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

## January 2011

Colin Davies BSc MEIA CENVP
Environmental Scientist
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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;
- Groundwaters; and
- Meteorological Station.

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

- Dust Deposition results for January 2011;
- Surface Water quality results for January 2011;
- Groundwater depth and quality results for January 2011; and
- Meteorological report for January 2011.

The January 2011 dust deposition results were generally lower than December 2010. All sites, on a year to date average basis, are currently below the Air Quality Management Plan exceedence 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 for the normal monthly sampling event on the 31 January 2011 at sites A and F. Sites B and D were dry and there was no access to site C. 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 low Electrical Conductivity, low Total Dissolved Solids, low Total Suspended Solids and no detectable Oil and Grease. pH levels remained stable and were within the neutral to slightly acidic range.

Groundwaters were sampled for normal monthly monitoring on 31 January 2011. Groundwater depths decreased at the majority of monitoring bores this month, indicating water moving towards the surface. EC remained relatively steady at all sites. pH at most sites remained steady with the exception of a slight increase at CQ10 and slight decreases at CQ13, MW8, MW9, MW13 and MW16.

The meteorological station data recovery for the month was 100%. The predominant winds were from the NE, with strongest winds from the NE, E and W. Recorded rainfall on site for January was 60.0 mm, which was slightly lower than that recorded at the BOM Peats Ridge Station and below the Peats Ridge long-term average for January. Results are detailed below:

| | |
|---|---|
| Rocla Calga Quarry | 60.0 mm |
| BOM Peats Ridge* | 88.2 mm |
| BOM Gosford* | 61.6 mm |
| BOM Peats Ridge Long term mean for January* | 115.4 mm |

*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 $g/m^2$.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.

# 2.0 Monthly Results

## 2.1 Dust Deposition Gauges

**Table 1** displays the results for January 2011 and the project average. Results are in $g/m^2$.month.

**Table 1: Dust Deposition results: 30-December-2010 to 31-January 2011**

| 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** | 0.6 | 0.5 | 0.1 | 83 | 1.2 |
| **CD2c** | 1.2 | 1.2 | <0.1 | 100 | 1.1 |
| **CD3** | 0.3 | 0.3 | <0.1 | 100 | 0.4 |
| **CD4** | 0.2 | 0.2 | <0.1 | 100 | 0.4 |
| **CD5** | 0.6 | 0.3 | 0.3 | 50 | 0.4 |
| **CD6** | 0.3 | 0.2 | 0.1 | 67 | 0.6 |

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 February 2010 to January 2011.

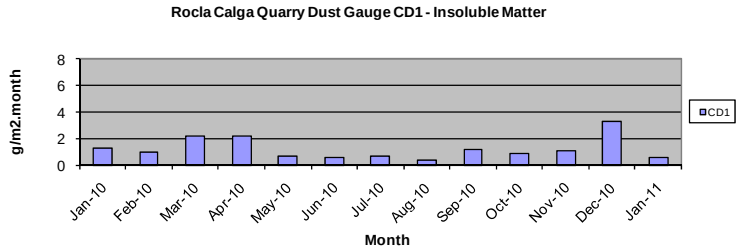
NA= Not Available.

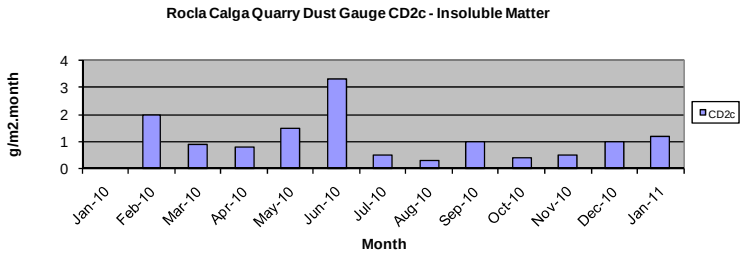
CD1 was installed on the 1 May 2006. CD2a was discontinued at the start of August 2006 due to quarry operations "mining out" the site of the gauge. The replacement gauge, Site CD2b, was located in a position adjacent to the boundary between B. Kashouli and F. & J. Gazzana in conformance with the Air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

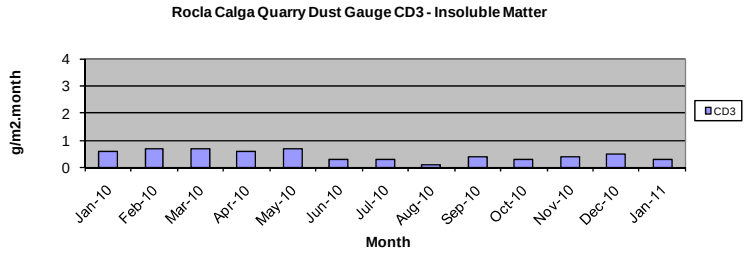
Dust deposition charts for all dust gauge sites appear in **Figure 1** below. The laboratory analysis is provided in **Appendix 1.**

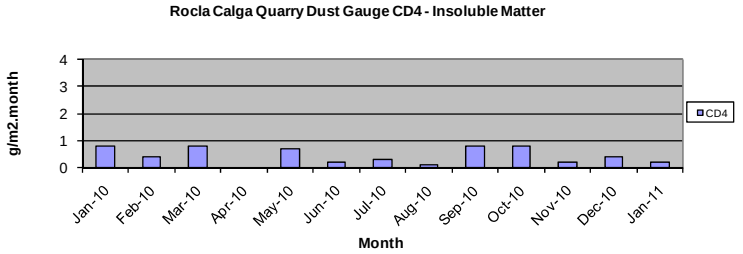
The predominant winds were from the NE, with strongest winds from the W, E and NE.

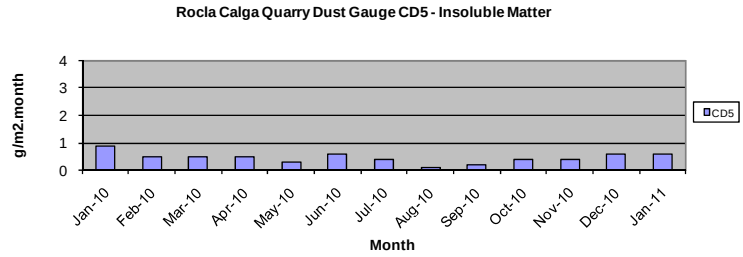
## Figure 1: Dust Deposition Charts

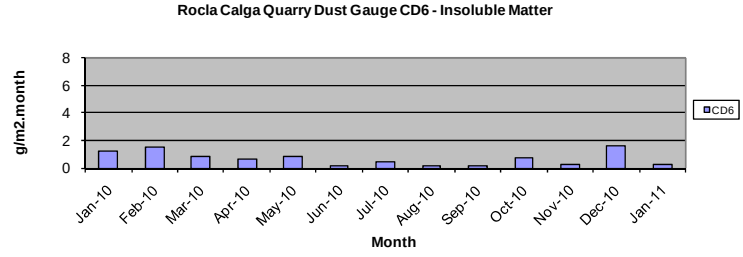


## 2.2 Water Monitoring

### 2.2.1 Surface Waters

Monthly surface water monitoring was conducted on the 31 January 2011 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1.**

**Table 2: Monthly surface water monitoring – January 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 | 5.73 | 79 | 57 | 7 | <5 |
| **B** | Dry | --- | --- | --- | --- | --- | --- | --- |
| **C** | --- | --- | --- | --- | --- | --- | --- | --- |
| **D** | Dry | --- | --- | --- | --- | --- | --- | --- |
| **F** | Dam | Clear | Clear | 4.82 | 85 | 42 | <5 | <5 |

At the time of sampling, there were no water discharges off site from any sampling location. Samples were collected at sites A and F. Sites B and D were dry and there was no access to site C. The samples were collected and analysed for a monthly sampling event. Results show pH within the neutral to slightly acidic range, low Electrical Conductivity, low Total Dissolved Solids, low Total Suspended Solids and no detectable Oil and Grease.

### 2.2.2 Groundwaters

Groundwaters were sampled on 31 January 2011. 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. Longer term monitoring is required to fully evaluate groundwater depth trends.

EC remained relatively steady at all sites. pH remained steady at most sites with the exception of a slight increase at CQ10 and slight decreases at CQ13, MW8, MW9, MW13 and MW16. Detailed biannual water quality monitoring is next due in April 2011.

