Carbon Based Environmental
Pty Limited
ABN 74 102 920 285

Rocla Quarry Products
Calga Quarry

Environmental Monitoring

Dust Deposition Gauges, Surface and Ground Waters and Meteorological Station

August 2013

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 23 September 2013

Executive Summary

Carbon Based Environmental is contracted by Rocla 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 Carbon Based Environmental and includes the following;

- Dust Deposition results for August 2013;
- Surface Water quality results for August 2013;
- Groundwater depth and quality results for August 2013; and
- Meteorological report for August 2013.

The August 2013 dust deposition results for insoluble solids were generally low and free of major contamination this month. 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.

Surface water samples were collected on 2 September at sites A, and F. Sites B, C and D were inaccessible and unable to be sampled this month. The samples were collected and analysed for a monthly sampling event. Results show pH within the acidic to neutral range, low Electrical Conductivity, low Total Dissolved Solids and low Total Suspended Solids. Oil and Grease was not detected at any site.

Groundwaters were sampled for normal monthly monitoring on 2 September 2013. Groundwater depth generally increased across the sampled groundwater bores when compared to last month with the exception being CQ9 which decreased in depth. Groundwater pH and EC were generally stable this month with the exception of CQ3, CQ8 and CQ10 which showed lower pH results when compared to the previous month.

The meteorological station data recovery for the month was approximately 100%. Recorded rainfall on site for August was 12.2 mm, which was lower than the Peats Ridge long-term average for August. A comparison is shown below:

Rocla Calga Quarry	12.2 mm
BOM Peats Ridge*	NA
BOM Gosford*	15.4 mm
BOM Peats Ridge Long term mean for August*	78.8 mm

NA = Not Available

*Data sourced from Bureau of Meteorology (BOM) website (www.bom.gov.au). No data was available from the BOM Peats Ridge station for August 2013

Note: Differences in the daily rainfall readings between BOM and the Rocla station may occur due to BOM stations reporting rainfall at 9am and the Rocla station recording rainfall at midnight.

1.0 Sampling Program

Rocla Calga Quarry conducts environmental monitoring in accordance to Development Consent, OEH (EPA) licence and Environmental Management Plans. Carbon Based Environmental are contracted to undertake dust deposition gauge, surface and groundwater and meteorological monitoring for the project. Carbon Based 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 10.1 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 at least bi-monthly for water quality and at least quarterly for water level. 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. Wind parameters are measured according to Australian Standard AS 2923 "Ambient Air— Guide for Measurement of Horizontal Wind for Air Quality Applications".

The weather stations have the following sensor configuration;
Air temperature

- Humidity
- Rainfall
- Atmospheric pressure
- Evaporation
- Solar radiation
- Wind speed
- Wind direction

Carbon Based 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: Rocla Calga Quarry environmental monitoring locations

2.0 Monthly Results

2.1 Dust Deposition Gauges

Table 1 displays the results for August 2013 and the project 12 month rolling average. Results are in g/m^2.month.

Table 1: Dust Deposition results: 2 August 2013 – 2 September 2013 (31 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	1.4
CD2c	1.9	0.5	1.4	26	1.2
CD3	0.8	0.7	0.1	88	0.8
CD4	0.4	0.3	0.1	75	0.4
CD5	0.2	0.2	<0.1	100	0.4
CD6	0.5	0.2	0.3	40	0.5

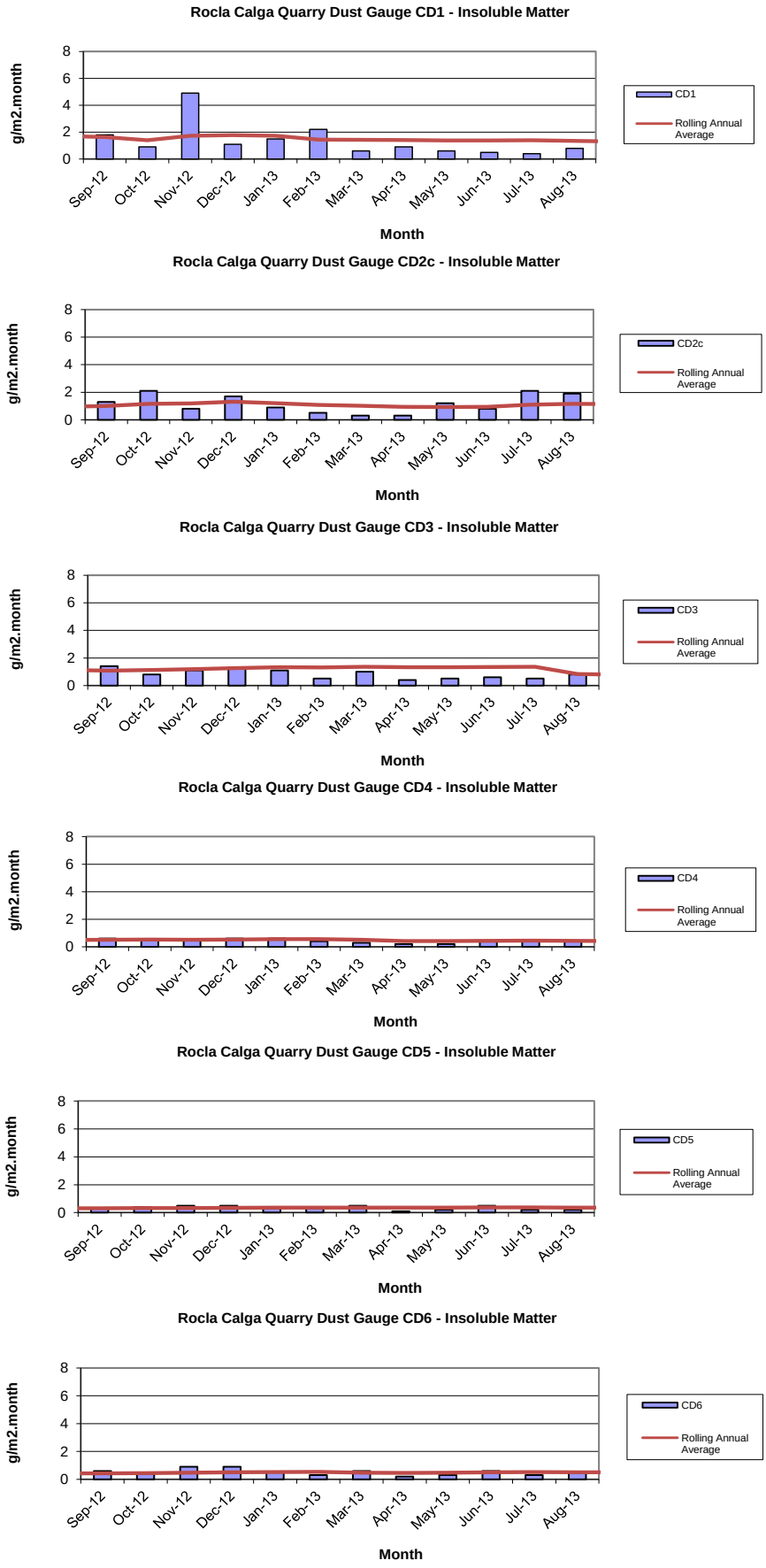
Insoluble Solids marked with an * indicate an excessively contaminated gauge. Contamination can include bird droppings, vegetation (such as plant matter, algae, pollen and seeds) and insects. Results in bold indicate insoluble solids levels above 3.7 g/m^2.month; the Development Consent's annual average amenity criteria at residential locations. The current rolling annual average is calculated from September 2012 to August 2013.

