# **Appendix 2\***

## Monthly Dust and Meteorological Reports

\*This appendix is presented on the CD included on the inside back cover this report

(No. of pages including blank pages = 208)

## DONALDSON COAL PTY LTD

Abel Underground Coal Mine Appendix 2

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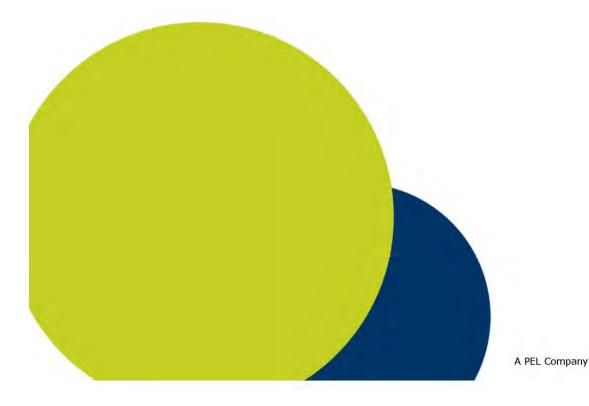
## REPORT

## **DUST AND METEOROLOGICAL DATA - JUNE 2011**

**Donaldson Coal** 

Job No: 3003

8 August 2011





PROJECT TITLE:	DUST AND METEOROLOGICAL DATA - JUNE 2011
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#### **1** INTRODUCTION

As part of their Air Quality Management Plan, Donaldson Coal operate an ambient air quality monitoring network, including dust monitoring in the vicinity of the mining lease and meteorological monitoring at a single station on-site. This report has been prepared as a summary of the data collected throughout the network during June 2011.

The dust monitoring network includes continuous monitoring using TSI DustTrak, high volume air sampling (HVAS) on a one-day-in-six run cycle and dust deposition monitoring.

The continuous monitoring network consists of two DustTrak monitors measuring  $PM_{10}$  at two sites and an additional DustTrak monitor used for one week each quarter to measure  $PM_{2.5}$ .

There are two HVAS locations used to determine ambient concentrations of  $PM_{10}$  and TSP. These operate on a one-day-in-six run cycle, in line with similar measurements made by the NSW Office of Environment and Heritage (OEH)<sup>a</sup> at other locations throughout the state.

Monthly levels of dust deposition are also measured using twelve gauges placed at various locations in the vicinity of the mine. The locations of each of these monitors and gauges are shown in **Figure 1**.

Table 1 lists the instruments used and pollutants measured at these locations.

Monitoring Location	Instrumenta Used	Pollutant Manitored
Beresfield	HVAS	PM16
Blackhill	HVAS	PMto
	HVAS	TSP
	DustTrak	PMLO
	DustTrak (1 week per quarter)	PM <sub>2.5</sub>
Weakleys Drive	DustTrak	PM <sub>10</sub>
DG1 - DG12	Deposition Gauges	Dust Deposition

Table 1: Summary of monitoring locations and instruments

Meteorological data are downloaded monthly and forwarded to PAEHolmes for processing. The meteorological station is situated at the site of the office buildings and measures the following parameters:

- wind speed;
- wind direction;
- temperature;
- solar radiation; and
- rainfall.

<sup>a</sup> The NSW EPA exists as a legal entity operated within the Office of Environment and Heritage (OEH) which came into existance in April 2011. OEH was previously part of the Department of Environment, Climate Change and Water (DECCW). The DECCW was also recently known as the Department of Environment and Climate Change (DECC), and prior to that the Department of Environment and Conservation (DEC). The terms NSW EPA, OEH, DECCW, DECC and DEC are interchangeable in this report.

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## 2 HIGH VOLUME AIR SAMPLING

High Volume Air Sampling (HVAS) was carried out at Beresfield and Blackhill by RCA Laboratories.  $PM_{10}$  is measured at both sites while TSP is only measured at Blackhill. The data collected during June 2011 are summarised in **Table 2**. A graph consisting of all the data collected to date is shown in **Figure 2**.

Date	Beresheld PM <sub>10</sub> (µg/m <sup>2</sup> )	Blackhill PMic (vg/m²)	Blackhill TSP (up/m*)
1/06/2011	13	13	23
7/06/2011	8	7	27
13/06/2011	6	4	16
19/06/2011	9	8	18
25/06/2011	13	11	21
Annual average	12	10	24

#### Table 2: HVAS data from Beresfield and Blackhill for June 2011

All measurements of  $PM_{10}$  for June are below the 24-hour OEH  $PM_{10}$  goal of 50 µg/m<sup>3</sup>. The highest 24-hour average  $PM_{10}$  concentration was 13 µg/m<sup>3</sup>, recorded at Beresfield on 1 June and 25 June 2011 and at Blackhill on 1 June 2011.

Figure 2 shows a seasonal trend in  $PM_{10}$  concentrations, peaking during the warmer months and decreasing during autumn and winter. This is a common trend and is seen consistently in the Hunter Valley.

The annual average  $PM_{10}$  concentrations for Beresfield and Blackhill were 12  $\mu g/m^3$  and 10  $\mu g/m^3$  respectively for the 12 months to June 2011. These values are below the OEH annual average  $PM_{10}$  goal of 30  $\mu g/m^3$ .

TSP measurements from the Blackhill site show that concentrations were below the OEH annual average TSP goal of 90  $\mu$ g/m<sup>3</sup>. It should be noted that the goal refers to an annual average and not a 24-hour average as measured by the high volume air sampler. The annual average TSP concentration for the 12 months to June 2011 was 24  $\mu$ g/m<sup>3</sup>.

These measurements will include all background sources relevant to that location, including contributions from the Donaldson mining operations.

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#### **3 CONTINUOUS MONITORING**

#### 3.1 DustTrak Monitoring at Blackhill

Monitoring Data at Blackhill was available for June 2011 and is shown in Figure 3.

Of the available data, the measured 24-hour average  $PM_{10}$  concentrations did not exceed the OEH goal of 50  $\mu g/m^3$ . A maximum 24-hour average  $PM_{10}$  concentration of 41  $\mu g/m^3$  was recorded on 26 June 2011.

#### 3.2 DustTrak Monitoring at Weakleys Drive

Monitoring data was not available for June 2011. During the measurement period, the instrument failed due to saturation of by water caused by heavy rain in the area.

#### 3.3 DustTrak PM<sub>2.5</sub> Monitoring at Blackhill

 $PM_{2.5}$  monitoring was carried out in June 2011. **Figure 5** presents the data and 24-hour average  $PM_{2.5}$  concentration. The maximum 24-hour average concentration recorded was 26 µg/m<sup>3</sup> on the 26 June 2011.

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### 4 DUST DEPOSITION MONITORING

Dust deposition monitoring is carried out each month via a network consisting of twelve (12) gauges. The results for June 2011 are shown in **Table 3**, in conjunction with results for the previous eleven months in order to provide an annual average for that period.

A summary of the complete data set from June 2000 is provided in Appendix A.

Month	Monthly dust deposition rate (g/m²/month)											
	DG1	DG2	DG3	DG4	DG5A	DG6	DG7	DG8	DG9	DG10	DG11	DG12
Jun-10	0.3	2.2*	3.0"	0.6#	0.2	1.2#	0.5	0.5*	0.6	0.7"	0.7*	0.4*
Jul-10	0.6*	1.1*	0.7*	0.7	0.5	0.3	0.5*	0.6*	0.7	0.2*	0.8	0.5
Aug-10	0.4	0.5*	1.9"	0.8*	0.2*	0.7*	0.5*	0.5*	0.6	0.5*	0.7*	0.4*
Sep-10	0.6#	2.6*	1.6#	1.0*	0.5*	1.1#	0.5#	1.0#	0.9*	0.6#	0.8#	0.9#
Oct-10	0.9*	1.6*	0.9*	0.5*	0.4*	0.5	1.0*	1.3*	1.2"	2.0*	1.2*	0.4*
Nov-10	0.9#	3.5*	0.9*	1.4*	1.1*	0.9	0.6*	0.9*	*	0.9*	0.8*	1.1*
Dec-10	1.0*	0.7*	0.9*	1.1*	0.5*	0.4*	0.6*	2.4*	1.0"	0.5	1.0*	1.4*
Jan-11	1.0*	0.7*	1.8"	1.2*	0.6*	0.7	0.9*	1.3*	1.0"	0.5*	1.5*	1.0
Feb-11	0.7	4.1*	0.9	1.0	0.7	0.7	1.0*	1.2	*	0.6	1.4	1.4
Mar-11	0.5	2.9*	+	0.9	1.7*	0.8	0.9*	1.9*	*	0.8*	1.2*	1.3*
Apr-11	0.7	0.6*	4.9*	0.8*	1.1*	0.7	0.9*	2.1*	0.8*	1.0*	0.3*	0.7*
May-11	0.4	1.1*	5.4*	0.7*	0.4	0.5*	0.6*	1.5*	0.4	0.4*	0.6*	0.7*
Jun-11	0.7	1.1	1.7	0.9	0.7	0.8	0.6	1.2	0.7	0.9	0.8	1.1
Annual Average	0.7	1.7	2.0	0.9	0.7	0.7	0.7	1.3	0.8	0.7	0.9	0.9

