



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

February 2016

A handwritten signature in black ink, appearing to read 'Colin Davies'.

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 18 March 2016

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 February 2016;
- Surface Water quality results for February 2016;
- Ground Water quality results for February 2016; and
- Meteorological report for February 2016.

The February 2016 dust deposition results for insoluble solids were generally low and free of major contamination. All sites, on a rolling annual average basis, are currently below the Air Quality Management Plan exceedance 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 3 March 2016 at sites A and F. Sites B and C were inaccessible and unable to be sampled this month. Site D was too low to sample. The samples were collected and analysed for a monthly sampling event. Results show pH within the slightly acidic range, low Electrical Conductivity, low Total Dissolved Solids and low Total Suspended Solids. Oil and Grease was not detected at any site in February 2016.

Bi-monthly groundwater monitoring is next scheduled for March 2016.

Data for February 2016 shows that rainfall recorded at the Rocla Calga Quarry was higher than the Gosford BOM mean rainfall however significantly lower than the Peats Ridge long term rainfall for February.

The rainfall comparison is provided below:

Rocla Calga Quarry	27.0 mm
BOM Peats Ridge*	NA
BOM Gosford*	24.4 mm
BOM Peats Ridge Long term mean for February*	154.3 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.

Sampling Program

Rocla Calga Quarry conducts environmental monitoring in accordance to Development Consent, OEH (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. 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 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 bi-monthly for depth and water quality. 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. Metrological parameters are measured according to Australian Standard [AS3580.14](#) "Methods for sampling and analysis of ambient air. Meteorological monitoring for ambient air quality monitoring 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.

The locations of monitoring points are provided in **Figure 1**.