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 2 September 2013 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1.**

Table 2: Monthly surface water monitoring – August 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	Clear	Slight	6.33	62	36	<5	<5
B	Dry							
C	No access							
D	Dry							
F	Dam	Clear	Clear	6.54	60	34	<5	<5

Samples were collected at sites A and F. Sites B, C and D were dry or inaccessible and unable to be sampled this month. The samples were collected and analysed for a monthly sampling event. Results show pH within the acidic to neutral range, low Electrical Conductivity, low Total Dissolved Solids and low Total Suspended Solids. Oil and Grease was not detected at any site.

2.3 Groundwater Monitoring

Groundwaters were sampled on 2 September 2013. Water quality tests for pH and electrical conductivity were conducted by Carbon Based 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 decreased at a majority of sites compared to last month, indicating water generally moved away from the surface. The only exception being CQ9 which showed a slight decrease in depth.

pH at all sites is in the acidic to neutral range. pH levels remained steady across all sampled sites with the exception of CQ3, CQ8 and CQ10 which decreased in pH. EC levels were generally similar when compared to the results obtained in July 2013.

Table 3: Groundwater Quality Data

Reference	Bore	Type	Depth to water TOC (m) April 06	Depth to water TOC (m) This report	pH This report	Electrical Conductivity (µS/cm) This report
CQ1	Voutos	* Monitor	20.59	16.76	7.4	195
CQ3	Voutos	* Monitor	10.53	10.26	5.1	185
CQ4	Voutos	* Monitor	8.78	10.98	4.3	114
CQ5	Gazzana	DIP Only	8.69	6.41	3.9	189
CQ6	Gazzana	DIP Only	16.00	NM	NM	NM
CQ7	Gazzana	* Monitor	6.89	6.39	4.4	123
CQ8	Gazzana	* Monitor	11.03	5.68	2.6	170
CQ9	Gazzana	DIP Only	10.10	6.09	3.8	131
CQ10	Voutos	* Monitor	NI	22.81	3.6	201
CQ11S	Gazzana	* Monitor	NI	10.18	4.2	185
CQ11D	Gazzana	* Monitor	NI	11.26	4.3	184
CQ12	Gazzana	* Monitor	NI	4.11	4.0	158
CQ13	Kashouli	* Monitor	NI	12.64	4.6	220
CP3	Gazzana	Domestic	10.40	9.3	4.1	170
CP4	Kashouli	Domestic	13.63	9.58	NM	NM
CP5	Kashouli	Domestic	16.61	6.64	4.5	181
CP6	Kashouli	Domestic	16.27	8.84	5.0	229
CP7	Kashouli	Production	8.56	2.07	4.7	164
CP8	Rozmanec	Domestic	22.17	NM	NM	NM
MW7	Rocla Bore	* Monitor	15.76	15.33	4.1	131
MW8	Rocla Bore	* Monitor	9.82	6.94	4.7	105
MW9	Rocla Bore	* Monitor	22.44	21.89	4.3	110
MW10	Rocla Bore	* Monitor	15.41	NM	NM	NM
MW13	Rocla Bore	DIP Only	NI	NM	NM	NM
MW16	Rocla Bore	DIP Only	NI	NM	NM	NM

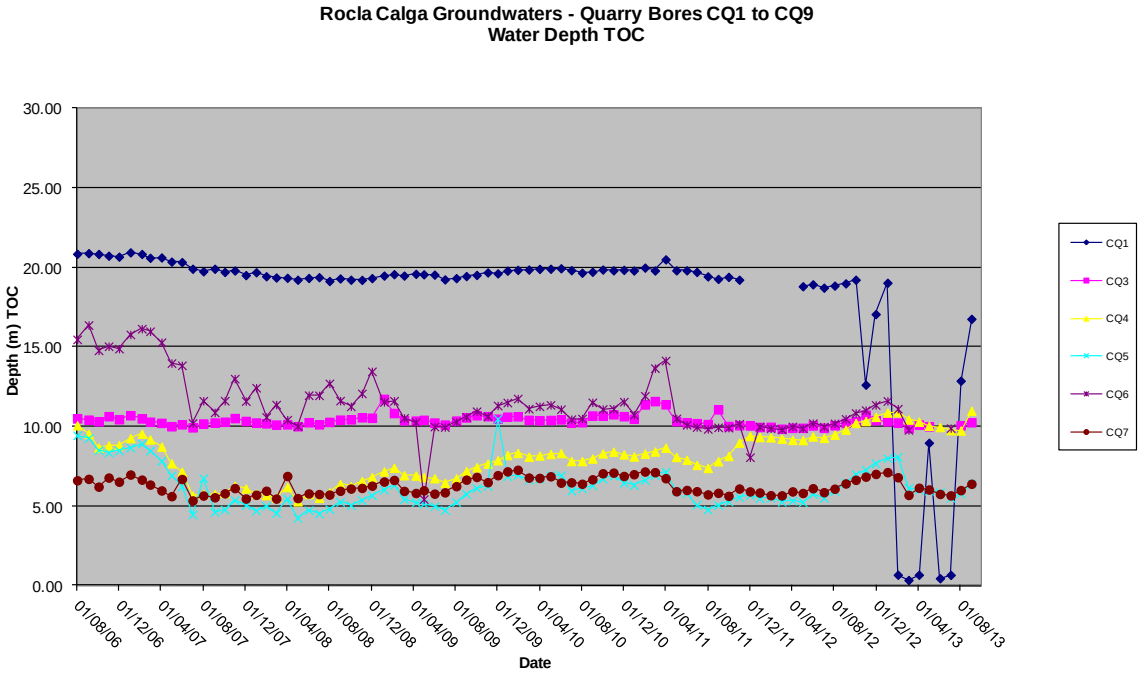
Notes:
TOC = Water level measured from top of bore case to water.
NM = Not Monitored – unable to sample water due to access restrictions.
NR = Not Required by resident.
* = Logger Installed.
NI = These bores were not installed in April 2006 but are now operational. April 2006 was the first set of measurements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

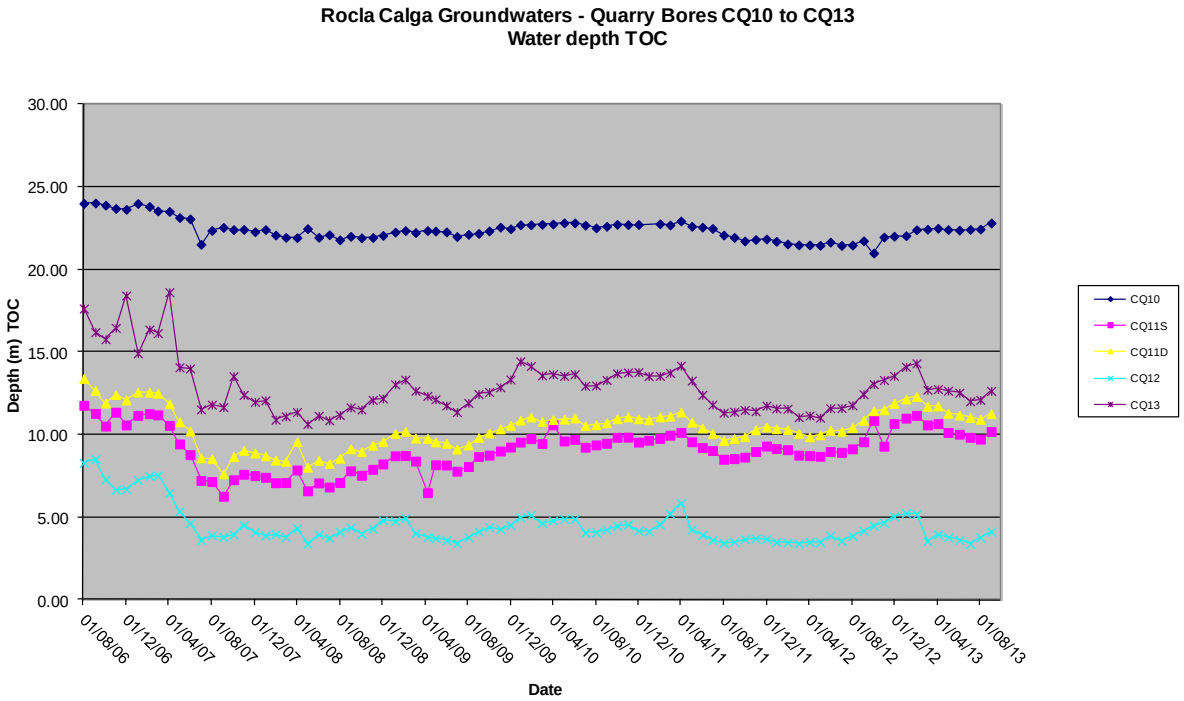
Shading is used to indicate the following trends in water depth (compared to the last reading):

