



**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**

MAY 2009

A handwritten signature in black ink that reads 'Colin Davies'. The signature is written in a cursive style with a horizontal line underneath.

Colin Davies BSc MEIA CENVP
Environmental Scientist
9 June 2009

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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;
- Ground Waters; and
- Meteorological Station.

This report was prepared by Carbon Based Environmental and includes the following;

- Dust Deposition results for May 2009;
- Surface Water quality results for May 2009;
- Ground Water depth and quality results for May 2009; and
- Meteorological report for May 2009.

The May 2009 dust deposition results were generally higher than April 2009. All sites, on a year to date average basis, are currently below the Air Quality Management Plan exceedence level of 3.7g/m².month. Results were found to be representative of dust levels as determined by the Australian Standard.

Surface water samples were collected for the normal monthly sampling event on the 1 June 2009 at sites A, B, C, D and F. At the time of sample collection, there was no water discharge observed from the site. Results show generally good quality water with most sites sampled maintaining pH within the slightly acidic range, low Electrical Conductivity, low Total Dissolved Solids and Total Suspended Solids and no detectable Oil and Grease. The pH at site F was elevated compared to historical levels.

Groundwaters were sampled for normal monthly monitoring on 1 June 2009. Groundwater depths decreased at the majority of monitoring bores this month, indicating water moving towards the surface. pH levels generally decreased slightly compared to the previous month. EC levels remained relatively steady.

The meteorological station data recovery for the month was approximately 100%. The predominant winds were split from the SSW-WSW and E-ENE, with strongest winds from the WSW. Recorded rainfall on site for May was 148.2mm, higher than that recorded at the BOM Peats Ridge Station and above the Peats Ridge long-term average for May. Results are detailed below:

Rocla Calga Quarry	148.2mm
BOM Peats Ridge*	93.8mm
BOM Gosford*	145.0mm
BOM Peats Ridge Long term mean for May*	98.2mm

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

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, DEC (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/m².month.

Surface water 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.

Groundwater sites are monitored 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.

2.0 MONTHLY RESULTS

2.1 DUST DEPOSITION GAUGES

Table 1 displays the results for May 2009 and the project average. Results are in g/m².month.

Table 1: Dust Deposition results: 01-May-2009 to 01-June-2009

Site	Monthly Insoluble Solids	Monthly Ash Residue	Monthly Combustible Matter	Monthly Ash Residue/ Insoluble Solids %	Current Project Average Insoluble Solids
CD1	1.2	0.9	0.3	75	1.3
CD2b	9.1*	8.3	0.8	91	1.7
CD3	1.8	1.4	0.4	22	0.8
CD4	0.7	0.4	0.3	43	1.0
CD5	0.7	0.4	0.3	43	0.9
CD6	1.6	0.4	1.2	75	1.2

Insoluble Solids marked with an * indicate an excessively contaminated gauge. Contamination can include bird droppings, vegetation (such as plant matter, algae, pollen, seeds), and insects. Results in bold indicate insoluble solids levels above 3.7 g/m².month, the Development Consent annual average amenity criteria at residential locations. Project average was calculated from the 28 October 2005 (start of the Development Consent period) from results supplied by Rocla or from the installation date of the gauges.

CD2b was contaminated with bird droppings and insects.

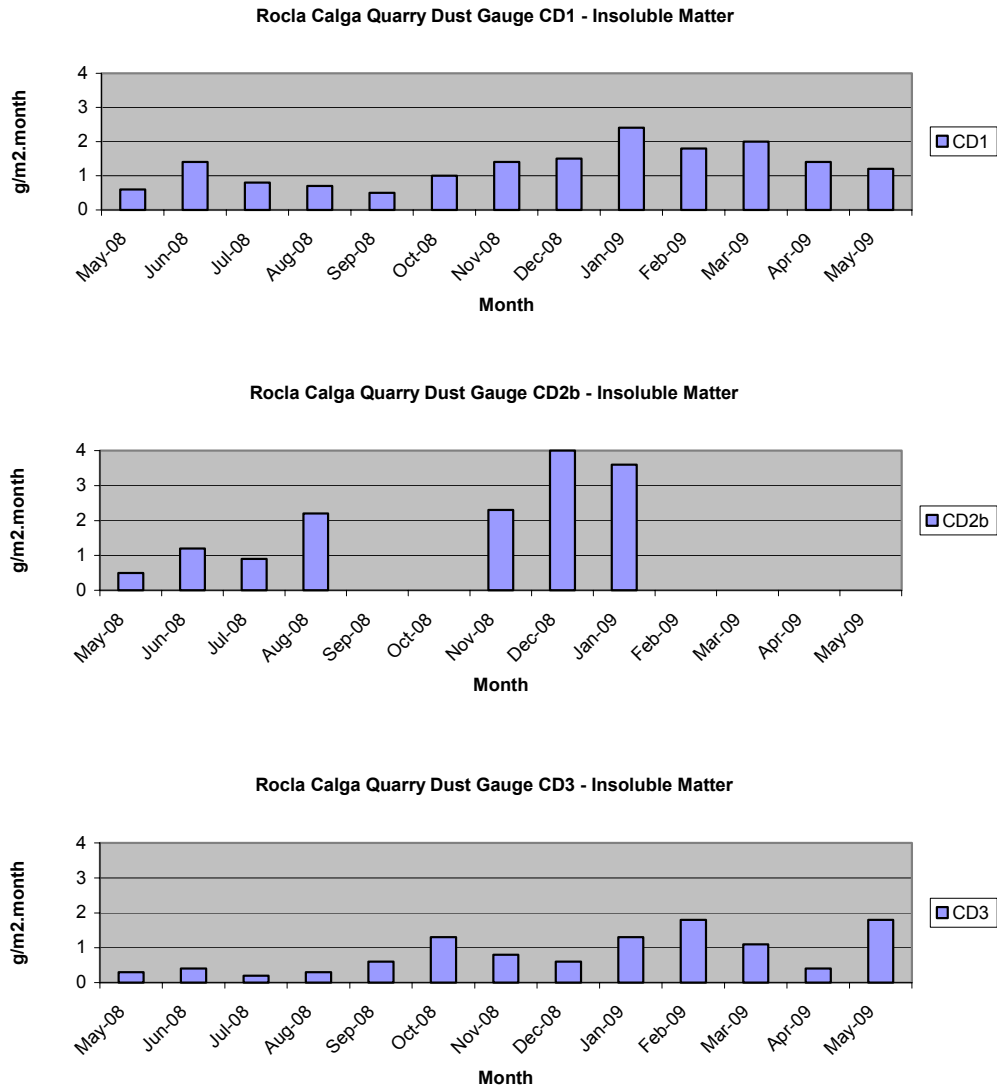
NA= Not Available.

