.6	1014.7	57.8	89.1	100.0
10/03/2017	16.0	19.0	24.2	57.0	78.8	91.0	0.0	0.0	0.8	9.4	16.0	24.8	1010.5	1011.9	1013.2	21.2	82.2	100.0
11/03/2017	14.7	19.1	26.0	55.0	78.4	93.0	0.0	0.0	0.8	5.8	14.8	26.7	1008.1	1010.2	1012.1	59.7	83.3	98.2
12/03/2017	14.7	21.6	31.2	36.0	72.3	95.0	0.0	0.0	1.8	9.8	14.7	32.7	1003.2	1006.2	1009.8	62.8	76.2	91.1
13/03/2017	19.4	22.4	28.8	52.0	75.8	94.0	14.4	0.0	1.9	12.5	19.4	30.5	1003.9	1008.1	1013.2	12.9	77.2	100.0
14/03/2017	18.9	20.0	21.9	89.0	93.9	96.0	56.6	0.0	1.4	10.3	18.9	23.3	1012.6	1015.3	1017.5	53.5	91.4	100.0
15/03/2017	18.8	20.7	23.9	81.0	92.8	97.0	17.4	0.0	1.8	10.7	18.8	25.5	1013.5	1015.9	1017.6	65.5	90.8	100.0
16/03/2017	20.6	21.9	25.8	86.0	95.3	97.0	65.4	0.0	1.6	10.3	20.6	29.2	1005.1	1008.5	1013.2	53.5	91.7	100.0
17/03/2017	18.4	19.4	20.9	84.0	91.3	96.0	14.0	0.0	2.7	13.4	18.4	21.9	1008.4	1014.8	1018.7	55.1	91.9	100.0
18/03/2017	18.3	20.5	22.4	91.0	94.8	97.0	39.8	0.4	2.6	11.6	18.4	24.3	1017.0	1018.6	1019.8	66.5	88.4	100.0
19/03/2017	20.3	22.9	28.1	73.0	92.3	97.0	19.0	0.4	3.5	10.7	20.4	32.1	1013.5	1015.7	1018.3	44.3	75.4	100.0
20/03/2017	21.2	23.3	27.2	73.0	89.5	96.0	0.0	0.0	0.8	8.0	21.2	30.0	1011.5	1013.8	1015.4	39.4	67.3	94.8
21/03/2017	20.8	23.7	30.5	65.0	88.3	97.0	11.0	0.0	0.4	7.6	20.8	36.6	1008.6	1011.1	1013.0	46.2	69.6	100.0
22/03/2017	20.1	23.1	29.9	69.0	89.2	97.0	22.2	0.0	0.7	10.7	20.1	35.1	1007.0	1009.6	1013.5	48.9	83.3	100.0
23/03/2017	18.3	19.9	21.9	81.0	90.6	96.0	1.8	0.0	0.5	6.3	18.3	22.8	1013.0	1014.7	1016.5	64.3	90.6	100.0
24/03/2017	17.4	18.9	23.2	74.0	91.4	97.0	4.0	0.0	0.4	7.2	17.4	24.2	1014.6	1016.4	1017.5	57.5	85.0	100.0
25/03/2017	17.0	19.9	25.0	66.0	85.0	96.0	0.0	0.0	0.4	5.4	17.0	26.0	1010.2	1013.3	1016.6	55.7	76.2	87.7
26/03/2017	17.2	21.3	28.6	63.0	86.6	97.0	0.0	0.0	0.9	6.7	17.3	30.9	1010.6	1012.4	1014.8	64.6	77.6	85.8
27/03/2017	16.1	21.9	29.4	56.0	83.1	97.0	0.2	0.0	0.8	7.2	16.1	31.9	1007.1	1010.8	1014.4	39.7	81.7	100.0
28/03/2017	20.1	21.2	23.2	79.0	88.9	97.0	0.4	0.0	0.3	5.8	20.1	24.4	1006.6	1009.7	1011.5	46.8	83.0	100.0
29/03/2017	20.1	25.6	33.6	53.0	80.6	97.0	0.2	0.0	0.6	6.7	20.1	40.2	1003.1	1006.6	1010.3	56.0	86.6	100.0
30/03/2017	14.2	21.0	27.3	61.0	84.8	96.0	62.6	0.0	1.8	13.9	12.9	28.9	1001.9	1005.2	1010.8	51.7	89.6	100.0
31/03/2017	13.4	16.6	20.8	59.0	77.9	94.0	1.2	0.0	1.9	11.2	12.4	20.9	1010.4	1012.9	1015.4	58.5	94.5	100.0
Monthly	13.4	20.6	33.6	36	87	97	412.2	0	1.2	13.9	12.4	40.2	1001.9	1012.1	1019.8	12.9	87.1	100