**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 (uS/cm) This report |
|---|---|---|---|---|---|---|
| **CQ1** | Voutos | * Monitor | 20.59 | 19.98 | 5.3 | 130 |
| **CQ3** | Voutos | * Monitor | 10.53 | 11.38 | 5.4 | 110 |
| **CQ4** | Voutos | * Monitor | 8.78 | 8.29 | 4.3 | 80 |
| **CQ5** | Gazzana | DIP Only | 8.69 | 6.62 | 4.0 | 140 |
| **CQ6** | Gazzana | DIP Only | 16.00 | 11.92 | 4.7 | 170 |
| **CQ7** | Gazzana | * Monitor | 6.89 | 7.16 | 4.2 | 93 |
| **CQ8** | Gazzana | * Monitor | 11.03 | 7.37 | 3.8 | 160 |
| **CQ9** | Gazzana | DIP Only | 10.10 | 9.60 | 3.8 | 100 |
| **CQ10** | Voutos | * Monitor | NI | 22.76 | 7.4 | 180 |
| **CQ11S** | Gazzana | * Monitor | NI | 9.76 | 3.8 | 150 |
| **CQ11D** | Gazzana | * Monitor | NI | 11.07 | 4.2 | 130 |
| **CQ12** | Gazzana | * Monitor | NI | 4.55 | 4.4 | 140 |
| **CQ13** | Kashouli | * Monitor | NI | 13.55 | 4.3 | 190 |
| **CP3** | Gazzana | Domestic | 10.40 | 8.65 | 4.0 | 140 |
| **CP4** | Kashouli | Domestic | 13.63 | 10.85 | 4.3 | 210 |
| **CP5** | Kashouli | Domestic | 16.61 | 8.29 | 3.7 | 230 |
| **CP6** | Kashouli | Domestic | 16.27 | 10.42 | 4.6 | 220 |
| **CP7** | Kashouli | Production | 8.56 | 3.62 | 5.1 | 140 |
| **CP8** | Rozmanec | Domestic | 22.17 | NR | NR | NR |
| **MW7** | Rocla Bore | * Monitor | 15.76 | 16.29 | 4.5 | 110 |
| **MW8** | Rocla Bore | * Monitor | 9.82 | 7.91 | 4.2 | 80 |
| **MW9** | Rocla Bore | * Monitor | 22.44 | 21.92 | 4.9 | 90 |
| **MW10** | Rocla Bore | * Monitor | 15.41 | 13.72 | 4.4 | 130 |
| **MW13** | Rocla Bore | DIP Only | NI | 8.08 | 4.1 | 100 |
| **MW16** | Rocla Bore | DIP Only | NI | 8.67 | 3.8 | 110 |

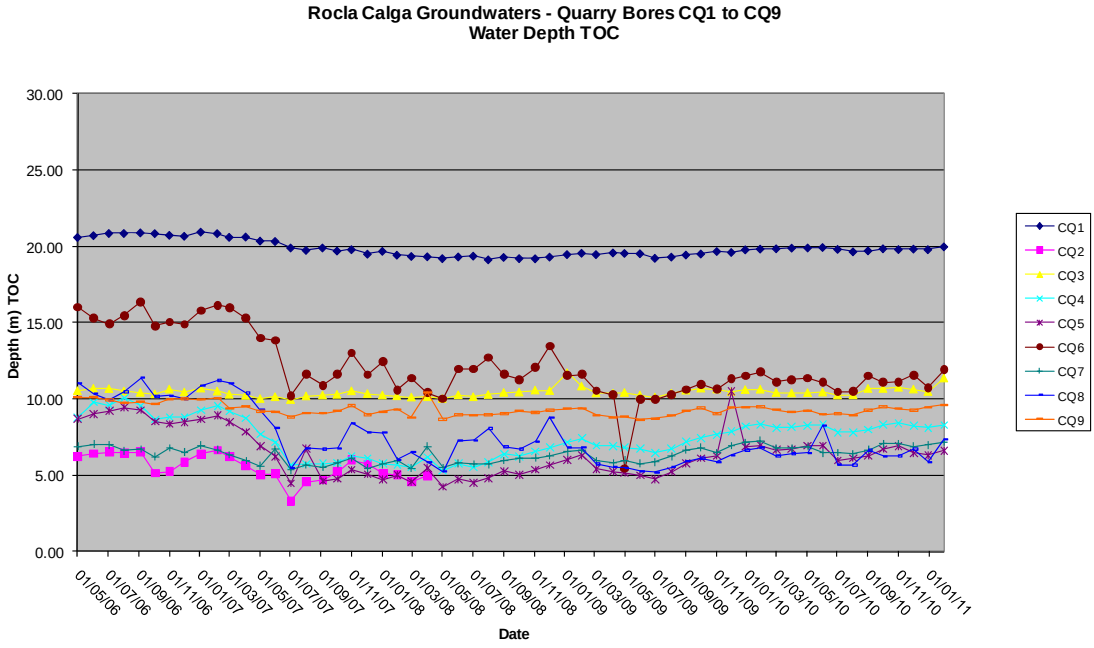
**Notes:**
TOC = Water level measured from top of bore case to water.
NM = Not Monitored – unable to sample water due to access restrictions.
NR = Not Required by resident.
* = Logger Installed.
NI = These bores were not installed in April 2006 but are now operational. April 2006 was the first set of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

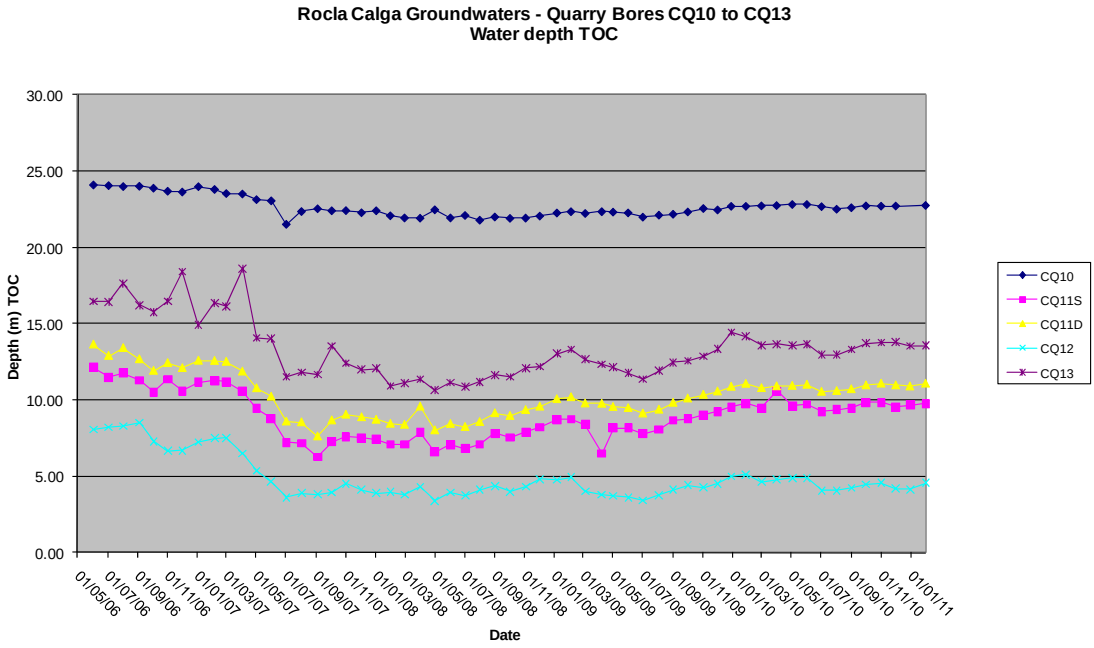
Shading is used to indicate the following trends in water depth (compared to the last reading):

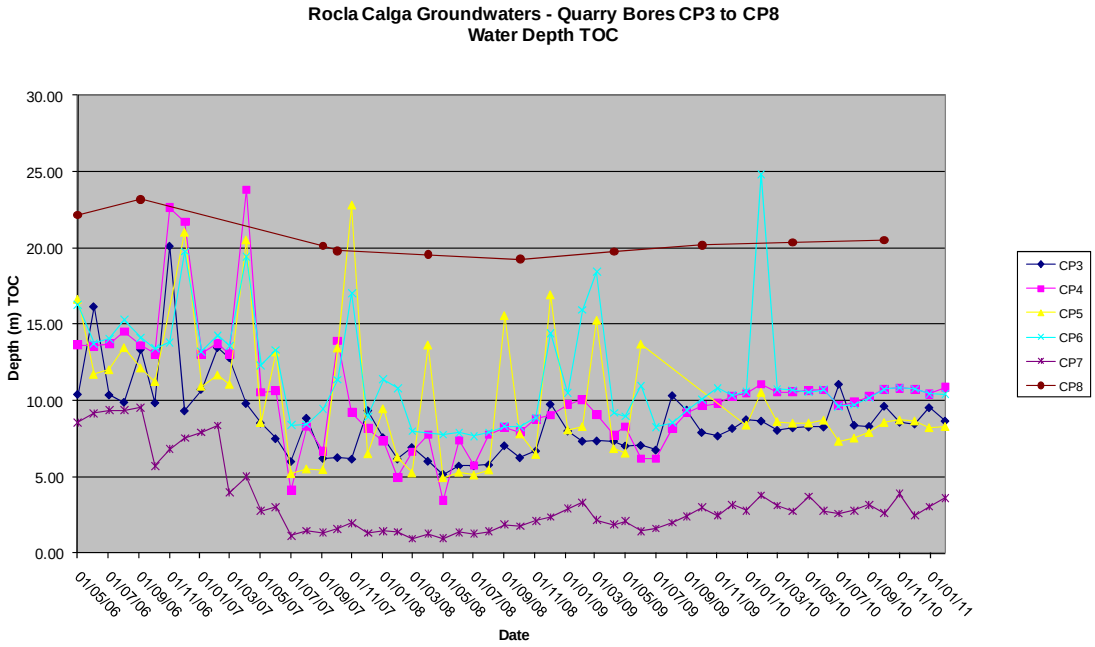
| | |
|---|---|
| | Increase to ground water depth (water moved away from surface) |
| | Decrease to ground water depth (water moved towards surface) |
| | Stable water depth (+/- 0.01m) |