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.

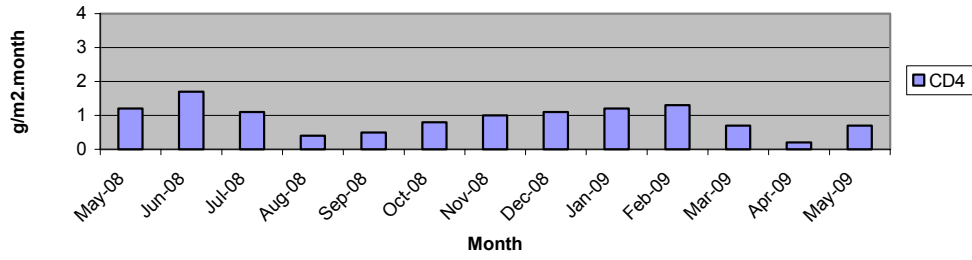
Dust deposition charts for all dust gauge sites appear in **Figure 1** below. The laboratory analysis is provided in **Appendix 1**.

The predominant winds were split from the SSW-WSW and E-ENE, with strongest winds from the WSW.

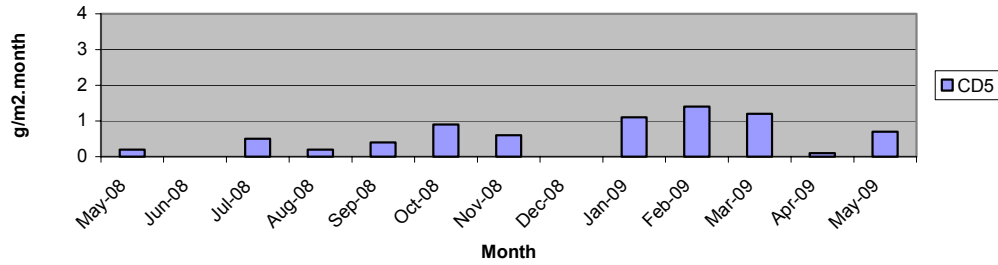
Figure 1: Dust Deposition Charts



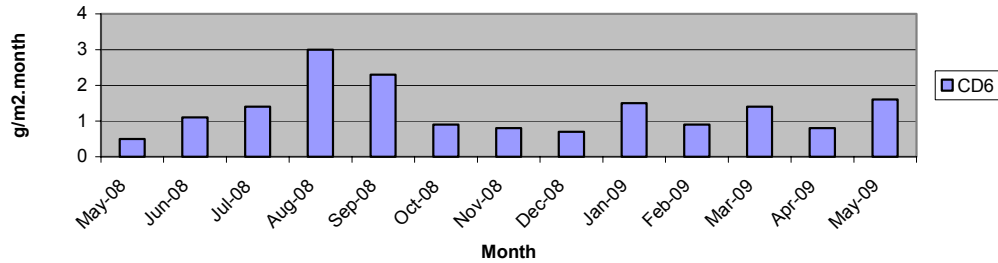
Rocla Calga Quarry Dust Gauge CD4 - Insoluble Matter



Rocla Calga Quarry Dust Gauge CD5 - Insoluble Matter



Rocla Calga Quarry Dust Gauge CD6 - Insoluble Matter



2.2 WATER MONITORING

2.2.1 Surface Waters

Monthly surface water monitoring was conducted on the 1 June 2009 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1**.

Table 2: Monthly surface water monitoring – May 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	Clear	5.83	65	54	9	<5
B	Trickle	Clear	Clear	6.31	82	67	4	<5
C	Trickle	Clear	Clear	5.57	98	68	2	<5
D	Trickle	Clear	Clear	5.21	92	166	<1	<5
F	Dam	Clear	Clear	8.92	60	50	8	<5

At the time of sampling, there were no water discharges off site from any sampling location.

Sites B, C and D were flowing at the time of sampling, and two samples were taken from dams A and F. The samples were collected and analysed for a monthly sampling event. Results show generally good water quality with slightly acidic pH, low Electrical Conductivity, low Total Dissolved Solids and Total Suspended Solids and no detectable Oil and Grease.

The pH at site F was elevated compared to historical levels.

2.2.2 Ground Waters

Groundwaters were sampled on 1 June 2009. 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 2 to 5**.

