



**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**

JUNE 2008

A handwritten signature in black ink that reads 'Colin Davies'.

Colin Davies BSc MEIA CENVP
Environmental Scientist
29 July 2008

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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 June 2008;
- Surface Water quality results for June 2008;
- Ground Water depth and quality results for June 2008; and
- Meteorological report for June 2008.

The June 2008 dust deposition results show a slight increase in dust deposition rates this month. 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 2 July 2008 at sites F and the small dam below site F, as the other sites were not flowing. At the time of sample collection, there was no water discharge observed from the site. Results show generally good quality water with the two sites maintaining slightly acidic pH, low Electrical Conductivity, low Total Suspended Solids, and no detectable Oil and Grease.

Groundwaters were sampled for normal monthly monitoring on 2 July 2008. Groundwater depths decreased at the majority of monitoring bores this month, indicating water moving towards the surface. pH and EC levels remained stable.

The meteorological station continued to return high data recovery and operated well in June 2008. The predominant winds were from the SSW, with strongest winds from the SW-W. Recorded rainfall on site for June 2008 was 153.8mm, lower than that recorded at the BOM Peats Ridge Station but higher than the Peats Ridge long-term average for June. Results are detailed below:

Rocla Calga Quarry	153.8mm
BOM Peats Ridge*	169.2mm
BOM Gosford*	214.4mm
BOM Peats Ridge Long term mean for June*	98.7mm

*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 and Total Oil and Grease is conducted monthly when sites A to D are flowing and Site F, a dam. 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 June 2008 and the project average. Results are in g/m².month.

Table 1: Dust Deposition results: 02-Jun-2008 to 02-Jul-2008 (30 days)

Site	Monthly Insoluble Solids	Monthly Ash Residue	Monthly Combustible Matter	Monthly Ash Residue/ Insoluble Solids %	Current Project Average Insoluble Solids
CD1	1.4	0.8	0.6	57	1.3
CD2b	1.2	0.4	0.8	33	1.5
CD3	0.4	0.1	0.3	25	0.8
CD4	1.7	1.2	0.5	71	1.1
CD5	23.9*	21.2	2.7	89	1.0
CD6	1.1	0.4	0.7	36	1.1

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.

NA= Not Available.

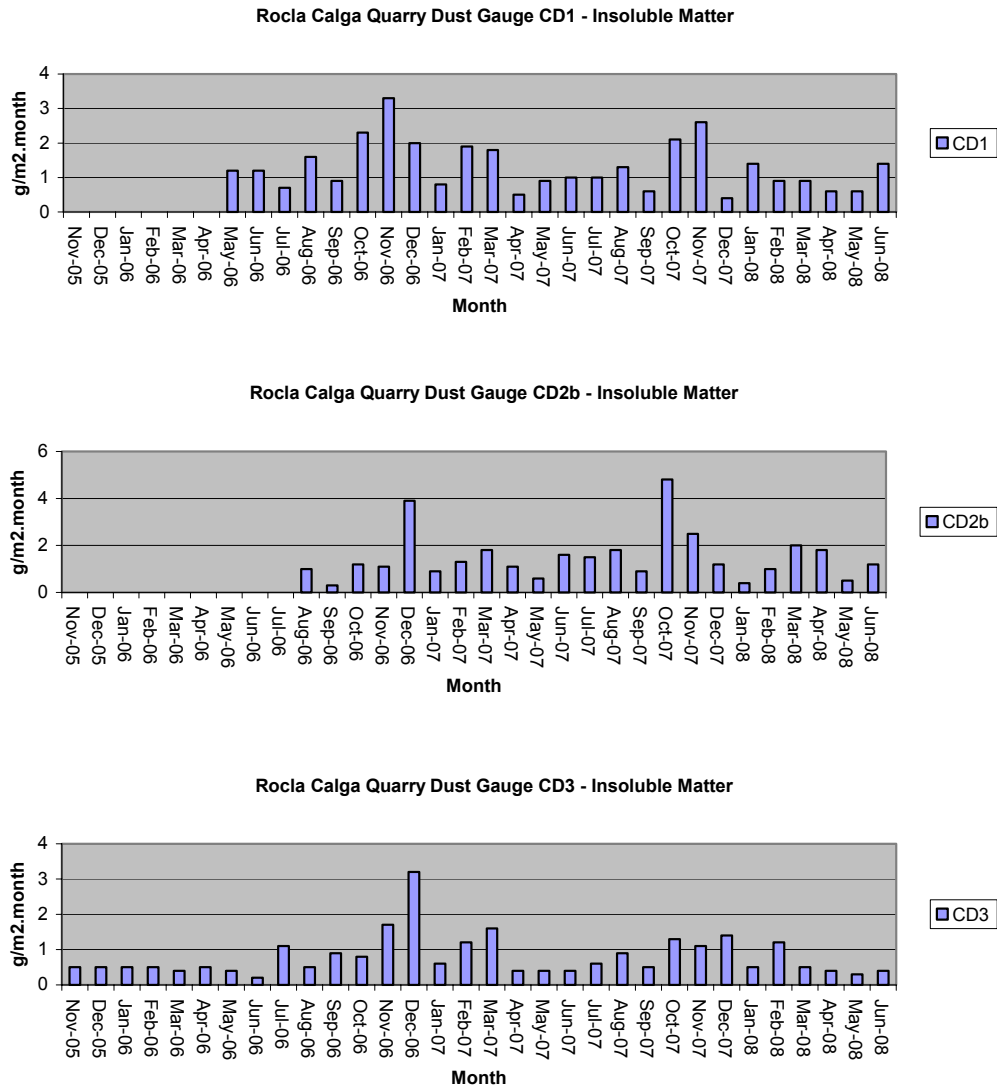
CD1 was installed on the 1 May 2006. CD2a was discontinued at the start of August 2006 due to quarry operations “mining out” the site of the gauge. The replacement gauge, Site CD2b, was located in a position adjacent to the boundary between B. Kashouli and F. & J. Gazzana in conformance with the Air 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.