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

**Figures 2 to 5: Groundwater Depth Charts.**




Rocla Calga Groundwaters - Quarry Bores CP3 to CP8
Water Depth TOC
Depth (m) TOC
30.00
25.00
20.00
15.00
10.00
5.00
0.00
01/05/06
01/07/06
01/09/06
01/11/06
01/01/07
01/03/07
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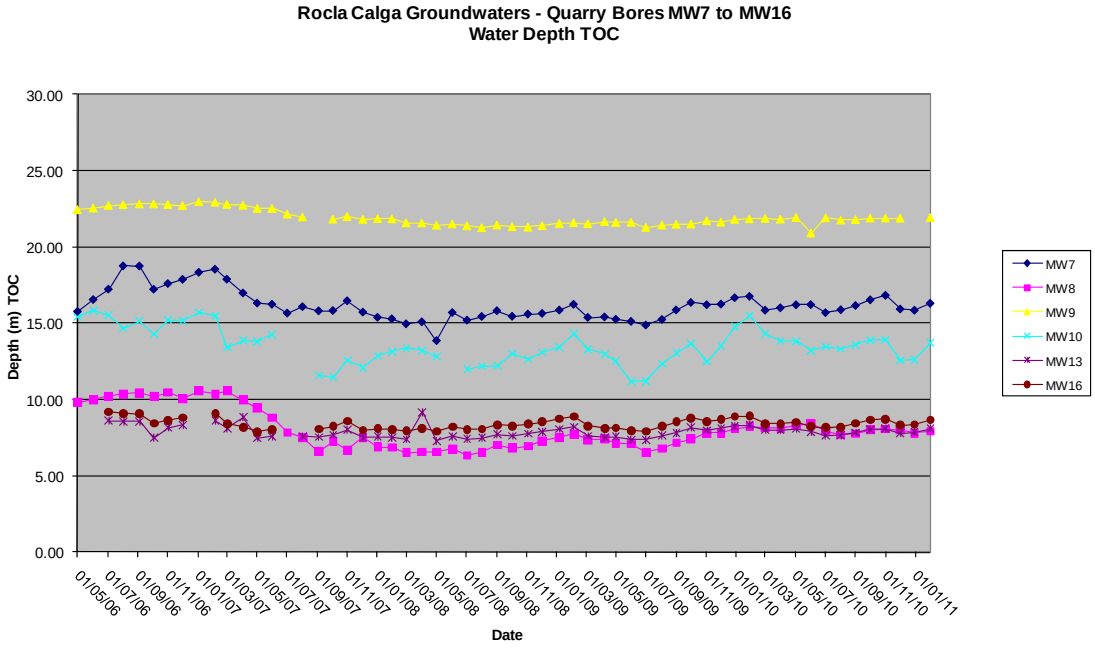
Date
CP3
CP4
CP5
CP6
CP7
CP8


Rocla Calga Groundwaters - Quarry Bores MW7 to MW16
Water Depth TOC
Depth (m) TOC
30.00
25.00
20.00
15.00
10.00
5.00
0.00
01/05/06
01/07/06
01/09/06
01/11/06
01/01/07
01/03/07
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01/11/10
01/01/11
Date
MW7
MW8
MW9
MW10
MW13
MW16

## 2.3 Meteorological Monitoring

The Rocla Calga Quarry weather station data recovery in January was 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 January 2011 shows rainfall recorded at the Rocla Calga Quarry was lower than that recorded at nearby Peats Ridge and Gosford BOM stations. The rainfall comparison is provided below:

| | |
|---|---|
| Rocla Calga Quarry | 60.0 mm |
| BOM Peats Ridge* | 88.2 mm |
| BOM Gosford* | 61.6 mm |
| BOM Peats Ridge Long term mean for January* | 115.4 mm |

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

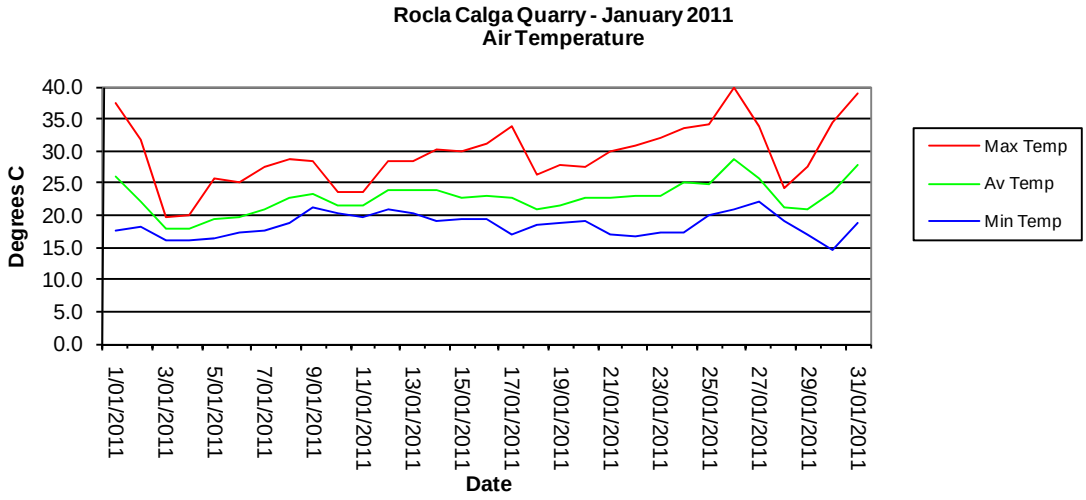
Results are displayed in the following table and figures.

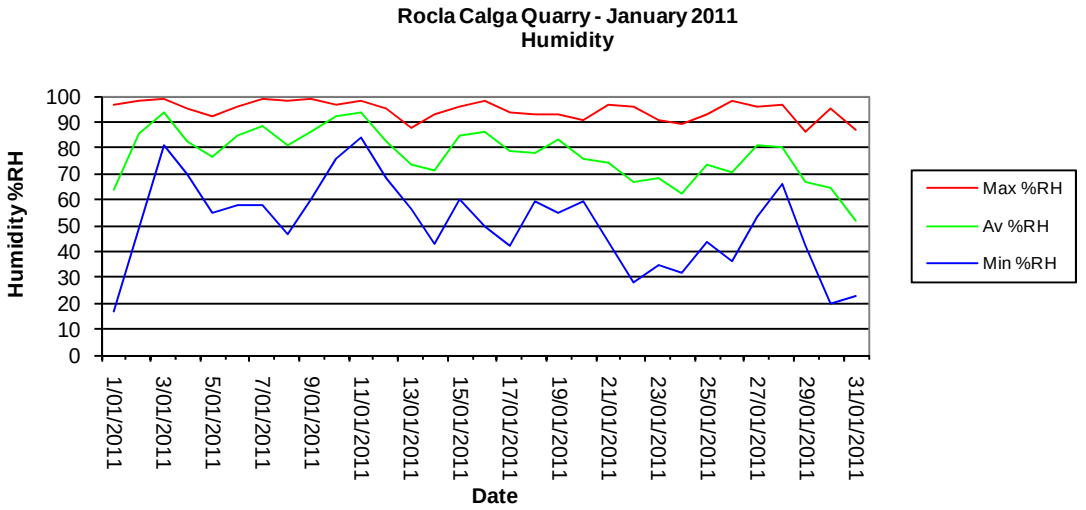
### 2.3.1 Monthly Meteorological Data Summary

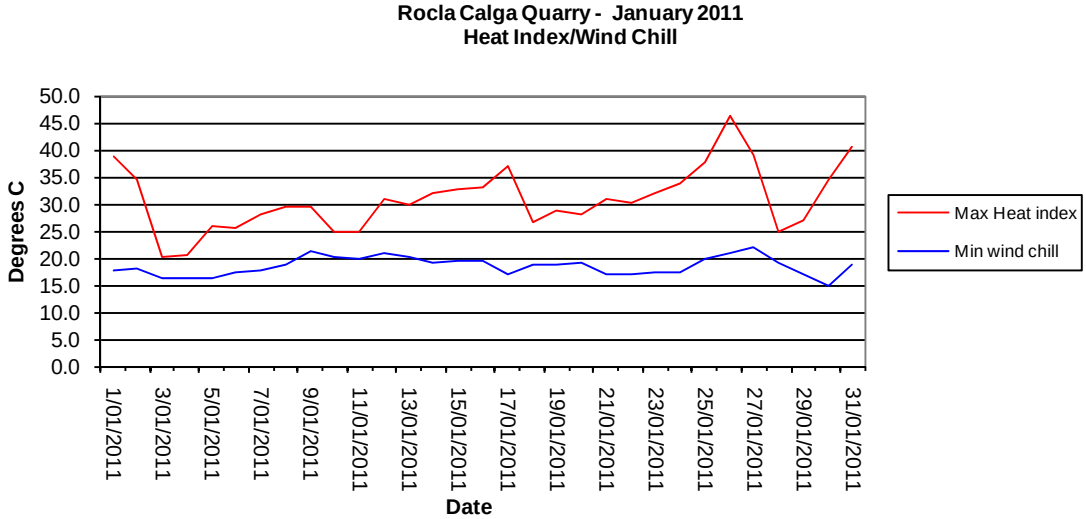
**Summary** **Jan-11** **Rocla - Calga**

