



**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**

MARCH 2007

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

Colin Davies BSc MEIA CENVP
Environmental Scientist
25 April 2007

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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 March 2007;
- Surface Water quality results for March 2007;
- Ground Water depth and quality results for March 2007; and
- Meteorological report for March 2007.

The March 2007 dust deposition results show decreased 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 on the 3 April 2007. Most sites were not flowing at the time of sampling with only 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 discharge 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 near neutral pH, low Electrical Conductivity, low Total Suspended Solids and no detectable Total Oil and Grease. The small dam below site F was slightly more acidic pH, having low Electrical Conductivity and Total Suspended Solids and no detectable Total Oil and Grease

Ground waters were sampled for the normal monthly monitoring on the 3 April 2007. Groundwater depths generally decreased this month at monitoring bores, indicating water moving toward the surface with relatively stable water quality, compared to last month.

The meteorological station continued to return high data recovery and operated well in March 2007. The recorded winds show mixed winds with no dominant directions. Recorded rainfall on site for March 2007 was less than the BOM Peats Ridge Station and less than the Peats Ridge long term average. Results are detailed below:

Rocla Calga Quarry Environmental Monitoring – March 2007

Rocla Calga Quarry	75.4mm
BOM Peats Ridge*	164.4mm
BOM Gosford*	143.6mm
BOM Peats Ridge Long term mean for March*	145.2mm

*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 when sites A to D are flowing and Site F, a dam. Additional samples are collected when daily rainfall exceeds 50mm.

Ground water 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 March 2007 and the project average.

Results are in g/m².month

Table 1: Dust Deposition results: 1/3/2007 to 3/4/2007.

Site	Monthly Insoluble Solids	Monthly Ash Residue	Monthly Combustible Matter	Monthly Ash Residue/ Insoluble Solids %	Current Project Average Insoluble Solids
CD1	1.8	0.7	1.1	39	1.6
CD2b	1.8	0.5	1.3	28	1.4
CD3	1.6	0.5	1.1	31	0.9
CD4	1.2	0.5	0.7	42	1.3
CD5	1.1	0.1	1.0	9	1.5
CD6	0.7	0.4	0.3	57	1.3

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.

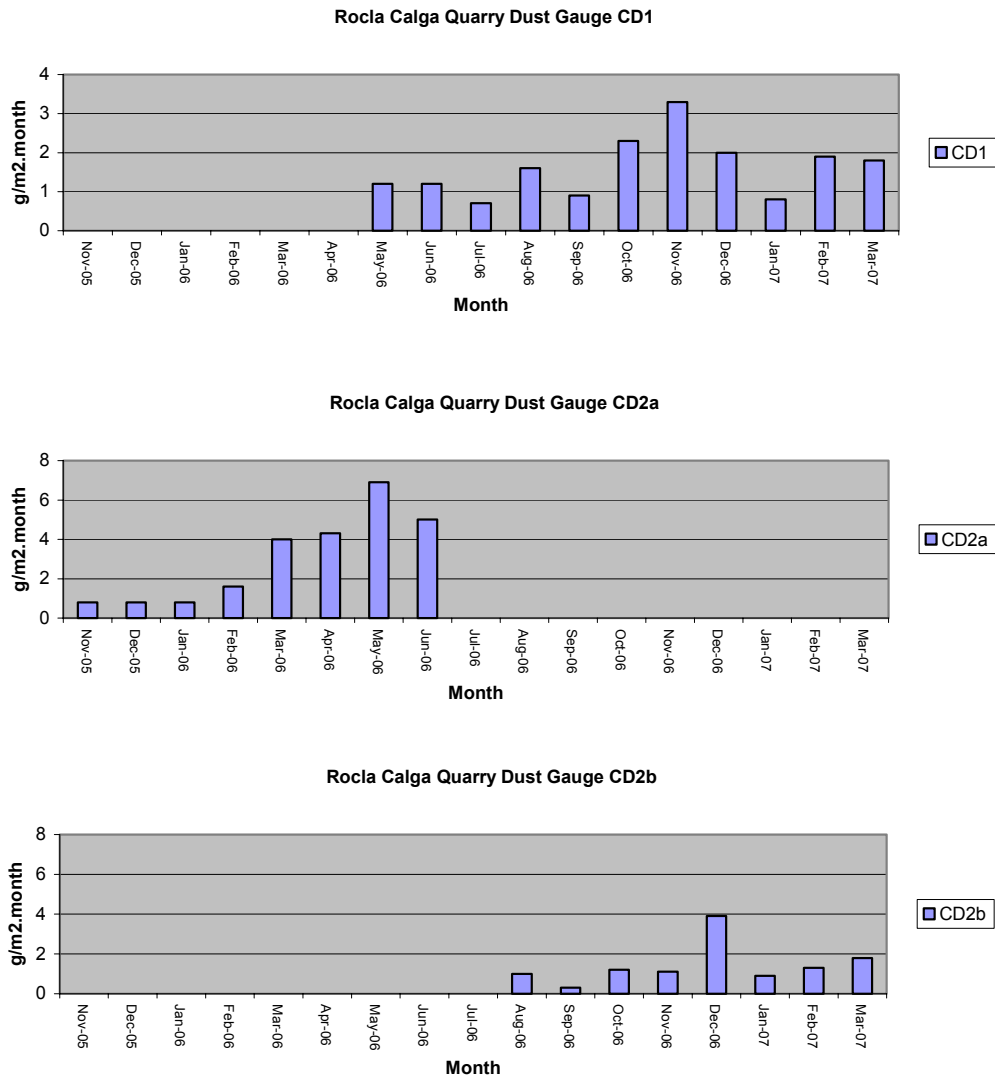
CD1 was installed on the 1 May 2006. CD2a was discontinued at the start of August 2006 due to quarry operations “mining out” the site of the gauge. The replacement gauge, Site CD2b, was located in a position adjacent to the boundary between B. Kashouli and F. & J. Gazzana in conformance with the Air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