CD5 contained a large amount of sand and bird droppings that contaminated the gauge this month.

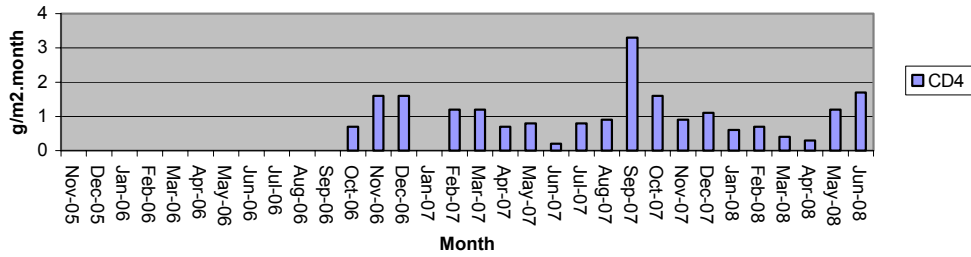
Dust deposition charts for all dust gauge sites appear in **Figure 1** below. The laboratory analysis is provided in **Appendix 1**.

The predominant winds were from the SSW, with strongest winds from the SW-W.

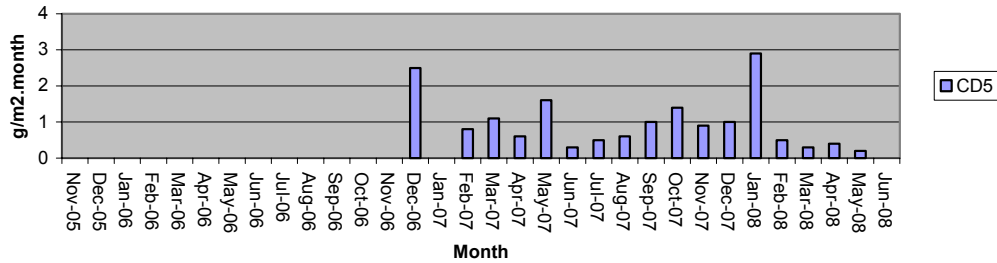
Figure 1: Dust Deposition Charts



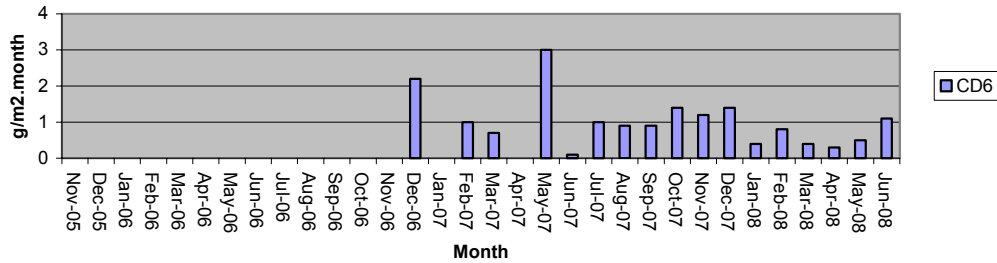
Rocla Calga Quarry Dust Gauge CD4 - Insoluble Matter



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 2 July 2008 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1**.

Table 2: Monthly surface water monitoring - 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	Not Flowing	--	--	--	--	--	--	--
B	Not Flowing	--	--	--	--	--	--	--
C	Not Flowing	--	--	--	--	--	--	--
D	Not Flowing	--	--	--	--	--	--	--
F	Dam	Clear	Clear	6.52	58	42	10	<5
Dam below F (Lower dam)*	Dam	Clear	Clear	5.77	58	38	19	<5

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

* The dam below Site F is not a requirement of the Site Water Management Plan.

There was no flow from any site at the time of sampling with two samples collected from dams; these were Site F and a small dam below site F, additional to the Site Water Management Plan requirements. The samples were collected and analysed for a monthly sampling event. Results show generally good water quality with slightly acidic pH, low Electrical Conductivity, and low Total Suspended Solids. Total Oil and Grease was not detected at either site.

2.2.2 Ground Waters

Groundwaters were sampled on 2 July 2008. 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 and EC levels remained generally stable. Detailed biannual water quality monitoring was last conducted in April 2008 and is next due in October 2008.

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	19.38	5.2	135
CQ2	Voutos	DIP Only	6.23	NO LONGER REQUIRED – REMOVED		
CQ3	Voutos	* Monitor	10.53	10.13	5.8	170
CQ4	Voutos	* Monitor	8.78	5.51	5.4	90
CQ5	Gazzana	DIP Only	8.69	4.52	5.2	170
CQ6	Gazzana	DIP Only	16.00	11.95	5.2	260
CQ7	Gazzana	* Monitor	6.89	5.74	5.3	100
CQ8	Gazzana	* Monitor	11.03	7.29	5.2	175
CQ9	Gazzana	DIP Only	10.10	8.94	5.3	125
CQ10	Voutos	* Monitor	NI	22.10	5.4	150
CQ11S	Gazzana	* Monitor	NI	6.82	5.2	160
CQ11D	Gazzana	* Monitor	NI	8.24	5.7	125
CQ12	Gazzana	* Monitor	NI	3.74	5.3	155
CQ13	Kashouli	* Monitor	NI	10.86	5.4	190
CP3	Gazzana	Domestic	10.40	5.73	4.9	165
CP4	Kashouli	Domestic	13.63	5.73	5.3	220
CP5	Kashouli	Domestic	16.61	5.11	5.2	260
CP6	Kashouli	Domestic	16.27	7.67	5.1	230
CP7	Kashouli	Production	8.56	1.27	5.3	305
CP8	Rozmanec	Domestic	22.17	NR	NR	NR
MW7	Rocla Bore	* Monitor	15.76	15.19	5.3	130
MW8	Rocla Bore	* Monitor	9.82	6.33	5.3	105
MW9	Rocla Bore	* Monitor	22.44	21.38	5.2	90
MW10	Rocla Bore	* Monitor	15.41	11.99	5.3	130

Notes:

TOC = Water level measured from top of bore case to water.

