



**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**

SEPTEMBER 2006

A handwritten signature in black ink, appearing to read 'Colin Davies', is positioned above a horizontal line.

Colin Davies BSc MEIA CENVP
Environmental Scientist
28 October 2006

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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 September 2006;
- Surface Water quality results for September 2006;
- Ground Water depth and quality results for September 2006; and
- Meteorological report for September 2006.

The September 2006 dust deposition results show low levels of insoluble solids at all monitoring sites this month. All sites, on a year to date average basis, are currently below the 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 on the 3 October 2006. Most sites were dry at the time of sampling with two samples collected; these were Site F and a small dam below site F, additional to the Site Water Management Plan requirements. At the time of sample collection, there was no water discharges observed from the site. The samples were collected and analysed for a monthly sampling event. Results show good quality water at site F with acidic pH (typical of the area), low Electrical Conductivity, low Total Suspended Solids and no detectable Total Oil and Grease. Two additional samples were taken at Site F on the 7 and 11 September 2006. The samples were taken following heavy rain although the rain did not exceed 50mm/day, the trigger for additional sampling in the Site Water Management Plan. The samples were taken from Site F as it is the main dam and discharge point for the quarry operations. Samples were taken by site personnel who reported no discharge from the dam. Water quality was acceptable for both samples, remaining within the Site Water Management Plan assessment criteria.

Ground waters were sampled on the 3 October 2006. Groundwater depths decreased at all site apart from one where stable level was recorded. The decrease in depth, water closer to the surface, was most likely attributable to the high rainfall in September. Relatively stable water quality, compared to last month, was recorded.

The meteorological station continued to return high data recovery and operated well in September 2006. The recorded winds show dominant SSW and WNW winds. Recorded rainfall on site for September 2006 was similar to the BOM Peats Ridge Station. Both stations recorded rainfall greater than the Peats Ridge long term average. Results are detailed below:

Rocla Calga Quarry Environmental Monitoring – September 2006

Rocla Calga Quarry	165.0mm
BOM Peats Ridge*	186.2mm
BOM Gosford*	195.4mm
BOM Peats Ridge Long term mean for September*	68.0mm

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

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 with additional samples collected when daily rainfall exceeds 50mm.

Ground water sites are monitored at least bi-monthly for water quality and 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 September 2006 and the project average. Results are in g/m².month

Table 1: Dust Deposition results: 4/09/2006 to 3/10/2006.

Site	Monthly Insoluble Solids	Monthly Ash Residue	Monthly Combustible Matter	Monthly Insoluble Solids/Ash Residue %	Current Project Average Insoluble Solids
CD1	0.9	0.4	0.5	44	1.1
CD2b	0.3	0.1	0.2	33	0.7
CD3	0.9	0.4	0.5	44	0.6

Results marked with CT 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 28 October 2005 (start of the Development Consent period) from some results supplied by Rocla and is not currently an annual amount of data for averaging purposes.

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.

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

Predominant wind directions for the month were SSW and WNW.