Groundwater depths decreased at the majority of monitoring bores this month, indicating water moving towards the surface. The CP series of bores generally show larger increases and decreases in depth to water due to pumping from the bores. Longer term monitoring is required to fully evaluate groundwater depth trends.

pH levels generally decreased slightly compared to the previous month, while EC levels generally remained steady. Detailed biannual water quality monitoring was conducted during April 2009 and is next due in October 2009.

Table 3: Ground Water Quality Data

Reference	Bore	Type	Depth to water TOC (m) April 06	Depth to water TOC (m) This report	pH This report	Electrical Conductivity (uS/cm) This report
CQ1	Voutos	* Monitor	20.59	19.54	3.9	135
CQ3	Voutos	* Monitor	10.53	10.24	6.1	135
CQ4	Voutos	* Monitor	8.78	6.74	4.6	75
CQ5	Gazzana	DIP Only	8.69	4.98	4.3	155
CQ6	Gazzana	DIP Only	16.00	9.99	4.1	205
CQ7	Gazzana	* Monitor	6.89	5.77	4.4	95
CQ8	Gazzana	* Monitor	11.03	5.27	4.3	160
CQ9	Gazzana	DIP Only	10.10	8.64	4.3	110
CQ10	Voutos	* Monitor	NI	22.27	4.7	145
CQ11S	Gazzana	* Monitor	NI	8.15	4.4	150
CQ11D	Gazzana	* Monitor	NI	9.47	5.9	115
CQ12	Gazzana	* Monitor	NI	3.60	4.2	145
CQ13	Kashouli	* Monitor	NI	11.76	5.1	180
CP3	Gazzana	Domestic	10.40	7.06	4.5	150
CP4	Kashouli	Domestic	13.63	6.20	NM	NM
CP5	Kashouli	Domestic	16.61	13.68	4.1	240
CP6	Kashouli	Domestic	16.27	10.95	4.2	220
CP7	Kashouli	Production	8.56	1.44	4.6	240
CP8	Rozmanec	Domestic	22.17	NR	NR	NR
MW7	Rocla Bore	* Monitor	15.76	15.11	4.6	110
MW8	Rocla Bore	* Monitor	9.82	7.11	4.6	85
MW9	Rocla Bore	* Monitor	22.44	21.61	4.3	85
MW10	Rocla Bore	* Monitor	15.41	11.19	4.5	115
MW13	Rocla Bore	DIP Only	NI	7.35	4.6	95
MW16	Rocla Bore	DIP Only	NI	7.97	4.4	110

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.

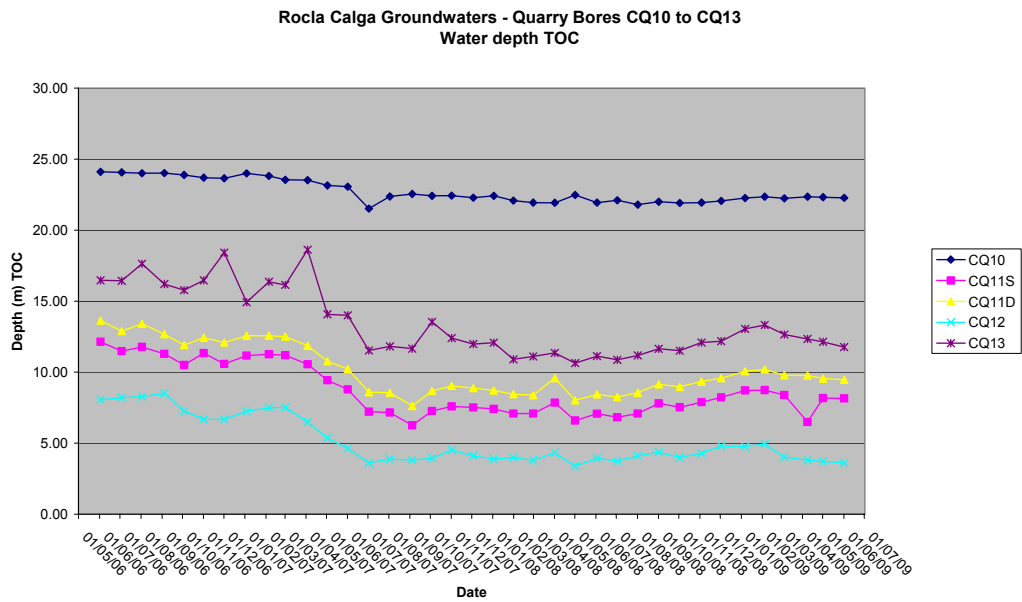
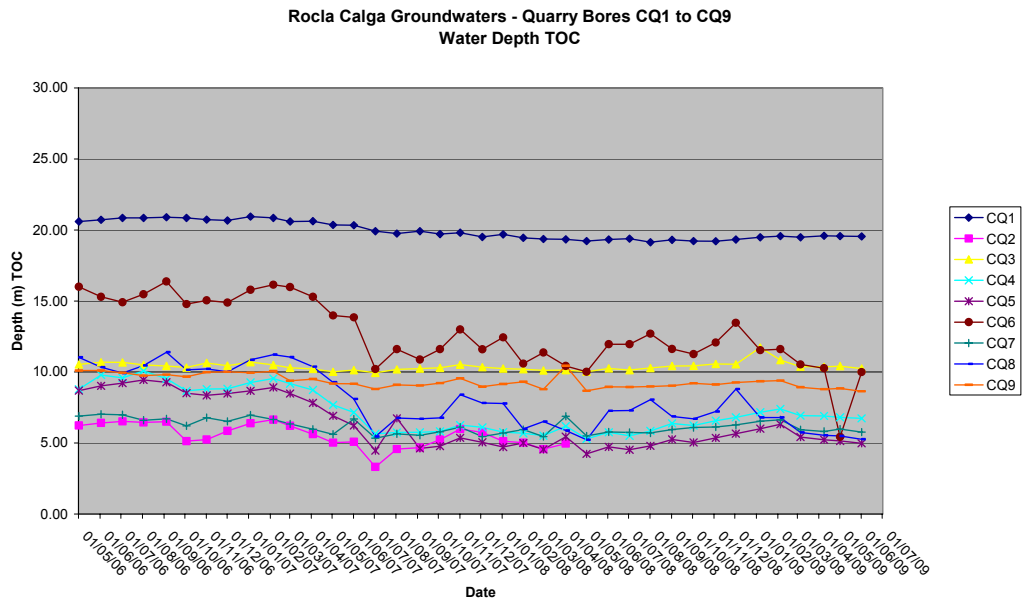
CP4 could not be sampled this month as the pump is broken.