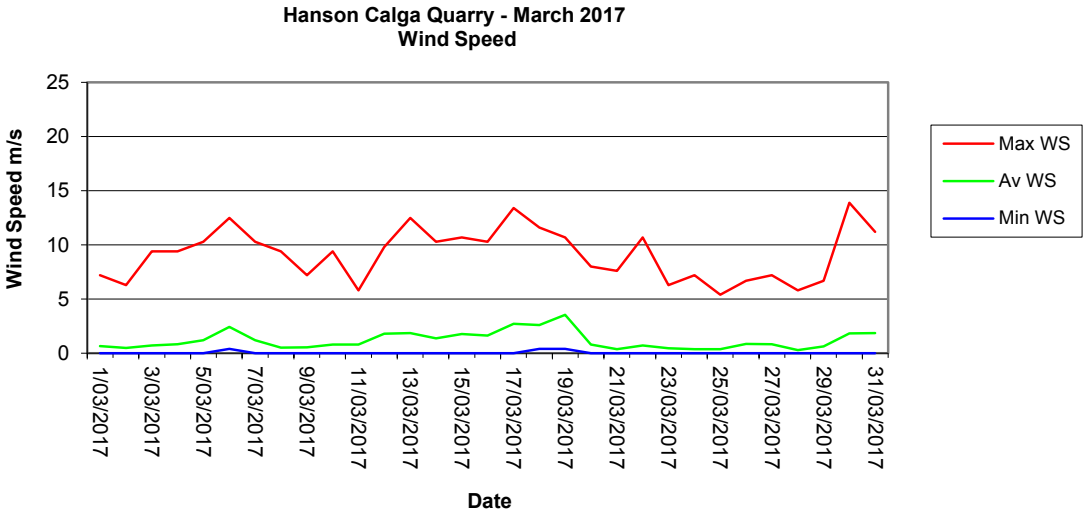
No data

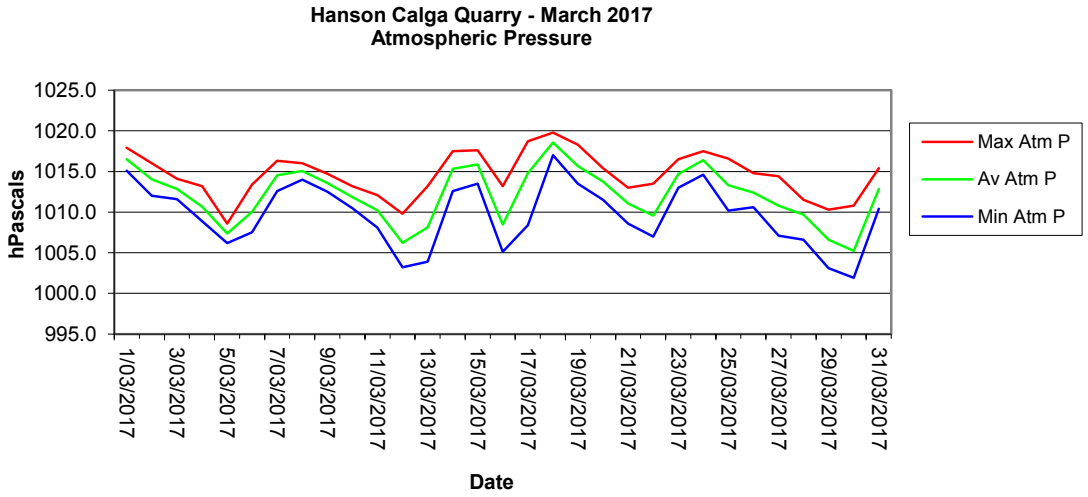
2.4.2 Monthly Weather Charts

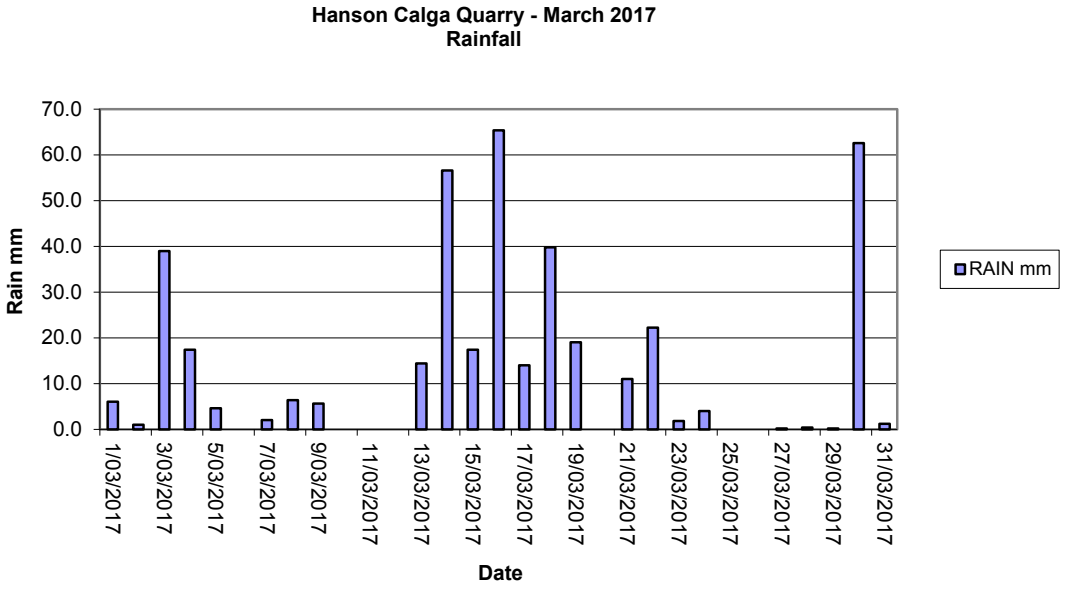


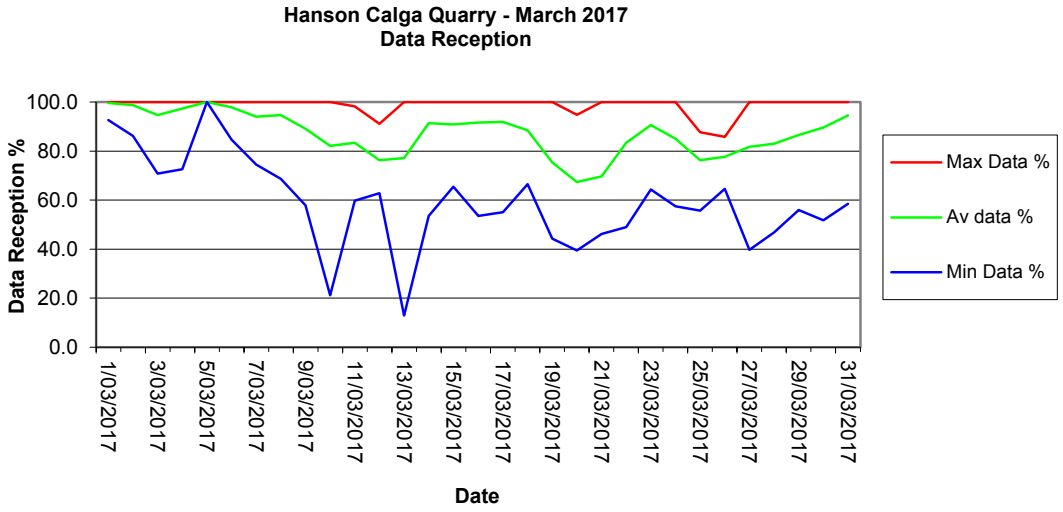





Hanson Calga Quarry - March 2017
Wind Speed
Wind Speed m/s
25
20
15
10
5
0
1/03/2017
3/03/2017
5/03/2017
7/03/2017
9/03/2017
11/03/2017
13/03/2017
15/03/2017
17/03/2017
19/03/2017
21/03/2017
23/03/2017
25/03/2017
27/03/2017
29/03/2017
31/03/2017
Date
Max WS
Av WS
Min WS


Hanson Calga Quarry - March 2017