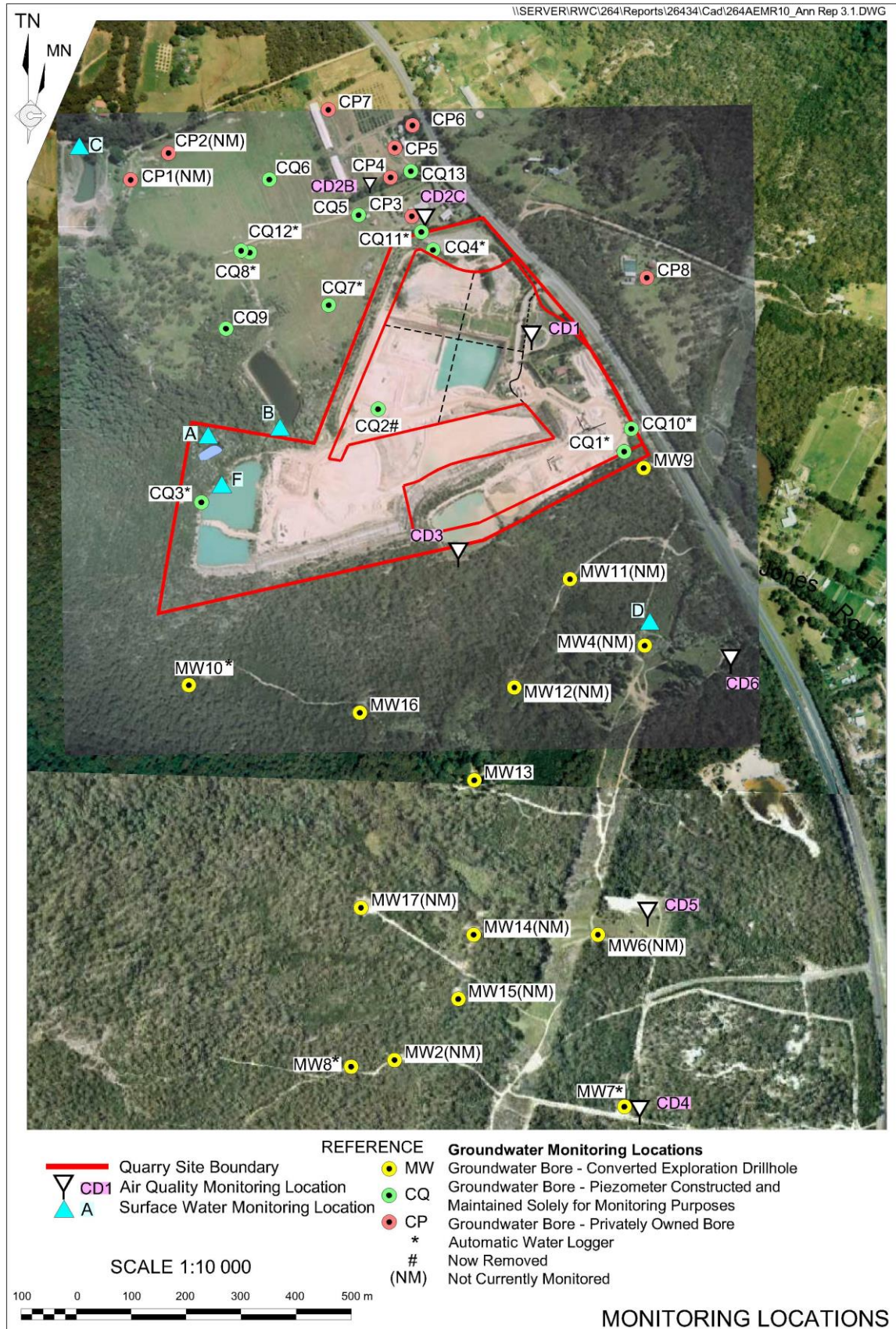


Figure 1: Rocla Calga Quarry environmental monitoring locations

2.0 Monthly Results

2.1 Dust Deposition Gauges

Table 1 displays the results for February 2016 and the project 12 month rolling average. Results are in g/m².month.

Table 1: Dust Deposition results: 2 February 2016 – 3 March 2016 (30 days)

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	0.7	0.6	0.1	86	1.0
CD2c	0.6	0.5	0.1	83	1.2
CD3	0.7	0.5	0.2	71	0.8
CD4	0.6	0.2	0.4	33	0.6
CD5	0.2	0.2	<0.1	100	0.5
CD6	0.5	0.3	0.2	60	0.6

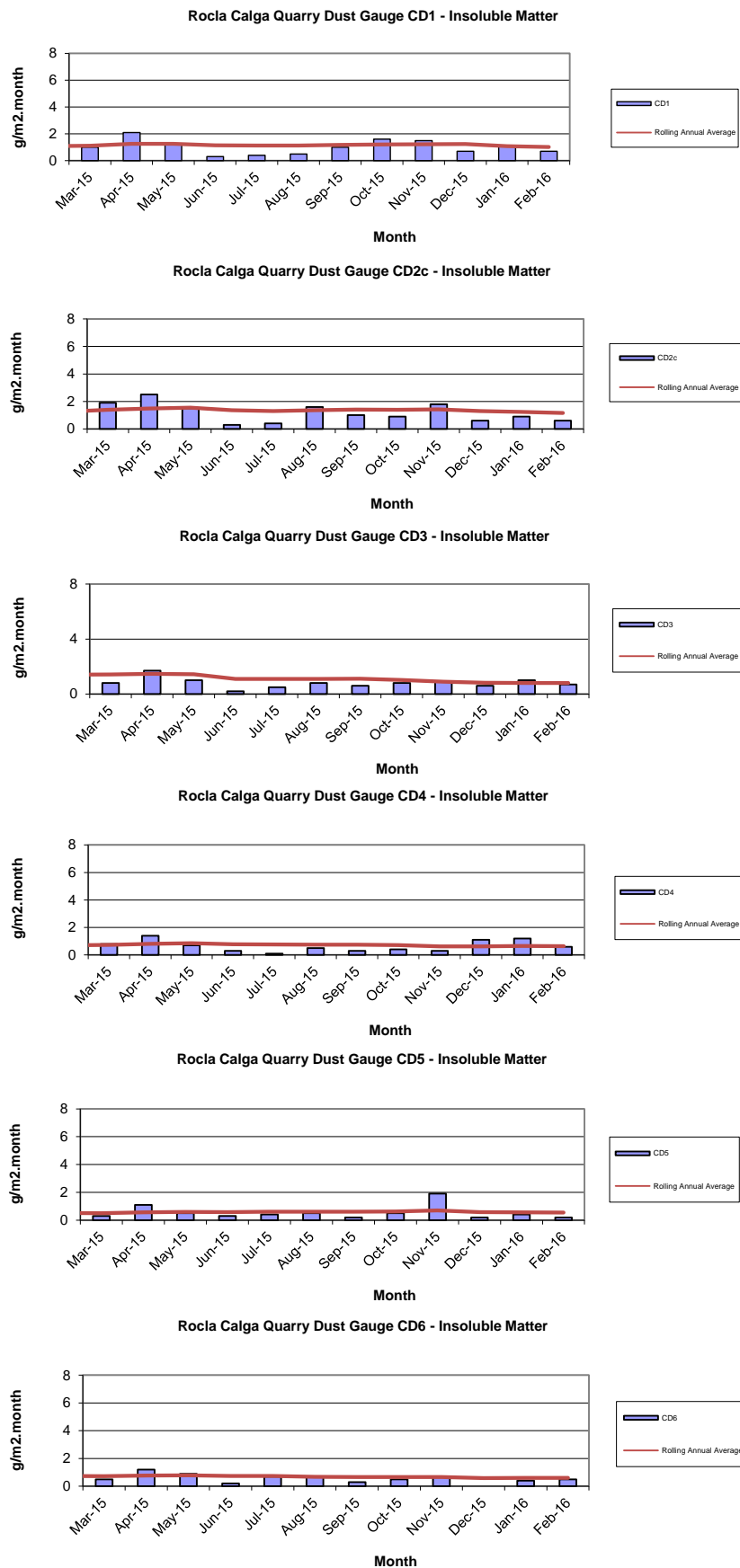
Insoluble Solids marked with an * indicate an excessively contaminated gauge. Contamination can include bird droppings, vegetation (such as plant matter, algae, pollen and seeds) and insects. Results in bold indicate insoluble solids levels above 3.7 g/m².month; the Development Consent's annual average amenity criteria at residential locations. The current rolling annual average is calculated from March 2015 to February 2016.