#### Table 3: Dust deposition monitoring for the 12-month period to June 2011

Data supplied by RCA Laboratories, \* Insects/bird droppings reported, \*Invalid. \* No recording, funnel damaged. Readings considered invalid have been removed when calculating the annual average.

The highest dust deposition measurement recorded in June 2011 was 1.7 g/m<sup>2</sup>/month at DG3.

It is noted that the OEH goal for dust deposition is expressed as an annual average and the annual average deposition rates for the gauges in the network are all significantly below the goal of 4 g/m<sup>2</sup>/month, indicating nuisance dust in the vicinity of the mine is not an issue.

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### 5 METEOROLOGICAL MONITORING

Monthly plots of the wind speed, temperature, solar radiation, and rainfall data collected in June 2011 are shown in **Figure 6** and a windrose plot is shown in **Figure 7**.

The graphs shown in **Figure 6** indicate that the instruments were recording appropriately. Data maxima and minima all appeared to be sensible for this site during June. Total rainfall for the month was 144.8 mm. This is consistent with permanent Bureau of Meteorology weather stations in the area.

A windrose (see **Figure 7**) created from the available 30-minute average wind data shows that winds were predominantly from the West and East-South East.

The site recorded calms (wind speed less than or equal to 0.5 m/s) for approximately 43% of the time. The relatively large fraction of calm winds is significantly higher than would be expected and may be as a result of the sheltered location of the weather station.

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APPENDIX A

**Dust Deposition Data** 

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							n²/mont		-			
Month	D1	D2	D3	D4	D5A	D6	D7	D8	D9	D10	D11	D12
Jun-00	0.7	0.5	0.5	0.7	0.8	0.4	3.8	3.2	0.5	0.7	-	1
Jul-00	0.4	0.4	0.5	0.7	0.8	0.5	0.8	1.5	0.4	0.4	-	
Aug-00	0.9	0.6	1.0	1.2	1.1	1.0	3.4	0.7	0.7	0.6	-	-
Sep-00	0.8	0.9	1.1	0.9	1.3	1.0	2,2	1.0	1.0	0.8	-	80
Oct-00	0.4	0.6	1.1	0.9	0.9	0.8	5.3	0.9	0.6	0.5	÷.	. •
Nov-00	5.2	0.7	1.4	0.8	1.0	0.4	24.1	9.4	1.1	0.6	-	-
Dec-00	2.8	1.4	1.9	1.3	1.1	0.8	2.1	2.5	0.9	0.9	14	-
Jan-01	0.7	1.7	1.4	1.8	0.7	1.3	1.1	2.4	1.1	0.6	-	-
Feb-01	0.9	3.1	2.0	0.5	0.9	0.7	0.7	6.7	1.3	0.5	1.0	
Mar-01	0.8	2.1	1.3	0.6	0.7	0.6	0.6	5.5	0.6	0.6	1.5	
Apr-01	0.8	0.7	1.3	0.5	0.7	0.4	0.3	5.1	0.7	0.6	0.8	-
May-01	0.2	0.2	0.4	0.4	0.3	0.3	0.6	1.8	0.6	0.8	0.9	4
Jun-01	0.5	0.4	0.5	1.0	1.0	0.4	0.4	8.8	0.7	0.6	0.6	-
Jul-01	0.5	0.3	1.8	0.5	0.8	-	16.3	4.9	0.9	0.7	0.7	+
Aug-01	0.4	0.4	0.8	0.8	1.0	1.7	1.0	÷	1.0	1.8	1.1	4
Sep-01	0.7	1.0	1.7	1.1	1.7	0.7	-	6.0	1.1	1.3	1.7	4
Oct-01	1.1	0.6	4.6	0.9	0.7	0.9	1.2	1.9	0.9	0.6	1.7	80
Nov-01	0.9	1.0	1.1	1.1	0.8	1.1	6.0	5.5	1.3	1.9	2.3	6.00
Dec-01	4.9	0.9	4.2	0.9	1.3	1.9	1.2	3.1	1.2	9.7	1.8	9.0
Jan-02	0.8	1.0	1.5	1.3	1.1	1.4	1.3	1.5	1.1	0.9	1.5	4
Feb-02	1.1	1.1	0.9	0.3	0.4	0.5	3.1	5.1	0.5	0.5	0.9	2
Mar-02	1.7	2.1	1.6	0.7	0.7	0.8	1.0	18	1.0	0.9	1.7	
Apr-02	1.0	0.4	1.0	0.8	0.8	0.6	0.9	10.1	0.5	0.7	1.0	*
May-02	0.6	0.6	6.0	0.7	0.4	1.2	0.9	3.1	0.7	0.2	1.0	1
Jun-02	1.4	0.4	1.7	0.6	0.5	0.8	0.6	2.1	0.6	0.5	1.0	2.
Jul-02	0.7	0.7	-	0.8	0.8	0.7	1.2	-	1.1	0.5	1.0	
				-			-		-			6
Aug-02	1.3	0.8	1.4	1.2	1.1	1.2	1.5		1.5	0.9	1.6	1
Sep-02	0.5	1.2	1.1	0.8	0.5	0.7	5.1	9.3	1.6	0.6	1.0	-
Oct-02	2.2	1.4	5.2	1.5	1.5	1.4	1.4	3.4	-	1.5	3.1	-
Nov-02	2.8	1.8	3.7	1.6	0.1	1.8	2.1	3.5	2.1	2	1.9	-
Dec-02	2.0		2.5	1.5	3.0	1.5	1.8	4.1	1.6	1.2	1.9	+
Jan-03	2.1	1.5	2.7	1.5	1.0	1.9	2.2	2.5	1.1	1.0	1.6	
Feb-03	1.4	1.1	2.6	1.1	0.9	1.2	1.7	5.9	1.2	1.0	1.5	
Mar-03	0.8	0.5	1.2	1.2	0.6	2.1	1.5	3.4	-	3.6	9.5	6
Apr-03	0.5	1.0	0.6	1.0	0.7	0.5	1.1	8.0	-	2.0	1.0	÷
May-03	0.5	0.4	0.6	0.2	0.2	0.6	1.3	1.6	0.5	0.8	1.2	4
Jun-03	0.5	0.6	0.8	0.8	0.4	0.6	0.8	0.7	0.9	0.7	0.7	-
Jul-03	0.3	0.4	0.4	0.6	0.4	0.5	0.7	0.5	0.5	0.5	0.7	4.0
Aug-03	0.8	0.2	0.7	1.1	0.5	1.3	1.8	2.1	1.3	0.7	0.9	-
Sep-03	0.6	0.7	1.1	0.7	0.8	1.7	1.4	1.3	2.5	0.9	1.3	-
Oct-03		0.9	1.4	0.9	0.7	1.9	1.0	1.4	0.6	0.8	1.3	4.1
Nov-03	2.6	0.8	1.0	1.1	0.4	1.3	1.5	1.5		0.8	1.3	4
Dec-03	1.0	1.0	1.4	1.3	1.1	1.5	1.6	2.0	1.8	0.9	1.4	P
Jan-04	8.5	1.5	2.1	1.5	1.3	2.6	1.4	2.2	1.7	1.5	1.7	
Feb-04	1.2	1.0	1.7	1.4	0.7	3.1	1.6	2.2	-	1.5	2.3	4
Mar-04	0.4	0.6	6.6	1.2	0.7	1.9	1.1	12.1	4.8	1.5	1.1	131.