Atmospheric Pressure
hPascals
1025.0
1020.0
1015.0
1010.0
1005.0
1000.0
995.0
1/03/2017
3/03/2017
5/03/2017
7/03/2017
9/03/2017
11/03/2017
13/03/2017
15/03/2017
17/03/2017
19/03/2017
21/03/2017
23/03/2017
25/03/2017
27/03/2017
29/03/2017
31/03/2017
Date
Max Atm P
Av Atm P
Min Atm P

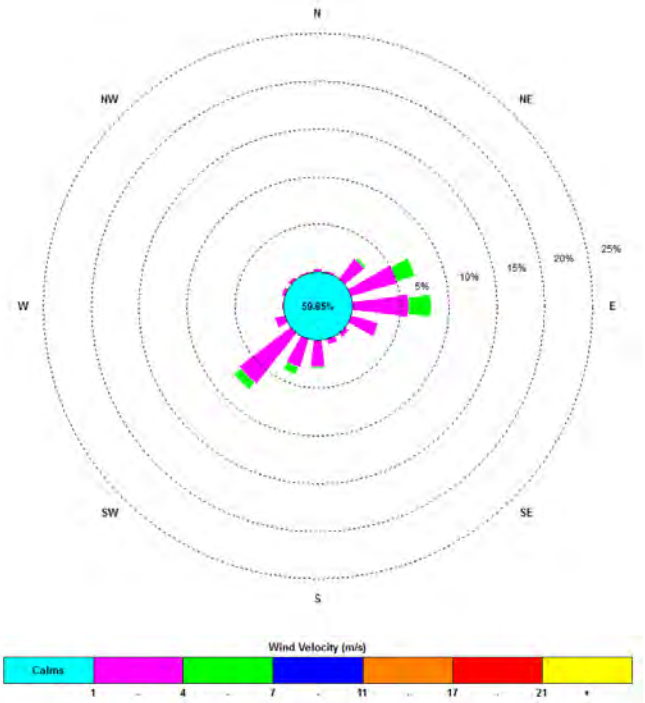

Hanson Calga Quarry - March 2017
Rainfall
Rain mm
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
1/03/2017
3/03/2017
5/03/2017
7/03/2017
9/03/2017
11/03/2017
13/03/2017
15/03/2017
17/03/2017
19/03/2017
21/03/2017
23/03/2017
25/03/2017
27/03/2017
29/03/2017
31/03/2017
Date
RAIN mm


Hanson Calga Quarry - March 2017
Data Reception
Data Reception %
100.0
80.0
60.0
40.0
20.0
0.0
1/03/2017
3/03/2017
5/03/2017
7/03/2017
9/03/2017
11/03/2017
13/03/2017
15/03/2017
17/03/2017
19/03/2017
21/03/2017
23/03/2017
25/03/2017
27/03/2017
29/03/2017
31/03/2017
Date
Max Data %
Av data %
Min Data %

2.4.3 Monthly Windrose Plot

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.