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 2** below. The laboratory analysis is provided in **Appendix 1**.

Figure 2: Dust Deposition Charts



2.2 Surface Water Monitoring

Monthly surface water monitoring was conducted on the 3 March 2016 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1**.

Table 2: Monthly surface water monitoring – February 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	Still	Clear	Clear	5.79	66	62	<5	<5
B	No access							
C	No Access							
D	Too low to sample							
F	Dam	Clear	Clear	4.63	80	64	10	<5

Samples were collected at sites A and F. Sites B and C were inaccessible and unable to be sampled this month. Site D was too low to sample. The samples were collected and analysed for a monthly sampling event. Results show pH within the slightly acidic range, low Electrical Conductivity, low Total Dissolved Solids and low Total Suspended Solids. Oil and Grease was not detected at any site in February 2016.

2.2.1 Non-Routine Surface Water Sampling

No non routine sampling was undertaken during February 2016.

2.3 Groundwater Monitoring

Bi-monthly groundwater monitoring is next scheduled for March 2016.

2.4 Meteorological Monitoring

The Rocla Calga Quarry weather station data recovery in February 2016 was approximately 100%.

The weather station data follows and includes;

- Monthly data numerical summary;
- Weather charts of air temperature, humidity, heat index and wind chill, atmospheric pressure, solar radiation, evapotranspiration, rain, wind speed and data reception; and
- Wind rose (frequency distribution diagram of wind speed and direction).

Monthly weather statistics from the nearby Bureau of Meteorology (BOM) at Peats Ridge station are no longer available. However, the long term rainfall mean is available via a link on the Gosford BOM Daily Weather Observation page.

Data for February 2016 shows that rainfall recorded at the Rocla Calga Quarry was higher than the Gosford BOM mean rainfall however significantly lower than the Peats Ridge long term rainfall for February.

The rainfall comparison is provided below:

Rocla Calga Quarry	27.0 mm
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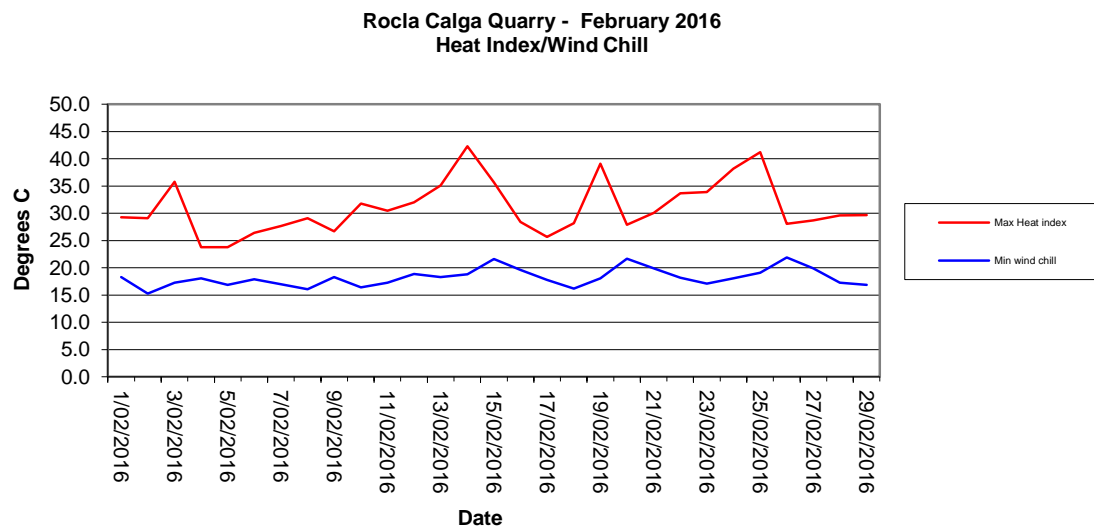
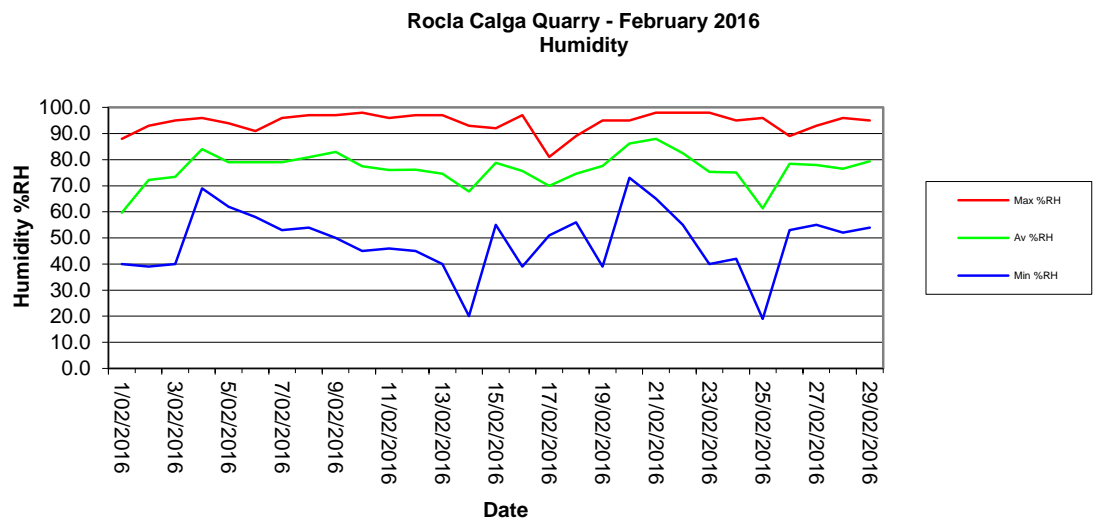
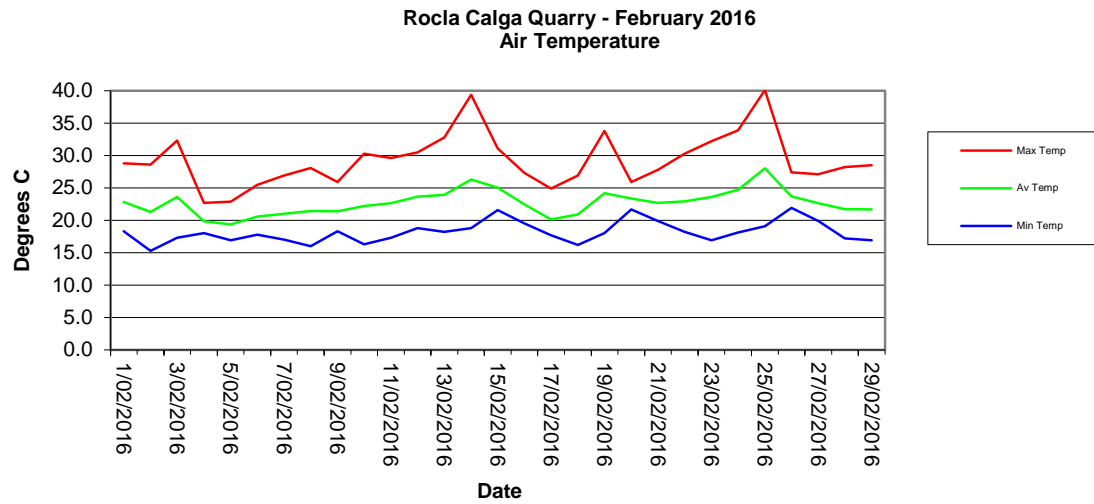
*Data sourced from Bureau of Meteorology (BOM) website (www.bom.gov.au).