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

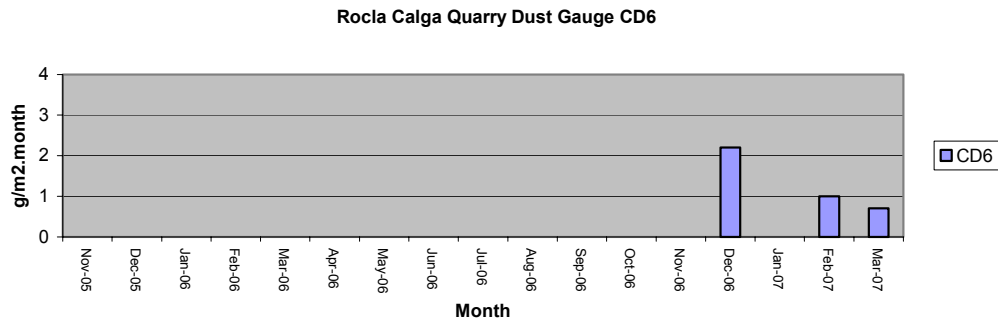
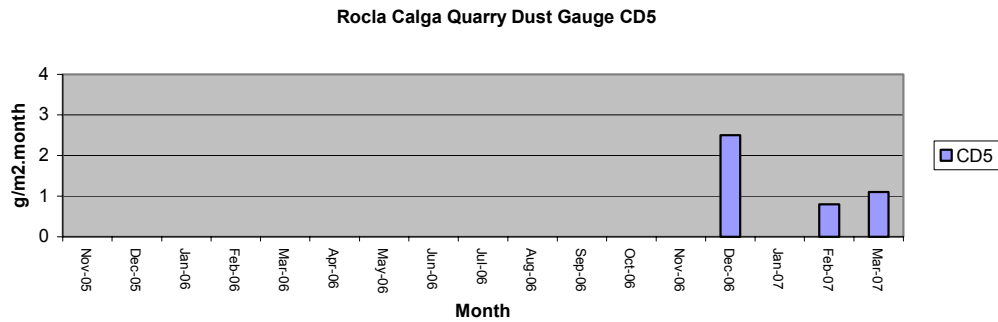
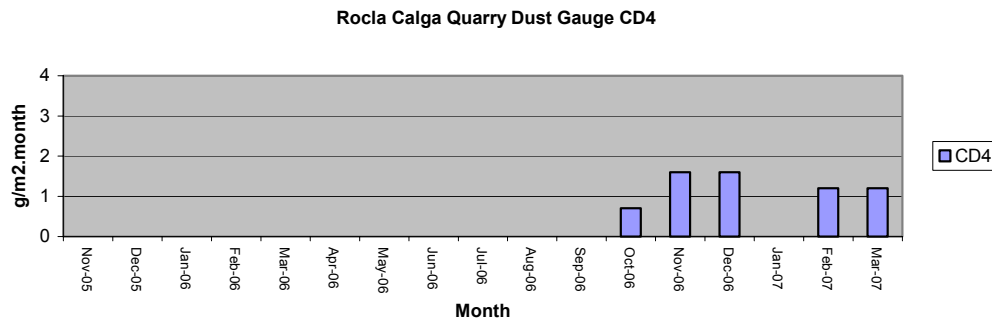
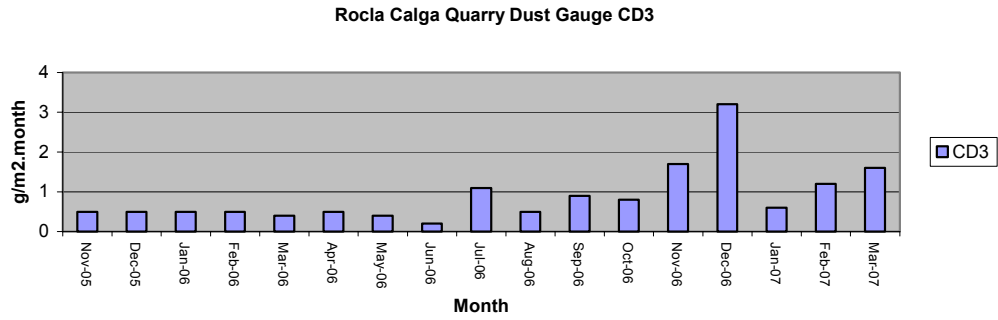
There were no predominant winds this month with winds mixed from many directions.

Rocla Calga Quarry Environmental Monitoring – March 2007

Figure 1: Dust Deposition Charts



Rocla Calga Quarry Environmental Monitoring – March 2007



2.2 WATER MONITORING

2.2.1 Surface Waters

Monthly surface water monitoring was conducted on the 3 April 2007. 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	Not Flowing	-	-	-	-	-	-
B	Not Flowing	-	-	-	-	-	-
C	Not Flowing	-	-	-	-	-	-
D	Not Flowing	-	-	-	-	-	-
F	Dam	Clear	Low	5.32	92	3	<5
Dam below F (Lower dam)*	Dam	Clear	Low	5.11	93	2	<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.