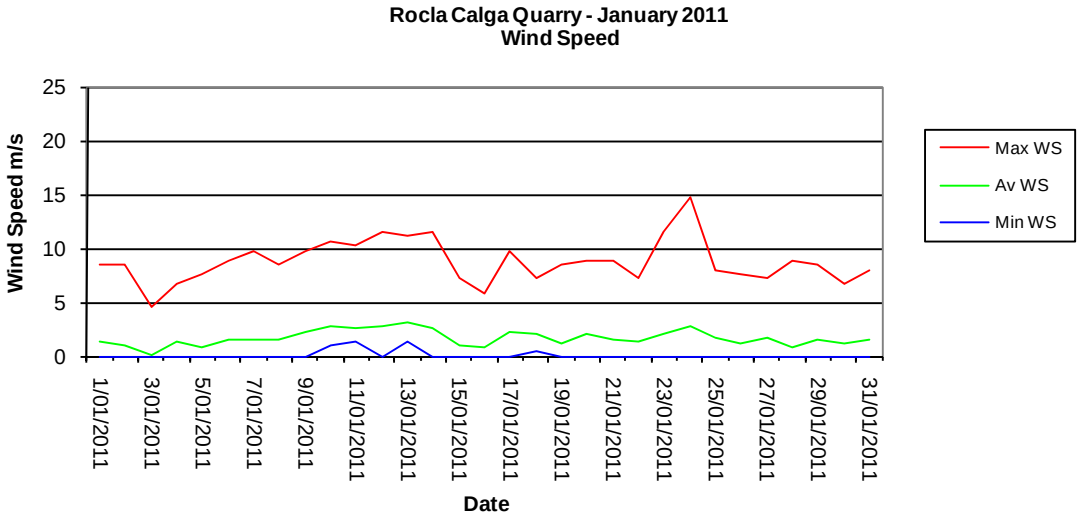
| Date | Min Temp | Av Temp | Max Temp | Min %RH | Av %RH | Max %RH | RAIN mm | ET mm | Min WS | Av WS | Max WS | Min wind chill | Max Heat index | Min Atm P | Av Atm P | Max Atm P | Min Solar Rad | Av Solar Rad | Max Solar Rad | Min Data % | Av data % | Max Data % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/01/2011 | 17.6 | 26.1 | 37.3 | 17 | 64 | 97 | 0.2 | 7.2 | 0 | 1.3 | 8.5 | 17.7 | 38.8 | 1007.7 | 1010.4 | 1013.4 | 0 | 362.7 | 1073 | 93 | 99.2 | 100 |
| 2/01/2011 | 18.2 | 22.0 | 31.6 | 49 | 85 | 98 | 12.0 | 4.7 | 0 | 1.0 | 8.5 | 18.2 | 34.3 | 1008.0 | 1010.3 | 1014.0 | 0 | 278.2 | 1017 | 95 | 98.8 | 100 |
| 3/01/2011 | 16.2 | 17.8 | 19.6 | 81 | 93 | 99 | 1.2 | 1.0 | 0 | 0.1 | 4.5 | 16.3 | 20.1 | 1010.0 | 1012.6 | 1013.7 | 0 | 70.5 | 527 | 94.7 | 99.8 | 100 |
| 4/01/2011 | 16.1 | 17.8 | 20.1 | 70 | 82 | 95 | 0.0 | 1.5 | 0 | 1.4 | 6.7 | 16.1 | 20.4 | 1009.6 | 1011.4 | 1013.3 | 0 | 87.8 | 369 | 97.7 | 100.0 | 100 |
| 5/01/2011 | 16.3 | 19.3 | 25.8 | 55 | 77 | 92 | 0.4 | 3.2 | 0 | 0.8 | 7.6 | 16.3 | 25.9 | 1003.6 | 1006.5 | 1009.6 | 0 | 193.7 | 984 | 100 | 100.0 | 100 |
| 6/01/2011 | 17.3 | 19.8 | 25.2 | 58 | 84 | 96 | 2.8 | 3.5 | 0 | 1.6 | 8.9 | 17.4 | 25.4 | 1007.0 | 1009.7 | 1012.5 | 0 | 202.7 | 1051 | 100 | 100.0 | 100 |
| 7/01/2011 | 17.5 | 20.9 | 27.6 | 58 | 89 | 99 | 3.8 | 3.5 | 0 | 1.5 | 9.8 | 17.6 | 28.2 | 1010.8 | 1012.1 | 1013.4 | 0 | 211.3 | 1131 | 95.6 | 99.9 | 100 |
| 8/01/2011 | 18.8 | 22.7 | 28.6 | 47 | 81 | 98 | 2.2 | 4.6 | 0 | 1.6 | 8.5 | 18.8 | 29.4 | 1010.4 | 1011.7 | 1013.2 | 0 | 259.2 | 1152 | 100 | 100.0 | 100 |
| 9/01/2011 | 21.1 | 23.2 | 28.3 | 60 | 86 | 99 | 19.4 | 4.1 | 0 | 2.2 | 9.8 | 21.1 | 29.4 | 1010.2 | 1012.6 | 1015.0 | 0 | 236.1 | 1141 | 100 | 100.0 | 100 |
| 10/01/2011 | 20.2 | 21.5 | 23.6 | 76 | 92 | 97 | 10.8 | 2.2 | 0.9 | 2.7 | 10.7 | 20.2 | 24.7 | 1012.5 | 1013.7 | 1015.1 | 0 | 130.4 | 812 | 98.2 | 100.0 | 100 |
| 11/01/2011 | 19.7 | 21.5 | 23.7 | 84 | 93 | 98 | 3.4 | 1.5 | 1.3 | 2.6 | 10.3 | 19.7 | 24.9 | 1009.3 | 1011.6 | 1013.4 | 0 | 84.4 | 434 | 98.5 | 100.0 | 100 |
| 12/01/2011 | 20.8 | 23.8 | 28.3 | 68 | 82 | 95 | 0.4 | 3.8 | 0 | 2.7 | 11.6 | 20.8 | 30.8 | 1008.8 | 1010.5 | 1012.4 | 0 | 186.6 | 984 | 99.7 | 100.0 | 100 |
| 13/01/2011 | 20.3 | 23.8 | 28.5 | 56 | 74 | 88 | 0.2 | 5.3 | 1.3 | 3.2 | 11.2 | 20.3 | 29.8 | 1010.8 | 1012.2 | 1013.9 | 0 | 257.6 | 1044 | 95 | 99.9 | 100 |
| 14/01/2011 | 19.1 | 23.8 | 30.2 | 43 | 71 | 93 | 0.0 | 5.6 | 0 | 2.6 | 11.6 | 19.1 | 31.8 | 1006.7 | 1009.3 | 1012.1 | 0 | 282.4 | 1107 | 92.1 | 99.9 | 100 |
| 15/01/2011 | 19.3 | 22.7 | 29.9 | 60 | 85 | 96 | 0.0 | 2.1 | 0 | 1.0 | 7.2 | 19.3 | 32.8 | 1005.5 | 1007.3 | 1009.4 | 0 | 125.7 | 683 | 100 | 100.0 | 100 |
| 16/01/2011 | 19.3 | 23.0 | 31.1 | 50 | 86 | 98 | 0.2 | 2.2 | 0 | 0.8 | 5.8 | 19.3 | 32.9 | 1004.4 | 1007.2 | 1009.5 | 0 | 130.8 | 625 | 96.5 | 99.9 | 100 |
| 17/01/2011 | 17.1 | 22.7 | 33.9 | 42 | 79 | 94 | 0.0 | 5.6 | 0 | 2.2 | 9.8 | 17.1 | 36.9 | 999.2 | 1002.1 | 1004.9 | 0 | 310.2 | 1032 | 93.9 | 99.7 | 100 |
| 18/01/2011 | 18.6 | 21.0 | 26.3 | 59 | 78 | 93 | 0.0 | 3.3 | 0.4 | 2.0 | 7.2 | 18.6 | 26.7 | 1004.0 | 1006.1 | 1008.3 | 0 | 161.2 | 926 | 96.8 | 99.3 | 100 |
| 19/01/2011 | 18.7 | 21.6 | 27.9 | 55 | 84 | 93 | 0.0 | 2.7 | 0 | 1.2 | 8.5 | 18.7 | 28.6 | 1006.8 | 1008.4 | 1010.9 | 0 | 138.2 | 807 | 92.7 | 99.1 | 100 |
| 20/01/2011 | 19.0 | 22.7 | 27.5 | 59 | 76 | 91 | 0.0 | 4.4 | 0 | 2.1 | 8.9 | 19.1 | 28.0 | 1009.9 | 1011.8 | 1013.6 | 0 | 228.9 | 1122 | 84.8 | 99.1 | 100 |
| 21/01/2011 | 16.9 | 22.7 | 29.8 | 44 | 74 | 97 | 0.2 | 5.3 | 0 | 1.6 | 8.9 | 16.9 | 30.9 | 1011.0 | 1012.9 | 1014.6 | 0 | 295.7 | 1061 | 98.8 | 100.0 | 100 |
| 22/01/2011 | 16.8 | 23.1 | 30.8 | 28 | 67 | 96 | 0.0 | 6.3 | 0 | 1.3 | 7.2 | 16.8 | 30.1 | 1012.4 | 1013.9 | 1015.8 | 0 | 340.2 | 1034 | 95.6 | 99.4 | 100 |
| 23/01/2011 | 17.4 | 23.0 | 31.9 | 35 | 68 | 91 | 0.0 | 6.1 | 0 | 2.0 | 11.6 | 17.4 | 31.8 | 1006.3 | 1009.3 | 1013.3 | 0 | 311.2 | 1039 | 95 | 99.2 | 100 |
| 24/01/2011 | 17.2 | 25.1 | 33.6 | 32 | 62 | 89 | 0.0 | 5.5 | 0 | 2.8 | 14.8 | 17.2 | 33.6 | 1000.1 | 1003.0 | 1006.4 | 0 | 217.0 | 1047 | 96.8 | 99.8 | 100 |
| 25/01/2011 | 19.9 | 24.9 | 34.1 | 44 | 74 | 93 | 0.0 | 5.8 | 0 | 1.8 | 8 | 19.9 | 37.6 | 1004.9 | 1006.5 | 1009.1 | 0 | 313.6 | 1006 | 91.8 | 99.3 | 100 |
| 26/01/2011 | 20.8 | 28.9 | 39.9 | 36 | 70 | 98 | 0.2 | 5.9 | 0 | 1.1 | 7.6 | 20.8 | 46.3 | 1006.2 | 1008.7 | 1011.1 | 0 | 291.0 | 1155 | 96.5 | 99.6 | 100 |
| 27/01/2011 | 22.0 | 25.6 | 33.7 | 53 | 81 | 96 | 2.4 | 4.8 | 0 | 1.7 | 7.2 | 22.0 | 39.2 | 1008.6 | 1011.6 | 1015.0 | 0 | 257.6 | 1108 | 90.6 | 99.6 | 100 |
| 28/01/2011 | 19.1 | 21.3 | 24.1 | 66 | 80 | 97 | 0.2 | 2.7 | 0 | 0.8 | 8.9 | 19.1 | 24.7 | 1014.6 | 1017.7 | 1020.6 | 0 | 152.7 | 818 | 96.2 | 98.9 | 100 |
| 29/01/2011 | 16.9 | 20.9 | 27.6 | 42 | 67 | 86 | 0.0 | 4.6 | 0 | 1.5 | 8.5 | 16.9 | 26.9 | 1018.7 | 1020.3 | 1021.1 | 0 | 234.5 | 1089 | 96.8 | 99.9 | 100 |
| 30/01/2011 | 14.6 | 23.7 | 34.4 | 20 | 64 | 95 | 0.0 | 6.3 | 0 | 1.1 | 6.7 | 14.7 | 34.4 | 1013.7 | 1017.1 | 1021.0 | 0 | 343.1 | 1040 | 94.7 | 99.5 | 100 |
| 31/01/2011 | 18.9 | 28.0 | 38.8 | 23 | 52 | 87 | 0.0 | 7.1 | 0 | 1.5 | 8 | 18.9 | 40.6 | 1009.6 | 1012.2 | 1014.9 | 0 | 326.5 | 995 | 87.7 | 98.5 | 100 |
| Monthly | 14.6 | 22.7 | 39.9 | 17 | 77 | 99 | 60.0 | 132.2 | 0 | 1.7 | 14.8 | 14.7 | 46.3 | 999.2 | 1010.7 | 1021.1 | 0 | 226.5 | 1155 | 84.8 | 99.6 | 100 |