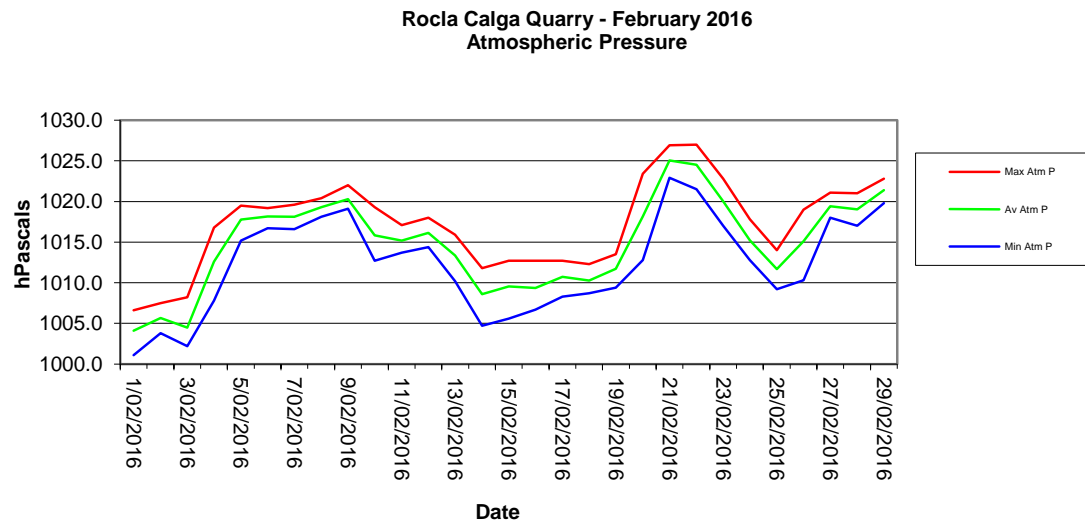
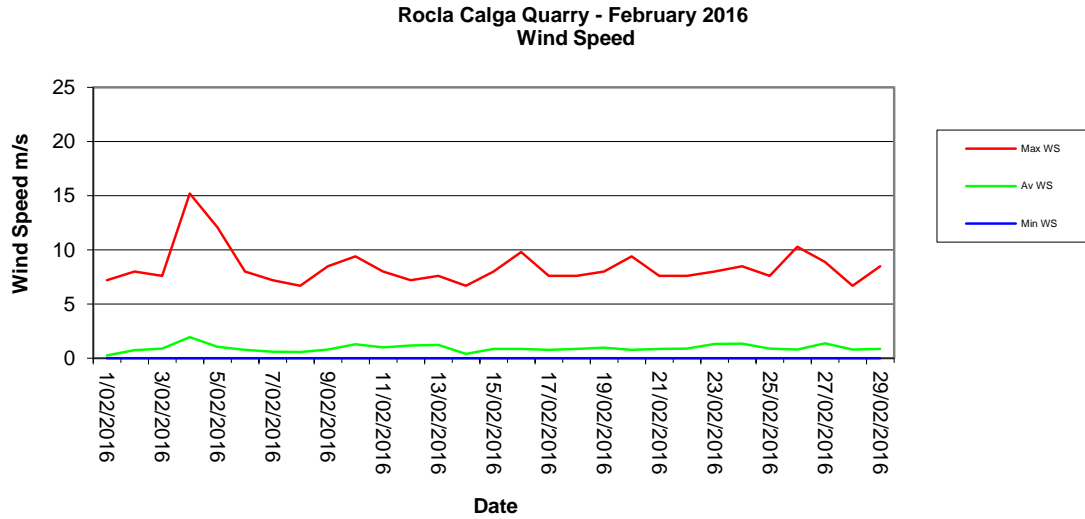
2.4.1 Monthly Meteorological Data Summary