00:15, 1 March 2017 – 23:45, 31 March 2017



The predominant winds were from the E and ENE and SW, with most frequent, strongest winds also from the E. The maximum wind speed was 13.9 m/s from the SSW.

Appendix 1

Field Sheets

Chain of Custody

Laboratory Certificates

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN1701297**	Page	: 1 of 4
Client	: **CBASED ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: All Deliverables	Contact	:
Address	: 47 BOOMERANG ST CESSNOCK NSW, AUSTRALIA 2325	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	: 03-Apr-2017 14:30
Order number	: ----	Date Analysis Commenced	: 04-Apr-2017
C-O-C number	: ----	Issue Date	: 07-Apr-2017 15:52
Sampler	: CARBON BASED ENVIRONMENTAL PTY LTD		
Site	:		
Quote number	: SYBQ/222/16		
No. of samples received	: 6		
No. of samples analysed	: 6		

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

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- Analytical Results

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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*
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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
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ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Analysis as per AS3580.10.1-2003. 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 2/03/17 - 3/04/17	CD2c 2/03/17 - 3/04/17	CD3 2/03/17 - 3/04/17	CD4 2/03/17 - 3/04/17	CD5 2/03/17 - 3/04/17
				Client sampling date / time	03-Apr-2017 00:00	03-Apr-2017 00:00	03-Apr-2017 00:00	03-Apr-2017 00:00	03-Apr-2017 00:00
Compound	CAS Number	LOR	Unit		EN1701297-001	EN1701297-002	EN1701297-003	EN1701297-004	EN1701297-005
					Result	Result	Result	Result	Result
EA120: Ash Content									
Ash Content	----	0.1	g/m².month		**0.5**	**0.2**	**0.2**	**0.1**	**0.1**
Ash Content (mg)	----	1	mg		**9**	**4**	**3**	**2**	**1**
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month		**0.3**	**0.3**	**0.2**	**0.6**	**0.1**
Combustible Matter (mg)	----	1	mg		**6**	**5**	**5**	**11**	**2**
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month		**0.8**	**0.5**	**0.4**	**0.7**	**0.2**
Total Insoluble Matter (mg)	----	1	mg		**15**	**9**	**8**	**13**	**3**

Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST** (Matrix: **AIR**)			Client sample ID	**CD6 2/03/17 - 3/04/17**	----	----	----	----
			Client sampling date / time	03-Apr-2017 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EN1701297-006**	--------	--------	--------	--------
				Result	---	---	---	---
EA120: Ash Content								
Ash Content	----	0.1	g/m².month	**0.1**	----	----	----	----
Ash Content (mg)	----	1	mg	**2**	----	----	----	----
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m².month	**0.3**	----	----	----	----
Combustible Matter (mg)	----	1	mg	**5**	----	----	----	----
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m².month	**0.4**	----	----	----	----
Total Insoluble Matter (mg)	----	1	mg	**7**	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1707841**	Page	: 1 of 4
Client	: **CBASED ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: All Deliverables	Contact	: Customer Services ES
Address	: 47 BOOMERANG ST CESSNOCK NSW, AUSTRALIA 2325	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6571 3334	Telephone	: +61-2-8784 8555
Project	: Hanson Quarry	Date Samples Received	: 03-Apr-2017 14:33
Order number	: ----	Date Analysis Commenced	: 03-Apr-2017
C-O-C number	: ----	Issue Date	: 07-Apr-2017 13:54
Sampler	: CARBON BASED ENVIRONMENTAL PTY LTD		
Site	:		
Quote number	: SYBQ/222/16		
No. of samples received	: 6		
No. of samples analysed	: 6		

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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 the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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.