Most sites were not flowing 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 discharge 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 detected Total Oil and Grease.

2.2.2 Ground Waters

Ground waters were sampled on the 3 April 2007. 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.**

Rocla Calga Quarry Environmental Monitoring – March 2007

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	20.62	4.7	130
CQ2	Voutos	DIP Only	6.23	5.62	5.1	70
CQ3	Voutos	* Monitor	10.53	10.22	6	140
CQ4	Voutos	* Monitor	8.78	8.73	5.6	95
CQ5	Gazzana	DIP Only	8.69	7.83	4.8	195
CQ6	Gazzana	DIP Only	16.00	15.29	4.5	275
CQ7	Gazzana	* Monitor	6.89	5.97	5	105
CQ8	Gazzana	* Monitor	11.03	10.38	4.6	195
CQ9	Gazzana	DIP Only	10.1	9.5	4.9	120
CQ10	Voutos	* Monitor	NI	23.51	4.9	120
CQ11s	Gazzana	* Monitor	NI	10.55	5.5	150
CQ11d	Gazzana	* Monitor	NI	11.86	5.9	130
CQ12	Gazzana	* Monitor	NI	6.48	4.7	145
CQ13	Kashouli	* Monitor	NI	18.62	4.9	195
CP3	Gazzana	Domestic	10.40	9.8	5	165
CP4	Kashouli	Domestic	13.63	23.82	4.6	230
CP5	Kashouli	Domestic	16.61	20.49	4.7	270
CP6	Kashouli	Domestic	16.27	19.44	4.6	220
CP7	Kashouli	Production	8.56	5.02	4.8	195
CP8	Rozmanec	Domestic	22.17	NR	NR	NR
MW7	Rocla Bore	* Monitor	15.76	16.97	5.4	140
MW8	Rocla Bore	* Monitor	9.82	9.97	5.2	95
MW9	Rocla Bore	* Monitor	22.44	22.73	5	95
MW10	Rocla Bore	* Monitor	15.41	13.85	4.9	125

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.

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)

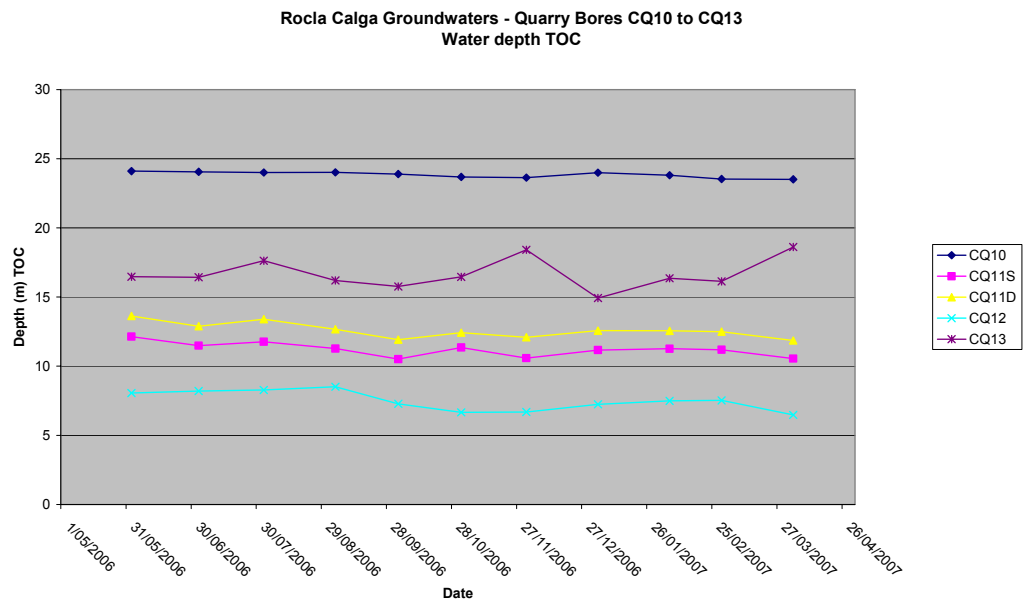
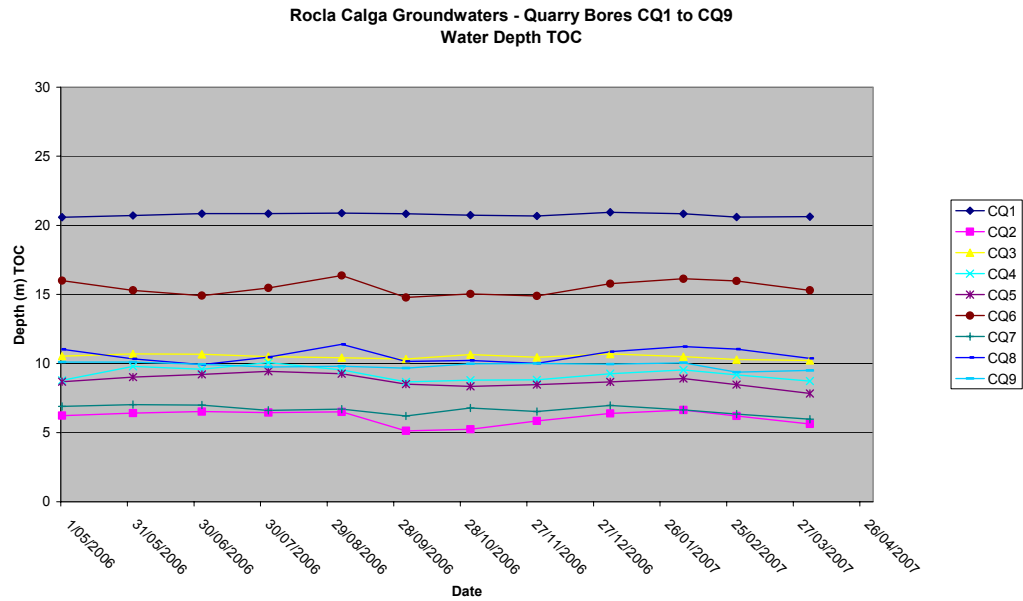
Water depth indicated decreases in groundwater depth (water moving towards the surface) at most monitoring, CQ and MW bores this month. The CP bores generally indicated a increase in depth to groundwater except at CP3 where depth to ground