Summary Feb-16 Rocla - Calga

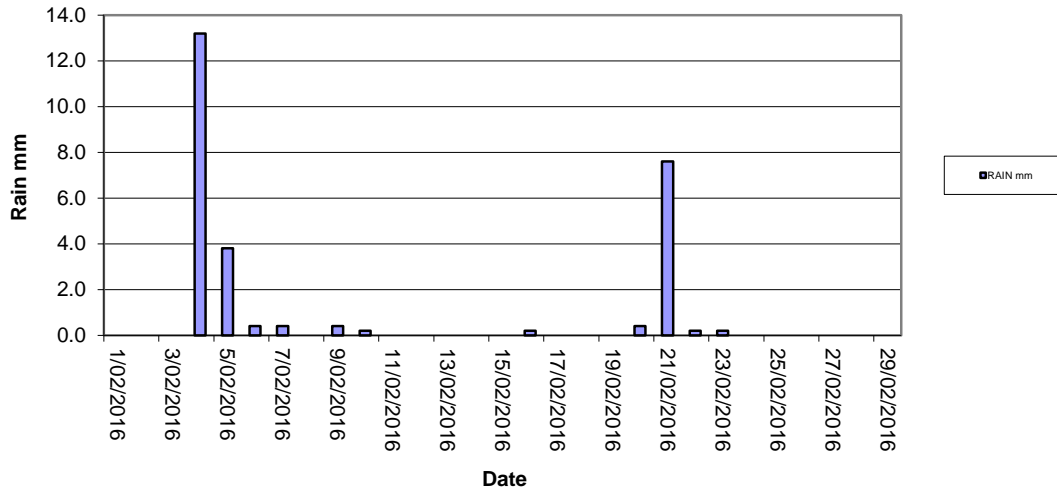
Date	Min Temp	Av Temp	Max Temp	Min %RH	Av %RH	Max %RH	RAIN mm	Min WS	Av WS	Max WS	Min wind chill	Max Heat index	Min Atm P	Av Atm P	Max Atm P	Min Data %	Av data %	Max Data %
1/02/2016	18.3	22.8	28.8	40.0	59.7	88.0	0.0	0.0	0.3	7.2	18.3	29.3	1001.1	1004.1	1006.6	61.4	88.3	97.7
2/02/2016	15.3	21.3	28.6	39.0	72.3	93.0	0.0	0.0	0.7	8.0	15.3	29.1	1003.8	1005.7	1007.5	79.5	96.0	98.0
3/02/2016	17.3	23.6	32.3	40.0	73.4	95.0	0.0	0.0	0.9	7.6	17.3	35.8	1002.2	1004.5	1008.2	60.8	90.5	98.0
4/02/2016	18.0	19.9	22.7	69.0	84.0	96.0	13.2	0.0	2.0	15.2	18.1	23.8	1007.8	1012.6	1016.8	83.6	93.4	98.0
5/02/2016	16.9	19.4	22.9	62.0	79.0	94.0	3.8	0.0	1.1	12.1	16.9	23.8	1015.2	1017.8	1019.5	93.0	97.2	98.0
6/02/2016	17.8	20.6	25.5	58.0	79.0	91.0	0.4	0.0	0.8	8.0	17.9	26.4	1016.7	1018.2	1019.2	81.6	92.3	98.0
7/02/2016	17.0	21.0	26.9	53.0	79.0	96.0	0.4	0.0	0.6	7.2	17.0	27.7	1016.6	1018.1	1019.6	86.8	91.3	96.2
8/02/2016	16.0	21.4	28.1	54.0	80.9	97.0	0.0	0.0	0.6	6.7	16.1	29.1	1018.1	1019.3	1020.4	69.6	86.6	95.9
9/02/2016	18.3	21.4	25.9	50.0	82.9	97.0	0.4	0.0	0.8	8.5	18.3	26.7	1019.1	1020.3	1022.0	38.3	89.0	98.0
10/02/2016	16.3	22.2	30.3	45.0	77.5	98.0	0.2	0.0	1.3	9.4	16.4	31.8	1012.7	1015.8	1019.3	71.3	93.0	98.0
11/02/2016	17.3	22.7	29.6	46.0	76.0	96.0	0.0	0.0	1.0	8.0	17.3	30.5	1013.7	1015.2	1017.1	77.5	93.4	98.0
12/02/2016	18.8	23.7	30.5	45.0	76.1	97.0	0.0	0.0	1.2	7.2	18.9	32.0	1014.4	1016.1	1018.0	46.5	86.9	98.0
13/02/2016	18.2	24.0	32.8	40.0	74.6	97.0	0.0	0.0	1.2	7.6	18.3	35.1	1010.2	1013.3	1015.9	71.3	89.5	98.0
14/02/2016	18.8	26.3	39.4	20.0	67.8	93.0	0.0	0.0	0.4	6.7	18.8	42.3	1004.7	1008.6	1011.8	78.4	88.3	93.0
15/02/2016	21.6	25.1	31.1	55.0	78.8	92.0	0.0	0.0	0.9	8.0	21.6	35.7	1005.6	1009.5	1012.7	54.7	85.3	96.2
16/02/2016	19.5	22.4	27.3	39.0	75.7	97.0	0.2	0.0	0.9	9.8	19.6	28.4	1006.7	1009.4	1012.7	55.0	89.8	98.0
17/02/2016	17.7	20.1	24.9	51.0	69.9	81.0	0.0	0.0	0.8	7.6	17.8	25.7	1008.3	1010.7	1012.7	59.6	87.0	97.4
18/02/2016	16.2	20.9	26.9	56.0	74.7	89.0	0.0	0.0	0.9	7.6	16.2	28.2	1008.7	1010.3	1012.3	86.0	95.3	98.0
19/02/2016	18.0	24.2	33.8	39.0	77.6	95.0	0.0	0.0	1.0	8.0	18.1	39.1	1009.4	1011.7	1013.5	35.7	85.2	98.0
20/02/2016	21.7	23.4	25.9	73.0	86.1	95.0	0.4	0.0	0.8	9.4	21.7	27.9	1012.8	1018.1	1023.4	73.4	90.5	98.0
21/02/2016	19.9	22.7	27.8	65.0	88.0	98.0	7.6	0.0	0.9	7.6	19.9	30.1	1022.9	1025.0	1026.9	82.7	94.0	98.0
22/02/2016	18.2	22.9	30.3	55.0	82.5	98.0	0.2	0.0	0.9	7.6	18.2	33.7	1021.5	1024.5	1027.0	71.6	92.0	98.0
23/02/2016	16.9	23.6	32.2	40.0	75.3	98.0	0.2	0.0	1.3	8.0	17.1	33.9	1017.0	1020.0	1022.8	52.9	86.7	98.0
24/02/2016	18.1	24.7	33.9	42.0	75.1	95.0	0.0	0.0	1.4	8.5	18.1	38.2	1012.8	1015.2	1017.8	42.7	86.8	98.0
25/02/2016	19.1	28.0	40.1	19.0	61.4	96.0	0.0	0.0	0.9	7.6	19.1	41.2	1009.2	1011.7	1014.0	58.2	89.5	98.0
26/02/2016	21.9	23.7	27.4	53.0	78.4	89.0	0.0	0.0	0.8	10.3	21.9	28.1	1010.3	1015.1	1019.0	74.0	94.4	98.0
27/02/2016	19.9	22.7	27.1	55.0	78.0	93.0	0.0	0.0	1.4	8.9	19.9	28.7	1018.0	1019.4	1021.1	88.6	94.4	98.0
28/02/2016	17.2	21.7	28.2	52.0	76.5	96.0	0.0	0.0	0.8	6.7	17.3	29.6	1017.0	1019.0	1021.0	85.4	92.8	97.7
29/02/2016	16.9	21.7	28.5	54.0	79.4	95.0	0.0	0.0	0.9	8.5	16.9	29.7	1019.8	1021.4	1022.8	37.4	87.3	98.0
Monthly	15.3	22.7	40.1	19	77	98	27.0	0	0.9	15.2	15.3	42.3	1001.1	1014.9	1027	35.7	90.6	98