- 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	03-Apr-2017 09:05	03-Apr-2017 08:40	03-Apr-2017 12:30	03-Apr-2017 12:35	03-Apr-2017 09:55
Compound	*CAS Number*	*LOR*	*Unit*		**ES1707841-001**	**ES1707841-002**	**ES1707841-003**	**ES1707841-004**	**ES1707841-005**
					Result	Result	Result	Result	Result
EA005: pH									
pH Value	----	0.01	pH Unit		**5.95**	**6.66**	**6.38**	**6.22**	**5.48**
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**60**	**96**	**104**	**132**	**68**
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**55**	**198**	**64**	**84**	**48**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**16**	**74**	<5	<5	<5
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L		<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Client sample ID	F	----	----	----	----
				Client sampling date / time	03-Apr-2017 08:45	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1707841-006	-------	-------	-------	-------
					Result	---	---	---	---
EA005: pH									
pH Value	----	0.01	pH Unit		**6.31**	----	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**63**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**118**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**115**	----	----	----	----
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L		<5	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WN1701048**	Page	: 1 of 2
Client	: **CBASED ENVIRONMENTAL PTY LTD**	Laboratory	: ALS Water - Newcastle
Contact	: MR PAUL SLOUGH	Contact	: Andrea Swan
Address	: 47 BOOMERANG ST CESSNOCK NSW, AUSTRALIA 2325	Address	: 5/585 Maitland Road Newcastle West NSW Australia 2304
Telephone	: ----	Telephone	: +61 2 4014 2500
Project	: Hanson Calga Waters	Date Samples Received	: 17-Mar-2017 09:00
Order number	: ----	Date Analysis Commenced	: 17-Mar-2017
C-O-C number	: ----	Issue Date	: 23-Mar-2017 15:47
Sampler	: ----		
Site	:		
Quote number	: SYBQ/222/16		
No. of samples received	: 4		
No. of samples analysed	: 4		

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Signatories

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Signatories	*Position*	*Accreditation Category*
Neil Martin	Team Leader - Chemistry	Chemistry, Newcastle West, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Client sample ID	A	B	D	F	----
				Client sampling date / time	14-Mar-2017 00:00	14-Mar-2017 00:00	14-Mar-2017 00:00	14-Mar-2017 00:00	----
Compound	*CAS Number*	*LOR*	*Unit*		**WN1701048-001**	**WN1701048-002**	**WN1701048-003**	**WN1701048-004**	--------
					Result	Result	Result	Result	---
EA005: pH									
pH Value	----	0.01	pH Unit		**6.89**	**6.33**	**6.35**	**6.26**	----
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	10	µS/cm		**86**	**106**	**60**	**23**	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	1	mg/L		**79**	**110**	**59**	**12**	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	1	mg/L		**98**	**42**	<1	**78**	----
EP021: Total Oil and Grease									
Total Oil and Grease	----	2	mg/L		<2	<2	**3**	<2	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1706407**	Page	: 1 of 2
Client	: **CBASED ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL SLOUGH	Contact	: Customer Services ES
Address	: 47 BOOMERANG ST CESSNOCK NSW, AUSTRALIA 2325	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: HANSON CALGA WATERS	Date Samples Received	: 17-Mar-2017 15:26
Order number	: ----	Date Analysis Commenced	: 20-Mar-2017
C-O-C number	: ----	Issue Date	: 23-Mar-2017 13:31
Sampler	: ----		
Site	:		
Quote number	: SYBQ/222/16		
No. of samples received	: 4		
No. of samples analysed	: 4		

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Accreditation No. 825
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ISO/IEC 17025 - Testing

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

General Comments

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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 no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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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.

- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Analysis as per AS3580.10.1-2003. 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: WATER (Matrix: WATER)			Client sample ID	A	B	D	F	----
			Client sampling date / time	16-Mar-2017 00:00	16-Mar-2017 00:00	16-Mar-2017 00:00	16-Mar-2017 00:00	----
Compound	CAS Number	LOR	Unit	ES1706407-001	ES1706407-002	ES1706407-003	ES1706407-004	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.49	6.66	6.27	6.55	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	70	100	63	74	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	165	267	75	208	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	220	86	<5	208	----
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	----