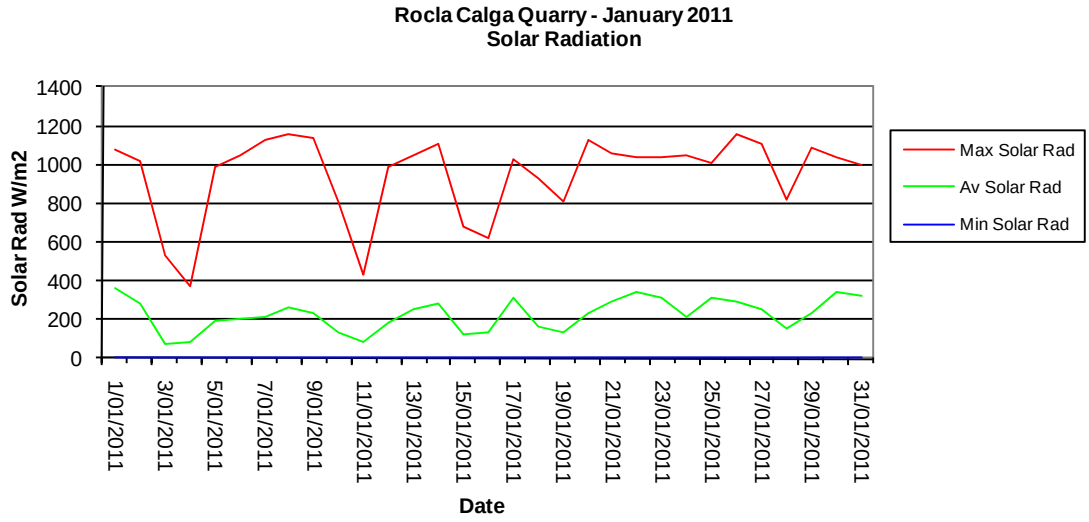
### 2.3.2 Monthly Weather Charts

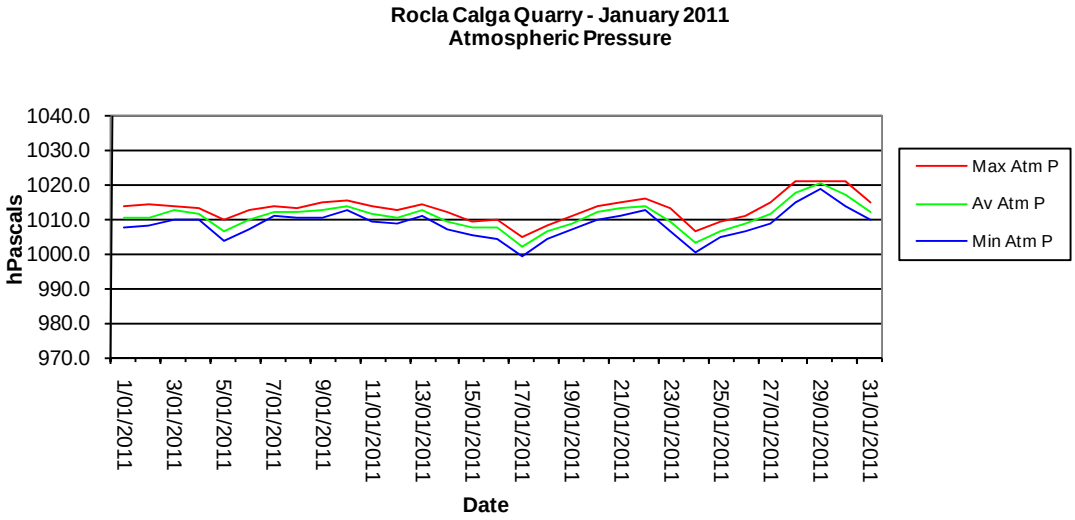


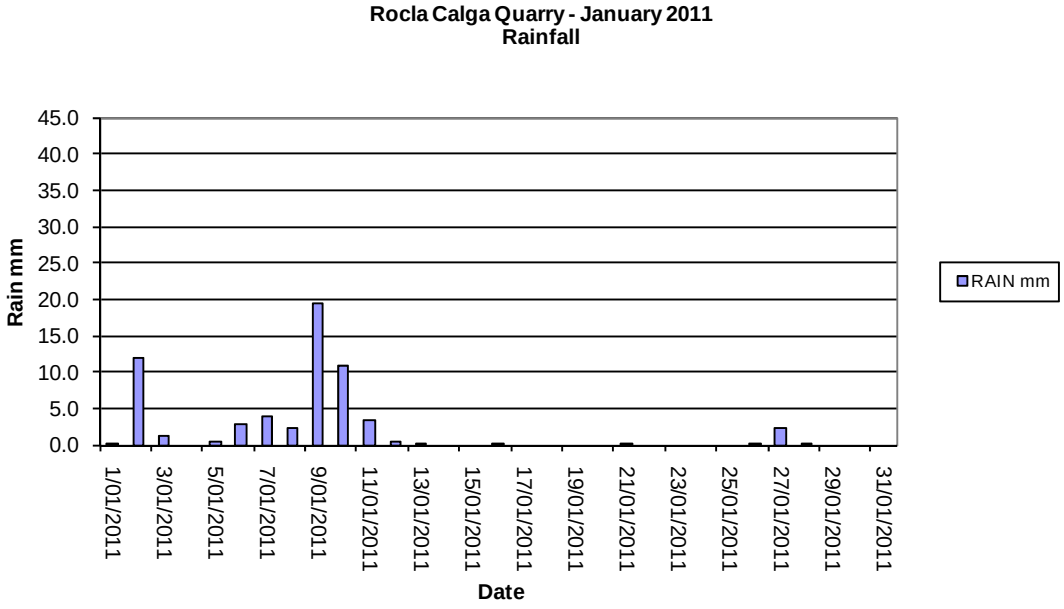



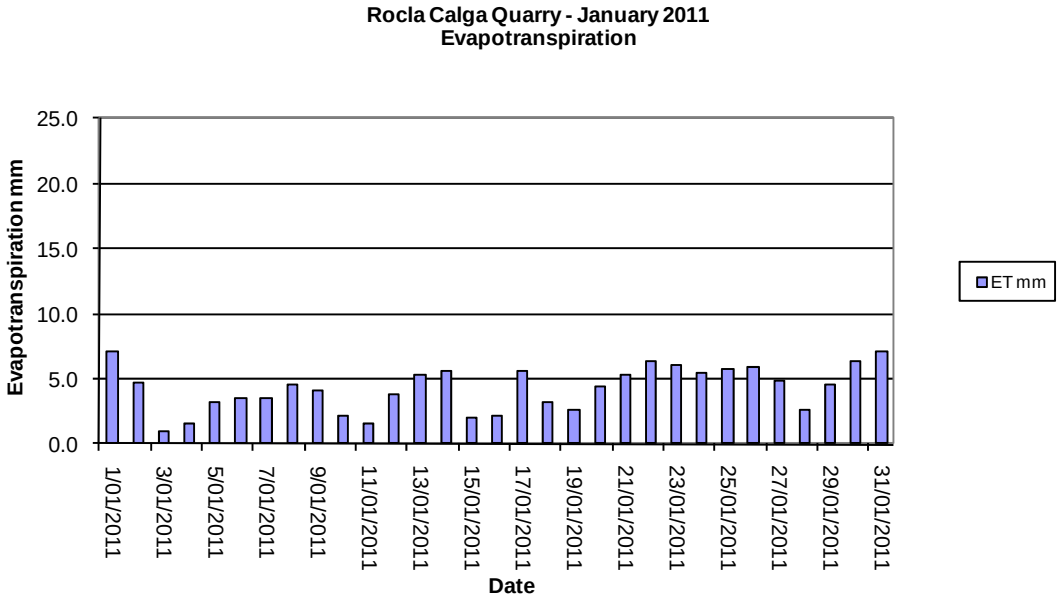



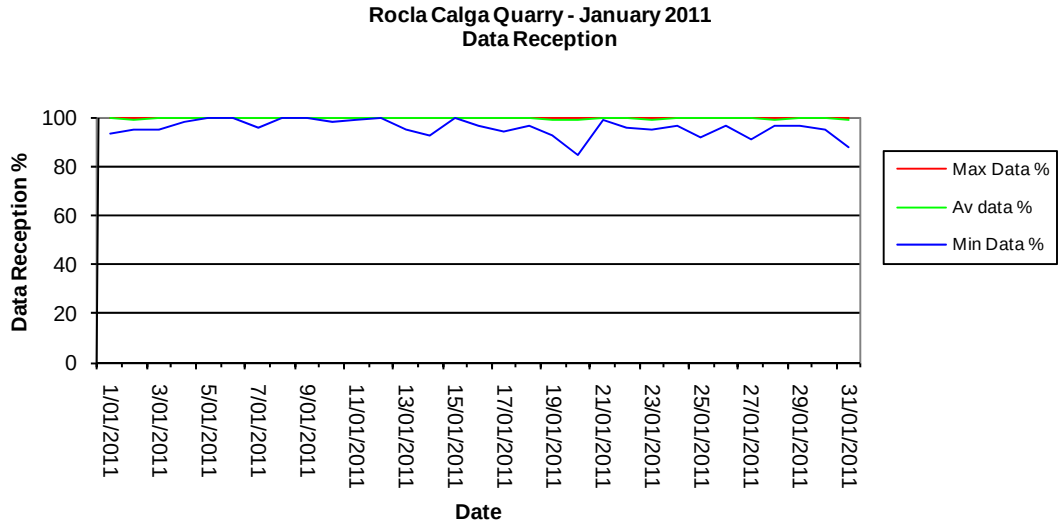

Rocla Calga Quarry - January 2011
Wind Speed
Wind Speed m/s
25
20
15
10
5
0
1/01/2011
3/01/2011
5/01/2011
7/01/2011
9/01/2011
11/01/2011
13/01/2011
15/01/2011
17/01/2011
19/01/2011
21/01/2011
23/01/2011
25/01/2011
27/01/2011
29/01/2011
31/01/2011
Date
Max WS
Av WS
Min WS


Rocla Calga Quarry - January 2011
Solar Radiation
Solar Rad W/m2
1400
1200
1000
800
600
400
200
0
1/01/2011
3/01/2011
5/01/2011
7/01/2011
9/01/2011
11/01/2011
13/01/2011
15/01/2011
17/01/2011
19/01/2011
21/01/2011
23/01/2011
25/01/2011
27/01/2011
29/01/2011
31/01/2011
Date
Max Solar Rad
Av Solar Rad
Min Solar Rad


Rocla Calga Quarry - January 2011
Atmospheric Pressure
hPascals
1040.0
1030.0
1020.0
1010.0
1000.0
990.0
980.0
970.0
1/01/2011
3/01/2011
5/01/2011
7/01/2011
9/01/2011
11/01/2011
13/01/2011
15/01/2011
17/01/2011
19/01/2011
21/01/2011
23/01/2011
25/01/2011
27/01/2011
29/01/2011
31/01/2011
Date
Max Atm P
Av Atm P
Min Atm P

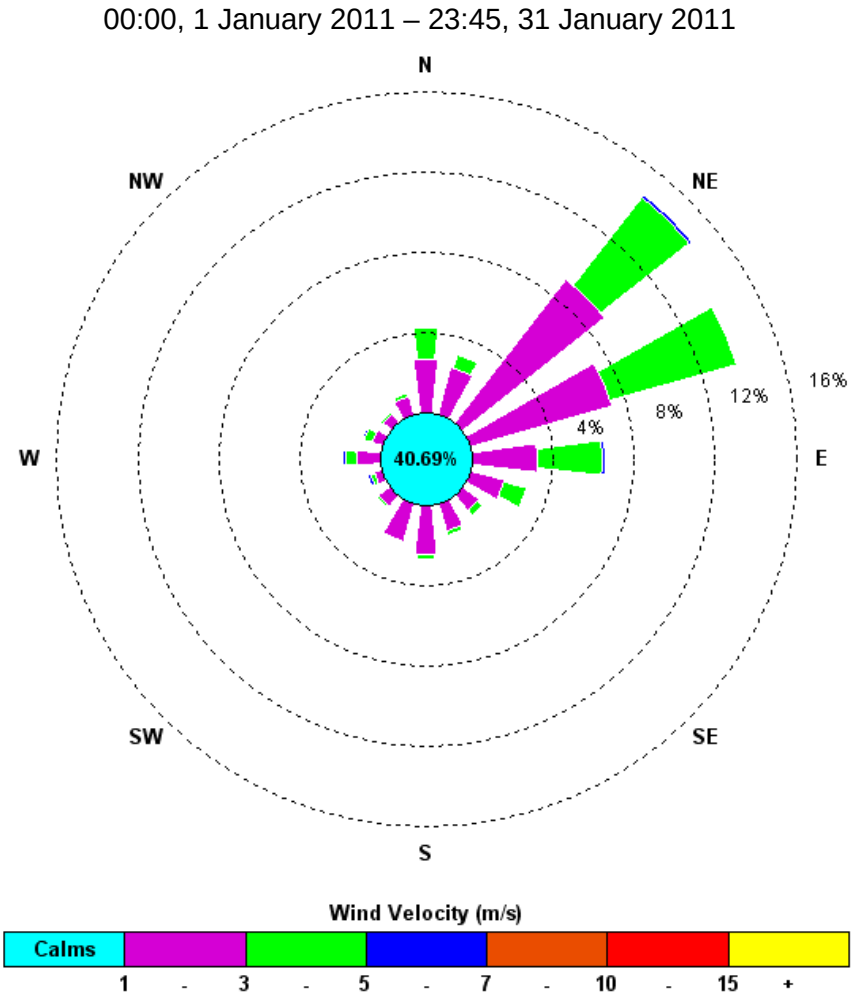

Rocla Calga Quarry - January 2011
Rainfall
Rain mm
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
1/01/2011
3/01/2011
5/01/2011
7/01/2011
9/01/2011
11/01/2011
13/01/2011
15/01/2011
17/01/2011
19/01/2011
21/01/2011
23/01/2011
25/01/2011
27/01/2011
29/01/2011
31/01/2011
Date
RAIN mm


Rocla Calga Quarry - January 2011
Evapotranspiration
Evapotranspiration mm
25.0
20.0
15.0
10.0
5.0
0.0
1/01/2011