2.4.2 Monthly Weather Charts

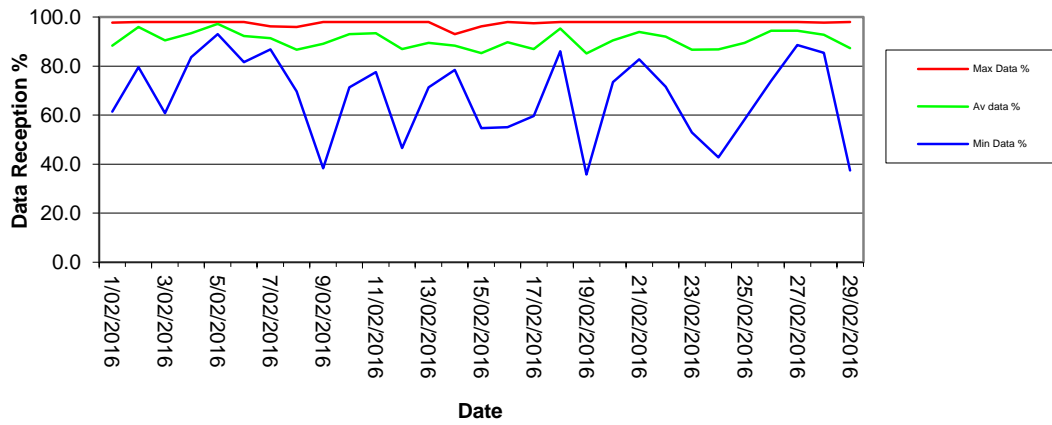




Rocla Calga Quarry - February 2016
Rainfall



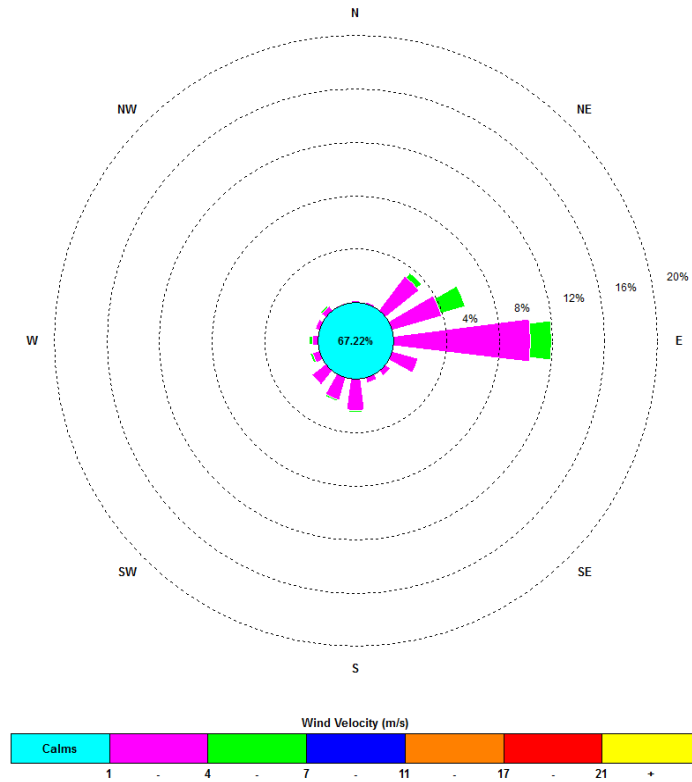
Rocla Calga Quarry - February 2016
Data Reception



2.4.3 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.

00:15, 1 February 2016 – 23:45, 29 February 2016



The predominant winds were from the E, with most frequent, strongest winds from the ENE. The maximum wind speed was 15.2 m/s from the S.

Appendix 1

Laboratory Certificates



Environmental

CERTIFICATE OF ANALYSIS

Work Order	: EN1600845	Page	: 1 of 4
Client	: CARBON BASED ENVIRONMENTAL	Laboratory	: Environmental Division Newcastle
Contact	: MR COLIN DAVIES (cbased)	Contact	:
Address	: 47 BOOMERANG ST CESSNOCK NSW, AUSTRALIA 2325	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
E-mail	: cbased@bigpond.com	E-mail	:
Telephone	: +61 49904443	Telephone	: +61 2 4014 2500
Facsimile	: +61 02 49904442	Facsimile	: +61 2 4967 7382
Project	: Rocla Calga Dusts	QC Level	: NEPM 2013 B3 & ALS QC Standard
Order number	: ---	Date Samples Received	: 03-Mar-2016 13:45
C-O-C number	: ---	Date Analysis Commenced	: 03-Mar-2016
Sampler	: ---	Issue Date	: 09-Mar-2016 14:17
Site	:	No. of samples received	: 6
Quote number	: ---	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

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

Dianne Blane

Laboratory Coordinator (2IC)

Newcastle - Inorganics, Mayfield West,
NSW



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 insufficient 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

ø = ALS is not NATA accredited for these tests.