Rocla Calga Quarry Environmental Monitoring – September 2006

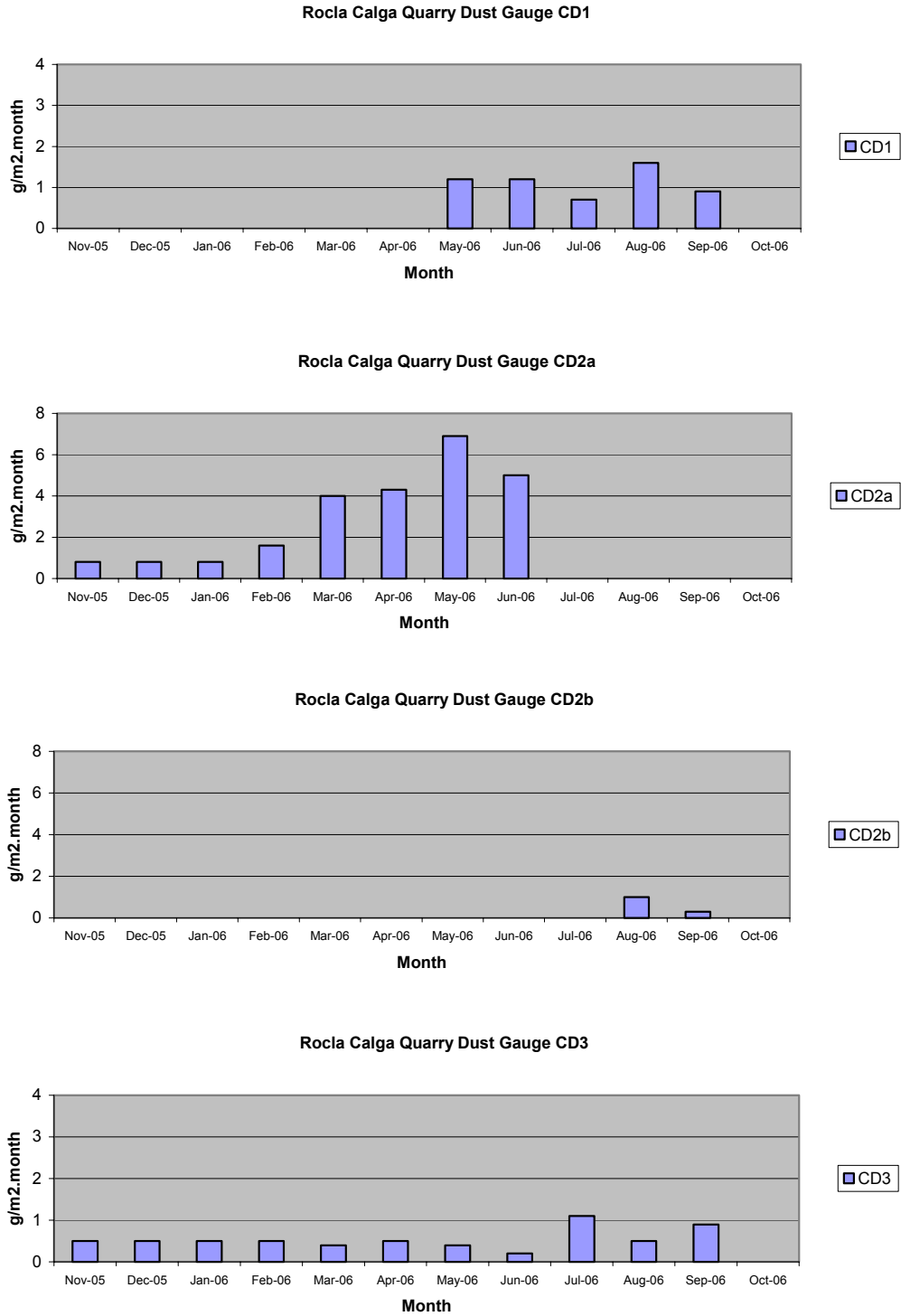


Figure 1: Dust Deposition Charts

2.2 WATER MONITORING

2.2.3 Surface Waters

Monthly surface water monitoring was conducted on the 3 October 2006. 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 Description	Turbidity Description	pH	EC (uS/cm)	TSS (mg/l)	Oil and Grease (mg/l)
A	Dry	-	-	-	-	-	-
B	Dry	-	-	-	-	-	-
C	Dry	-	-	-	-	-	-
D	Dry	-	-	-	-	-	-
E	Dry	-	-	-	-	-	-
F	Dam	Clear	Low	6.64	96	13	<5
Dam below F (Lower dam)*	Dam	Clear	Low	5.18	96	8	<5

At the time of sampling, no water was observed discharging off site from any sampling location. * The dam below Site F is not a requirement of the Site Water Management Plan.

Most sites were dry at the time of sampling with two samples collected; these were Site F and a small dam below site F, additional to the Site Water Management Plan requirements. At the time of sample collection, there was no water discharges observed from the site. The samples were collected and analysed for a monthly sampling event. Results show very good quality water at site F with slightly acidic pH, low Electrical Conductivity, low Total Suspended Solids and no detectable Total Oil and Grease.

Two additional samples were collected by Rocla Calga staff on the 7th and 11th September at Site F following heavy rain. The results are presented in Table 3. The laboratory analysis sheets are provided in **Appendix 1**.

Site	Observed Flow Rate	Water Colour Description	Turbidity Description	pH	EC (uS/cm)	TSS (mg/l)	Oil and Grease (mg/l)
F (7/9)	Dam	Clear	Low	5.97	92	3	<5
F (11/9)	Dam	Clear	Slight	5.16	93	45	<5

Rocla Calga Quarry Environmental Monitoring – September 2006

Water quality was acceptable for both samples, remaining within the Site Water Management Plan assessment criteria. Quarry staff advised that the dam did not discharge from the site.

2.2.3 Ground Waters

Ground waters were sampled on the 3 October 2006. 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**.

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	20.84	4.7	135
CQ2	Voutos	DIP Only	6.23	5.13	5	80
CQ3	Voutos	* Monitor	10.53	10.32	6.5	145
CQ4	Voutos	* Monitor	8.78	8.67	5.1	100
CQ5	Gazzana	DIP Only	8.69	8.51	4.5	195
CQ6	Gazzana	DIP Only	16.00	14.78	4.3	290
CQ7	Gazzana	* Monitor	6.89	6.21	4.7	105
CQ8	Gazzana	* Monitor	11.03	10.15	4.4	200
CQ9	Gazzana	Dip Only	10.1	9.67	4.6	120
CQ10	Voutos	* Monitor	NI	23.89	5.8	135
CQ11s	Gazzana	* Monitor	NI	10.51	5.2	145
CQ11d	Gazzana	* Monitor	NI	11.91	5.8	135
CQ12	Gazzana	* Monitor	NI	7.28	4.5	145
CQ13	Kashouli	* Monitor	NI	15.77	4.8	195
CP3	Gazzana	Domestic	10.4	9.84	4.7	165
CP4	Kashouli	Domestic	13.63	13.05	NM	NM
CP5	Kashouli	Domestic	16.61	11.23	NM	NM
CP6	Kashouli	Domestic	16.27	13.42	NM	NM
CP7	Kashouli	Production	8.56	5.7	4.6	215
CP8	Rozmanec	Domestic	22.17	NR	NR	NR
MW7	Rocla Bore	* Monitor	15.76	17.22	4.7	130
MW8	Rocla Bore	* Monitor	9.82	10.18	4.9	95
MW9	Rocla Bore	* Monitor	22.44	22.82	4.6	95
MW10	Rocla Bore	* Monitor	15.41	14.28	4.7	135

Rocla Calga Quarry Environmental Monitoring – September 2006

Notes:

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

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

NR = Not Required by resident.