3/01/2011
5/01/2011
7/01/2011
9/01/2011
11/01/2011
13/01/2011
15/01/2011
17/01/2011
19/01/2011
21/01/2011
23/01/2011
25/01/2011
27/01/2011
29/01/2011
31/01/2011
Date
ET mm


Rocla Calga Quarry - January 2011
Data Reception
Data Reception %
100
80
60
40
20
0
1/01/2011
3/01/2011
5/01/2011
7/01/2011
9/01/2011
11/01/2011
13/01/2011
15/01/2011
17/01/2011
19/01/2011
21/01/2011
23/01/2011
25/01/2011
27/01/2011
29/01/2011
31/01/2011
Date
Max Data %
Av data %
Min Data %

### 2.3.3 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.




The predominant winds were from the NE, with strongest winds from the W, E and NE. The maximum wind speed was 14.8m/s from the WNW.

# Appendix 1

# Laboratory Certificates

## Environmental Division

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **EN1100248** | Page | : 1 of 4 |
| Client | : **CARBON BASED ENVIRONMENTAL** | Laboratory | : Environmental Division Newcastle |
| Contact | : MS RENAE MIKKA | Contact | : Peter Keyte |
| Address | : 47 BOOMERANG ST<br>CESSNOCK NSW, AUSTRALIA 2325 | Address | : 5 Rosegum Road Warabrook NSW Australia 2304 |
| E-mail | : cbased1@bigpond.com | 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 1999 Schedule B(3) and ALS QCS3 requirement |
| Order number | : ---- | | |
| C-O-C number | : ---- | Date Samples Received | : 31-JAN-2011 |
| Sampler | : ---- | Issue Date | : 07-FEB-2011 |
| Site | : ---- | | |
| | | No. of samples received | : 6 |
| Quote number | : SY/269/10 | 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

This document is issued in accordance with NATA accreditation requirements.