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

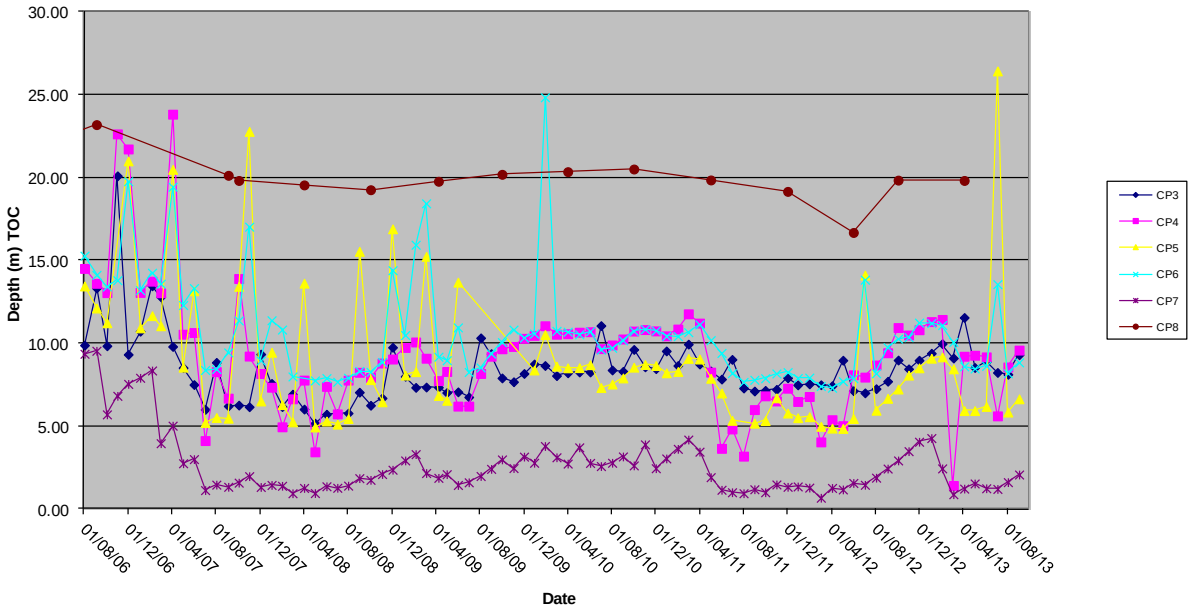
Available groundwater loggers were downloaded and will be forwarded to the Rocla Calga Quarry groundwater consultant.

Figures 3 to 6: Groundwater Depth Charts.

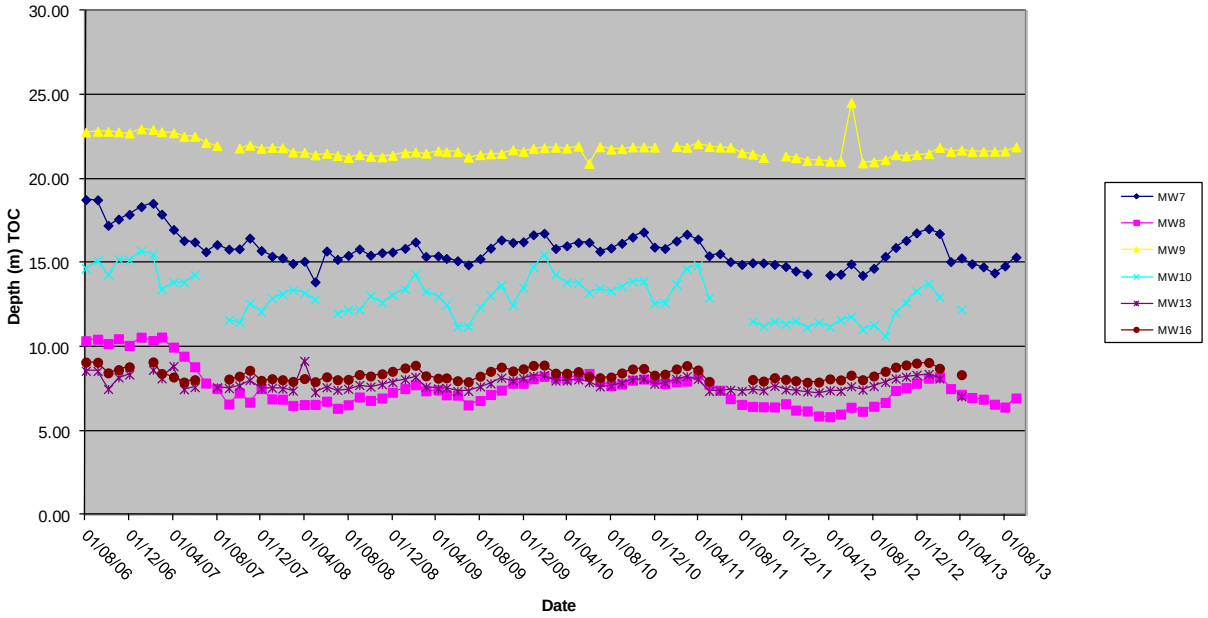




Rocla Calga Groundwaters - Quarry Bores CP3 to CP8
Water Depth TOC



Rocla Calga Groundwaters - Quarry Bores MW7 to MW16
Water Depth TOC



2.4 Meteorological Monitoring

The Rocla Calga Quarry weather station data recovery in August 2013 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 was unavailable for August 2013.

Data for August 2013 shows that rainfall recorded at the Rocla Calga Quarry was lower than the Gosford BOM and significantly lower than the Peats Ridge long term mean rainfall for August 2013. The rainfall comparison is provided below:

Rocla Calga Quarry	12.2 mm
BOM Peats Ridge*	NA
BOM Gosford*	15.4
BOM Peats Ridge Long term mean for August*	78.8 mm

NA = Not Available
*Data sourced from Bureau of Meteorology (BOM) website (www.bom.gov.au).