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Apr-04	0.6	1.0	0.8	0.8	0.6	1.9	0.8	1.4	0.9	1.2	1.1	-
May-04	0.2	0.9	2.2	0.9	0.8	0.7	0.9	1.4	1.2	0.9	1.5	-
Jun-04	0.4	0.6	0.7	0.9	0.6	1.4	1.0	0.9	1.0	1.0	0.8	
Jul-04	0.4	0.6	5.3#	0.6	0.5	2.9	1.0	1.1	0.9	0.6	1.2	4
Aug-04	0.5	0.5	0.5	1.3	0.7	1.1	1.1	1.4	-	1.0	1.0	-
Sep-04	0.6	0.6	0.8	2.2	1.0	1.0	0.9	4.4	0.9	16.7	1.1	*
Oct-04	0.7	0.9	1.2	0.9	0.8	1.4	1.0	10.5	1.0	1.0	0.8	÷.,
Nov-04	0.8	0.7	1.3	1.9	0.7	0.9	1.0	3.0	1.1	1.1	1.6	*
Dec-04	2.0	1.4	3.6	1.5	1.3	2.2	3.2	7.9	1.8	5.5	2.5	-
Jan-05	1.2	1.0	3.7	1.6	1.4	4.0	2.3	2.7	2.6	2.5	2.8	÷.
Feb-05	1.2	1.2	1.8	1.6	1.3	2.0	1.7	-	2.3	1.5	2.3	4.
Mar-05	1.3	0.9	1.4	0.9	0.9	3.0	1.2	7.7	-	0.8	1.3	.6
Apr-05	1.1	0.7	0.9	0.8	0.7	0.9	1.4	3.3	1.1	0.8	0.9	2
May-05	0.7	8.6	1.1	0.8	0.7	0.8	0.9	4.4	1.2	0.8	1.1	-
Jun-05	1.3	0.8	1.3	1.3	0.8	1.2	1.2	1.3	1.5	2.5	0.9	-
Jul-05	1.0	0.5	0.5	0.7	0.4	1.6	0.7	1.2	0.8	4.3	1.1	
Aug-05	0.6	0.6	0.8	1.0	0.8	0.9	0.7	1.0	0.9	1.0	0.9	-
Sep-05	0.6	0.7	0.8	0.7	0.7	1.2	1.3	1.3	1.0	0.9	1.1	~
Oct-05	0.8	0.9	1.3	0.9	0.8	1.4	1.2	1.9	1.3	1.1	1.3	4
Nov-05	12 m	2.3	2.3	2.0	1.7	1.2	2.0	3.2	1.6	1.4	2.2	4
Dec-05	1.9	3.2	2.3	3.3	2.6	3.4	2.3	-	1.3	2.1	3.9	20
Jan-06	1.0	2.1	1.7	1.0	23.	3.5	-	2.7	1.1	4	1.5	-
Feb-06	2.2	1.0	0.9	1.2	1.1	1.7	1.1	2.9	-	2.3	1.8	÷.
Mar-06	0.7	0.6	2.3	0.7	0.6	0.9	1.0	1.4	0.7	0.8	1.5	*
Apr-06	0.6	0.7	1.1	0.8	0.6	1.1	0.8	1.0	1.0	1.8	1.5	-
May-06	1.0	3.1	1.0	-	1.1	1.4	1.1	4.1	+	7.0	1.5	9
Jun-06	0.4	0.3	0.7	0.5	0.4	0.6	0.7	0.8	0.6	0.9	0.9	-
Jul-06	0.3	0.3	1	1.3	0.4	0.7	0.7	2.7		0.6	0.6	-
Aug-06	0.9	0.6	0.8	0.7	0.7	0.8	0.7	1.7		3.7	0.9	-
Sep-06	1.6	0.7	1.1	1.7	0.7	1	0.9	1.3	1.2	0.8	1.6	-
Oct-06	2	1.4	1.6	1.8	0.9	1.8	1.2	1.8	1.5	1.8	1.9	-
Nov-06	4.3	2.2	3	2.3	2.3	5.3	2.4	3.3	2.3	2.3	2.9	4
Dec-06	1.2	3.4	1.9	2.3	2.3		2.1	2.1		4.9	3.9	4
Jan-07	2	0.9	1.5	0.7	0.7	1.7	1.1		1.2	1.7	0.9	9
Feb-07	1.7	0.9	1.6	0.7	0.6	1	1.8	1.7	1.1	1.2	1.7	1.4
Mar-07	1.3	0.9	1.7	0.8	1.2	0.6	2.2	1.7	1	0.9	1.7	4
Apr-07	0.5	0.7	0.9	0.6	4.8	1.2	0.5	2.7	0.5	0.8	0.9	4
May-07	0.8	0.5	0.6	1.2	0.6	0.6	0.7	1.9	0.5	0.7	0.8	ω.
Jun-07	0.6	0.5	0.7	1.1	0.1	0.5	0.1	0.5	0.1	0.4	0.3	4
Jul-07	0.5	0.4	0.6	2.1	0.5	0.8	0.6	0.6	0.4	0.5	0.7	*
Aug-07	1.5	0.4	0.7	1	0.7	0.7	0.5	1	0.6	0.6	0.7	4
Sep-07	1.3	0.5	1.8	1	0.7	0.9	0.9	1.3	1	0.7	1.6	Q
Oct-07	4.2	0.9	1.1	1.4	1.1	1.7	1.8	1.7	1.6	1.4	2.2	
Nov-07	0.8	0.8	1.1	0.9	1.1	1.1	1.1	1.7	0.6	0.8	1.5	-
Dec-07	1.3	0.8	3	0.7	0.5	0.8	0.5	1.1	0.3	0.8	0.6	÷.,
Jan-08	2.6	0.8	3.7	0.5	0.5	0.5	0.4	2.2	0.8	0.3	0.8	Ψ.
Feb-08	0.4	0.1	14	0.1	0.1	0.3	0.1	0.3	0.2	0.2	0.3	