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* |
|---|---|---|
| Peter Keyte | Newcastle Manager | Newcastle |

## 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 insuffient 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 is not held for results reported in g/m².mth. Period sampled: 31/12/2010 - 31/01/2011.**

## Analytical Results

Sub-Matrix: **DUST**

| Compound | CAS Number | LOR | Unit | Client sample ID: CD1 | CD2C | CD3 | CD4 | CD5 |
|---|---|---|---|---|---|---|---|---|
| | | | | Client sampling date / time: 31-JAN-2011 14:25 | 31-JAN-2011 14:25 | 31-JAN-2011 14:25 | 31-JAN-2011 14:25 | 31-JAN-2011 14:25 |
| | | | | EN1100248-001 | EN1100248-002 | EN1100248-003 | EN1100248-004 | EN1100248-005 |
| **EA120: Ash Content** | | | | | | | | |
| **Ash Content** | ---- | 0.1 | g/m².month | **0.5** | **1.2** | **0.3** | **0.2** | **0.3** |
| **Ash Content (mg)** | ---- | 1 | mg | **10** | **22** | **5** | **3** | **6** |
| **EA125: Combustible Matter** | | | | | | | | |
| **Combustible Matter** | ---- | 0.1 | g/m².month | **0.1** | <0.1 | <0.1 | <0.1 | **0.3** |
| **Combustible Matter (mg)** | ---- | 1 | mg | **1** | **1** | **1** | <1 | **5** |
| **EA141: Total Insoluble Matter** | | | | | | | | |
| **Total Insoluble Matter** | ---- | 0.1 | g/m².month | **0.6** | **1.2** | **0.3** | **0.2** | **0.6** |
| **Total Insoluble Matter (mg)** | ---- | 1 | mg | **11** | **23** | **6** | **3** | **11** |

## Analytical Results

| Sub-Matrix: **DUST** | | | | Client sample ID | **CD6** | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Client sampling date / time | 31-JAN-2011 14:25 | ---- | ---- | ---- | ---- |
| *Compound* | *CAS Number* | *LOR* | *Unit* | | **EN1100248-006** | **----** | **----** | **----** | **----** |
| **EA120: Ash Content** | | | | | | | | | |
| **Ash Content** | ---- | 0.1 | g/m².month | | **0.2** | ---- | ---- | ---- | ---- |
| **Ash Content (mg)** | ---- | 1 | mg | | **3** | ---- | ---- | ---- | ---- |
| **EA125: Combustible Matter** | | | | | | | | | |
| **Combustible Matter** | ---- | 0.1 | g/m².month | | **0.1** | ---- | ---- | ---- | ---- |
| **Combustible Matter (mg)** | ---- | 1 | mg | | **2** | ---- | ---- | ---- | ---- |
| **EA141: Total Insoluble Matter** | | | | | | | | | |
| **Total Insoluble Matter** | ---- | 0.1 | g/m².month | | **0.3** | ---- | ---- | ---- | ---- |
| **Total Insoluble Matter (mg)** | ---- | 1 | mg | | **5** | ---- | ---- | ---- | ---- |

## Environmental Division

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **ES1101875** | Page | : 1 of 3 |
| Client | : **CARBON BASED ENVIRONMENTAL** | Laboratory | : Environmental Division Sydney |
| Contact | : MS RENAE MIKKA | Contact | : Charlie Pierce |
| Address | : 47 BOOMERANG ST<br>CESSNOCK NSW, AUSTRALIA 2325 | Address | : 277-289 Woodpark Road Smithfield NSW Australia 2164 |
| E-mail | : cbased1@bigpond.com | E-mail | : sydney.enviro.services@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 1999 Schedule B(3) and ALS QCS3 requirement |
| Order number | : ---- | | |
| C-O-C number | : ---- | Date Samples Received | : 31-JAN-2011 |
| Sampler | : CBE | Issue Date | : 08-FEB-2011 |
| Site | : ---- | | |
| | | No. of samples received | : 2 |
| Quote number | : SY/269/10 V2 | 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

This document is issued in accordance with NATA accreditation requirements.

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 | Inorganics |
| Hoa Nguyen | Inorganic Chemist | Inorganics |
| Peter Keyte | Newcastle Manager | Newcastle |

## 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 insuffient 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 | | | | Client sample ID | A | F | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Client sampling date / time | [31-JAN-2011] | [31-JAN-2011] | ---- | ---- | ---- |
| Compound | CAS Number | LOR | Unit | | ES1101875-001 | ES1101875-002 | ---- | ---- | ---- |
| **EA005: pH** | | | | | | | | | |
| **pH Value** | ---- | 0.01 | pH Unit | | **5.73** | **4.82** | ---- | ---- | ---- |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | | |
| **Electrical Conductivity @ 25°C** | ---- | 1 | µS/cm | | **79** | **85** | ---- | ---- | ---- |
| **EA015: Total Dissolved Solids** | | | | | | | | | |
| **^ Total Dissolved Solids @180°C** | GIS-210-010 | 1 | mg/L | | ---- | **42** | ---- | ---- | ---- |
| **Total Dissolved Solids @180°C** | GIS-210-010 | 1 | mg/L | | **57** | ---- | ---- | ---- | ---- |
| **EA025: Suspended Solids** | | | | | | | | | |
| **^ Suspended Solids (SS)** | ---- | 5 | mg/L | | **7** | <5 | ---- | ---- | ---- |
| **EP020: Oil and Grease (O&G)** | | | | | | | | | |
| **Oil & Grease** | ---- | 5 | mg/L | | <5 | <5 | ---- | ---- | ---- |

# Appendix 2

# Additional Bureau of Meteorology Data from Peats Ridge and Gosford Monitoring Stations

## Peats Ridge, New South Wales
## January 2011 Daily Weather Observations

Australian Government
Bureau of Meteorology

| Date | Day | Temps | | Rain | Evap | Sun | Max wind gust | | | 9am | | | | | | 3pm | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | | | | Dirn | Spd | Time | Temp | RH | Cld | Dirn | Spd | MSLP | Temp | RH | Cld | Dirn | Spd | MSLP |
| | | °C | °C | mm | mm | hours | | km/h | local | °C | % | eighths | | km/h | hPa | °C | % | eighths | | km/h | hPa |
| 1 | Sa | 16.0 | 35.1 | 0 | 6.4 | | | | | 29.3 | 60 | 0 | N | 4 | | 33.8 | 63 | 0 | E | 9 | |
| 2 | Su | 16.8 | 31.2 | 0 | 7.8 | | | | | 21.2 | 87 | 8 | S | 4 | | 28.6 | 61 | 3 | ESE | 9 | |
| 3 | Mo | 15.3 | 19.8 | 11.0 | 3.8 | | | | | 18.2 | 93 | 8 | S | 4 | | 18.1 | 93 | 8 | S | 4 | |
| 4 | Tu | 15.5 | 19.9 | 0.2 | 2.8 | | | | | 16.5 | 91 | 8 | SW | 4 | | 18.8 | 75 | 8 | S | 2 | |
| 5 | We | 15.7 | 23.8 | 0 | 1.4 | | | | | 19.0 | 72 | 7 | SE | 4 | | 22.0 | 69 | 7 | E | 6 | |
| 6 | Th | 16.4 | 22.9 | 0.8 | 2.2 | | | | | 19.1 | 81 | 7 | S | 4 | | 22.1 | 74 | 8 | SE | 9 | |
| 7 | Fr | 16.3 | 25.6 | 7.6 | 2.6 | | | | | 20.0 | 96 | 7 | SSW | 4 | | 25.2 | 72 | 5 | SE | 9 | |
| 8 | Sa | 18.5 | 26.1 | 9.0 | 2.4 | | | | | 23.0 | 74 | 4 | E | 6 | | 26.1 | 67 | 5 | E | 7 | |
| 9 | Su | 20.6 | 26.4 | 17.4 | 4.6 | | | | | 21.6 | 95 | 8 | NE | 4 | | 24.8 | 78 | 7 | E | 4 | |
| 10 | Mo | 19.6 | 23.5 | 19.0 | 0.6 | | | | | 20.8 | 96 | 8 | SE | 9 | | 22.0 | 91 | 7 | E | 9 | |
| 11 | Tu | 19.5 | 23.6 | 13.0 | 0.4 | | | | | 21.0 | 95 | 8 | ENE | 6 | | 21.4 | 95 | 8 | E | 9 | |
| 12 | We | 20.2 | 27.5 | 3.6 | 0.6 | | | | | 23.6 | 85 | 5 | NE | 19 | | 26.3 | 80 | 7 | E | 4 | |
| 13 | Th | 20.2 | 26.6 | 0 | 3.6 | | | | | 23.8 | 81 | 3 | NE | 9 | | 26.2 | 66 | 6 | NE | 19 | |
| 14 | Fr | 18.7 | 28.6 | 0 | 4.2 | | | | | 24.0 | 69 | 2 | NE | 9 | | 27.1 | 60 | 4 | E | 7 | |
| 15 | Sa | 18.4 | 28.2 | 0 | 5.6 | | | | | 22.4 | 84 | 8 | | Calm | | 27.3 | 72 | 8 | NW | 4 | |
| 16 | Su | 20.3 | 26.6 | 0.8 | 1.6 | | | | | 21.4 | 93 | 8 | S | 4 | | 24.6 | 74 | 7 | SSE | 4 | |
| 17 | Mo | | 33.5 | 0 | 3.2 | | | | | 23.6 | 70 | 0 | NW | 4 | | 32.1 | 54 | 3 | SE | 6 | |
| 18 | Tu | 17.5 | 24.5 | 0 | 4.8 | | | | | 19.5 | 84 | 8 | SW | 4 | | 23.7 | 69 | 8 | E | 4 | |
| 19 | We | 18.8 | 26.3 | 0 | 3.6 | | | | | 20.2 | 95 | 8 | E | 4 | | 25.5 | 58 | 3 | NE | 4 | |
| 20 | Th | 18.8 | 26.0 | 0 | 4.0 | | | | | 22.7 | 82 | 3 | E | 4 | | 24.9 | 72 | 6 | NE | 13 | |
| 21 | Fr | 15.7 | 27.5 | 0 | 5.2 | | | | | 22.7 | 74 | 1 | ESE | 9 | | 27.5 | 62 | 3 | E | 4 | |
| 22 | Sa | 15.1 | 27.8 | 0 | 6.0 | | | | | 22.5 | 74 | 2 | N | 4 | | 27.2 | 42 | 0 | NE | 4 | |
| 23 | Su | 16.2 | 29.2 | 0 | 6.2 | | | | | 22.7 | 70 | 5 | NE | 4 | | 27.3 | 57 | 0 | E | 4 | |
| 24 | Mo | 16.4 | 33.5 | 0 | 6.6 | | | | | 25.1 | 55 | 6 | NW | 9 | | 32.6 | 39 | 7 | NW | 9 | |
| 25 | Tu | 18.5 | 33.1 | 0 | 5.6 | | | | | 23.5 | 76 | 4 | W | 4 | | 29.6 | 64 | 0 | NE | 4 | |
| 26 | We | 19.3 | 37.7 | 0 | 5.6 | | | | | 27.2 | 77 | 2 | E | 4 | | 32.3 | 64 | 5 | ENE | 9 | |
| 27 | Th | 21.6 | 31.5 | 0 | 6.2 | | | | | 22.6 | 96 | 8 | S | 4 | | 30.0 | 72 | 1 | E | 7 | |
| 28 | Fr | 18.9 | 24.2 | 5.6 | 5.0 | | | | | 21.6 | 84 | 7 | SE | 9 | | 22.2 | 74 | 6 | S | 4 | |
| 29 | Sa | 14.5 | 23.9 | 0.2 | 3.8 | | | | | 20.1 | 76 | 6 | E | 4 | | 23.5 | 73 | 3 | NE | 6 | |
| 30 | Su | 13.9 | 32.3 | 0 | 3.8 | | | | | 22.2 | 79 | 0 | NE | 4 | | 30.1 | 62 | 0 | SE | 9 | |
| 31 | Mo | 17.7 | 36.4 | 0 | 6.6 | | | | | 27.2 | 54 | 0 | NW | 4 | | 35.0 | 39 | 0 | E | 4 | |
| **Statistics for January 2011** | | | | | | | | | | | | | | | | | | | | | |
| Mean | | 17.7 | 27.8 | | 4.1 | | | | | 22.2 | 80 | 5 | | 5 | | 26.4 | 67 | 4 | | 6 | |
| Lowest | | 13.9 | 19.8 | | 0.4 | | | | | 16.5 | 54 | 0 | | Calm | | 18.1 | 39 | 0 | S | 2 | |
| Highest | | 21.6 | 37.7 | 19.0 | 7.8 | | | | | 29.3 | 96 | 8 | NE | 19 | | 35.0 | 95 | 8 | NE | 19 | |
| Total | | | | 88.2 | 126.8 | | | | | | | | | | | | | | | | |