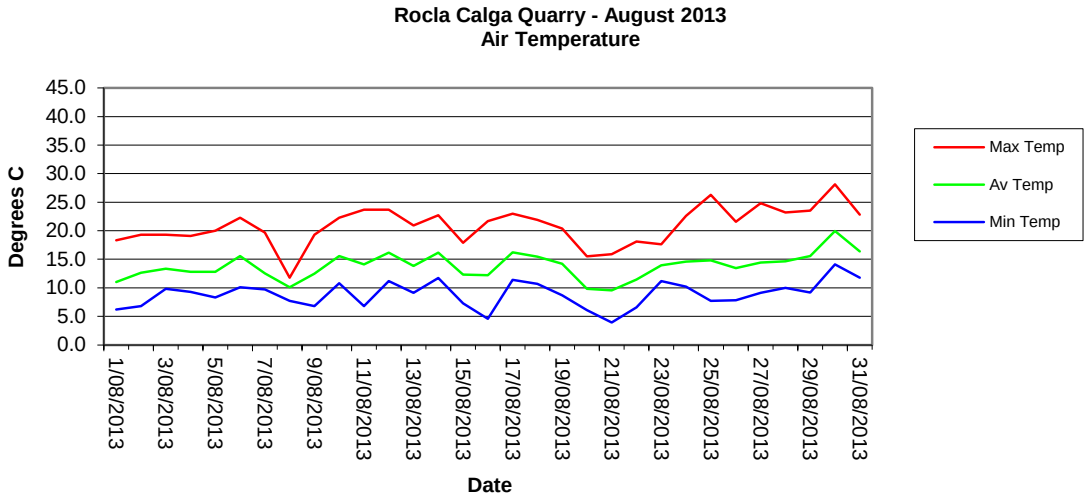
Results are displayed in the following table and figures.

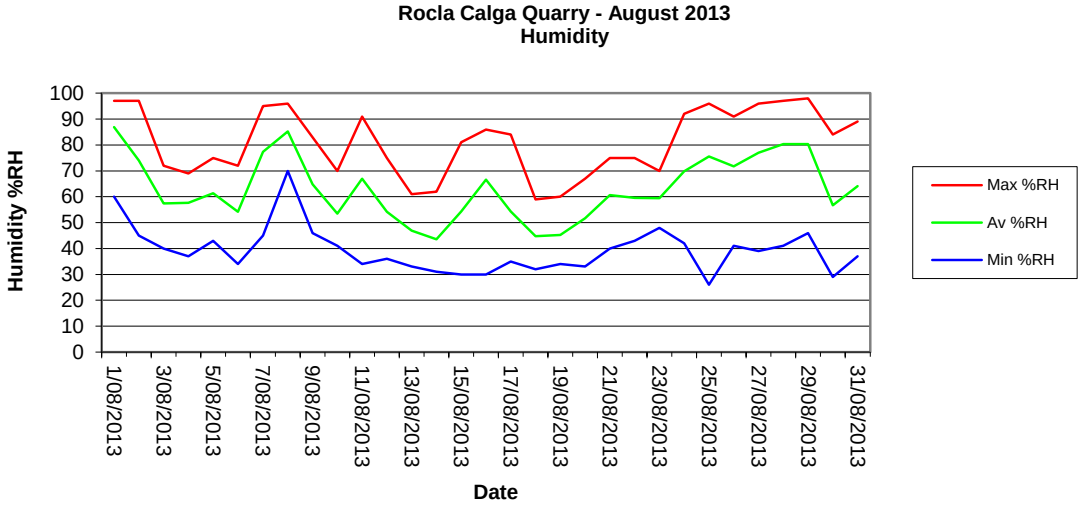
2.4.1 Monthly Meteorological Data Summary