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Mar-08	4.5	0.6	9.2+	0.6	2.9	2.1	0.6	1.5	0.5	1	0.9	-
April-08	0.4"	0.4*	0.8"	0.4"	0.4*	0.8*	1.1"	1.7"	1.2	1.1*	1.1*	9
May-08	1.1	2.4*	0.9	1.4	0.9	0.9	0.7	2.7	1*	1.1	1.3"	9.5
June-08	0.2	0.4*	0.1	0.5	0.1*	0.1	0.3	0.5"	0.1	0.8	0.2	4
July-08	0.4	0.7*	1.3″	0.6	0.8*	0.9	0.8	1	0.7	0.5	1.1	-
Aug-08	1	0.5	0.7	0.6	0.5	1.9	0.8	1	1	0.9	1.4	*
Sep-08	0.6	1	1.3	0.7	0.6	0.9	0.6	0.9	0.9	0.9	1.8	ω.
Oct-08	1	0.5	1	1.3	1.3	1.2	1	1.4	0.8	1.6	1.8	*
Nov-08	0.8	1.4	2.7	2.5	0.9	1.2	0.8	2.4	1.1	1	1.7	÷
Dec-08	0.4	0.4	0.6	0.5	0.3	1.1	0.6	15	0.9	0.7	1.2	Q. 1
Jan-09	1.1	3"	1.6	0.8	0.9	1.4	0.7	1.5	0.9	0.9	5+	1.
Feb-09	0.4	4.4	1.5	1.1	0.9	1.6	0.8	1.2	1.4	2.5	1.2	.4
Mar-09	2.8	5.8	2.7	2.4	1.9	2.1	2.5	2.4	2.3	5.7	2.7	2
Apr-09	2	0.8	0.8	0.6	0.6	3.2	1.1	1.1	1	0.6	0.9	-
May-09	0.6	1.6	0.8	2.4	0.9	5.6 +	1.4	1.1	1.3	0.7	1.5	-
Jun-09	0.4	1.3	0.8	0.5	0.5	3.3	0.9	0.6	1	3.4	0.7	~
Jul-09	0.2	1.0	0.6	0.4	0.3	3.8	0.5	0.6	0.6	0.3	0.6	-
Aug-09	0.8	3.6	0.8	1.2	1.0	1.8	0.8	1.8	1.3	0.8	1.0	-
Sep-09	1.0	1.8*	1.8	8.3 +	1	1.8	0.9*	1.8*	1.7*	0.7	1.4*	4
Oct-09+	4.3	9#	5.2"	11.3"	3.2	3.8"	2.4"	6.8"	3.0*	2.2	3.2"	5.7
Nov-09	0.8*	1.7*	1.4#	1.3*	0.7*	2.1*	1.3*	8.0*	*	1.0*	*	2.3
Dec-09	1.4"	4.0*	1.6#	2.4"	1.7*	1.8	1.6	2.6#	1.7*	1.7*	2.2#	1.7
Jan-10	0.6*	0.8*	5.6#	1.2*	2.4*	1.2#	0.8*	1.4*	1.3*	0.8*	1.3*	1.1
Feb-10	1.9*	11.3*	1.9*	1.4"	1.5*	1.1*	1.2#	1.6#	1.1*	0.8*	1.8*	1.34
Mar-10	0.6"	0.6"	3.2*	1"	4.1*	0.6#	0.6"	1.2	0.6	0.2*	0.8*	1.1*
Apr-10	0.8*	1.8#	2.4#	0.7*	+	0.3	0.6*	0.9"	0.6#	0.4#	0.8*	0.8
May-10	0.8	4.9"	3.0*	1.1	1.2	1.0	0.7	1.3	1.0*	0.5	1.1*	0.8
Jun-10	0.3	2.2#	3.0*	0.6#	0.2	1.2*	0.5	0.5*	0.6	0.7*	0.7*	0.4
Jul-10	0.6"	1.1"	0.7"	0.7	0.5	0.3	0.5*	0.6"	0.7	0.2"	0.8	0.5
Aug-10	0.4	0.5#	1.9*	0.8*	0.2#	0.7#	0.5#	0.5*	0.6	0.5*	0.7*	0.4
Sep-10	0.6#	2.6"	1.6#	1.0#	0.5*	1.1"	0.5#	1.0*	0.9#	0.6#	0.8*	0.9
Oct-10	0.9*	1.6#	0.9*	0.5*	0.4*	0.5	1.0"	1.3*	1.2*	2.0*	1.2*	0.4
Nov-10	0.9*	3.5*	0.9*	1.4*	1.1"	0.9	0.6#	0.9*	*	0.9*	0.8*	1.1
Dec-10	1.0*	0.7*	0.9*	1.1*	0.5#	0.4*	0.6#	2.4*	1.0*	0.5	1.0*	1.4
Jan-11	1.0*	0.7*	1.8*	1.2*	0.6*	0.7	0.9*	1.3*	1.0*	0.5*	1.5*	1.0
Feb-11	0.7	4.1+	0.9	1.0	0.7	0.7	1.0*	1.2	*	0.6	1.4	1.4
Mar-11	0.5	2.9*	+	0.9	1.7*	0.8	0.9*	1.9*	*	0.8*	1.2*	1.3
Apr-11	0.7	0.6*	4.9*	0.8*	1.1*	0.7	0.9*	2.1*	0.8*	1.0*	0.3*	0.7
May-11	0.4	1.1"	5.4"	0.7"	0.4	0.5*	0.6*	1.5"	0.4	0.4"	0.6"	0.7
Jun-11	0.7	1.1	1.7	0.9	0.7	0.8	0.6	1.2	0.7	0.9	0.8	1.1

# - sample contaminated | + - sample invalid]\*Broken funnel

[Note: Samples for October 2009 have been considered invalid, due to a widespread dust storm experienced on 23<sup>rd</sup> September 2009.]

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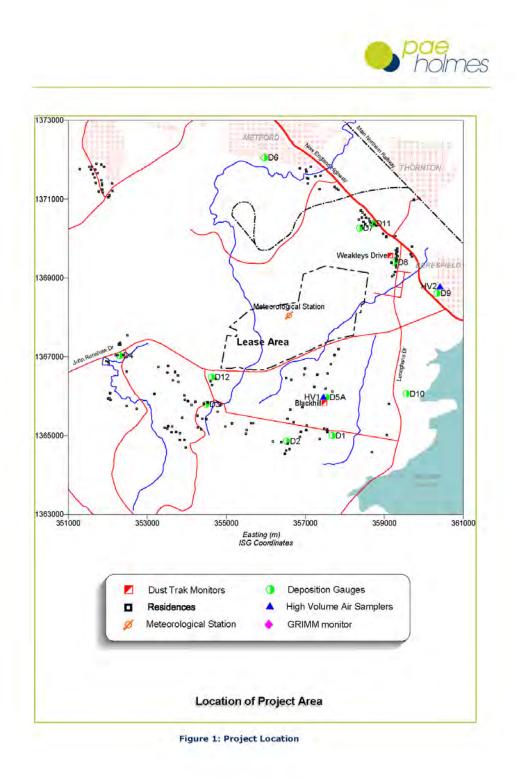
DONALDSON COAL PTY LTD Abel Underground Coal Mine Appendix 2



APPENDIX B

Figures

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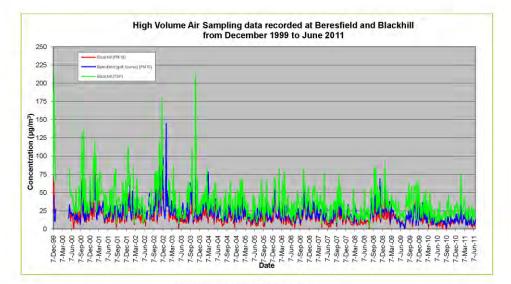
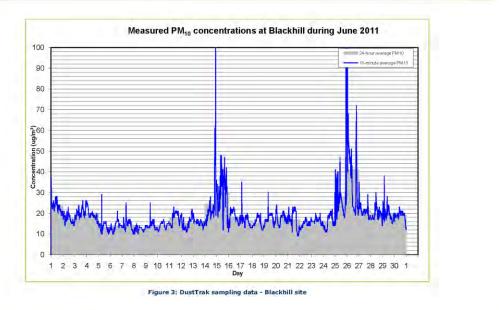


Figure 2: High Volume Air Sampling data

B-3

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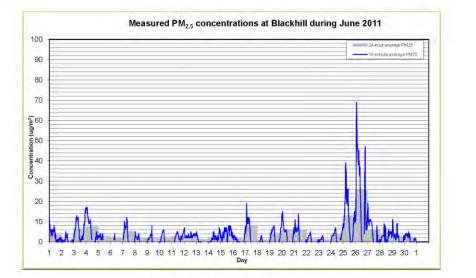




No Monitoring was available for this site in June 2011 due to equipment failure caused by water damage. Figure 4: DustTrak sampling data - Weakleys Drive site







B-5







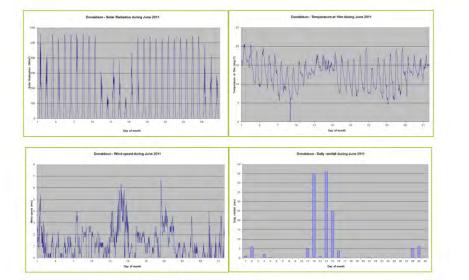


Figure 6: Meteorological conditions

B-7

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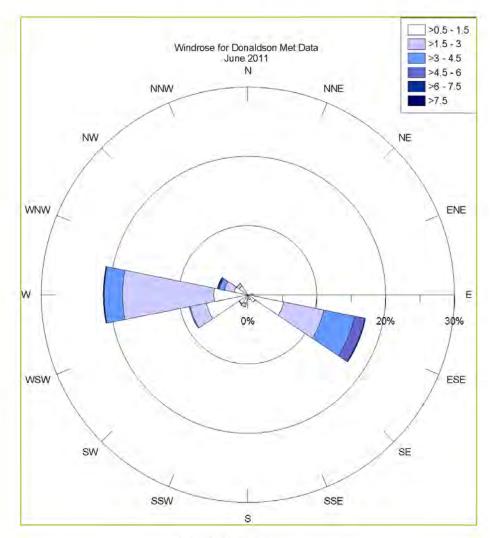