Rocla Calga Quarry Environmental Monitoring – March 2007

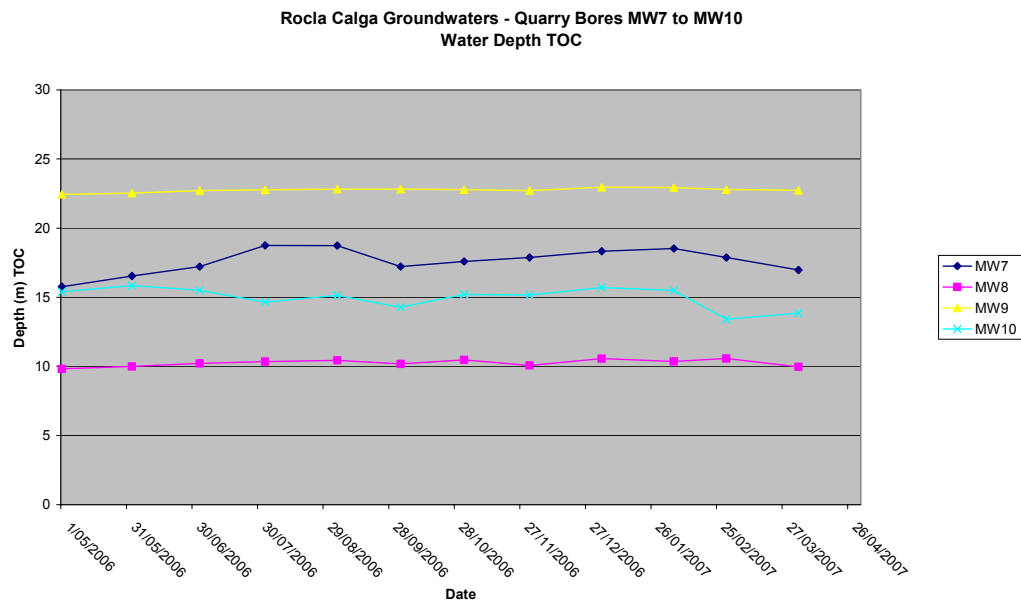
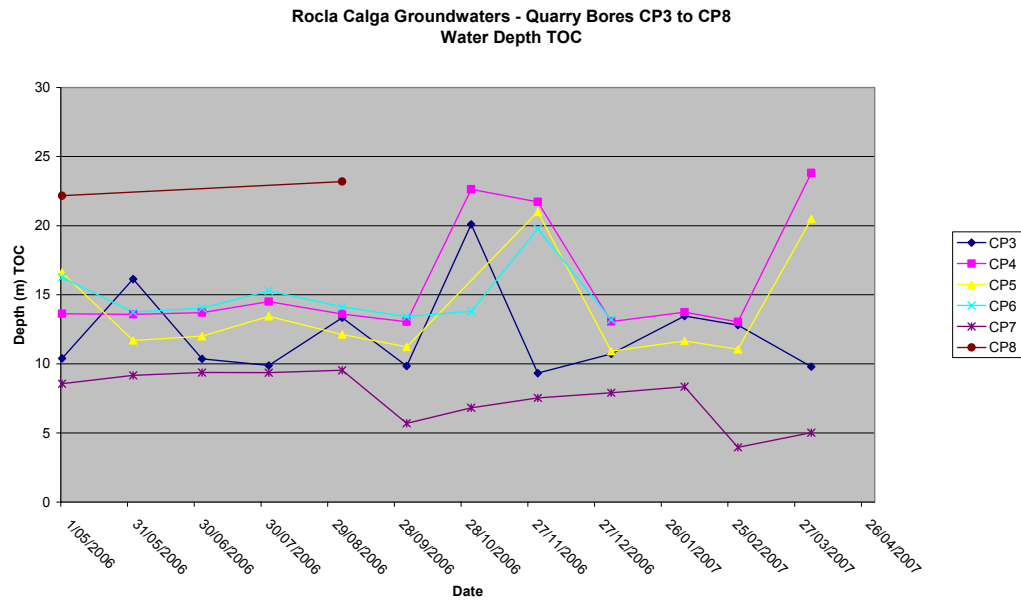
water decreased. The CP series of bores generally show larger increases and decreases in depth to water due to pumping from the bores.

Longer term monitoring is required to fully evaluate groundwater depth trends.

Figures 2 to 5: Groundwater Depth Charts.



Rocla Calga Quarry Environmental Monitoring – March 2007



Groundwater quality results remained relatively stable compared to last month and indicate acidic water of low electrical conductivity. Detailed bi-annual water quality monitoring is next due in April 2007.