NM = Not Monitored – unable to sample water due to access restrictions.

NA = Parameter not available.

NR = Not Required by resident.

* = Logger Installed.

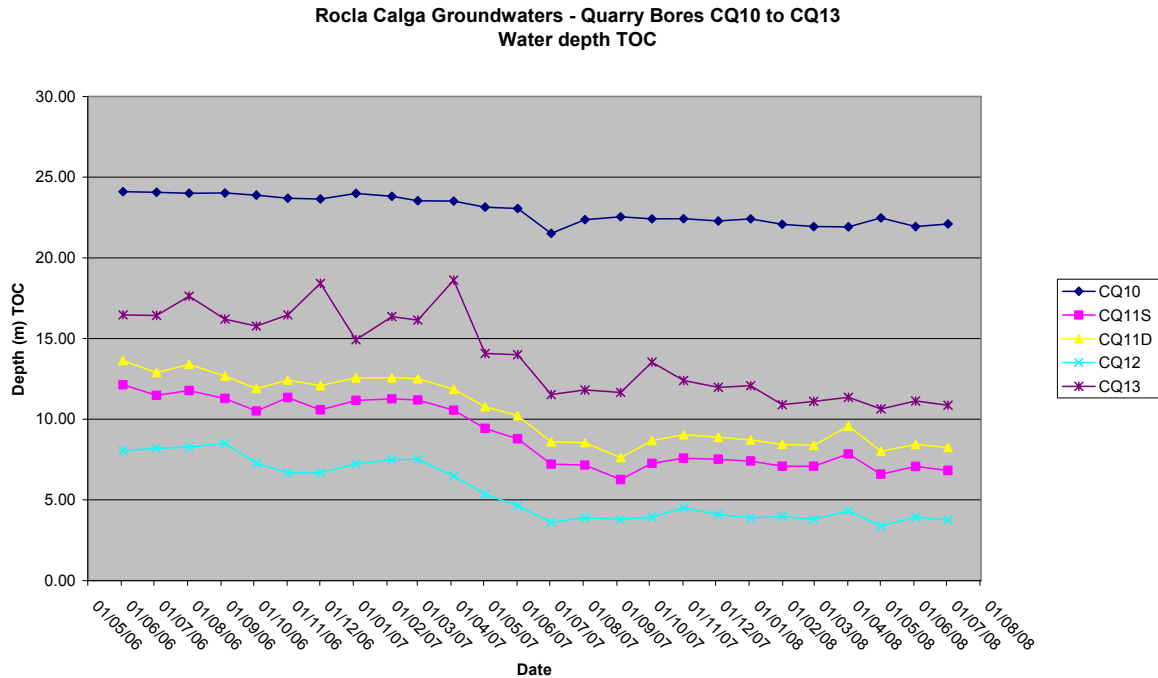
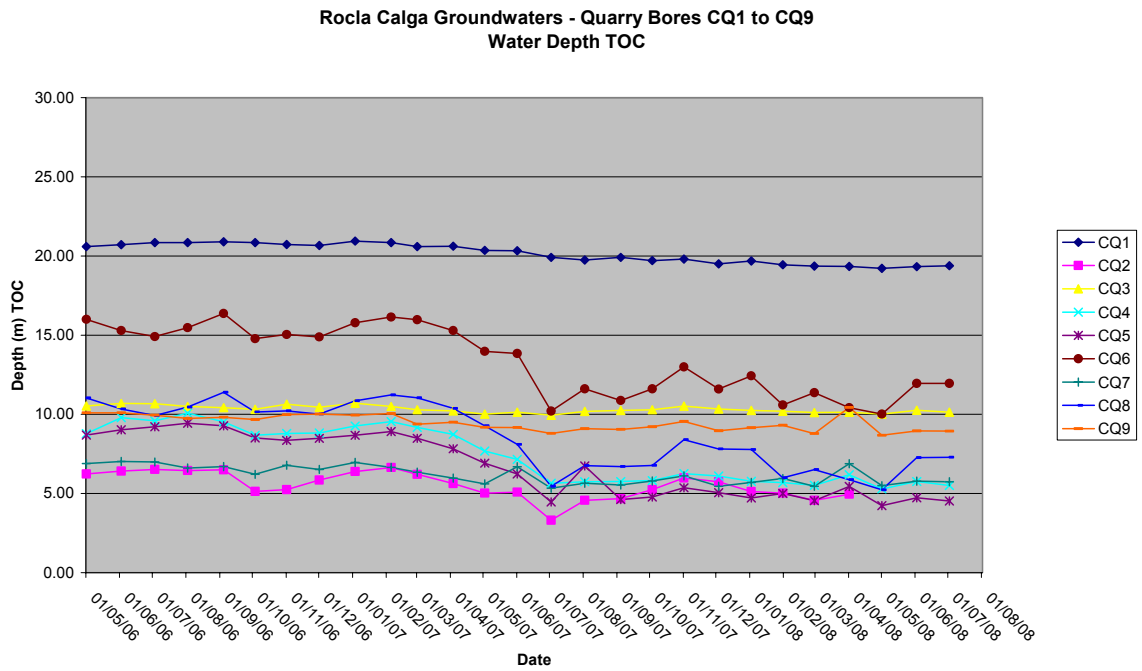
NI = These bores were not installed in April 2006 but are now operational. April 2006 was the first set of measurements taken by Carbon Based Environmental Pty Limited.