## Gosford, New South Wales
## January 2011 Daily Weather Observations

Australian Government
Bureau of Meteorology

| Date | Day | Temps | | Rain | Evap | Sun | Max wind gust | | | 9am | | | | | | 3pm | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | | | | Dirn | Spd | Time | Temp | RH | Cld | Dirn | Spd | MSLP | Temp | RH | Cld | Dirn | Spd | MSLP |
| | | °C | °C | mm | mm | hours | | km/h | local | °C | % | eighths | | km/h | hPa | °C | % | eighths | | km/h | hPa |
| 1 | Sa | 15.2 | 34.2 | 0 | | | SE | 24 | 16:01 | 25.4 | 74 | | ENE | 4 | | 32.2 | 41 | | E | 9 | |
| 2 | Su | 16.8 | 29.1 | 0 | | | SSE | 35 | 17:52 | 22.6 | 88 | | SSE | 6 | | 25.9 | 71 | | SSE | 13 | |
| 3 | Mo | 18.2 | 22.1 | 9.8 | | | E | 30 | 14:11 | 20.2 | 90 | | SSE | 7 | | 20.5 | 80 | | SSE | 9 | |
| 4 | Tu | 16.8 | 22.3 | 0.4 | | | SSW | 26 | 09:59 | 19.5 | 82 | | SE | 7 | | 21.3 | 65 | | SSE | 9 | |
| 5 | We | 14.5 | 25.1 | 0 | | | SE | 22 | 13:56 | 21.1 | 61 | | | Calm | | 23.6 | 59 | | SE | 13 | |
| 6 | Th | 18.0 | 24.8 | 0.6 | | | SSE | 35 | 10:28 | 21.4 | 82 | | SSE | 13 | | 24.1 | 73 | | SSE | 17 | |
| 7 | Fr | 17.0 | 26.7 | 6.8 | | | ESE | 26 | 13:16 | 21.9 | 96 | | SSE | 7 | | 26.2 | 67 | | ENE | 13 | |
| 8 | Sa | 18.5 | 27.7 | 4.8 | | | SE | 24 | 13:53 | 24.6 | 72 | | ESE | 9 | | 27.0 | 53 | | SE | 13 | |
| 9 | Su | 21.9 | 27.8 | 21.2 | | | NE | 30 | 11:55 | 23.7 | 98 | | NE | 7 | | 26.9 | 74 | | ESE | 11 | |
| 10 | Mo | 21.3 | 26.2 | 3.6 | | | SSE | 28 | 08:48 | 23.5 | 82 | | NE | 9 | | 23.1 | 80 | | ENE | 11 | |
| 11 | Tu | 20.8 | 26.1 | 7.6 | | | SE | 35 | 14:11 | 22.1 | 99 | | | Calm | | 23.7 | 92 | | ENE | 7 | |
| 12 | We | 20.4 | 27.9 | 1.8 | | | ENE | 37 | 16:03 | 26.1 | 79 | | NNE | 7 | | 26.4 | 77 | | ENE | 9 | |
| 13 | Th | 22.5 | 27.9 | 0 | | | ENE | 37 | 14:26 | 25.4 | 73 | | ENE | 11 | | 26.5 | 59 | | ENE | 15 | |
| 14 | Fr | 18.3 | 29.3 | 0 | | | NNW | 33 | 09:14 | 25.2 | 68 | | N | 9 | | 27.4 | 58 | | E | 11 | |
| 15 | Sa | 18.7 | 30.2 | 0 | | | NNW | 20 | 10:35 | 23.0 | 82 | | | Calm | | 28.1 | 67 | | WNW | 6 | |
| 16 | Su | 21.7 | 28.7 | 0 | | | S | 20 | 05:39 | 23.0 | 98 | | SSE | 6 | | 26.1 | 73 | | NW | 6 | |
| 17 | Mo | 15.8 | 33.6 | 0.2 | | | SSW | 31 | 17:08 | 24.8 | 71 | | NE | 4 | | 27.0 | 70 | | SSE | 15 | |
| 18 | Tu | 19.7 | 24.6 | 0 | | | SE | 20 | 17:05 | 22.0 | 74 | | SW | 6 | | 24.2 | 63 | | ESE | 9 | |
| 19 | We | 19.2 | 26.8 | 0 | | | E | 24 | 15:03 | 21.7 | 98 | | | Calm | | 25.9 | 66 | | E | 11 | |
| 20 | Th | 19.5 | 27.4 | 0.6 | | | ENE | 41 | 16:32 | 25.1 | 68 | | ESE | 9 | | 26.4 | 62 | | NE | 11 | |
| 21 | Fr | 15.4 | 28.9 | 0 | | | ENE | 28 | 18:10 | 23.8 | 77 | | ENE | 4 | | 27.8 | 54 | | E | 11 | |
| 22 | Sa | 15.3 | 29.1 | 0 | | | ENE | 22 | 15:00 | 23.2 | 77 | | NE | 4 | | 27.8 | 32 | | ENE | 9 | |
| 23 | Su | 16.3 | 29.1 | 0 | | | ENE | 35 | 15:50 | 24.2 | 64 | | ENE | 9 | | 27.3 | 57 | | ENE | 13 | |
| 24 | Mo | 15.9 | 36.5 | 0 | | | NNW | 31 | 11:18 | 25.7 | 62 | | ESE | 6 | | 35.9 | 29 | | NNW | 11 | |
| 25 | Tu | 21.8 | 31.8 | 0 | | | N | 24 | 16:23 | 24.5 | 69 | | N | 6 | | 30.1 | 55 | | NE | 9 | |
| 26 | We | 19.4 | 37.7 | 0 | | | SSE | 31 | 21:38 | 27.5 | 77 | | ESE | 2 | | 31.6 | 62 | | N | 9 | |
| 27 | Th | 22.8 | 31.9 | 0 | | | S | 28 | 23:02 | 23.6 | 98 | | | Calm | | 30.2 | 64 | | SE | 11 | |
| 28 | Fr | 21.5 | 25.6 | 4.2 | | | SSE | 28 | 02:28 | 23.6 | 69 | | SE | 13 | | 24.4 | 64 | | SE | 13 | |
| 29 | Sa | 15.0 | 26.4 | 0 | | | ESE | 24 | 12:10 | 21.9 | 71 | | | Calm | | 25.3 | 46 | | NNE | 9 | |
| 30 | Su | 12.9 | 31.3 | 0 | | | E | 24 | 13:14 | 22.4 | 72 | | NE | 4 | | 29.7 | 43 | | E | 11 | |
| 31 | Mo | 16.5 | 36.9 | 0 | | | N | 22 | 17:14 | 25.2 | 73 | | ESE | 4 | | 35.3 | 32 | | ENE | 11 | |
| Statistics for January 2011 | | | | | | | | | | | | | | | | | | | | | |
| | Mean | 18.3 | 28.8 | | | | | | | 23.5 | 78 | | | 5 | | 27.0 | 60 | | | 10 | |
| | Lowest | 12.9 | 22.1 | | | | | | | 19.5 | 61 | | | Calm | | 20.5 | 29 | | # | 6 | |
| | Highest | 22.8 | 37.7 | 21.2 | | | ENE | 41 | | 27.5 | 99 | | # | 13 | | 35.9 | 92 | | SSE | 17 | |
| | Total | | | 61.6 | | | | | | | | | | | | | | | | | |