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 March 2007 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 March 2007 shows lower rainfall at the Rocla Calga Quarry station compared to the nearby Peats Ridge and Gosford BOM stations. The rainfall comparison is provided below.

Rocla Calga Quarry	75.4mm
BOM Peats Ridge*	164.4mm
BOM Gosford*	143.6mm
BOM Peats Ridge Long term mean for March*	145.2mm

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

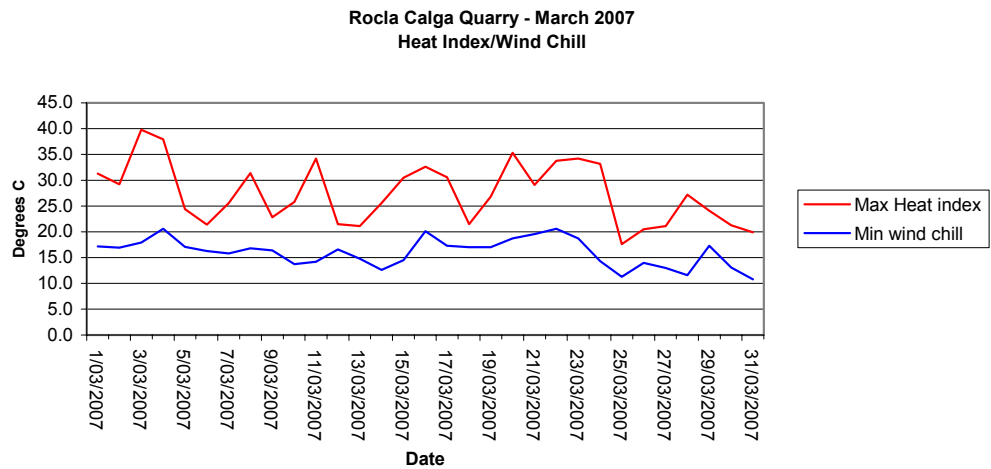
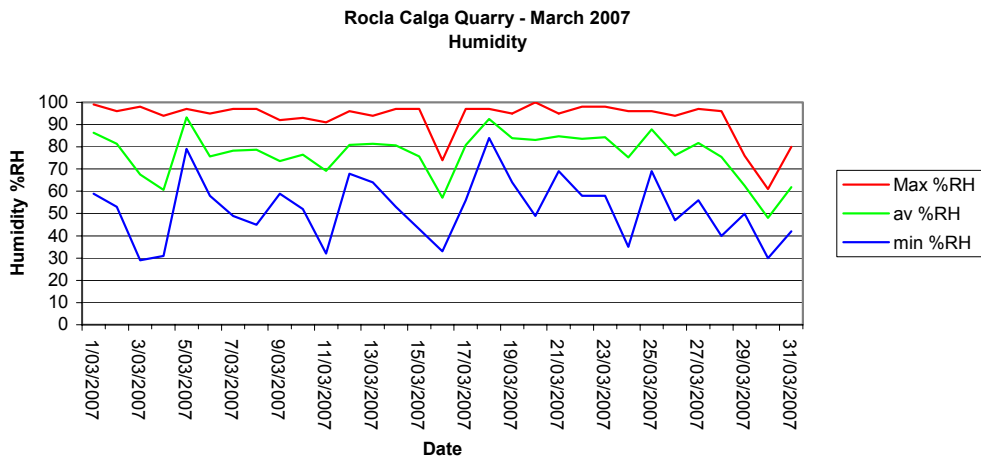
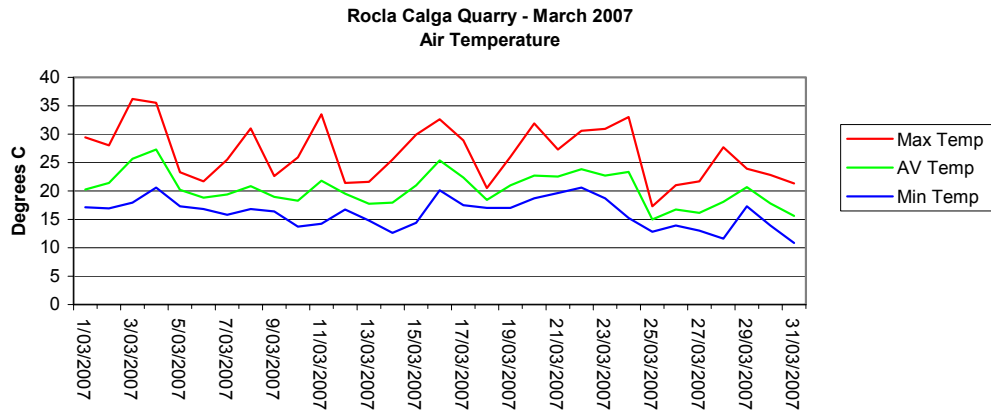
Results are displayed in the following table and figures.