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

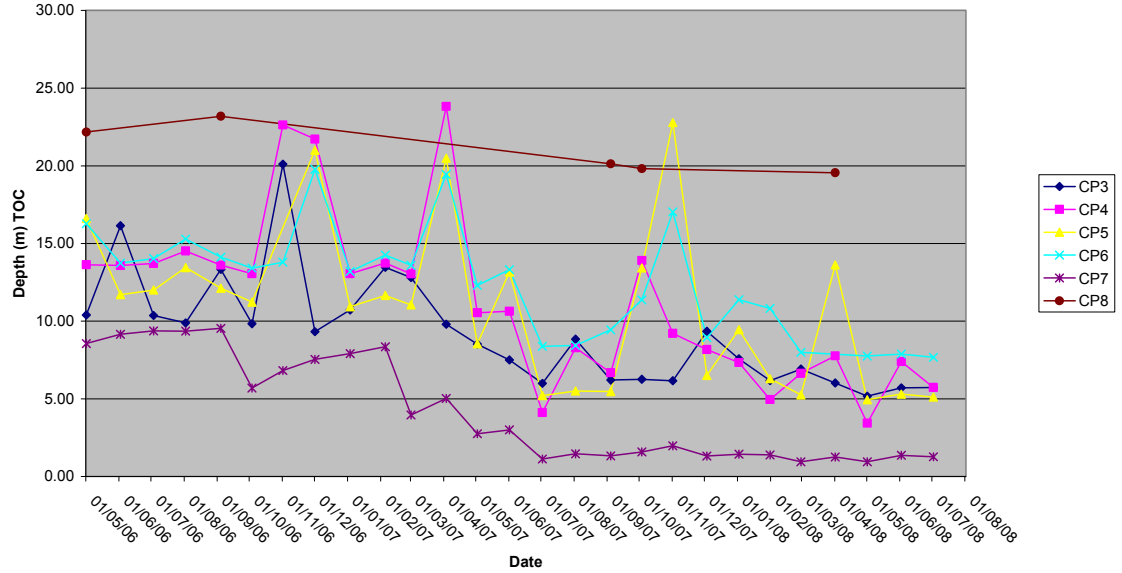
	Increase to ground water depth (water moved away from surface)
	Decrease to ground water depth (water moved towards surface)
	Stable water depth (+/- 0.01m)

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

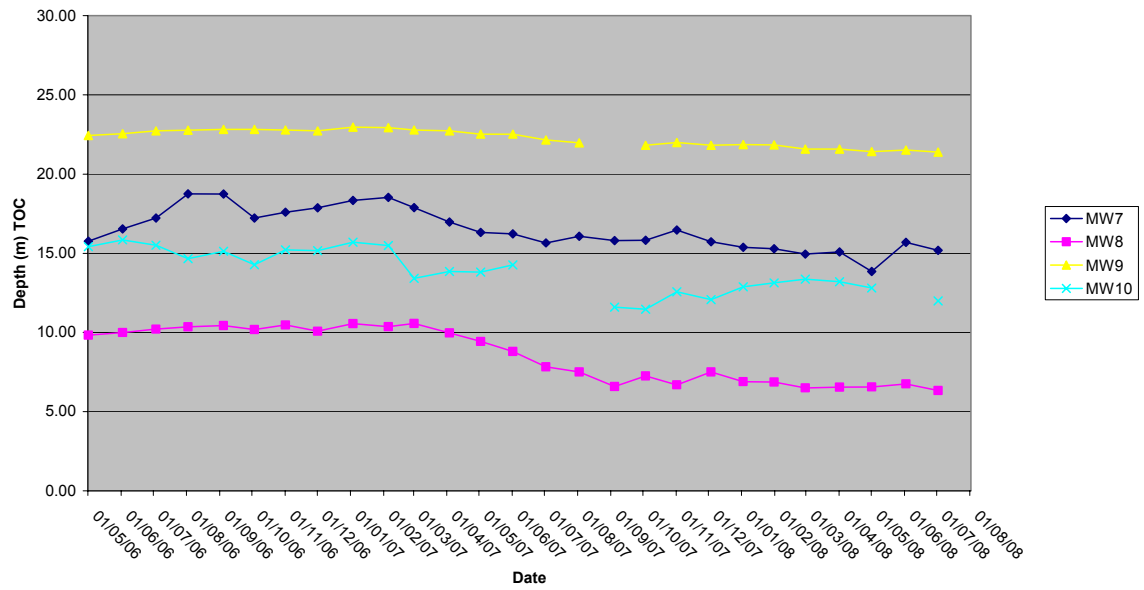
Figures 2 to 5: Groundwater Depth Charts.