* = Logger Installed.

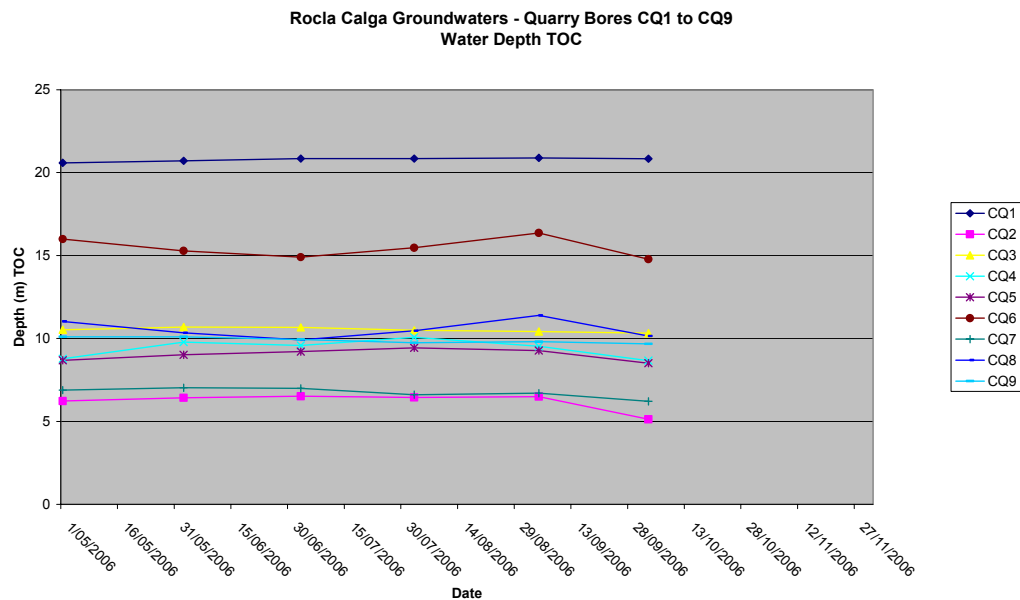
- = These bores were not installed in April 2006 but are now operational. April was the first set of measurements taken by Carbon Based Environmental Pty Limited.

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

	Increase to ground water depth (water moved away from surface)
	Decrease to ground water depth (water moved towards surface)
	Stable water depth

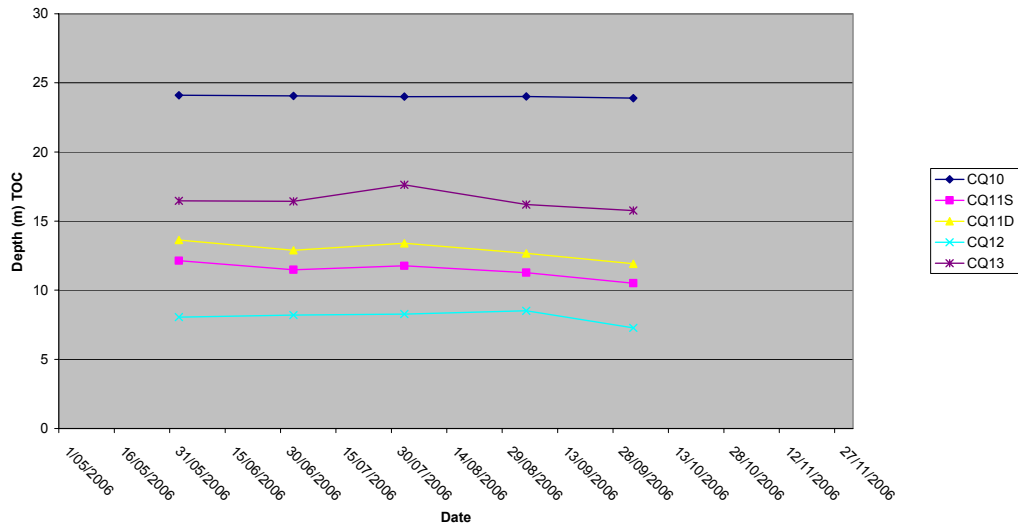
Water depth indicated decreases, water moving towards the ground surface, this month at all sites apart from one where the water level remained stable. The decrease in depth from surface to water is most likely due to the high rainfall in September 2006 and subsequent groundwater recharge. Longer term monitoring is required to fully evaluate groundwater depth trends.

Figures 2 to 5 Groundwater Depth Charts.