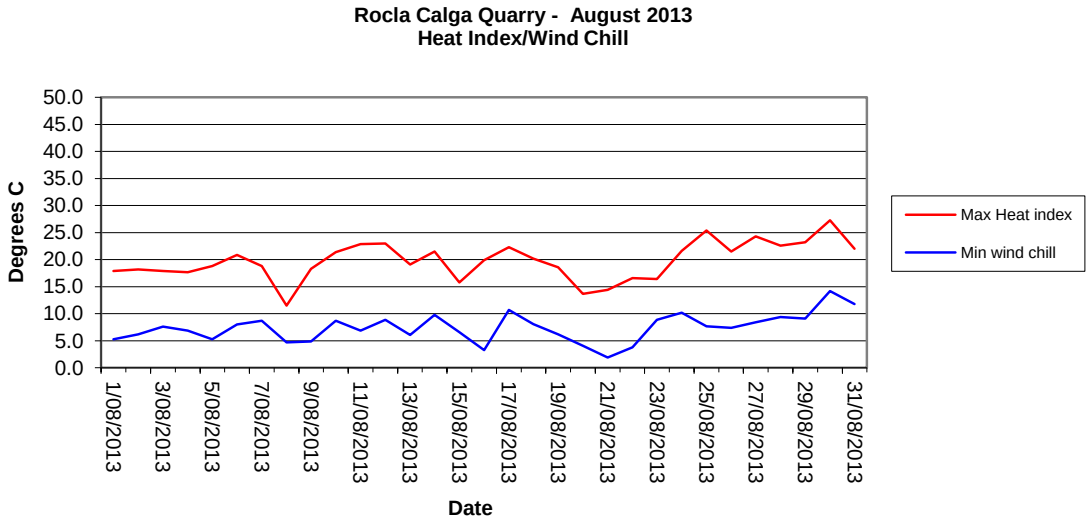
Summary **Aug-13** **Rocla - Calga**

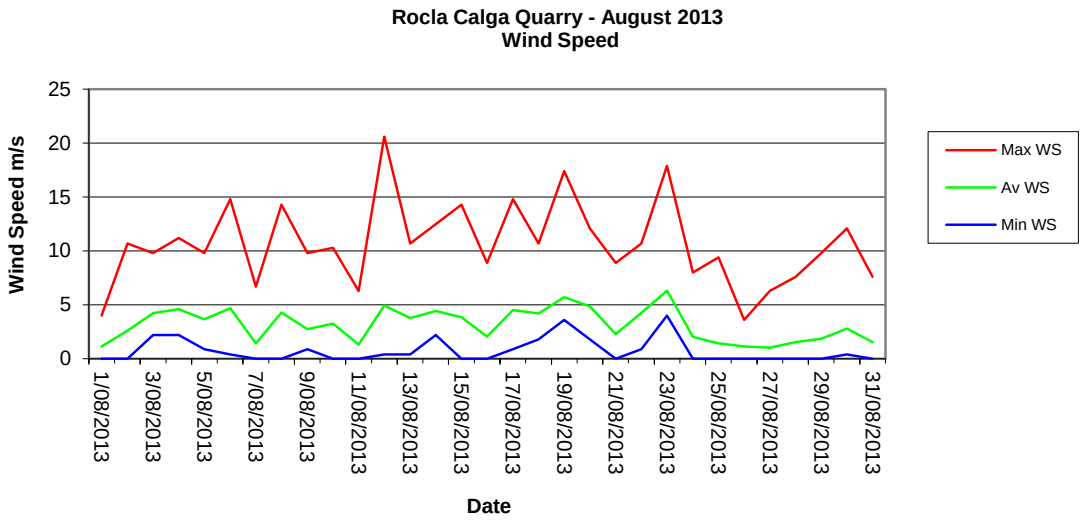
Date	Min Temp	Av Temp	Max Temp	Min %RH	Av %RH	Max %RH	RAIN mm	ET mm	Min WS	Av WS	Max WS	Min wind chill	Max Heat index	Min Atm P	Av Atm P	Max Atm P	Min Solar Rad	Av Solar Rad	Max Solar Rad	Min Data %	Av data %	Max Data %
1/08/2013	6.2	11.0	18.3	60	87	97	0.2	1.1	0	1.1	4	5.3	17.9	1018.9	1020.9	1022.8	0	68.6	654	80.1	99.0	100
2/08/2013	6.8	12.6	19.3	45	74	97	0.2	2.3	0	2.6	10.7	6.2	18.2	1012.0	1015.2	1018.6	0	92.5	601	92.4	99.6	100
3/08/2013	9.8	13.3	19.3	40	57	72	0.0	3.1	2.2	4.2	9.8	7.6	17.9	1011.0	1013.3	1015.4	0	83.0	617	91.5	99.9	100
4/08/2013	9.3	12.8	19.1	37	58	69	0.0	3.4	2.2	4.6	11.2	6.9	17.7	1011.0	1013.1	1016.3	0	88.1	672	100	100.0	100
5/08/2013	8.3	12.8	20.0	43	61	75	0.0	2.8	0.9	3.7	9.8	5.3	18.8	1012.8	1015.4	1017.1	0	81.6	616	99.1	100.0	100
6/08/2013	10.1	15.6	22.3	34	54	72	0.0	3.9	0.4	4.7	14.8	8.0	20.9	1007.4	1010.9	1014.6	0	89.3	623	96.2	99.9	100
7/08/2013	9.7	12.5	19.7	45	77	95	6.2	1.5	0	1.4	6.7	8.7	18.8	1007.3	1010.0	1012.5	0	72.8	586	97.4	99.9	100
8/08/2013	7.7	10.1	11.8	70	85	96	5.2	1.2	0	4.3	14.3	4.7	11.5	1004.7	1009.2	1016.0	0	53.7	384	94.7	99.5	100
9/08/2013	6.8	12.5	19.3	46	65	83	0.0	2.4	0.9	2.8	9.8	4.9	18.3	1012.8	1015.0	1018.1	0	83.3	666	93.3	99.6	100
10/08/2013	10.8	15.6	22.3	41	53	70	0.0	3.1	0	3.3	10.3	8.7	21.4	1012.3	1014.0	1015.8	0	85.7	640	95.6	99.7	100
11/08/2013	6.8	14.1	23.7	34	67	91	0.0	2.1	0	1.3	6.3	6.9	22.9	1010.7	1014.2	1017.4	0	83.8	651	94.2	99.9	100
12/08/2013	11.2	16.2	23.7	36	54	75	0.0	9.5	0.4	4.9	20.6	8.9	23.0	1002.1	1006.8	1010.7	0	43.8	363	97.7	99.9	100
13/08/2013	9.1	13.9	20.9	33	47	61	0.0	3.6	0.4	3.8	10.7	6.1	19.1	1010.6	1012.5	1014.7	0	93.1	659	90.6	99.6	100
14/08/2013	11.7	16.2	22.7	31	44	62	0.0	4.5	2.2	4.4	12.5	9.8	21.5	1007.0	1010.2	1014.0	0	99.6	669	93	99.9	100
15/08/2013	7.3	12.3	17.9	30	54	81	0.0	3.3	0	3.9	14.3	6.6	15.8	1008.3	1017.3	1022.3	0	99.6	675	89.5	99.8	100
16/08/2013	4.6	12.2	21.7	30	67	86	0.0	2.6	0	2.1	8.9	3.3	19.9	1011.9	1018.6	1022.9	0	97.2	670	92.1	99.6	100
17/08/2013	11.4	16.2	23.0	35	54	84	0.0	3.9	0.9	4.5	14.8	10.7	22.3	1005.8	1009.6	1013.5	0	73.7	644	92.1	99.9	100
18/08/2013	10.7	15.4	21.9	32	45	59	0.0	4.2	1.8	4.2	10.7	8.1	20.2	1010.9	1013.5	1016.3	0	102.5	683	99.7	100.0	100
19/08/2013	8.7	14.2	20.4	34	45	60	0.0	4.8	3.6	5.7	17.4	6.2	18.6	1005.5	1008.9	1012.0	0	91.7	697	91.8	99.6	100
20/08/2013	6.1	9.8	15.5	33	52	67	0.0	3.8	1.8	4.9	12.1	4.1	13.7	1010.2	1012.4	1015.5	0	111.8	698	99.7	100.0	100
21/08/2013	3.9	9.6	15.9	40	61	75	0.0	2.1	0	2.3	8.9	1.9	14.4	1012.8	1014.4	1015.9	0	74.9	724	94.2	99.9	100
22/08/2013	6.6	11.5	18.1	43	60	75	0.0	2.9	0.9	4.3	10.7	3.8	16.6	1009.6	1012.1	1014.9	0	87.0	615	92.1	99.7	100
23/08/2013	11.2	13.9	17.6	48	59	70	0.0	3.7	4	6.3	17.9	8.9	16.4	1008.0	1010.1	1013.7	0	69.9	512	98.5	99.9	100
24/08/2013	10.2	14.6	22.6	42	70	92	0.0	2.5	0	2.0	8	10.2	21.6	1013.6	1018.7	1022.7	0	113.2	708	96.2	99.8	100
25/08/2013	7.7	14.8	26.3	26	76	96	0.0	2.5	0	1.4	9.4	7.7	25.4	1018.6	1021.4	1023.8	0	117.6	730	93	99.9	100
26/08/2013	7.8	13.4	21.6	41	72	91	0.0	2.0	0	1.2	3.6	7.4	21.5	1019.0	1021.5	1024.1	0	106.1	737	90.9	99.7	100
27/08/2013	9.1	14.4	24.8	39	77	96	0.0	2.3	0	1.0	6.3	8.4	24.3	1016.9	1019.5	1021.5	0	122.6	720	94.2	99.5	100
28/08/2013	10.0	14.7	23.2	41	80	97	0.2	2.3	0	1.6	7.6	9.4	22.6	1017.7	1020.0	1022.9	0	118.5	719	92.7	99.5	100
29/08/2013	9.2	15.6	23.5	46	80	98	0.2	2.0	0	1.9	9.8	9.1	23.2	1015.3	1020.0	1023.4	0	101.0	651	90.9	99.7	100
30/08/2013	14.1	19.9	28.1	29	57	84	0.0	4.0	0.4	2.8	12.1	14.2	27.3	1010.1	1013.5	1016.1	0	121.9	691	97.7	99.9	100
31/08/2013	11.8	16.4	22.8	37	64	89	0.0	2.3	0	1.6	7.6	11.8	22.0	1015.9	1019.9	1024.5	0	92.9	589	96.8	99.9	100
Monthly	3.9	13.8	28.1	26	63	98	12.2	95.5	0	3.2	20.6	1.9	27.3	1002.1	1014.6	1024.5	0	91.0	737	80.1	99.8	100