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



Rocla Calga Groundwaters - Quarry Bores MW7 to MW10
Water Depth TOC



2.3 METEOROLOGICAL MONITORING

The Rocla Calga Quarry weather station was fully operational in June 2008 with approximately 100% data recovery. 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 June 2008 shows lower 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	153.8mm
BOM Peats Ridge*	169.2mm
BOM Gosford*	214.4mm
BOM Peats Ridge Long term mean for June*	98.7mm

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

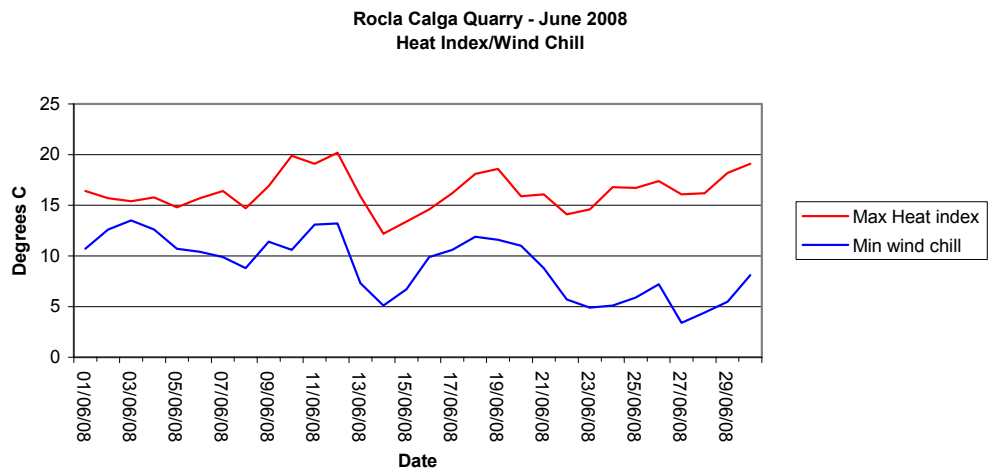
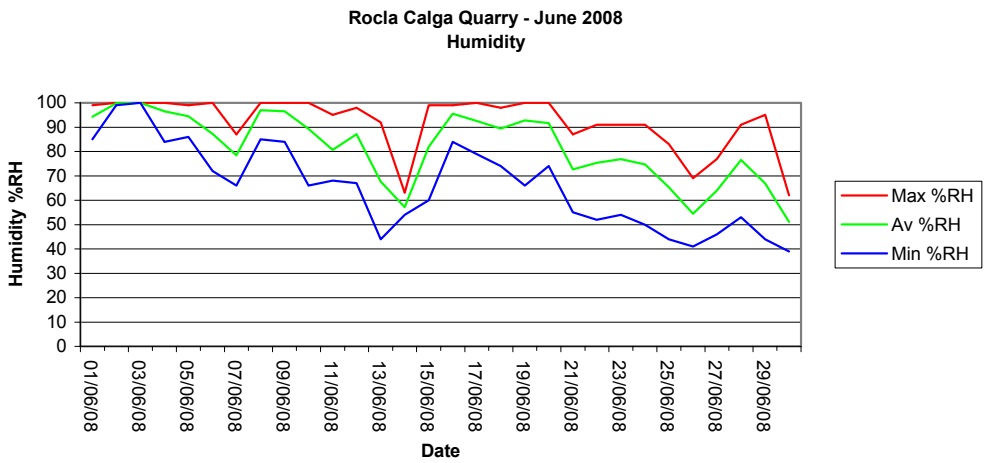
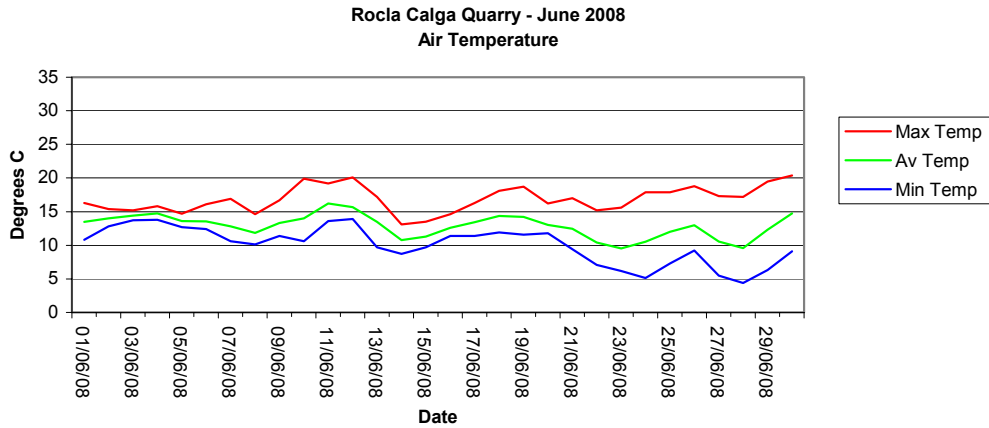
Results are displayed in the following table and figures.