Rocla Calga Quarry Environmental Monitoring – March 2007

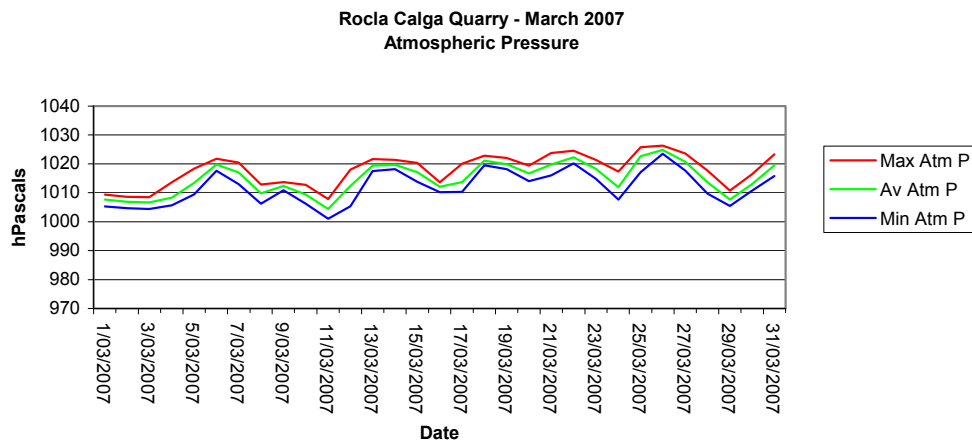
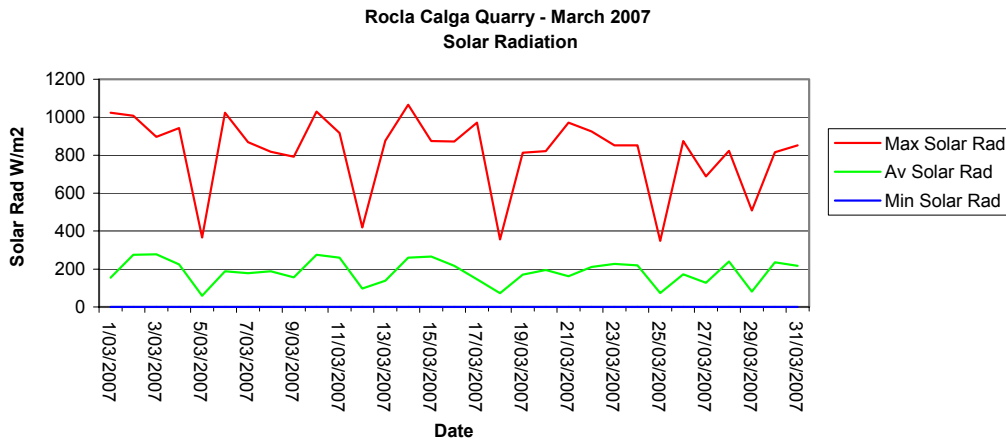
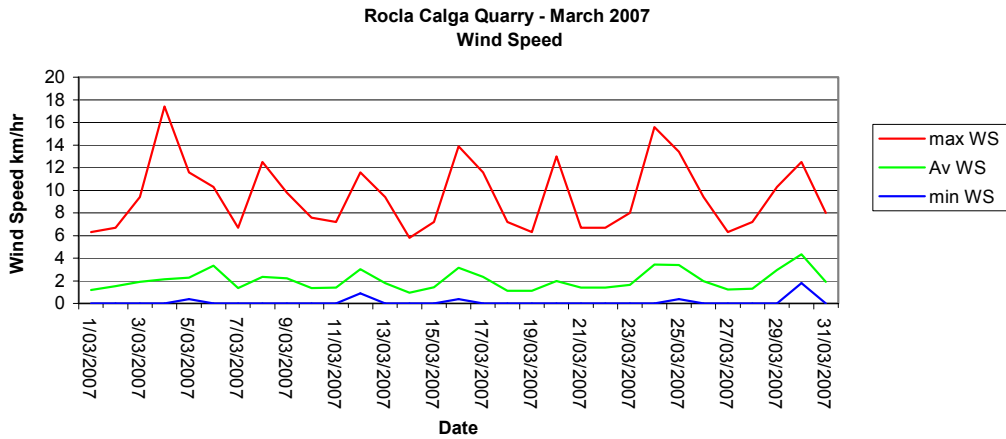
Summary Mar-07 Rocla - Calga