- Analysis as per AS3580.10.1-2003. Samples passed through a 1mm sieve prior to analysis. NATA accreditation does not apply for results reported in g/m².mth as sampling data was provided by the client.

Sub-Matrix: **DEPOSITIONAL DUST**
(Matrix: **AIR**)

Sub-Matrix: DEPOSITIONAL DUST (Matrix: AIR)				Client sample ID	CD1 02/02/16 - 03/03/16 [03-Mar-2016] EN1600845-001 Result	CD2c 02/02/16 - 03/03/16 [03-Mar-2016] EN1600845-002 Result	CD3 02/02/16 - 03/03/16 [03-Mar-2016] EN1600845-003 Result	CD4 02/02/16 - 03/03/16 [03-Mar-2016] EN1600845-004 Result	CD5 02/02/16 - 03/03/16 [03-Mar-2016] EN1600845-005 Result
Compound	CAS Number	LOR	Unit	Client sampling date / time					
EA120: Ash Content									
Ash Content	—	0.1	g/m².month		0.6	0.5	0.5	0.2	0.2
Ash Content (mg)	—	1	mg		11	8	9	3	3
EA125: Combustible Matter									
Combustible Matter	—	0.1	g/m².month		0.1	0.1	0.2	0.4	<0.1
Combustible Matter (mg)	—	1	mg		2	2	4	8	1
EA141: Total Insoluble Matter									
Total Insoluble Matter	—	0.1	g/m².month		0.7	0.6	0.7	0.6	0.2
Total Insoluble Matter (mg)	—	1	mg		13	10	13	11	4



Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST**
 (Matrix: **AIR**)

Client sample ID

CD6

Client sampling date / time

02/02/16 - 03/03/16

[03-Mar-2016]

EN1600845-006

Compound	CAS Number	LOR	Unit	Result	Result	Result	Result	Result
EA120: Ash Content								
Ash Content	---	0.1	g/m ² .month	0.3	---	---	---	---
Ash Content (mg)	---	1	mg	5	---	---	---	---
EA125: Combustible Matter								
Combustible Matter	---	0.1	g/m ² .month	0.2	---	---	---	---
Combustible Matter (mg)	---	1	mg	3	---	---	---	---
EA141: Total Insoluble Matter								
Total Insoluble Matter	---	0.1	g/m ² .month	0.5	---	---	---	---
Total Insoluble Matter (mg)	---	1	mg	8	---	---	---	---



Environmental

CERTIFICATE OF ANALYSIS

Work Order	ES1604808	Page	1 of 2
Client	CARBON BASED ENVIRONMENTAL	Laboratory	Environmental Division Sydney
Contact	MR COLIN DAVIES (cbased)	Contact	
Address	47 BOOMERANG ST CESSNOCK NSW, AUSTRALIA 2325	Address	277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	cbased@bigpond.com	E-mail	
Telephone	+61 49904443	Telephone	+61-2-8784 8555
Facsimile	+61 02 49904442	Facsimile	+61-2-8784 8500
Project	ROCLA QUARRY	QC Level	NEPM 2013 B3 & ALS QC Standard
Order number	---	Date Samples Received	03-Mar-2016 13:46
C-O-C number	---	Date Analysis Commenced	03-Mar-2016
Sampler	---	Issue Date	09-Mar-2016 17:00
Site		No. of samples received	2
Quote number	---	No. of samples analysed	2

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

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

Ankit Joshi
Barbara Coupland

Position

Inorganic Chemist
Quality Officer

Accreditation Category

Sydney Inorganics, Smithfield, NSW
Newcastle - Inorganics, Mayfield West,
NSW



General Comments

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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
 @ = ALS is not NATA accredited for these tests.

- Sampling time not provided. For operational reasons an assumed date/time (3pm on date of receipt) is used. Sample results may be affected if the analysis falls outside of actual holding time.
- EA015 : TDS result has been confirmed by re-analysis for sample 1.

Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	A [03-Mar-2016] ES1604808-001 Result	F [03-Mar-2016] ES1604808-002 Result	---	---	---
EA005: pH								
pH Value	---	0.01	pH Unit	5.79	4.63	---	---	---
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	---	1	µS/cm	66	80	---	---	---
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	---	10	mg/L	62	64	---	---	---
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	---	5	mg/L	<5	10	---	---	---
EP020: Oil and Grease (O&G)								
Oil & Grease	---	5	mg/L	<5	<5	---	---	---