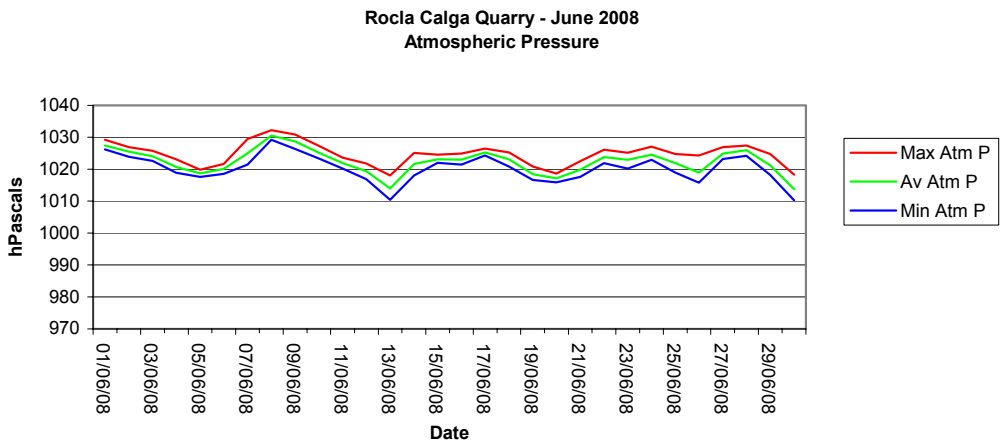
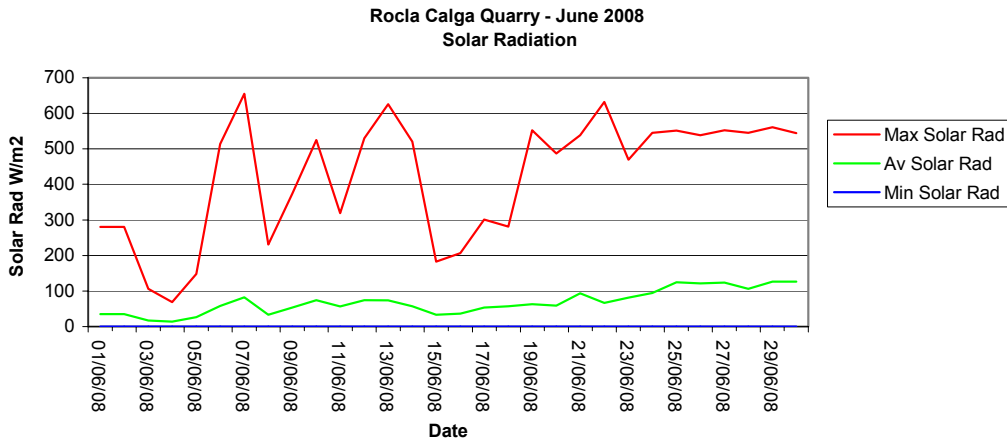
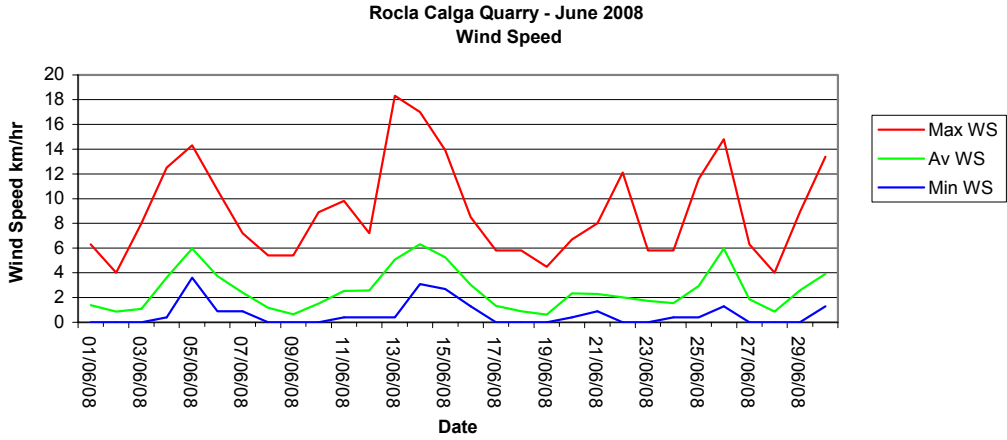
2.3.1 Monthly Meteorological Data Summary