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 %
1/03/2007	17.1	20.2	29.4	59	86	99	0.2	2.7	0	1.2	6.3	17.2	31.3	1005.3	1007.6	1009.4	0	154.1	1024	85.1	99.6	100
2/03/2007	16.9	21.4	28	53	81	96	0.0	4.5	0	1.5	6.7	16.9	29.2	1004.7	1006.9	1008.6	0	274.5	1007	94.2	99.6	100
3/03/2007	17.9	25.7	36.2	29	68	98	0.2	5.9	0	1.9	9.4	17.9	39.8	1004.4	1006.7	1008.5	0	276.9	896	95.3	99.9	100
4/03/2007	20.6	27.3	35.5	31	61	94	6.6	5.1	0	2.1	17.4	20.6	37.9	1005.7	1008.3	1013.6	0	223.6	943	93.9	99.9	100
5/03/2007	17.3	20.2	23.3	79	93	97	16.2	1.0	0.4	2.3	11.6	17.1	24.4	1009.5	1013.5	1018.4	0	59.3	366	97.7	99.8	100
6/03/2007	16.8	18.8	21.7	58	76	95	1.8	3.8	0	3.3	10.3	16.3	21.4	1017.6	1019.8	1021.8	0	187.6	1023	96.8	99.7	100
7/03/2007	15.8	19.4	25.5	49	78	97	0.0	3.2	0	1.4	6.7	15.8	25.6	1013	1017.1	1020.5	0	177.8	869	97.4	99.5	100
8/03/2007	16.8	20.8	31	45	79	97	13.2	3.7	0	2.3	12.5	16.8	31.4	1006.2	1009.8	1012.9	0	188.3	818	95.9	99.7	100
9/03/2007	16.4	18.9	22.6	59	74	92	0.0	3.2	0	2.2	9.8	16.4	22.8	1010.9	1012.4	1013.7	0	155.8	793	85.4	99.3	100
10/03/2007	13.7	18.3	25.9	52	76	93	0.0	4.5	0	1.4	7.6	13.7	25.8	1006.2	1009.4	1012.8	0	274.3	1030	97.1	99.2	100
11/03/2007	14.2	21.8	33.5	32	69	91	0.0	4.7	0	1.4	7.2	14.2	34.2	1001	1004.5	1007.8	0	260.4	917	96.5	99.6	100
12/03/2007	16.7	19.5	21.4	68	81	96	3.6	2.2	0.9	3.0	11.6	16.6	21.5	1005.4	1012.4	1018	0	96.9	419	97.1	99.7	100
13/03/2007	14.8	17.7	21.6	64	81	94	2.2	2.5	0	1.8	9.4	14.8	21.1	1017.5	1019.5	1021.7	0	138.2	876	96.5	99.6	100
14/03/2007	12.6	17.9	25.5	53	81	97	0.2	4.0	0	1.0	5.8	12.6	25.6	1018.2	1019.7	1021.4	0	259.8	1066	97.4	99.6	100
15/03/2007	14.4	20.9	29.9	43	76	97	0.0	4.7	0	1.4	7.2	14.5	30.5	1013.8	1017.1	1020.4	0	266.1	875	94.7	99.8	100
16/03/2007	20.1	25.4	32.6	33	57	74	0.0	5.8	0.4	3.2	13.9	20.1	32.6	1010.2	1012.1	1013.6	0	217.6	872	98	99.9	100
17/03/2007	17.5	22.4	28.9	56	81	97	10.8	3.0	0	2.4	11.6	17.3	30.6	1010.3	1013.7	1020.1	0	146.3	971	98.5	99.9	100
18/03/2007	17	18.4	20.5	84	92	97	1.2	1.2	0	1.1	7.2	17	21.5	1019.5	1021.1	1022.8	0	72.2	355	83.9	99.4	100
19/03/2007	17	21.0	26	64	84	95	0.0	2.9	0	1.1	6.3	17	26.8	1018.2	1019.9	1022.1	0	170.7	813	97.4	99.7	100
20/03/2007	18.7	22.7	31.9	49	83	100	4.6	3.6	0	2.0	13	18.7	35.3	1014	1016.7	1019.4	0	194.6	821	94.2	99.9	100
21/03/2007	19.6	22.5	27.3	69	85	95	0.0	2.8	0	1.4	6.7	19.6	29.1	1016	1019.8	1023.8	0	161.8	972	97.7	99.8	100
22/03/2007	20.6	23.8	30.6	58	84	98	0.0	3.8	0	1.4	6.7	20.6	33.8	1020.2	1022.3	1024.5	0	211.7	926	97.7	99.9	100
23/03/2007	18.7	22.7	30.9	58	84	98	0.2	4.0	0	1.6	8	18.7	34.2	1014.9	1018.3	1021.4	0	227.5	851	94.2	99.8	100
24/03/2007	15.2	23.3	33	35	75	96	4.2	5.0	0	3.4	15.6	14.3	33.2	1007.7	1011.9	1017.3	0	220.0	851	97.7	99.8	100
25/03/2007	12.8	15.0	17.3	69	88	96	7.2	1.6	0.4	3.4	13.4	11.3	17.6	1017.1	1022.6	1025.8	0	73.6	348	97.1	99.1	100
26/03/2007	13.9	16.7	21	47	76	94	0.6	3.4	0	2.0	9.4	14	20.5	1023.5	1024.8	1026.3	0	172.0	875	91.5	99.3	100
27/03/2007	13	16.1	21.7	56	82	97	2.0	2.1	0	1.2	6.3	13	21.1	1017.7	1020.8	1023.6	0	126.8	688	89.5	98.6	100
28/03/2007	11.6	18.1	27.7	40	75	96	0.2	4.1	0	1.3	7.2	11.6	27.2	1009.7	1013.6	1017.7	0	240.1	823	81	99.2	100
29/03/2007	17.3	20.7	23.9	50	63	76	0.2	2.7	0	3.0	10.3	17.3	24.1	1005.5	1007.7	1010.8	0	81.3	509	93.3	99.8	100
30/03/2007	13.9	17.8	22.8	30	48	61	0.0	6.2	1.8	4.3	12.5	13.1	21.3	1010.8	1013.0	1016.5	0	235.7	815	96.8	99.4	100
31/03/2007	10.8	15.6	21.3	42	62	80	0.0	4.1	0	1.9	8	10.8	19.9	1015.8	1019.5	1023.3	0	217.2	851	96.2	99.4	100
Monthly	10.8	20.4	36.2	29	77	100	75.4	111.9	0	2.0	17.4	10.8	39.8	1001	1014.9	1026.3	0	185.9	1066	81	99.6	100