Figure 7: Windrose

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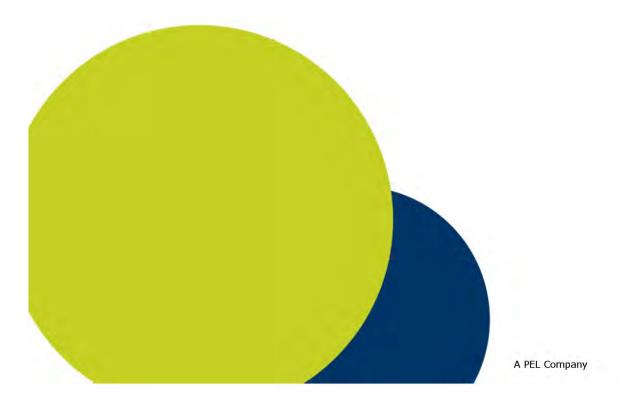
## REPORT

## **DUST AND METEOROLOGICAL DATA - JULY 2011**

**Donaldson Coal** 

Job No: 3003

29 September 2011





#### PROJECT TITLE:

JOB NUMBER:

PREPARED FOR:

PREPARED BY:

APPROVED FOR RELEASE BY:

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DUST AND METEOROLOGICAL DATA -JULY 2011

3003

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#### **1** INTRODUCTION

As part of their Air Quality Management Plan, Donaldson Coal operate an ambient air quality monitoring network, including dust monitoring in the vicinity of the mining lease and meteorological monitoring at a single station on-site. This report has been prepared as a summary of the data collected throughout the network during July 2011.

The dust monitoring network includes continuous monitoring using TSI DustTrak, high volume air sampling (HVAS) on a one-day-in-six run cycle and dust deposition monitoring.

The continuous monitoring network consists of two DustTrak monitors measuring  $PM_{10}$  at two sites and an additional DustTrak monitor used for one week each quarter to measure  $PM_{2.5}$ .

There are two HVAS locations used to determine ambient concentrations of  $PM_{10}$  and TSP. These operate on a one-day-in-six run cycle, in line with similar measurements made by the NSW Office of Environment and Heritage (OEH)<sup>a</sup> at other locations throughout the state.

Monthly levels of dust deposition are also measured using twelve gauges placed at various locations in the vicinity of the mine. The locations of each of these monitors and gauges are shown in **Figure 1**.

Table 1 lists the instruments used and pollutants measured at these locations.

Manitaring Location	Instruments Used	Follutant Monitored
Beresfield	HVAS	PM <sub>10</sub>
Blackhill	HVAS	PMto
	HVAS	TSP
	DustTrak	PMLO
	DustTrak (1 week per quarter)	PM <sub>2.5</sub>
Weakleys Drive	DustTrak	PM <sub>10</sub>
DG1 - DG12	Deposition Gauges	Dust Deposition

Table 1: Summary of monitoring locations and instruments

Meteorological data are downloaded monthly and forwarded to PAEHolmes for processing. The meteorological station is situated at the site of the office buildings and measures the following parameters:

- wind speed;
- wind direction;
- temperature;
- solar radiation; and
- rainfall.

<sup>a</sup> The NSW EPA exists as a legal entity operated within the Office of Environment and Heritage (OEH) which came into existence in April 2011. OEH was previously part of the Department of Environment, Climate Change and Water (DECCW). The DECCW was also recently known as the Department of Environment and Climate Change (DECC), and prior to that the Department of Environment and Conservation (DEC). The terms NSW EPA, OEH, DECCW, DECC and DEC are interchangeable in this report.

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#### **2 HIGH VOLUME AIR SAMPLING**

High Volume Air Sampling (HVAS) was carried out at Beresfield and Blackhill by RCA Laboratories.  $PM_{10}$  is measured at both sites while TSP is only measured at Blackhill. The data collected during July 2011 are summarised in **Table 2**. A graph consisting of all the data collected to date is shown in **Figure 2**.

	Table 2:	HVAS	data fre	om Ber	esfield an	d Blackhill	for July	2011	
--	----------	------	----------	--------	------------	-------------	----------	------	--

Date	Barestield RM1 . (ug/m1)	Blackhill PML (µg/ml)	Blackhill (SP (pg/m))
1/07/2011	8	2	13
7/07/2011	21	8	26
13/07/2011	18	19	58
19/07/2011	4	4	17
25/07/2011	8	8	26
31/07/2011	16	12	22
Annual average	12	10	25

All measurements of  $PM_{10}$  for July are below the 24-hour OEH  $PM_{10}$  goal of 50  $\mu g/m^3$ . The highest 24-hour average  $PM_{10}$  concentration was 21  $\mu g/m^3$ , recorded at Beresfield on 7 July 2011.

Figure 2 shows a seasonal trend in  $\mathsf{PM}_{10}$  concentrations, peaking during the warmer months and decreasing during autumn and winter. This is a common trend and is seen consistently in the Hunter Valley.

The annual average  $PM_{10}$  concentrations for Beresfield and Blackhill were 12  $\mu g/m^3$  and 10  $\mu g/m^3$  respectively for the 12 months to July 2011. These values are below the OEH annual average  $PM_{10}$  goal of 30  $\mu g/m^3$ .

TSP measurements from the Blackhill site show that concentrations were below the OEH annual average TSP goal of 90  $\mu g/m^3$ . It should be noted that the goal refers to an annual average and not a 24-hour average as measured by the high volume air sampler. The annual average TSP concentration for the 12 months to July 2011 was 25  $\mu g/m^3$ .

These measurements will include all background sources relevant to that location, including contributions from the Donaldson mining operations.

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## **3 CONTINUOUS MONITORING**

#### 3.1 DustTrak Monitoring at Blackhill

Monitoring Data at Blackhill was available for July 2011 and is shown in Figure 3.

Of the available data, the measured 24-hour average  $PM_{10}$  concentrations exceeded the OEH goal of 50 µg/m<sup>3</sup> on one day only. A maximum 24-hour average  $PM_{10}$  concentration of 68 µg/m<sup>3</sup> was recorded on 9 July 2011.

#### 3.2 DustTrak Monitoring at Weakleys Drive

Monitoring data was not available for July 2011. During the measurement period, the instrument failed due to power failure.

#### 3.3 DustTrak PM<sub>2.5</sub> Monitoring at Blackhill

PM2.5 monitoring was not carried out in July 2011.

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#### 4 DUST DEPOSITION MONITORING

Dust deposition monitoring is carried out each month via a network consisting of twelve (12) gauges. The results for July 2011 are shown in **Table 3**, in conjunction with results for the previous eleven months in order to provide an annual average for that period.

A summary of the complete data set from June 2000 is provided in Appendix A.

Month	Monthly dust deposition rate (g/m <sup>2</sup> /month)													
	DG1	DG2	DG3	DG4	DG5A	DG6	DG7	DG8	DG9	DG10	DG11	DG12		
Jun-10	0.3	2.2*	3.0*	0.6*	0.2	1.2*	0.5	0.5*	0.6	0.7*	0.7*	0.4*		
Jul-10	0.6*	1.1#	0.7*	0.7	0.5	0.3	0.5*	0.6*	0.7	0.2*	0.8	0.5		
Aug-10	0.4	0.5*	1.9"	0.8*	0.2*	0.7*	0.5*	0.5*	0.6	0.5*	0.7*	0.4*		
Sep-10	0.6#	2.6*	1.6#	1.0*	0.5*	1.1#	0.5#	1.0#	0.9*	0.6#	0.8#	0.9*		
Oct-10	0.9*	1.6*	0.9*	0.5*	0.4*	0.5	1.0*	1.3*	1.2"	2.0*	1.2*	0.4*		
Nov-10	0.9*	3.5*	0.9*	1.4*	1.1*	0.9	0.6*	0.9*	*	0.9*	0.8*	1.1*		
Dec-10	1.0*	0.7*	0.9*	1.1*	0.5*	0.4*	0.6#	2.4*	1.0"	0.5	1.0*	1.4*		
Jan-11	1.0*	0.7*	1.8*	1.2*	0.6*	0.7	0.9*	1.3*	1.0*	0.5*	1.5*	1.0		
Feb-11	0.7	4.1*	0.9	1.0	0.7	0.7	1.0*	1.2	*	0.6	1.4	1.4		
Mar-11	0.5	2.9*	+	0.9	1.7*	0.8	0.9*	1.9*	*	0.8*	1.2*	1.3*		
Apr-11	0.7	0.6*	4.9*	0.8*	1.1*	0.7	0.9*	2.1*	0.8*	1.0*	0.3*	0.7*		
May-11	0.4	1.1*	5.4ª	0.7*	0.4	0.5*	0.6*	1.5*	0.4	0.4*	0.6#	0.7*		
Jun-11	0.7	1.1	1.7	0.9	0.7	0.8	0.6	1.2	0.7	0.9	0.8	1.1		
Jul- 11	0.6	0.5	1.6	<0.1	0.4	0.3	0.3	1.8	0.8	0.5	0.9	0.7		
Annual Average	0.7	1.7	2.0	0.9	0.7	0.7	0.7	1.4	0.8	0.8	0.9	0.9		