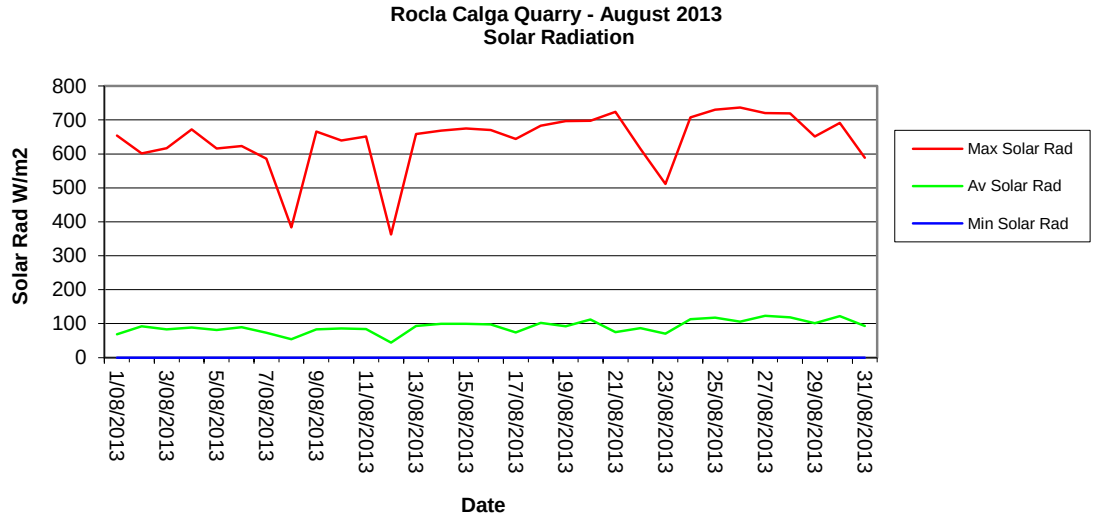
2.4.2 Monthly Weather Charts

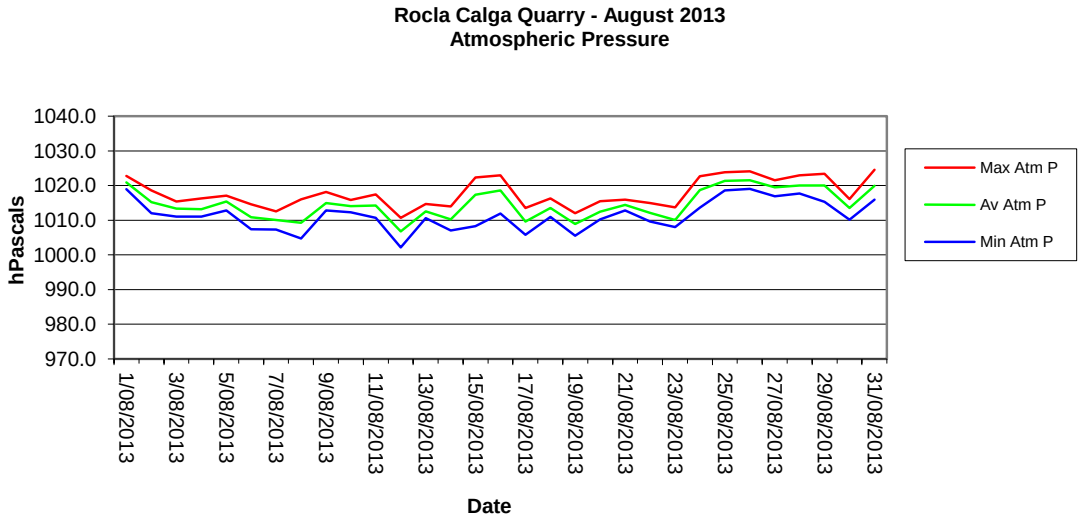


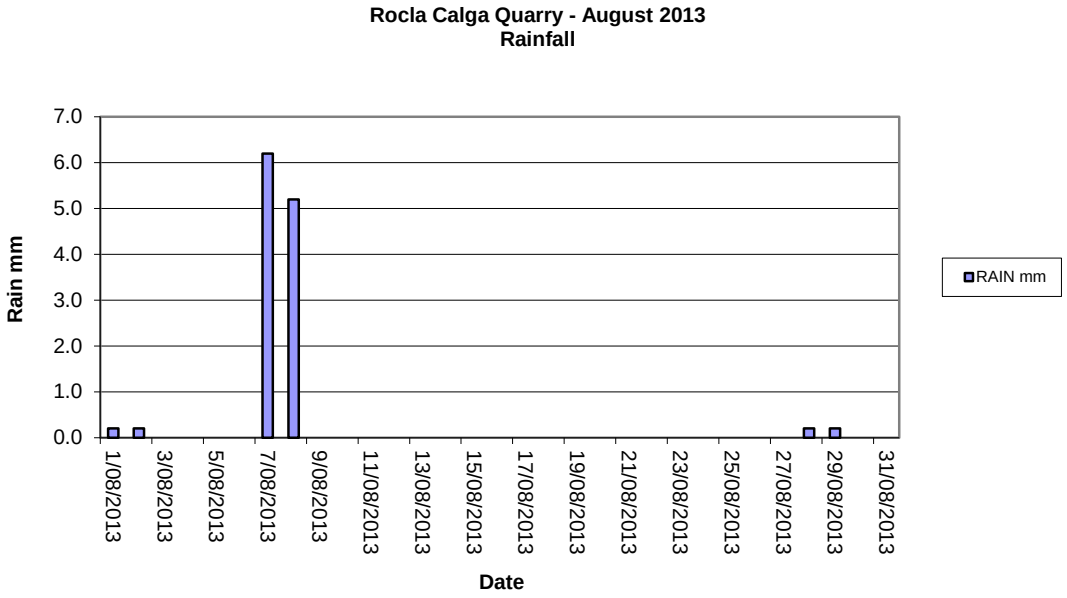


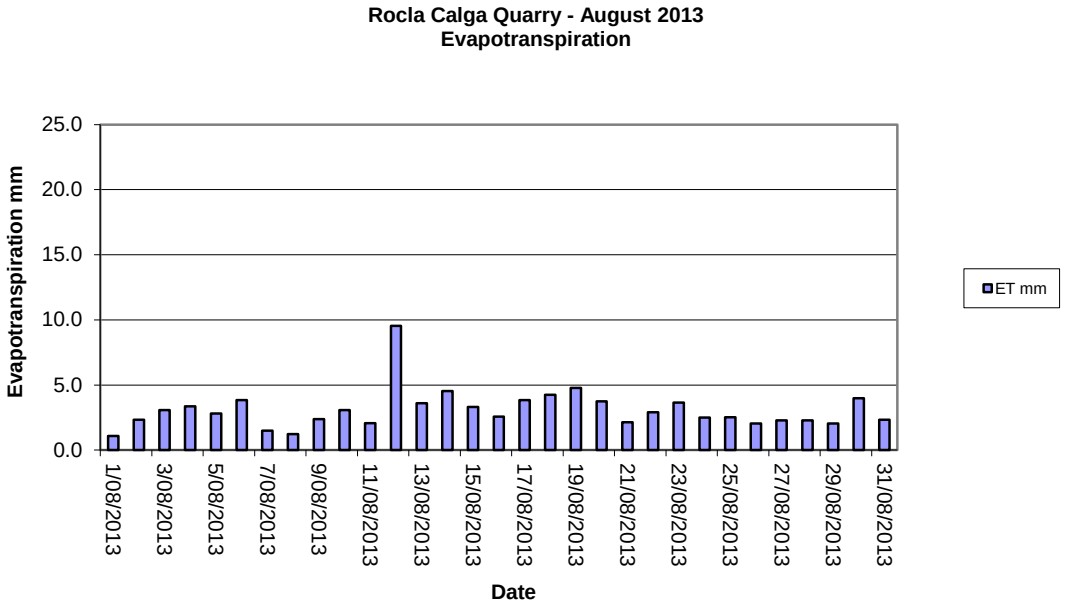


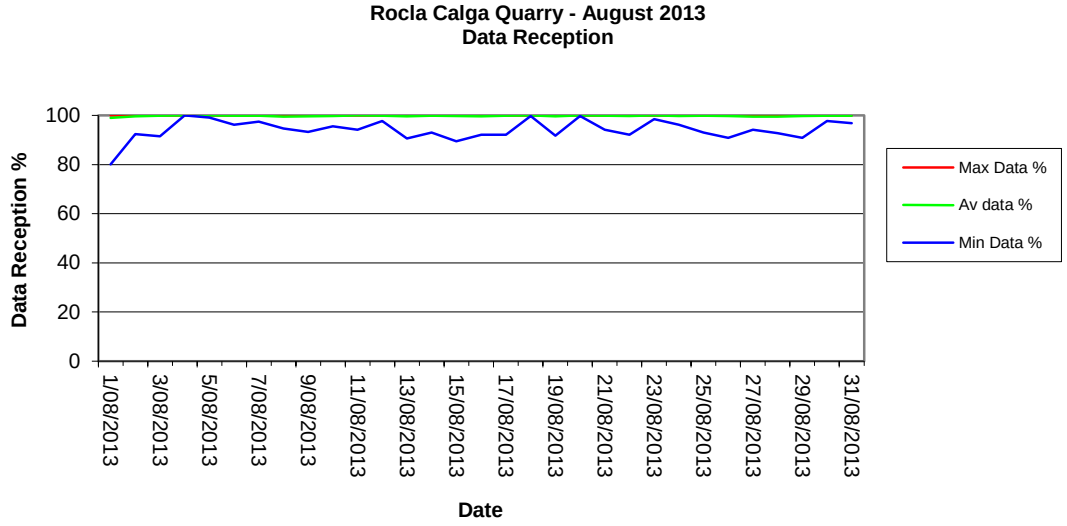

Rocla Calga Quarry - August 2013
Wind Speed
Wind Speed m/s
25
20
15
10
5
0
1/08/2013
3/08/2013
5/08/2013
7/08/2013
9/08/2013
11/08/2013
13/08/2013
15/08/2013
17/08/2013
19/08/2013
21/08/2013
23/08/2013
25/08/2013
27/08/2013
29/08/2013
31/08/2013
Date
Max WS
Av WS
Min WS


Rocla Calga Quarry - August 2013
Solar Radiation
Solar Rad W/m2
800
700
600
500
400
300
200
100
0
1/08/2013
3/08/2013
5/08/2013
7/08/2013
9/08/2013
11/08/2013
13/08/2013
15/08/2013
17/08/2013
19/08/2013
21/08/2013
23/08/2013
25/08/2013
27/08/2013
29/08/2013
31/08/2013
Date
Max Solar Rad
Av Solar Rad
Min Solar Rad


Rocla Calga Quarry - August 2013
Atmospheric Pressure
hPascals
1040.0
1030.0
1020.0
1010.0
1000.0
990.0
980.0
970.0
1/08/2013
3/08/2013
5/08/2013
7/08/2013
9/08/2013
11/08/2013
13/08/2013
15/08/2013
17/08/2013
19/08/2013
21/08/2013
23/08/2013
25/08/2013
27/08/2013
29/08/2013
31/08/2013
Date
Max Atm P
Av Atm P
Min Atm P