Rocla Calga Quarry Environmental Monitoring – March 2007

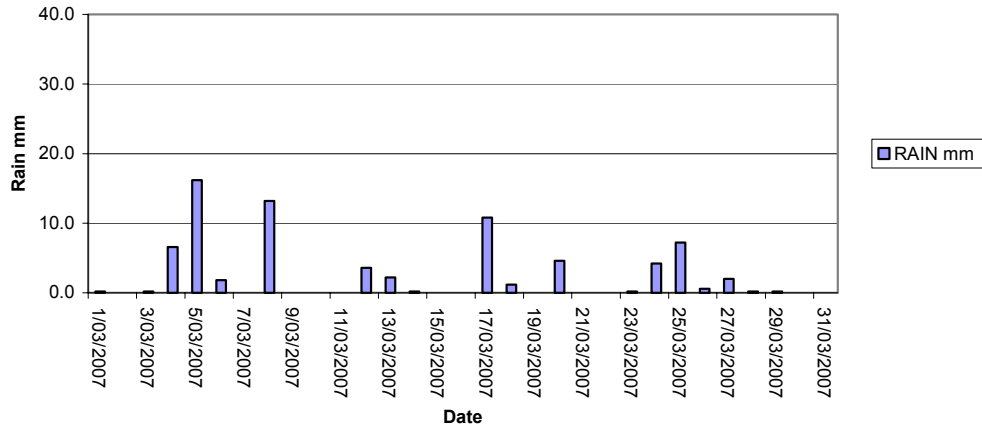


Rocla Calga Quarry Environmental Monitoring – March 2007

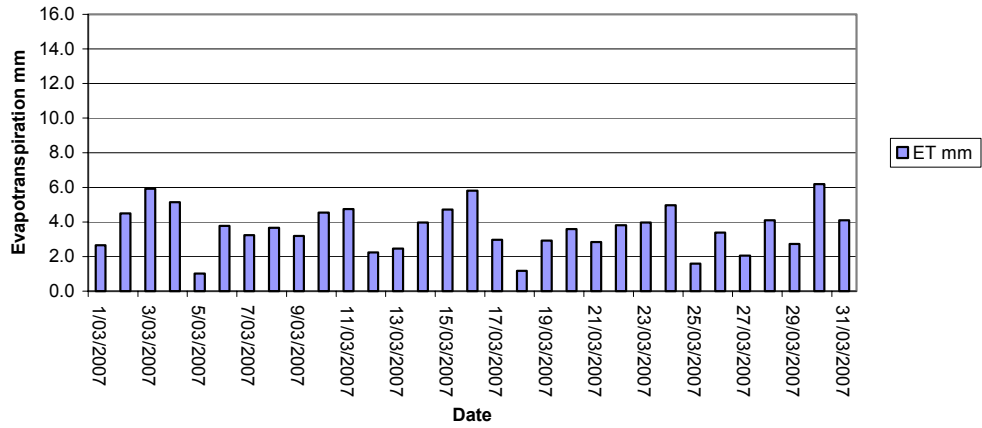


Rocla Calga Quarry Environmental Monitoring – March 2007

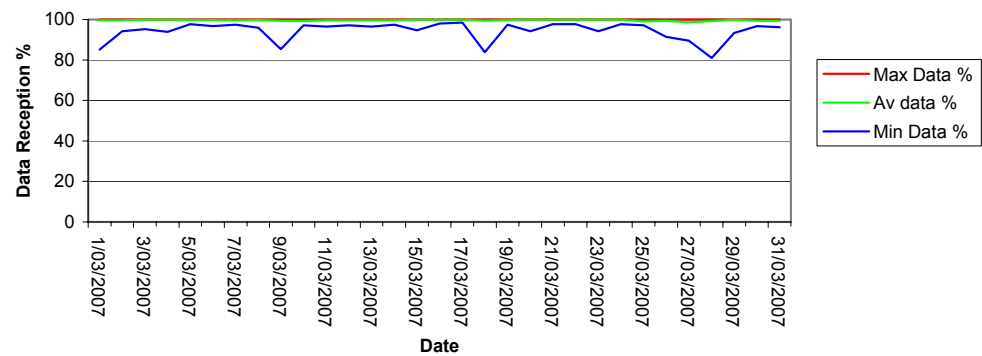
Rocla Calga Quarry - March 2007
Rain



Rocla Calga Quarry - March 2007
Evapotranspiration

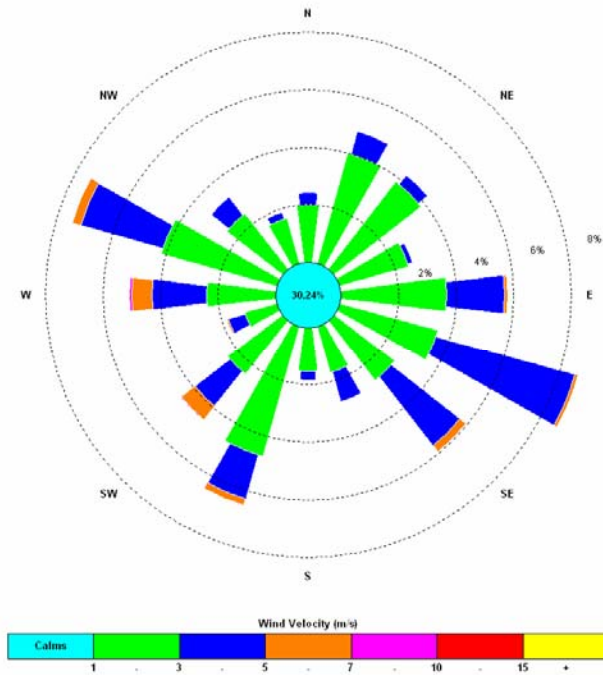


Rocla Calga Quarry - March 2007
Data Reception



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 1m/s.



The windrose shows mixed winds from many directions this month. The maximum wind speed was 17.4m/s recorded from the S.

APPENDIX 1
LABORATORY CERTIFICATES

APPENDIX 2

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