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

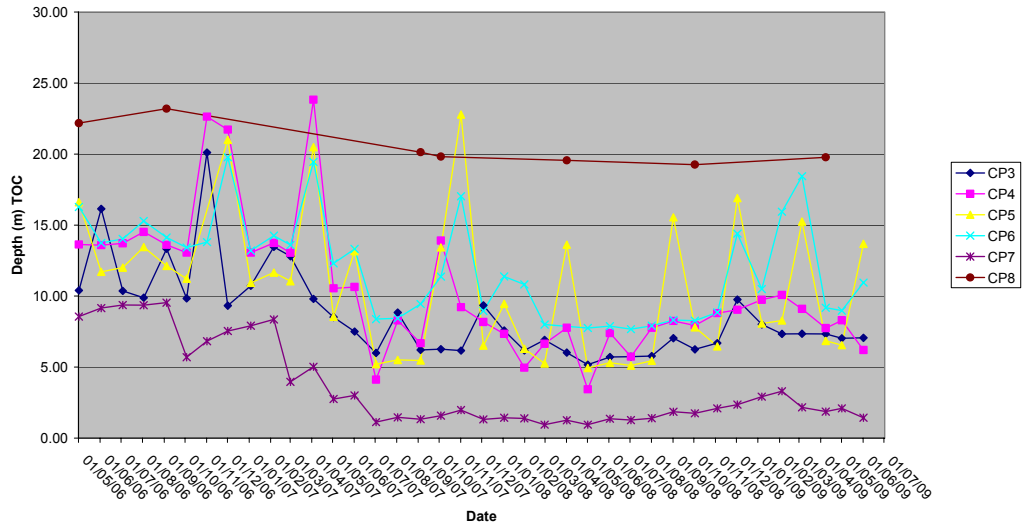
	Increase to ground water depth (water moved away from surface)
	Decrease to ground water depth (water moved towards surface)
	Stable water depth (+/- 0.01m)

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

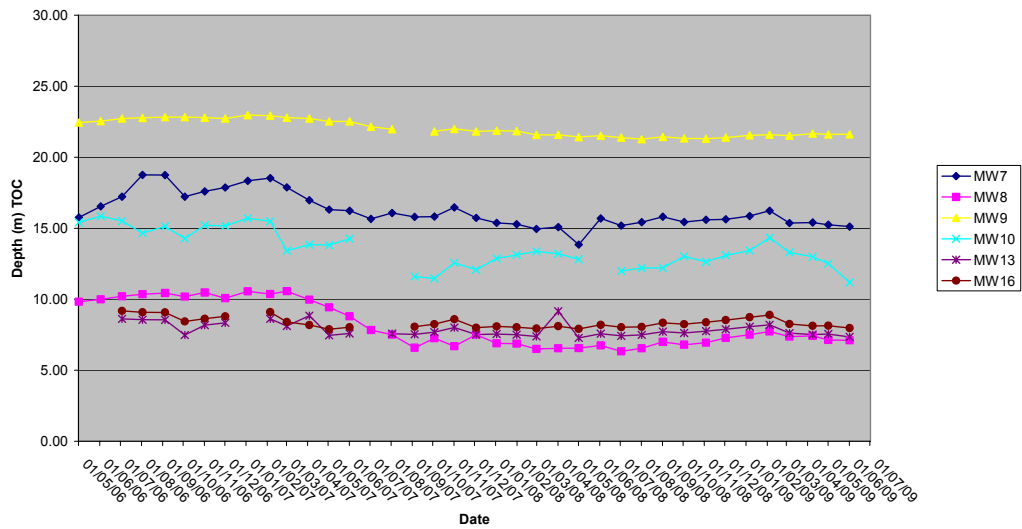
Figures 2 to 5: Groundwater Depth Charts.



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



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



2.3 METEOROLOGICAL MONITORING

The Rocla Calga Quarry weather station data recovery in May 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 two nearby Bureau of Meteorology (BOM) stations, Peats Ridge and Gosford are included in **Appendix 2** for comparison purposes.