Summary Jun-08 Rocla - Calga

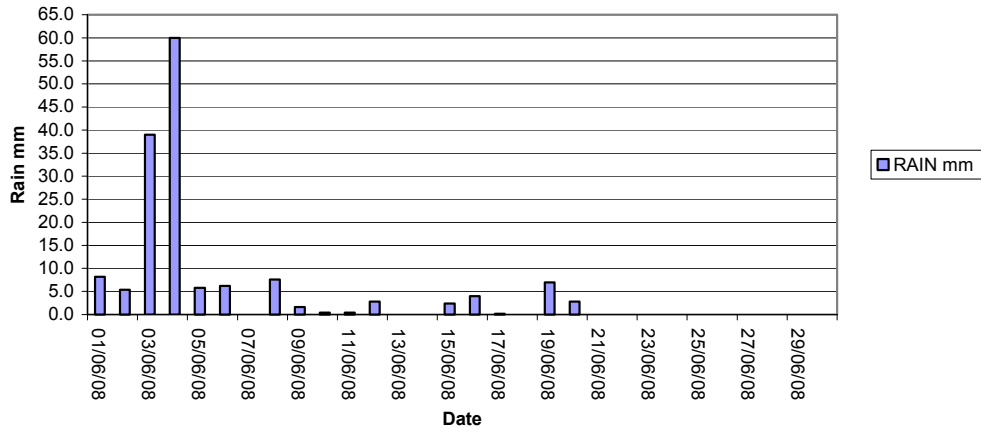
Date	Min Temp	Av Temp	Max Temp	Min %RH	Av %RH	Max %RH	RAIN mm	ET mm	Min WS	Av WS	Max WS	Min wind chill	Max Heat index	Min Atm P	Av Atm P	Max Atm P	Min Solar Rad	Av Solar Rad	Max Solar Rad	Min Data %	Av data %	Max Data %
01/06/08	10.8	13.5	16.3	85	94	99	8.2	0.5	0	1.4	6.3	10.7	16.4	1026.2	1027.4	1029.2	0	34.5	280	82.7	87.9	100
02/06/08	12.8	14.0	15.4	99	100	100	5.4	0.4	0	0.9	4	12.6	15.7	1023.9	1025.5	1026.9	0	34.6	280	60.5	85.0	100
03/06/08	13.7	14.4	15.2	100	100	100	39.0	0.2	0	1.1	8	13.5	15.4	1022.6	1024.0	1025.8	0	17.3	106	71.9	87.9	100
04/06/08	13.8	14.7	15.8	84	97	100	60.0	0.3	0.4	3.6	12.5	12.6	15.8	1018.9	1020.7	1023.1	0	13.6	69	70.8	89.3	100
05/06/08	12.7	13.6	14.7	86	94	99	5.8	0.8	3.6	6.0	14.3	10.7	14.8	1017.6	1018.7	1019.8	0	26.2	148	75.4	93.5	100
06/06/08	12.4	13.5	16.1	72	87	100	6.2	1.3	0.9	3.7	10.7	10.4	15.7	1018.5	1020.1	1021.6	0	58.3	513	79.8	89.5	100
07/06/08	10.6	12.8	16.9	66	78	87	0.0	1.8	0.9	2.4	7.2	9.9	16.4	1021.5	1025.0	1029.5	0	81.7	655	81.6	89.6	100
08/06/08	10.1	11.8	14.6	85	97	100	7.6	0.5	0	1.2	5.4	8.8	14.7	1029.2	1030.5	1032.2	0	33.1	231	78.4	91.4	100
09/06/08	11.4	13.3	16.7	84	97	100	1.6	0.7	0	0.7	5.4	11.4	16.9	1026.4	1028.7	1030.9	0	53.2	374	76	90.3	98.8
10/06/08	10.6	14.0	19.9	66	89	100	0.4	1.3	0	1.5	8.9	10.6	19.9	1023.4	1025.2	1027.3	0	74.6	525	63.5	95.6	100
11/06/08	13.6	16.2	19.2	68	81	95	0.4	1.5	0.4	2.5	9.8	13.1	19.1	1020.2	1021.9	1023.6	0	56.2	319	89.5	99.6	100
12/06/08	13.9	15.7	20.1	67	87	98	2.8	1.5	0.4	2.6	7.2	13.2	20.2	1016.9	1019.4	1021.8	0	74.0	530	79.8	95.4	100
13/06/08	9.7	13.5	17.2	44	68	92	0.0	3.1	0.4	5.1	18.3	7.3	15.9	1010.4	1013.9	1018	0	73.4	626	86.8	96.6	100
14/06/08	8.7	10.8	13.1	54	57	63	0.0	3.2	3.1	6.3	17	5.1	12.2	1018	1021.7	1025.1	0	57.4	520	91.8	99.0	100
15/06/08	9.7	11.3	13.5	60	82	99	2.4	1.4	2.7	5.2	13.9	6.7	13.4	1022	1023.1	1024.6	0	33.0	183	93.3	99.3	100
16/06/08	11.4	12.6	14.6	84	95	99	4.0	0.6	1.3	3.0	8.5	9.9	14.6	1021.5	1023.0	1024.9	0	36.4	207	88.6	98.9	100
17/06/08	11.4	13.4	16.3	79	93	100	0.2	0.7	0	1.3	5.8	10.6	16.2	1024.3	1025.3	1026.5	0	53.2	301	96.8	99.6	100
18/06/08	11.9	14.4	18.1	74	89	98	0.0	0.9	0	0.9	5.8	11.9	18.1	1020.9	1023.1	1025.3	0	57.3	281	91.2	99.1	100
19/06/08	11.6	14.2	18.7	66	93	100	7.0	1.0	0	0.6	4.5	11.6	18.6	1016.6	1018.5	1020.9	0	62.7	552	71.3	98.4	100
20/06/08	11.8	13.0	16.2	74	92	100	2.8	1.1	0.4	2.3	6.7	11	15.9	1015.9	1017.1	1018.6	0	59.2	487	97.4	99.6	100
21/06/08	9.4	12.5	17	55	73	87	0.0	2.2	0.9	2.3	8	8.8	16.1	1017.6	1019.8	1022.5	0	93.5	538	95.9	99.4	100
22/06/08	7.1	10.4	15.2	52	75	91	0.0	1.6	0	2.0	12.1	5.7	14.1	1021.9	1023.8	1026.1	0	66.8	632	94.7	99.3	100
23/06/08	6.2	9.6	15.6	54	77	91	0.0	1.6	0	1.7	5.8	4.9	14.6	1020.2	1023.0	1025.2	0	81.4	469	95.3	99.0	100
24/06/08	5.1	10.5	17.9	50	75	91	0.0	1.8	0.4	1.6	5.8	5.1	16.8	1022.9	1024.6	1027.1	0	94.5	545	91.5	98.8	100
25/06/08	7.3	12.0	17.9	44	65	83	0.0	2.8	0.4	2.9	11.6	5.9	16.7	1019	1021.9	1024.7	0	124.3	551	92.7	99.5	100
26/06/08	9.2	13.0	18.8	41	54	69	0.0	4.4	1.3	6.0	14.8	7.2	17.4	1015.8	1019.0	1024.3	0	121.8	538	97.4	99.8	100
27/06/08	5.5	10.6	17.3	46	64	77	0.0	2.5	0	1.9	6.3	3.4	16.1	1023.2	1024.9	1026.9	0	123.7	552	95.3	99.3	100
28/06/08	4.4	9.6	17.2	53	76	91	0.0	1.8	0	0.9	4	4.4	16.2	1024.2	1025.9	1027.4	0	105.8	545	78.1	98.9	100
29/06/08	6.3	12.3	19.5	44	67	95	0.0	2.9	0	2.6	8.9	5.5	18.2	1018.2	1021.2	1024.7	0	126.3	561	95.6	99.3	100
30/06/08	9.1	14.7	20.4	39	51	62	0.0	3.8	1.3	3.9	13.4	8.1	19.1	1010.3	1013.7	1018.3	0	126.0	544	95.6	99.7	100
Monthly	4.4	12.9	20.4	39	82	100	153.8	47.9	0	2.6	18.3	3.4	20.2	1010.3	1022.4	1032.2	0	68.5	655	60.5	96.0	100