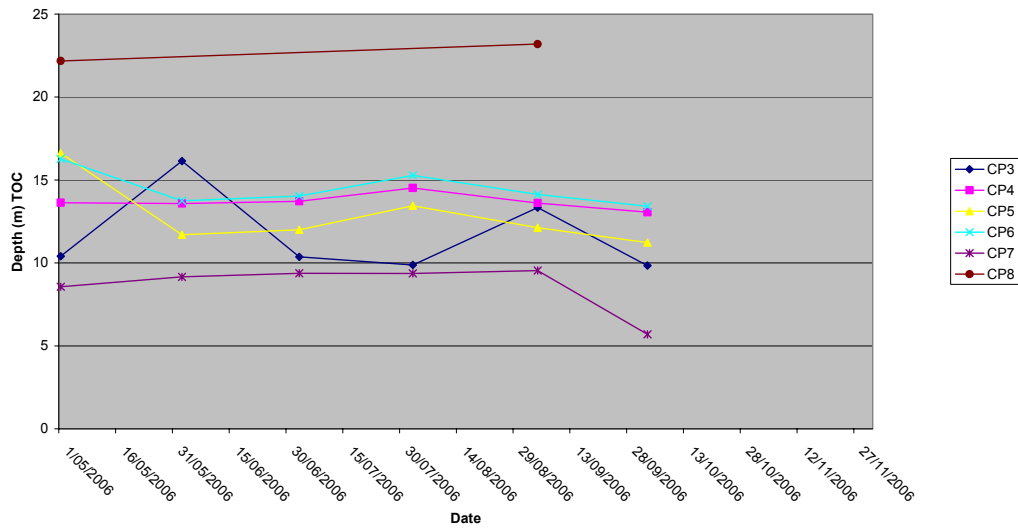


Rocla Calga Quarry Environmental Monitoring – September 2006

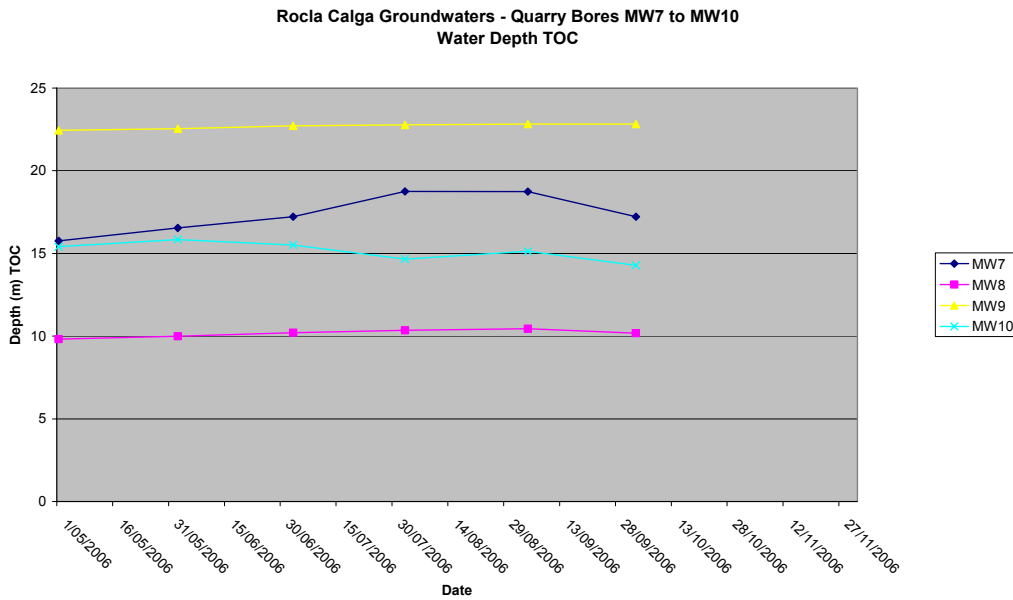
Rocla Calga Groundwaters - Quarry Bores CQ10 to CQ13
Water depth TOC



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



Rocla Calga Quarry Environmental Monitoring – September 2006



Groundwater quality results remained relatively stable compared to last month and indicate acidic water of low electrical conductivity.

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

2.3 METEOROLOGICAL MONITORING

The Rocla Calga Quarry weather station was fully operational in September 2006 with 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.
- 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 September 2006 shows good correlation between the Rocla Calga Quarry station and the nearby Peats Ridge BOM station and the Gosford BOM station. The rainfall comparison is provided below and shows above average rainfall conditions.

Rocla Calga Quarry	165.0mm
BOM Peats Ridge*	186.2mm
BOM Gosford*	195.4mm
BOM Peats Ridge Long term mean for August*	68.0mm