Data for May 2009 shows higher rainfall at the Rocla Calga Quarry station compared to the nearby Peats Ridge BOM station and Gosford BOM station. The rainfall comparison is provided below:

Rocla Calga Quarry	148.2mm
BOM Peats Ridge*	93.8mm
BOM Gosford*	145.0mm
BOM Peats Ridge Long term mean for May*	98.2mm

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

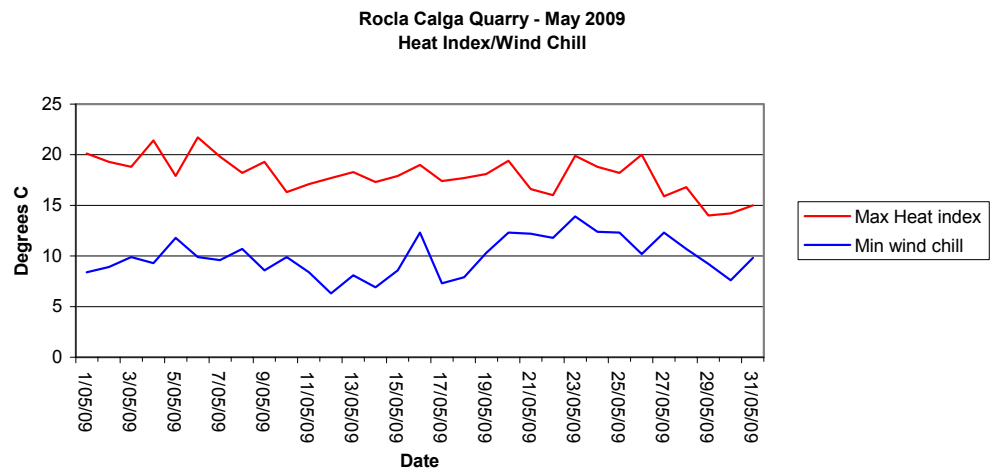
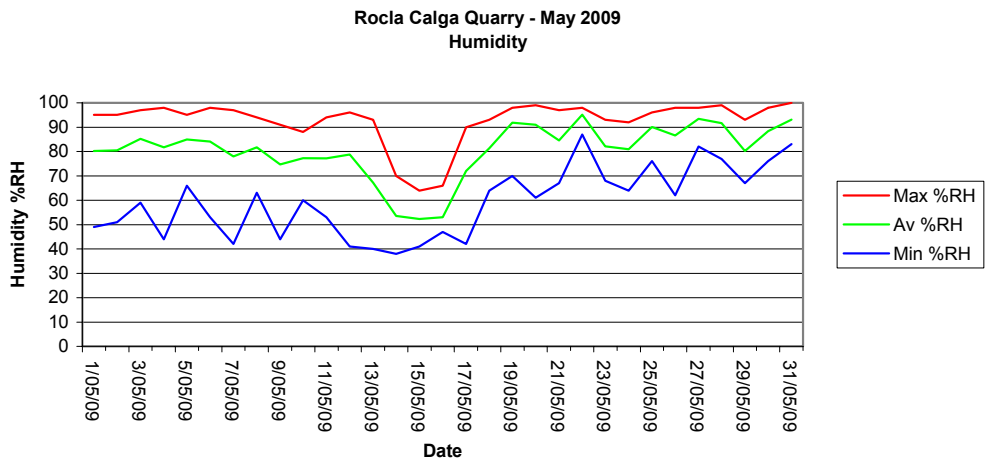
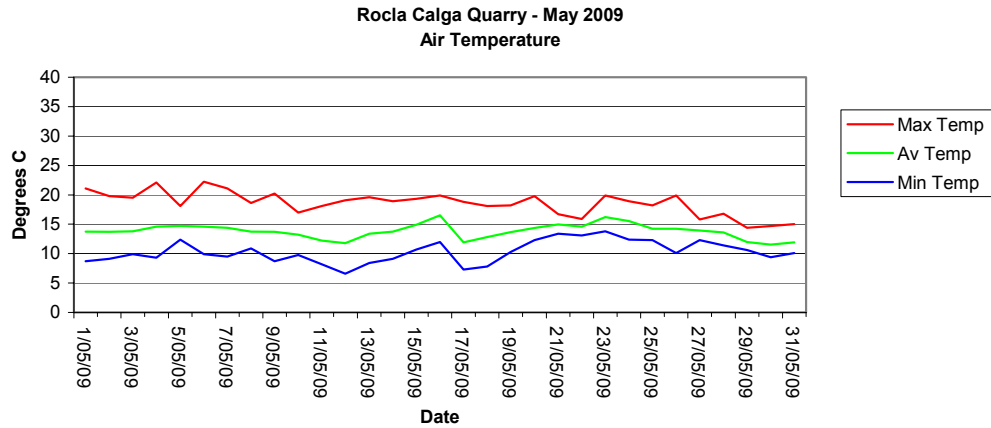
Results are displayed in the following table and figures.