2.3.2 Monthly weather charts

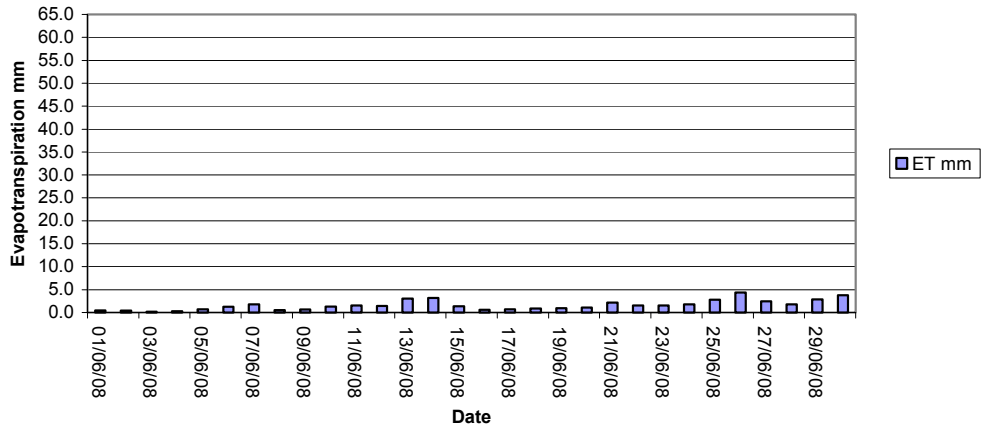




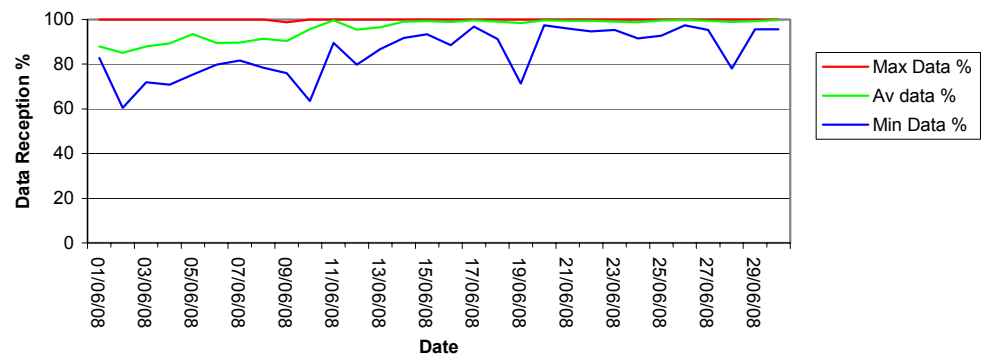
Rocla Calga Quarry - June 2008
Rainfall



Rocla Calga Quarry - June 2008
Evapotranspiration



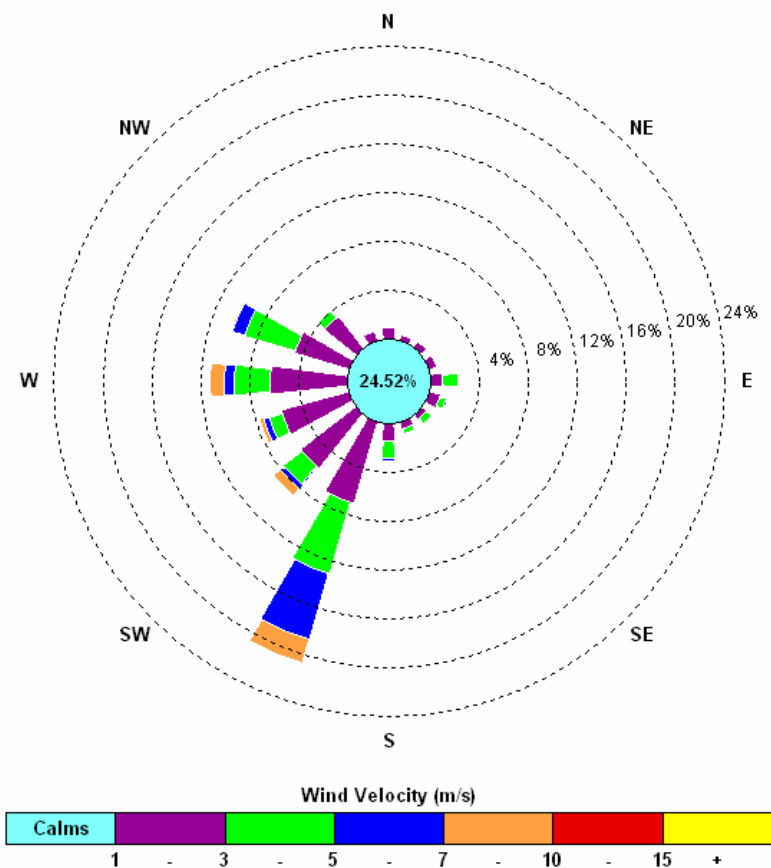
Rocla Calga Quarry - June 2008
Data Reception



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 June 2008 – 23:45, 30 June 2008



The windrose shows predominant winds from SSW this month. The maximum wind speed was 18.3 m/s from the WSW.

APPENDIX 1
LABORATORY CERTIFICATES

APPENDIX 2

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