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

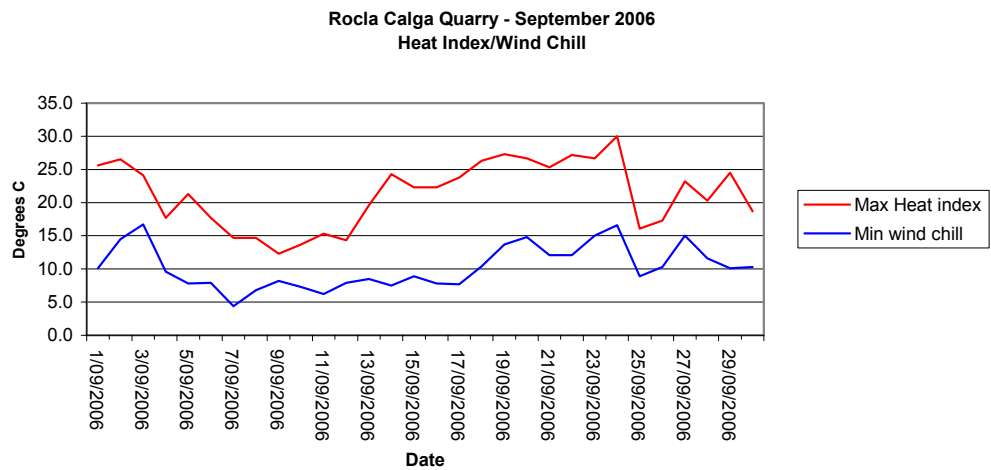
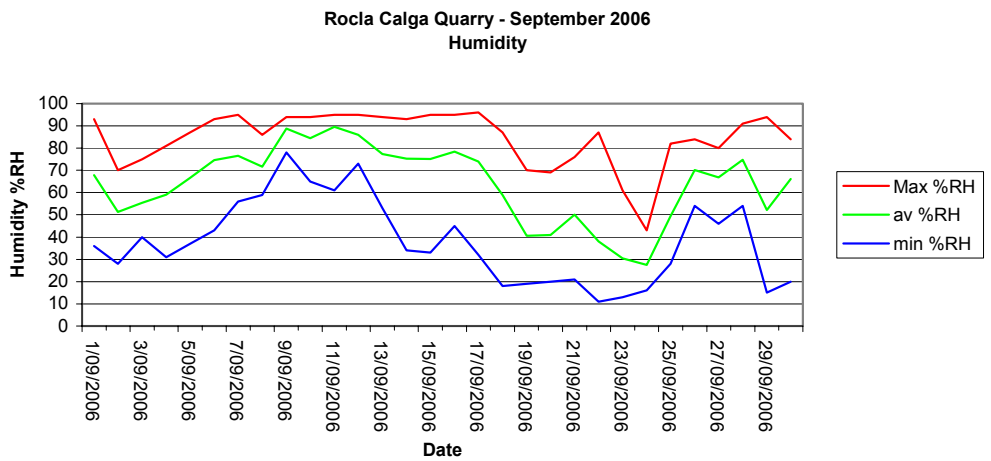
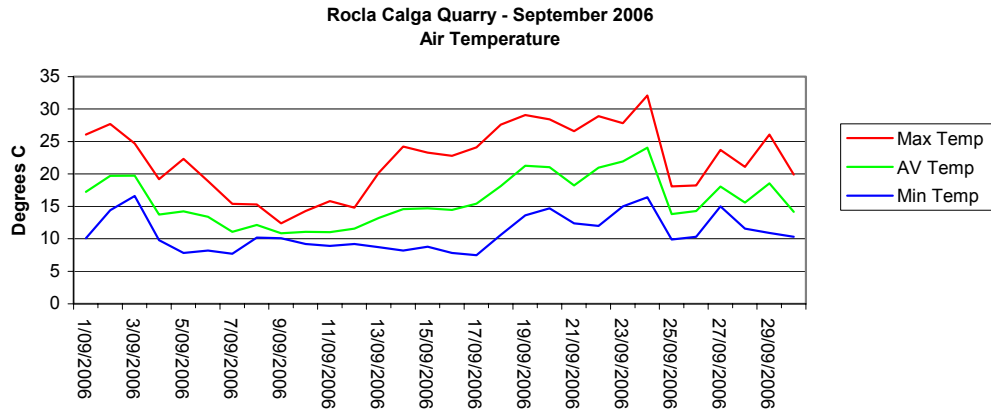
Results are displayed in the following table and figures.