Rocla Calga Quarry - August 2013
Rainfall
Rain mm
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1/08/2013
3/08/2013
5/08/2013
7/08/2013
9/08/2013
11/08/2013
13/08/2013
15/08/2013
17/08/2013
19/08/2013
21/08/2013
23/08/2013
25/08/2013
27/08/2013
29/08/2013
31/08/2013
Date
RAIN mm

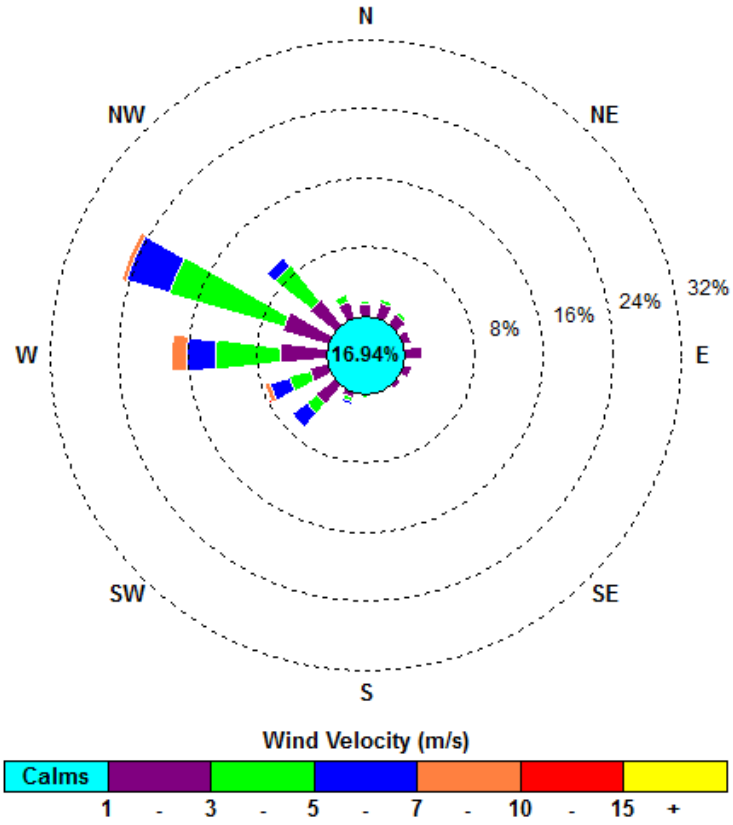

Rocla Calga Quarry - August 2013
Evapotranspiration
Evapotranspiration mm
25.0
20.0
15.0
10.0
5.0
0.0
1/08/2013
3/08/2013
5/08/2013
7/08/2013
9/08/2013
11/08/2013
13/08/2013
15/08/2013
17/08/2013
19/08/2013
21/08/2013
23/08/2013
25/08/2013
27/08/2013
29/08/2013
31/08/2013
Date
ET mm


Rocla Calga Quarry - August 2013
Data Reception
Data Reception %
100
80
60
40
20
0
1/08/2013
3/08/2013
5/08/2013
7/08/2013
9/08/2013
11/08/2013
13/08/2013
15/08/2013
17/08/2013
19/08/2013
21/08/2013
23/08/2013
25/08/2013
27/08/2013
29/08/2013
31/08/2013
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 less than a 15 minute average of 1m/s.

00:15, 01 August 2013 – 23:45, 31 August 2013



The predominant winds were from the W to NW, with strongest winds from the W/WNW. The maximum wind speed was 20.6 m/s from the WSW.