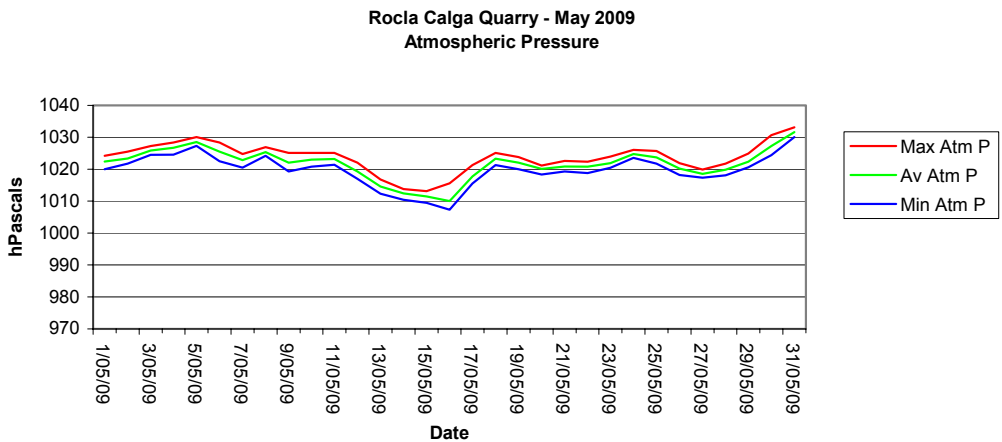
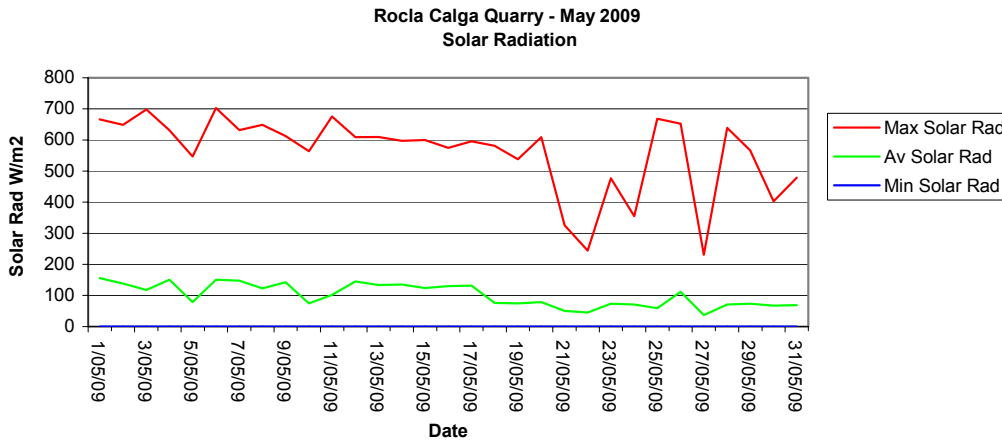
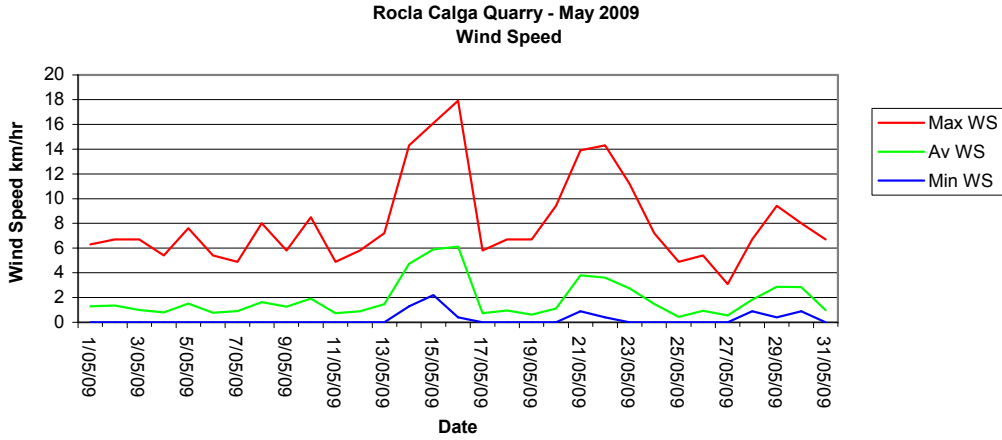
2.3.1 Monthly Meteorological Data Summary