Rocla Calga Quarry Environmental Monitoring – September 2006

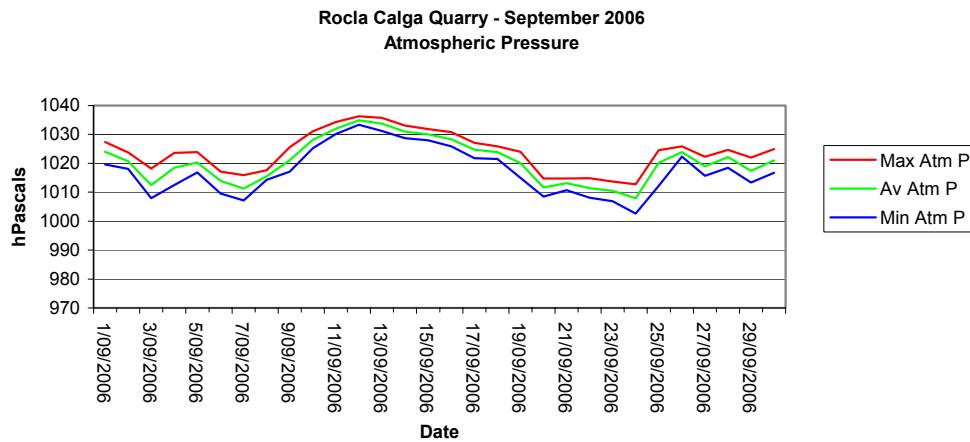
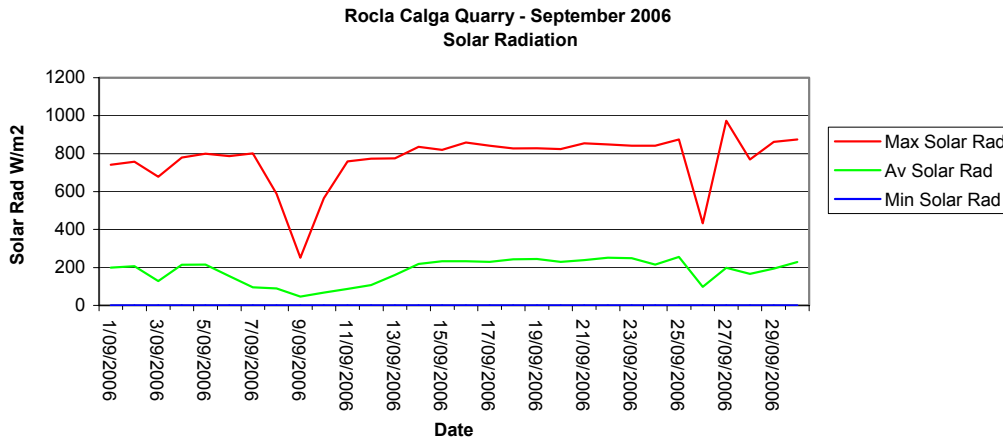
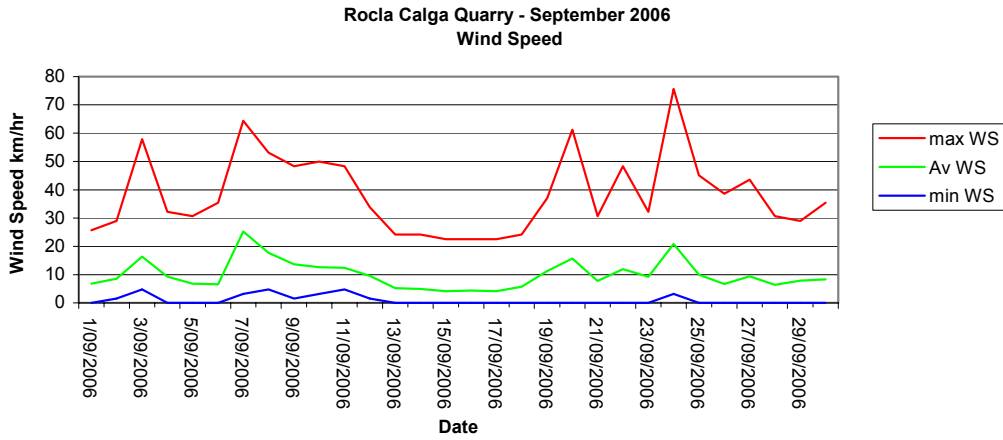
Summary Sep-06 Rocla - Calga