Table 3: Dust deposition monitoring for the 12-month period to July 2011

considered invalid have been removed when calculating the annual average.

The highest dust deposition measurement recorded in July 2011 was 1.8 g/m<sup>2</sup>/month at DG8.

It is noted that the OEH goal for dust deposition is expressed as an annual average and the annual average deposition rates for the gauges in the network are all significantly below the goal of 4 g/m<sup>2</sup>/month, indicating nuisance dust in the vicinity of the mine is not an issue.

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### 5 METEOROLOGICAL MONITORING

Monthly plots of the wind speed, temperature, solar radiation, and rainfall data collected in July 2011 are shown in **Figure 6** and a windrose plot is shown in **Figure 7**.

The graphs shown in **Figure 6** Indicate that the instruments were recording appropriately. Data maxima and minima all appeared to be sensible for this site during July. Total rainfall for the month was 100.2 mm. This is consistent with permanent Bureau of Meteorology weather stations in the area.

A windrose (see **Figure 7**) created from the available 30-minute average wind data shows that winds were predominantly from the West.

The site recorded calms (wind speed less than or equal to 0.5 m/s) for approximately 44% of the time. The relatively large fraction of calm winds is significantly higher than would be expected and may be as a result of the sheltered location of the weather station.

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APPENDIX A

**Dust Deposition Data** 

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Month	D1		D3	Dust D4	deposit D5A	lon (g/m D6	/month) D7	DS	D9	D10	D11	D12
Jun-00	0.7	0.5	0.5	0.7	0.8	0.4	3.8	3.2	0.5	0.7	.4.	÷.
Jul-00	0.4	0.4	0.5	0.7	0.8	0.5	0.8	1.5	0.4	0.4	4	4
Aug-00	0.9	0.6	1.0	1.2	1.1	1.0	3.4	0.7	0.7	0.6	14	4
Sep-00	0.8	0.9	1.1	0.9	1.3	1.0	2.2	1.0	1.0	0.8	-	- 2-
Oct-00	0.4	0.6	1.1	0.9	0.9	0.8	5.3	0.9	0.6	0.5	-	-
Nov-00	5.2	0.7	1.4	0.8	1.0	0.4	24.1	9.4	1.1	0.6	-	-
Dec-00	2.8	1.4	1.9	1.3	1.1	0.8	2.1	2.5	0.9	0.9	4	+
Jan-01	0.7	1.7	1.4	1.8	0.7	1.3	1.1	2.4	1.1	0.6	-	-
Feb-01	0.9	3.1	2.0	0.5	0.9	0.7	0.7	6.7	1.3	0.5	1.0	-
Mar-01	0.8	2.1	1.3	0.6	0.7	0.6	0.6	5.5	0.6	0.6	1.5	-
Apr-01	0.8	0.7	1.3	0.5	0.7	0.4	0.3	5.1	0.7	0.6	0.8	-
May-01	0.2	0.2	0.4	0.4	0.3	0.3	0.6	1.8	0.6	0.8	0.9	4
Jun-01	0.5	0.4	0.5	1.0	1.0	0.4	0.4	8.8	0.7	0.6	0.6	-
Jul-01	0.5	0.3	1.8	0.5	0.8	-	16.3	4.9	0.9	0.7	0.7	-
Aug-01	0.4	0.4	0.8	0.8	1.0	1.7	1.0	-	1.0	1.8	1.1	1
Sep-01	0.7	1.0	1.7	1.1	1.7	0.7	-	6.0	1.1	1.3	1.7	4
Oct-01	1.1	0.6	4.6	0.9	0.7	0.9	1.2	1.9	0.9	0.6	1.7	82
Nov-01	0.9	1.0	1.1	1.1	0.8	1.1	6.0	5.5	1.3	1.9	2.3	5
Dec-01	4.9	0.9	4.2	0.9	1.3	1.9	1.2	3.1	1.2	9.7	1.8	40
Jan-02	0.8	1.0	1.5	1.3	1.1	1.4	1.3	1.5	1.1	0.9	1.5	8
Feb-02	1.1	1.1	0.9	0.3	0.4	0.5	3.1	5.1	0.5	0.5	0.9	2
Mar-02	1.7	2.1	1.6	0.7	0.7	0.8	1.0	18	1.0	0.9	1.7	4
Apr-02	1.0	0.4	1.0	0.8	0.8	0.6	0.9	10.1	0.5	0.7	1.0	*
May-02	0.6	0.6	6.0	0.7	0.4	1.2	0.9	3.1	0.7	0.2	1.0	1
Jun-02	1.4	0.4	1.7	0.6	0.5	0.8	0.6	2.1	0.6	0.5	1.0	4
Jul-02	0.7	0.7	-	0.8	0.8	0.7	1.2	-	1.1	0.5	1.0	-
Aug-02	1.3	0.8	1.4	1.2	1.1	1.2	1.5	4	1.5	0.9	1.6	÷
Sep-02	0.5	1.2	1.1	0.8	0.5	0.7	5.1	9.3	1.6	0.6	1.0	-
Oct-02	2.2	1.4	5.2	1.5	1.5	1.4	1.4	3.4	4	1.5	3.1	4.
Nov-02	2.8	1.8	3.7	1.6	0.1	1.8	2.1	3.5	2.1	2	1.9	÷
Dec-02	2.0	. 4	2.5	1.5	3.0	1.5	1.8	4.1	1.6	1.2	1.9	÷
Jan-03	2.1	1.5	2.7	1.5	1.0	1.9	2.2	2.5	1.1	1.0	1.6	×
Feb-03	1.4	1.1	2.6	1.1	0.9	1.2	1.7	5.9	1.2	1.0	1.5	-
Mar-03	0.8	0.5	1.2	1.2	0.6	2.1	1.5	3.4	-	3.6	9.5	4.1
Apr-03	0.5	1.0	0.6	1.0	0.7	0.5	1.1	8.0	-	2.0	1.0	4.
May-03	0.5	0.4	0.6	0.2	0.2	0.6	1.3	1.6	0.5	0.8	1.2	4
Jun-03	0.5	0.6	0.8	0.8	0.4	0.6	0.8	0.7	0.9	0.7	0.7	-
Jul-03	0.3	0.4	0.4	0.6	0.4	0.5	0.7	0.5	0.5	0.5	0.7	4.0
Aug-03	0.8	0.2	0.7	1.1	0.5	1.3	1.8	2.1	1.3	0.7	0.9	2
Sep-03	0.6	0.7	1.1	0.7	0.8	1.7	1.4	1.3	2.5	0.9	1.3	-
Oct-03		0.9	1.4	0.9	0.7	1.9	1.0	1.4	0.6	0.8	1.3	4.1
Nov-03	2.6	0.8	1.0	1.1	0.4	1.3	1.5	1.5		0.8	1.3	4
Dec-03	1.0	1.0	1.4	1.3	1.1	1.5	1.6	2.0	1.8	0.9	1.4	80
Jan-04	8.5	1.5	2.1	1.5	1.3	2.6	1.4	2.2	1.7	1.5	1.7	4
Feb-04	1.2	1.0	1.7	1.4	0.7	3.1	1.6	2.2	-	1.5	2.3	4
Mar-04	0.4	0.6	6.6	1.2	0.7	1.9	1.1	12.1	4.8	1.5	1.1	1.2