Summary May-09 Rocla - Calga

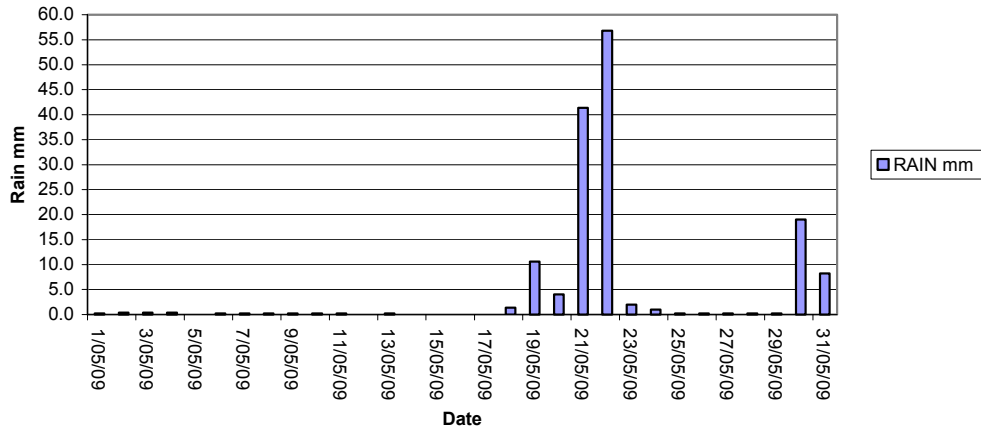
Date	Min Temp	Av Temp	Max Temp	Min %RH	Av %RH	Max %RH	RAIN mm	ET mm	Min WS	Av WS	Max WS	Min wind chill	Max Heat index	Min Atm P	Av Atm P	Max Atm P	Min Solar Rad	Av Solar Rad	Max Solar Rad	Min Data %	Av data %	Max Data %
1/05/09	8.7	13.7	21.1	49	80	95	0.2	2.4	0	1.3	6.3	8.4	20.1	1020	1022.4	1024.2	0	155.9	666	79.5	97.0	100
2/05/09	9.1	13.7	19.8	51	80	95	0.4	2.2	0	1.4	6.7	8.9	19.3	1021.7	1023.4	1025.5	0	137.9	649	76.3	90.2	100
3/05/09	9.9	13.8	19.5	59	85	97	0.4	1.7	0	1.0	6.7	9.9	18.8	1024.5	1025.9	1027.2	0	118.1	698	79.2	91.8	100
4/05/09	9.3	14.6	22.1	44	82	98	0.4	2.3	0	0.8	5.4	9.3	21.4	1024.6	1026.7	1028.4	0	150.3	631	85.7	94.6	100
5/05/09	12.4	14.7	18.1	66	85	95	0.0	1.4	0	1.5	7.6	11.8	17.9	1027.3	1028.5	1030.1	0	78.4	547	79.5	90.8	100
6/05/09	9.9	14.6	22.2	53	84	98	0.2	2.3	0	0.8	5.4	9.9	21.7	1022.5	1025.5	1028.4	0	150.2	703	76.9	91.8	100
7/05/09	9.5	14.4	21.1	42	78	97	0.2	2.4	0	0.9	4.9	9.6	19.8	1020.5	1022.8	1024.7	0	147.5	632	67.8	91.6	100
8/05/09	10.9	13.7	18.6	63	82	94	0.2	2.0	0	1.6	8	10.7	18.2	1024.2	1025.3	1026.9	0	123.0	649	75.7	94.5	100
9/05/09	8.7	13.7	20.2	44	75	91	0.2	2.6	0	1.3	5.8	8.6	19.3	1019.3	1022.1	1025.1	0	142.9	612	65.5	87.3	100
10/05/09	9.8	13.2	17	60	77	88	0.2	1.7	0	1.9	8.5	9.9	16.3	1020.8	1023.0	1025.1	0	74.7	564	80.7	91.0	99.1
11/05/09	8.2	12.2	18.1	53	77	94	0.2	1.6	0	0.7	4.9	8.4	17.1	1021.4	1023.2	1025.1	0	101.5	675	77.8	91.7	100
12/05/09	6.6	11.8	19.1	41	79	96	0.0	2.2	0	0.9	5.8	6.3	17.7	1017	1019.3	1022.1	0	145.0	609	76	94.3	100
13/05/09	8.4	13.4	19.6	40	67	93	0.2	2.5	0	1.5	7.2	8.1	18.3	1012.3	1014.6	1016.8	0	134.0	610	81.9	95.1	100
14/05/09	9.1	13.7	18.9	38	54	70	0.0	4.3	1.3	4.7	14.3	6.9	17.3	1010.4	1012.4	1013.8	0	135.6	597	71.9	94.5	100
15/05/09	10.7	14.9	19.3	41	52	64	0.0	4.8	2.2	5.9	16.1	8.6	17.9	1009.5	1011.4	1013.1	0	124.0	600	98	99.8	100
16/05/09	12	16.5	19.9	47	53	66	0.0	5.1	0.4	6.1	17.9	12.3	19	1007.3	1010.0	1015.6	0	129.8	574	97.4	99.8	100
17/05/09	7.3	12.0	18.8	42	72	90	0.0	2.2	0	0.7	5.8	7.3	17.4	1015.5	1017.8	1021.3	0	131.6	596	100	100.0	100
18/05/09	7.8	12.8	18.1	64	81	93	1.4	1.4	0	0.9	6.7	7.9	17.7	1021.3	1023.3	1025.1	0	75.9	581	96.2	99.9	100
19/05/09	10.3	13.6	18.2	70	92	98	10.6	1.1	0	0.6	6.7	10.3	18.1	1020	1022.1	1023.8	0	74.5	538	87.1	98.7	100
20/05/09	12.3	14.3	19.8	61	91	99	4.0	1.2	0	1.1	9.4	12.3	19.4	1018.4	1020.1	1021.1	0	78.7	609	90.4	99.5	100
21/05/09	13.4	15.0	16.7	67	85	97	41.4	1.5	0.9	3.8	13.9	12.2	16.6	1019.3	1020.9	1022.6	0	50.5	326	92.7	99.8	100
22/05/09	13.1	14.6	15.9	87	95	98	56.8	0.7	0.4	3.6	14.3	11.8	16	1018.8	1020.7	1022.3	0	45.3	244	94.4	99.9	100
23/05/09	13.8	16.3	19.9	68	82	93	2.0	1.9	0	2.7	11.2	13.9	19.9	1020.4	1021.9	1024	0	73.9	477	95.3	99.9	100
24/05/09	12.4	15.5	18.9	64	81	92	1.0	1.6	0	1.5	7.2	12.4	18.8	1023.5	1024.8	1026	0	71.0	355	93	99.9	100
25/05/09	12.3	14.2	18.2	76	90	96	0.2	0.9	0	0.4	4.9	12.3	18.2	1021.7	1023.7	1025.7	0	58.9	668	97.4	99.9	100
26/05/09	10.1	14.2	19.9	62	87	98	0.2	1.7	0	0.9	5.4	10.2	20	1018.2	1020.2	1021.9	0	111.1	652	98	99.9	100
27/05/09	12.3	13.9	15.8	82	93	98	0.2	0.5	0	0.6	3.1	12.3	15.9	1017.3	1018.5	1019.9	0	37.3	231	95	99.9	100
28/05/09	11.4	13.6	16.8	77	92	99	0.2	1.1	0.9	1.8	6.7	10.7	16.8	1018.1	1019.8	1021.7	0	70.8	639	92.1	99.9	100
29/05/09	10.6	12.0	14.4	67	80	93	0.2	1.6	0.4	2.9	9.4	9.2	14	1020.6	1022.3	1024.9	0	73.4	566	95.6	99.9	100
30/05/09	9.4	11.6	14.7	76	88	98	19.0	1.3	0.9	2.8	8	7.6	14.2	1024.4	1027.2	1030.7	0	67.5	403	99.4	100.0	100
31/05/09	10.1	11.9	15.0	83	93	100	8.2	1.0	0	1.0	6.7	9.8	15	1030.1	1031.6	1033.1	0	69.1	479	98.2	99.9	100
Monthly	6.6	13.8	22.2	38	80	100	148.2	60.9	0	1.9	17.9	6.3	21.7	1007.3	1021.7	1033.1	0	101.2	703	65.5	96.5	100