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 %
1/09/2006	10.1	17.2	26.1	36	68	93	0.0	3.8	0	6.8	25.7	10.1	25.6	1019.6	1023.9	1027.4	0	199.3	742	95.6	99.4	100
2/09/2006	14.4	19.7	27.7	28	51	70	0.0	4.8	1.6	8.6	29	14.5	26.5	1018.1	1020.7	1023.8	0	206.4	758	98	99.8	100
3/09/2006	16.6	19.7	24.7	40	55	75	0.6	4.8	4.8	16.4	57.9	16.7	24.1	1007.9	1012.5	1018.2	0	128.6	678	92.7	99.7	100
4/09/2006	9.8	13.7	19.2	31	59	81	0.0	4.3	0	9.3	32.2	9.6	17.7	1012.5	1018.5	1023.6	0	214.3	779	96.5	99.3	100
5/09/2006	7.8	14.2	22.3	37	67	87	0.0	4.0	0	6.8	30.6	7.8	21.3	1016.9	1020.3	1023.9	0	215.8	800	96.8	99.8	100
6/09/2006	8.2	13.4	18.9	43	75	93	18.8	2.7	0	6.6	35.4	7.9	17.7	1009.6	1013.9	1017.1	0	154.5	786	96.8	99.4	100
7/09/2006	7.7	11.1	15.4	56	77	95	29.8	2.9	3.2	25.3	64.4	4.4	14.7	1007.2	1011.3	1015.9	0	95.2	801	96.5	99.8	100
8/09/2006	10.2	12.1	15.3	59	72	86	0.0	2.6	4.8	17.7	53.1	6.8	14.7	1014.3	1015.6	1017.6	0	89.2	588	94.2	99.9	100
9/09/2006	10.1	10.9	12.4	78	89	94	42.6	1.0	1.6	13.6	48.3	8.2	12.3	1017.1	1021.1	1025.6	0	45.7	251	92.7	99.9	100
10/09/2006	9.2	11.1	14.3	65	84	94	38.6	1.5	3.2	12.6	49.9	7.3	13.7	1025.2	1028.2	1031.1	0	67.4	565	93.9	99.9	100
11/09/2006	8.9	11.0	15.8	61	90	95	32.8	1.5	4.8	12.4	48.3	6.2	15.3	1030.1	1032.0	1034.3	0	87.4	759	99.1	99.9	100
12/09/2006	9.2	11.6	14.8	73	86	95	1.2	1.7	1.6	9.6	33.8	7.9	14.3	1033.4	1034.9	1036.3	0	107.1	774	93.6	99.8	100
13/09/2006	8.7	13.2	20.2	53	77	94	0.0	2.6	0	5.2	24.1	8.5	19.6	1031.2	1033.8	1035.7	0	159.8	775	96.8	99.6	100
14/09/2006	8.2	14.6	24.2	34	75	93	0.0	3.6	0	5.0	24.1	7.5	24.3	1028.7	1031.0	1033.1	0	218.5	836	97.1	99.6	100
15/09/2006	8.8	14.7	23.3	33	75	95	0.0	3.8	0	4.2	22.5	8.9	22.3	1028	1030.1	1031.8	0	233.3	820	95.6	99.4	100
16/09/2006	7.8	14.5	22.8	45	78	95	0.2	3.6	0	4.4	22.5	7.8	22.3	1025.9	1028.3	1030.8	0	232.4	859	97.1	99.5	100
17/09/2006	7.5	15.4	24.1	32	74	96	0.2	3.7	0	4.2	22.5	7.7	23.8	1021.8	1024.7	1027.1	0	230.5	842	97.4	99.7	100
18/09/2006	10.6	18.1	27.6	18	59	87	0.0	4.5	0	5.7	24.1	10.4	26.3	1021.5	1023.9	1025.9	0	242.2	827	95.3	99.6	100
19/09/2006	13.6	21.3	29.1	19	41	70	0.0	6.5	0	11.3	37	13.7	27.3	1015	1020.1	1024	0	243.7	828	98.2	99.8	100
20/09/2006	14.7	21.1	28.4	20	41	69	0.0	7.5	0	15.7	61.2	14.8	26.7	1008.5	1011.6	1014.8	0	230.3	824	94.4	99.8	100
21/09/2006	12.4	18.2	26.6	21	50	76	0.0	5.1	0	7.8	30.6	12.1	25.3	1010.7	1013.2	1014.8	0	238.1	854	97.4	99.7	100
22/09/2006	12	21.0	28.9	11	38	87	0.0	7.4	0	12.0	48.3	12.1	27.2	1008.1	1011.5	1014.9	0	251.4	848	96.8	99.7	100
23/09/2006	15	21.9	27.8	13	31	61	0.0	6.8	0	9.2	32.2	15	26.7	1006.9	1010.5	1013.7	0	248.3	842	96.5	99.7	100
24/09/2006	16.4	24.0	32.1	16	28	43	0.0	20.7	3.2	20.8	75.6	16.6	30	1002.6	1008.0	1012.8	0	216.1	841	93.6	99.9	100
25/09/2006	9.9	13.8	18.1	28	49	82	0.0	5.3	0	10.0	45.1	8.9	16.1	1012.2	1020.2	1024.5	0	256.3	875	93	99.3	100
26/09/2006	10.3	14.3	18.2	54	70	84	0.0	2.3	0	6.7	38.6	10.3	17.3	1022.4	1023.8	1025.9	0	98.3	432	93	99.9	100
27/09/2006	15	18.1	23.7	46	67	80	0.0	4.2	0	9.4	43.5	15	23.2	1015.7	1018.9	1022.3	0	197.9	973	98.2	99.9	100
28/09/2006	11.6	15.6	21.1	54	75	91	0.0	3.2	0	6.4	30.6	11.6	20.3	1018.5	1022.2	1024.6	0	165.7	769	94.7	99.2	100
29/09/2006	10.9	18.6	26.1	15	52	94	0.2	4.5	0	7.9	29	10.1	24.5	1013.3	1017.4	1022	0	193.3	861	95.3	99.4	100
30/09/2006	10.3	14.2	19.9	20	66	84	0.0	4.3	0	8.3	35.4	10.3	18.7	1016.8	1021.0	1024.9	0	227.8	875	94.4	98.8	100
Monthly	7.5	15.9	32.1	11	64	96	165.0	135.1	0	10.0	75.6	4.4	30	1002.6	1020.8	1036.3	0	183.2	973	92.7	99.6	100