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Apr-04	0.6	1.0	0.8	0.8	0.6	1.9	0.8	1.4	0.9	1.2	1.1	-
May-04	0.2	0.9	2.2	0.9	0.8	0.7	0.9	1.4	1.2	0.9	1.5	9
Jun-04	0.4	0.6	0.7	0.9	0.6	1.4	1.0	0.9	1.0	1.0	0.8	
Jul-04	0.4	0.6	5.3#	0.6	0.5	2.9	1.0	1.1	0.9	0.6	1.2	4
Aug-04	0.5	0.5	0.5	1.3	0.7	1.1	1.1	1.4	-	1.0	1.0	-
Sep-04	0.6	0.6	0.8	2.2	1.0	1.0	0.9	4.4	0.9	16.7	1.1	*
Oct-04	0.7	0.9	1.2	0.9	0.8	1.4	1.0	10.5	1.0	1.0	0.8	ω.
Nov-04	0.8	0.7	1.3	1.9	0.7	0.9	1.0	3.0	1.1	1.1	1.6	$\mathbf{x}$
Dec-04	2.0	1.4	3.6	1.5	1.3	2.2	3.2	7.9	1.8	5.5	2.5	4
Jan-05	1.2	1.0	3.7	1.6	1.4	4.0	2.3	2.7	2.6	2.5	2.8	ý.
Feb-05	1.2	1.2	1.8	1.6	1.3	2.0	1.7	-	2.3	1.5	2.3	4.
Mar-05	1.3	0.9	1.4	0.9	0.9	3.0	1.2	7.7	4	0.8	1.3	1
Apr-05	1.1	0.7	0.9	0.8	0.7	0.9	1.4	3.3	1.1	0.8	0.9	2
May-05	0.7	8.6	1.1	0.8	0.7	0.8	0.9	4.4	1.2	0.8	1.1	-
Jun-05	1.3	0.8	1.3	1.3	0.8	1.2	1.2	1.3	1.5	2.5	0.9	-
Jul-05	1.0	0.5	0.5	0.7	0.4	1.6	0.7	1.2	0.8	4.3	1.1	~
Aug-05	0.6	0.6	0.8	1.0	0.8	0.9	0.7	1.0	0.9	1.0	0.9	
Sep-05	0.6	0.7	0.8	0.7	0.7	1.2	1.3	1.3	1.0	0.9	1.1	~
Oct-05	0.8	0.9	1.3	0.9	0.8	1.4	1.2	1.9	1.3	1.1	1.3	4
Nov-05	*	2.3	2.3	2.0	1.7	1.2	2.0	3.2	1.6	1.4	2.2	4
Dec-05	1.9	3.2	2.3	3.3	2.6	3.4	2.3	-	1.3	2.1	3.9	-
Jan-06	1.0	2.1	1.7	1.0	23.	3.5	-	2.7	1.1	-	1.5	-
Feb-06	2.2	1.0	0.9	1.2	1.1	1.7	1.1	2.9		2.3	1.8	ω.
Mar-06	0.7	0.6	2.3	0.7	0.6	0.9	1.0	1.4	0.7	0.8	1.5	*
Apr-06	0.6	0.7	1.1	0.8	0.6	1.1	0.8	1.0	1.0	1.8	1.5	-
May-06	1.0	3.1	1.0	-	1.1	1.4	1.1	4.1	-	7.0	1.5	φ.
Jun-06	0.4	0.3	0.7	0.5	0.4	0.6	0.7	0.8	0.6	0.9	0.9	-
Jul-06	0.3	0.3	1	1.3	0.4	0.7	0.7	2.7	+	0.6	0.6	-
Aug-06	0.9	0.6	0.8	0.7	0.7	0.8	0.7	1.7	1	3.7	0.9	1
Sep-06	1.6	0.7	1.1	1.7	0.7	1	0.9	1.3	1.2	0.8	1.6	-
Oct-06	2	1.4	1.6	1.8	0.9	1.8	1.2	1.8	1.5	1.8	1.9	10
Nov-06	4.3	2.2	3	2.3	2.3	5.3	2.4	3.3	2.3	2.3	2.9	4
Dec-06	1.2	3,4	1.9	2.3	2.3		2.1	2.1		4.9	3.9	÷.
Jan-07	2	0.9	1.5	0.7	0.7	1.7	1.1		1.2	1.7	0.9	4
Feb-07	1.7	0.9	1.6	0.7	0.6	1	1.8	1.7	1.1	1.2	1.7	2
Mar-07	1.3	0.9	1.7	0.8	1.2	0.6	2.2	1.7	1	0.9	1.7	4
Apr-07	0.5	0.7	0.9	0.6	4.8	1.2	0.5	2.7	0.5	0.8	0.9	-
May-07	0.8	0.5	0.6	1.2	0.6	0.6	0.7	1.9	0.5	0.7	0.8	1
Jun-07	0.6	0.5	0.7	1.1	0.1	0.5	0.1	0.5	0.1	0.4	0.3	
Jul-07	0.5	0.4	0.6	2.1	0.5	0.8	0.6	0.6	0.4	0.5	0.7	+
Aug-07	1.5	0.4	0.7	1	0.7	0.7	0.5	1	0.6	0.6	0.7	-
Sep-07	1.3	0.5	1.8	1	0.7	0.9	0.9	1.3	1	0.7	1.6	A.
Oct-07	4.2	0.9	1.1	1.4	1.1	1.7	1.8	1.7	1.6	1.4	2.2	-
Nov-07	0.8	0.8	1.1	0.9	1.1	1.1	1.1	1.7	0.6	0.8	1.5	-
Dec-07	1.3	0.8	3	0.7	0.5	0.8	0.5	1.1	0.3	0.8	0.6	÷.
Jan-08	2.6	0.8	3.7	0.5	0.5	0.5	0.4	2.2	0.8	0.3	0.8	4
Feb-08	0.4	0.1	14	0.1	0.1	0.3	0.1	0.3	0.2	0.2	0.3	