2.3.2 Monthly weather charts

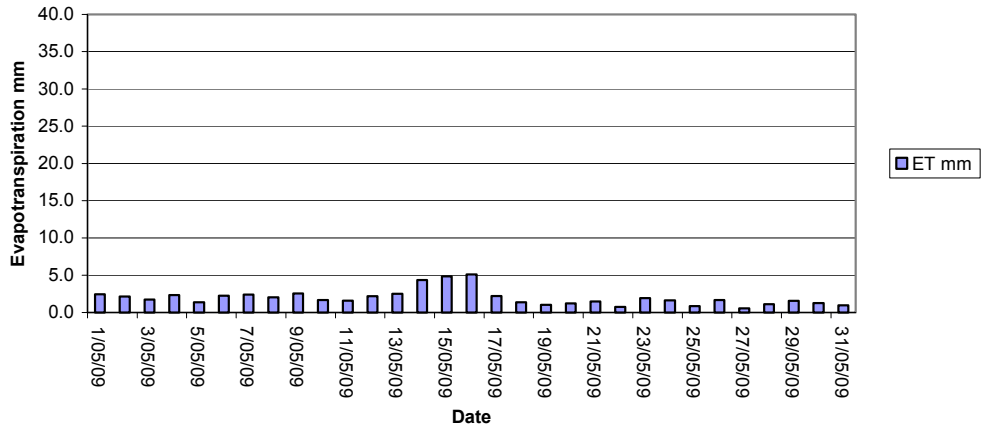




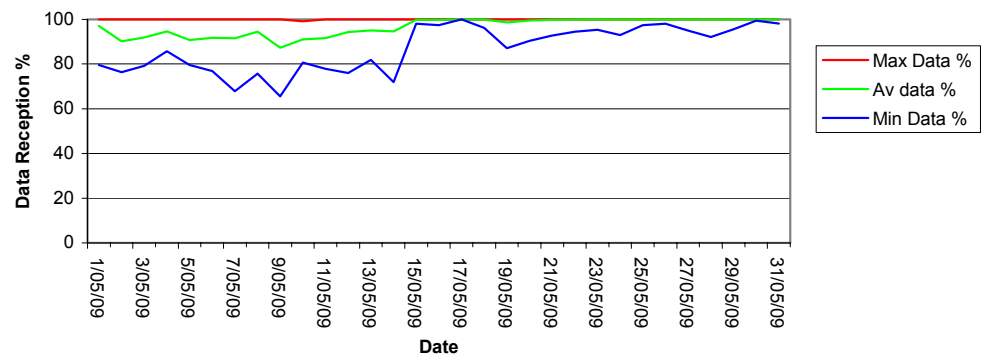
Rocla Calga Quarry - May 2009
Rainfall



Rocla Calga Quarry - May 2009
Evapotranspiration



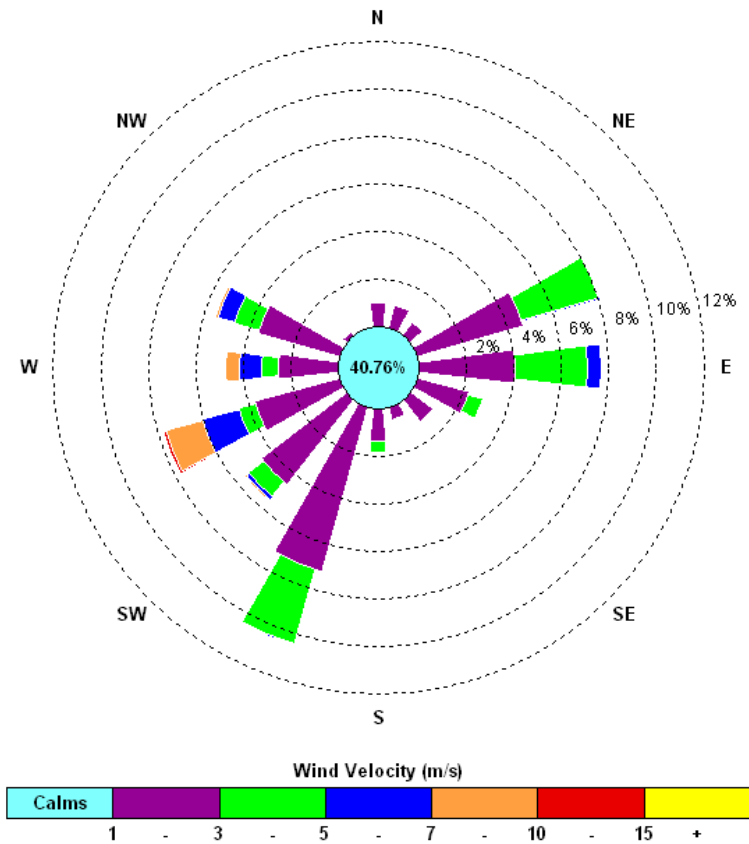
Rocla Calga Quarry - May 2009
Data Reception



2.3.3 Windrose plot

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

00:00, 1 May 2009 – 23:45, 31 May 2009



The windrose shows predominant winds were split from the SSW-WSW and E-ENE, with strongest winds from the WSW. The maximum wind speed was 17.9 m/s from the W and WSW.

APPENDIX 1
LABORATORY CERTIFICATES

APPENDIX 2

ADDITIONAL BUREAU OF METEOROLOGY DATA FROM PEATS RIDGE AND GOSFORD MONITORING STATIONS