Rocla Calga Quarry Environmental Monitoring – September 2006

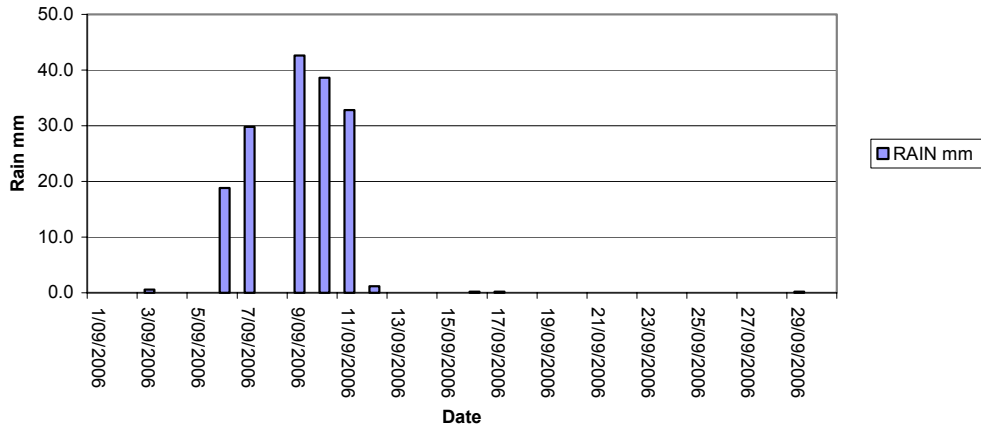


Rocla Calga Quarry Environmental Monitoring – September 2006

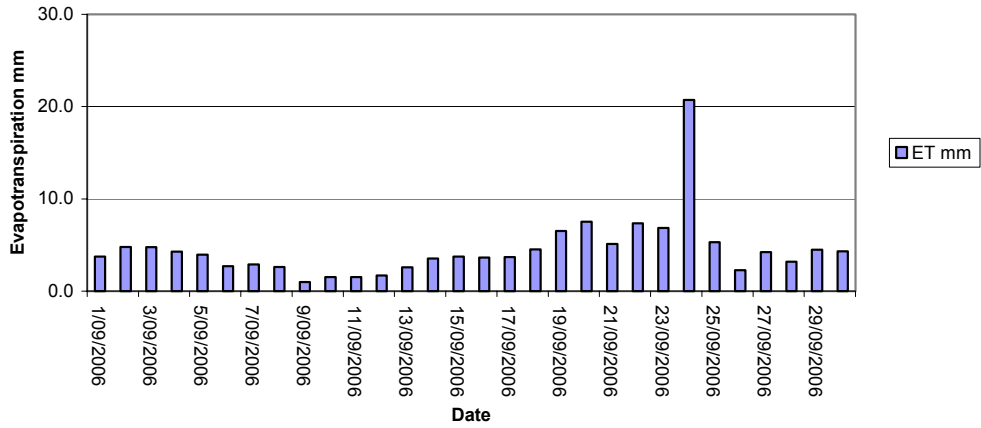


Rocla Calga Quarry Environmental Monitoring – September 2006

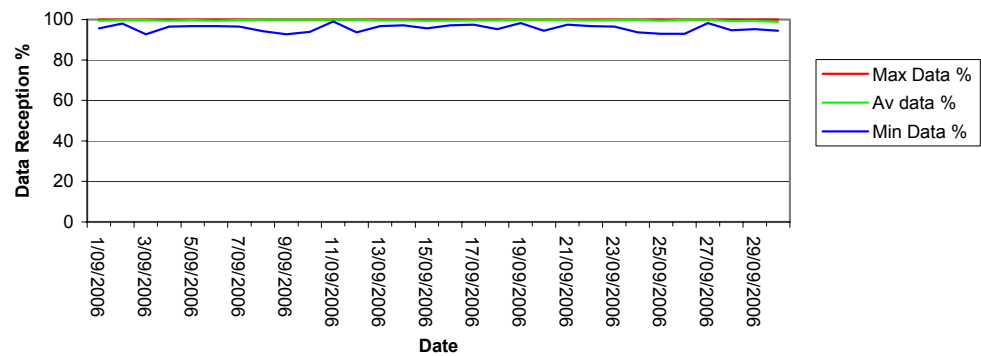
Rocla Calga Quarry - September 2006
Rain



Rocla Calga Quarry - September 2006
Evapotranspiration

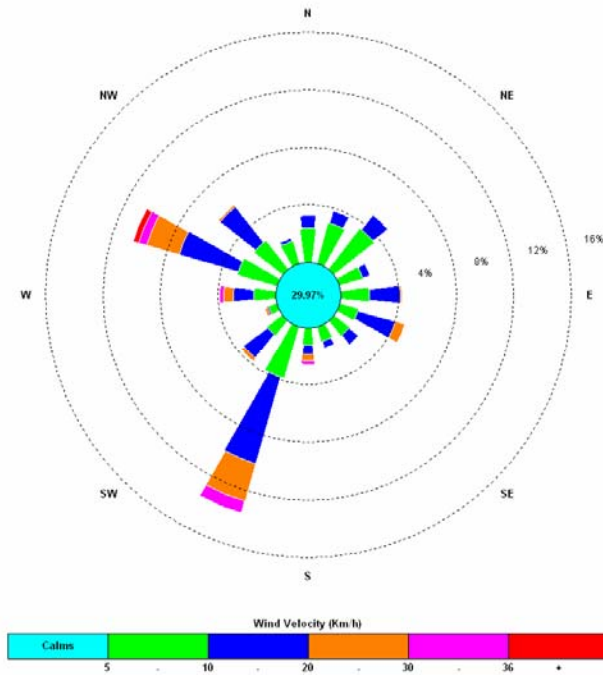


Rocla Calga Quarry - September 2006
Data Reception



2.4.3 Windrose plots

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 5km/hr.



The windrose shows dominant strong winds from the SSW and WNW. The maximum wind speed was 64.4km/hr recorded from the SSW.

APPENDIX 1
LABORATORY CERTIFICATES

APPENDIX 2

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