Appendix 1

Laboratory Certificates

ALS Group

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: EN1303225	Page	: 1 of 4
Client	: CARBON BASED ENVIRONMENTAL	Laboratory	: Environmental Division Newcastle
Contact	: MS RENAE MIKKA	Contact	: Peter Keyte
Address	: 47 BOOMERANG ST CESSNOCK NSW, AUSTRALIA 2325	Address	: 5 Rosegum Road Warabrook NSW Australia 2304
E-mail	: renae.mikka@cbased.com.au	E-mail	: peter.keyte@als.com.au
Telephone	: +61 49904443	Telephone	: 61-2-4968-9433
Facsimile	: +61 02 49904442	Facsimile	: +61-2-4968 0349
Project	: ROCLA CALGA DUSTS	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 02-SEP-2013
Sampler	: CARBON BASED	Issue Date	: 06-SEP-2013
Site	: ----		
		No. of samples received	: 6
Quote number	: SY/428/12	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED ACCREDITATION

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics

General Comments

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

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

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

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

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

- **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: DUST (Matrix: AIR)

Compound	CAS Number	LOR	Unit	Client sample ID	CD1 02/08/13 - 02/09/13	CD2c 02/08/13 - 02/09/13	CD3 02/08/13 - 02/09/13	CD4 02/08/13 - 02/09/13	CD5 02/08/13 - 02/09/13
				Client sampling date / time	02-SEP-2013 14:10	02-SEP-2013 14:10	02-SEP-2013 14:10	02-SEP-2013 14:10	02-SEP-2013 14:10
					EN1303225-001	EN1303225-002	EN1303225-003	EN1303225-004	EN1303225-005
EA120: Ash Content									
Ash Content	----	0.1	g/m².month		0.5	0.5	0.7	0.3	0.2
Ash Content (mg)	----	1	mg		10	9	12	6	3
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month		0.3	1.4	0.1	0.1	<0.1
Combustible Matter (mg)	----	1	mg		4	25	2	2	<1
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month		0.8	1.9	0.8	0.4	0.2
Total Insoluble Matter (mg)	----	1	mg		14	34	14	8	3

Analytical Results

Sub-Matrix: DUST (Matrix: AIR)			Client sample ID	CD6 02/08/13 - 02/09/13	----	----	----	----
			Client sampling date / time	02-SEP-2013 14:10	----	----	----	----
Compound	CAS Number	LOR	Unit	EN1303225-006	----	----	----	----
EA120: Ash Content								
Ash Content	----	0.1	g/m².month	0.2	----	----	----	----
Ash Content (mg)	----	1	mg	4	----	----	----	----
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	0.5	----	----	----	----
Total Insoluble Matter (mg)	----	1	mg	9	----	----	----	----

ALS Group

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **ES1319219**	Page	: 1 of 3
Client	: **CARBON BASED ENVIRONMENTAL**	Laboratory	: Environmental Division Sydney
Contact	: MR COLIN DAVIES	Contact	: Client Services
Address	: 47 BOOMERANG ST CESSNOCK NSW, AUSTRALIA 2325	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: cbased@bigpond.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 49904443	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 49904442	Facsimile	: +61-2-8784 8500
Project	: ROCLA QUARRY	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 02-SEP-2013
Sampler	: CBE	Issue Date	: 05-SEP-2013
Site	: ----		
		No. of samples received	: 2
Quote number	: SY/428/12	No. of samples analysed	: 2

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Merrin Avery	Supervisor - Inorganic	Newcastle - Inorganics

General Comments

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

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

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

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

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	A	F	-----	-----	-----
				Client sampling date / time	[02-SEP-2013]	[02-SEP-2013]	----	----	----
Compound	CAS Number	LOR	Unit		ES1319219-001	ES1319219-002	----	----	----
EA005: pH									
pH Value	----	0.01	pH Unit		6.33	6.54	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		62	60	----	----	----
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	10	mg/L		36	34	----	----	----
EA025: Suspended Solids									
Suspended Solids (SS)	----	5	mg/L		<5	<5	----	----	----
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L		<5	<5	----	----	----

CARBON BASED ENVIRONMENTAL PTY LIMITED

Todays Collection	
Time Start:	8.10
Time Finish:	1.00

Date: 2.9.13

Client : Rocla Calga

Project :

GROUNDWATERS

Site	DEPTH	Odour	Water Turbidity	Water Colour	1		2		Bottles (Apr/Oct)	Downloaded Logger? (Y/N)
					pH	EC	pH	EC		
CQ1	16.76	NO	C S T	C LO O B G	7.38	196.2us	7.35	195.1us	1x 250ml GP, 1x 1L GP, 1RP	
CQ3	10.26	YES	C S T	C LO O B G	4.97	184.3us	5.05	185.4us	1x 250ml GP, 1x 1L GP, 1RP	
CQ4	10.98	NO	C S T	C LO O B G	4.37	113.9us	4.34	114.3us	1x 250ml GP, 1x 1L GP, 1RP	
CQ5	6.41	NO	C S T	C LO O B G	3.90	186.3us	3.92	188.5us	1x 250ml GP, 1x 1L GP, 1RP	
CQ6			C S T	C LO O B G					1x 250ml GP, 1x 1L GP, 1RP	No access electric fence
CQ7	6.39	NO	C S T	C LO O B G	4.38	122.3us	4.40	123.1us	1x 250ml GP, 1x 1L GP, 1RP	
CQ8	5.68	NO	C S T	C LO O B G	2.61	170.7us	2.63	170.3us	1x 250ml GP, 1x 1L GP, 1RP	
CQ9	6.09	NO	C S T	C LO O B G	3.80	131.9us	3.75	130.9us	1x 250ml GP, 1x 1L GP, 1RP	
CQ10	22.81	NO	C S T	C LO O B G	3.56	205.1us	3.55	201.1us	1x 250ml GP, 1x 1L GP, 1RP	
CQ11S	10.18	NO	C S T	C LO O B G	4.26	184.9us	4.24	184.5us	1x 250ml GP, 1x 1L GP, 1RP	
CQ11D	11.26	NO	C S T	C LO O B G	4.28	184.8us	4.31	184.4us	1x 250ml GP, 1x 1L GP, 1RP	
CQ12	4.11	NO	C S T	C LO O B G	4.10	157.7us	4.04	157.8us	1x 250ml GP, 1x 1L GP, 1RP	
CQ13	12.64	NO	C S T	C LO O B G	4.60	219.7us	4.58	219.5us	1x 250ml GP, 1x 1L GP, 1RP	
CP3	9.30	NO	C S T	C LO O B G	4.09	169.3us	4.11	169.5us	1x 250ml GP, 1x 1L GP, 1RP	
CP4	9.58	NO	C S T	C LO O B G					1x 250ml GP, 1x 1L GP, 1RP	Pump not Working
CP5	6.64	NO	C S T	C LO O B G	4.44	180.0us	4.46	180.8us	1x 250ml GP, 1x 1L GP, 1RP	
CP6	8.84	NO	C S T	C LO O B G	5.05	233.5us	4.98	229.1us	1x 250ml GP, 1x 1L GP, 1RP	
CP7	2.07	NO	C S T	C LO O B G	4.64	164.3us	4.65	164.1us	1x 250ml GP, 1x 1L GP, 1RP	
CP8			C S T	C LO O B G					1x 250ml GP, 1x 1L GP, 1RP	Only required Apr/Oct
MW7	15.33	NO	C S T	C LO O B G	4.06	131.8us	4.07	130.9us	1x 250ml GP, 1x 1L GP, 1RP	
MW8	6.94	NO	C S T	C LO O B G	4.91	104.4us	4.74	105.1us	1x 250ml GP, 1x 1L GP, 1RP	
MW9	21.89	NO	C S T	C LO O B G	4.24	109.1us	4.30	109.6us	1x 250ml GP, 1x 1L GP, 1RP	
MW10			C S T	C LO O B G					1x 250ml GP, 1x 1L GP, 1RP	No access Bud-track
MW13			C S T	C LO O B G					1x 250ml GP, 1x 1L GP, 1RP	
MW16			C S T	C LO O B G					1x 250ml GP, 1x 1L GP, 1RP	

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

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

pH/EC meter #: 10

Signed: RKg

Sampled by: Leeso + Wazza

PH 4.0 → 4.16 3.98

PH 10 → 9.86 10.01

EC 12.8 → 12.79