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Mar-08	4.5	0.6	9.2+	0.6	2.9	2.1	0.6	1.5	0.5	1	0.9	-
April-08	0.4"	0.4"	0.8"	0.4"	0.4*	0.8"	1.1"	1.7"	1.2	1.1*	1.1*	9
May-08	1.1	2.4"	0.9	1.4	0.9	0.9	0.7	2.7	1#	1.1	1.3*	8.
June-08	0.2	0.4"	0.1	0.5	0.1"	0.1	0.3	0.5"	0.1	0.8	0.2	4
July-08	0.4	0.7"	1.3″	0.6	0.8*	0.9	0.8	1	0.7	0.5	1.1	-
Aug-08	1	0.5	0.7	0.6	0.5	1.9	0.8	1	1	0.9	1.4	*
Sep-08	0.6	1	1.3	0.7	0.6	0.9	0.6	0.9	0.9	0.9	1.8	Ψ.
Oct-08	1	0.5	1	1.3	1.3	1.2	1	1.4	0.8	1.6	1.8	*
Nov-08	0.8	1.4	2.7	2.5	0.9	1.2	0.8	2.4	1.1	1	1.7	÷ -
Dec-08	0.4	0.4	0.6	0.5	0.3	1.1	0.6	15	0.9	0.7	1.2	Q. 11
Jan-09	1.1	3"	1.6	0.8	0.9	1.4	0.7	1.5	0.9	0.9	5+	4.
Feb-09	0.4	4.4	1.5	1.1	0.9	1.6	0.8	1.2	1.4	2.5	1.2	
Mar-09	2.8	5.8	2.7	2.4	1.9	2.1	2.5	2.4	2.3	5.7	2.7	4
Apr-09	2	0.8	0.8	0.6	0.6	3.2	1.1	1.1	1	0.6	0.9	-
May-09	0.6	1.6	0.8	2.4	0.9	5.6 +	1.4	1.1	1.3	0.7	1.5	-
Jun-09	0.4	1.3	0.8	0.5	0.5	3.3	0.9	0.6	1	3.4	0.7	-
Jul-09	0.2	1.0	0.6	0.4	0.3	3.8	0.5	0.6	0.6	0.3	0.6	-
Aug-09	0.8	3.6	0.8	1.2	1.0	1.8	0.8	1.8	1.3	0.8	1.0	-
Sep-09	1.0	1.8#	1.8	8.3 +	1	1.8	0.9*	1.8*	1.7*	0.7	1.4*	4
Oct-09+	4.3	9#	5.2"	11.3"	3.2	3.8*	2.4"	6.8"	3.0*	2.2	3.2"	5.7"
Nov-09	0.8*	1.7*	1.4#	1.3*	0.7*	2.1*	1.3*	8.0*	*	1.0*	*	2.3
Dec-09	1.4"	4.0#	1.6"	2.4"	1.7*	1.8	1.6	2.6#	1.7*	1.7*	2.2#	1.7
Jan-10	0.6*	0.8*	5.6#	1.2*	2.4*	1.2*	0.8*	1.4*	1.3*	0.8*	1.3*	1.1*
Feb-10	1.9*	11.3*	1.9*	1.4"	1.5*	1.1*	1.2*	1.6#	1.1*	0.8*	1.8*	1.3*
Mar-10	0.6"	0.6*	3.2*	1"	4.1*	0.6*	0.6"	1.2	0.6	0.2*	0.8*	1.1*
Apr-10	0.8*	1.8*	2.4#	0.7#	+	0.3	0.6*	0.9*	0.6*	0.4*	0.8*	0.84
May-10	0.8	4.9*	3.0*	1.1	1.2	1.0	0.7	1.3	1.0#	0.5	1.1*	0.8
Jun-10	0.3	2.2*	3.0*	0.6#	0.2	1.2*	0.5	0.5*	0.6	0.7*	0.7*	0.4*
Jul-10	0.6"	1.1"	0.7"	0.7	0.5	0.3	0.5*	0.6"	0.7	0.2"	0.8	0.5
Aug-10	0.4	0.5#	1.9#	0.8#	0.2#	0.7#	0.5"	0.5*	0.6	0.5#	0.7*	0.4*
Sep-10	0.6#	2.6#	1.6#	1.0#	0.5*	1.1"	0.5#	1.0#	0.9*	0.6#	0.8*	0.9*
Oct-10	0.9*	1.6*	0.9*	0.5*	0.4*	0.5	1.0"	1.3*	1.2*	2.0#	1.2*	0.4*
Nov-10	0.9#	3.5*	0.9#	1.4#	1.1"	0.9	0.6#	0.9*	*	0.9*	0.8*	1.1*
Dec-10	1.0*	0.7*	0.9*	1.1*	0.5*	0.4"	0.6*	2.4*	1.0*	0.5	1.0*	1.4
Jan-11	1.0*	0.7*	1.8*	1.2*	0.6*	0.7	0.9*	1.3*	1.0*	0.5*	1.5*	1.0
Feb-11	0.7	4.1+	0.9	1.0	0.7	0.7	1.0*	1.2	*	0.6	1.4	1.4
Mar-11	0.5	2.9*	+	0.9	1.7"	0.8	0.9*	1.9*	*	0.8*	1.2*	1.3*
Apr-11	0.7	0.6*	4.9*	0.8*	1.1*	0.7	0.9*	2.1*	0.8*	1.0*	0.3"	0.7
May-11	0.4	1.1"	5.4"	0.7"	0.4	0.5"	0.6*	1.5"	0.4	0.4*	0.6"	0.7
Jun-11	0.7	1.1	1.7	0.9	0.7	0.8	0.6	1.2	0.7	0.9	0,8	1.1
Jul- 11	0.6	0.5	1.6	<0.1	0.4	0.3	0.3	1.8	0.8	0.5	0.9	0.7

\* - sample contaminated + - sample invalid \*Broken funnel

[Note: Samples for October 2009 have been considered invalid, due to a widespread dust storm experienced on 23<sup>rd</sup> September 2009.]

Dust and Meteorological Data – July 2011 Donaldson Coal | PAEHolmes Job 3003



APPENDIX B

Figures

Dust and Meteorological Data - July 2011 Donaldson Coal | PAEHolmes Job 3003



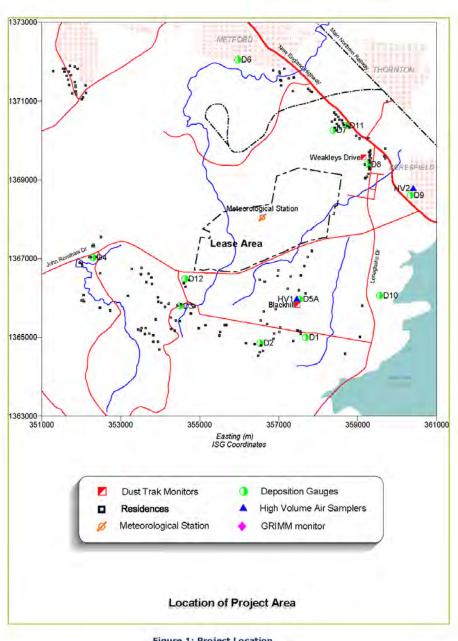


Figure 1: Project Location

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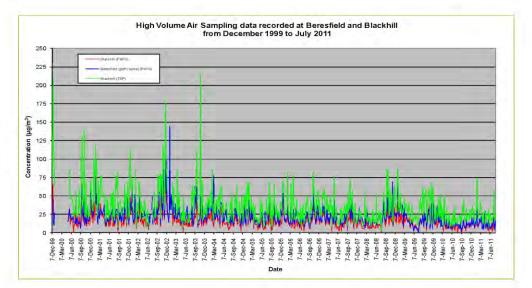
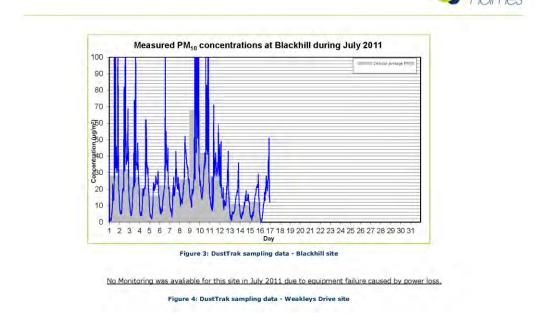


Figure 2: High Volume Air Sampling data

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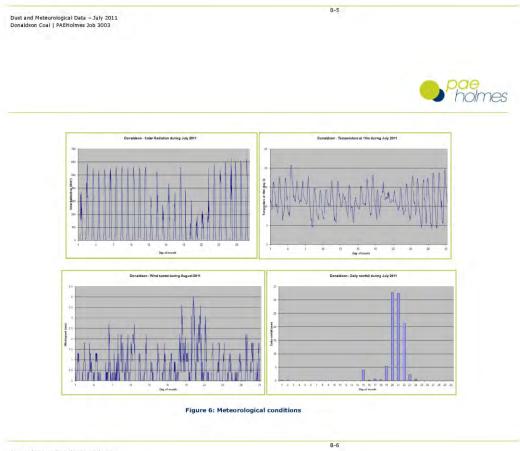


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No Monitoring was undertaken for July 2011.

Figure 5: DustTrak PM2.5 monitoring data



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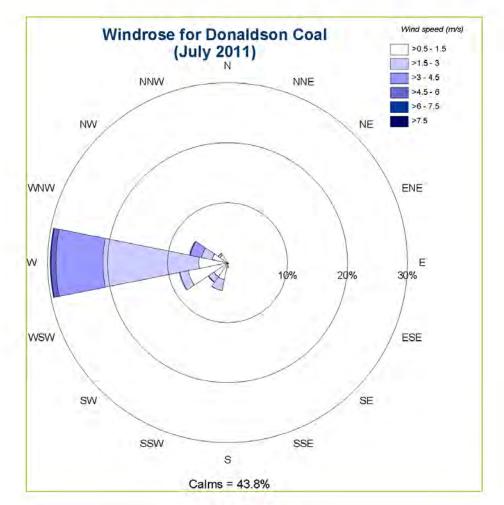


Figure 7: Windrose

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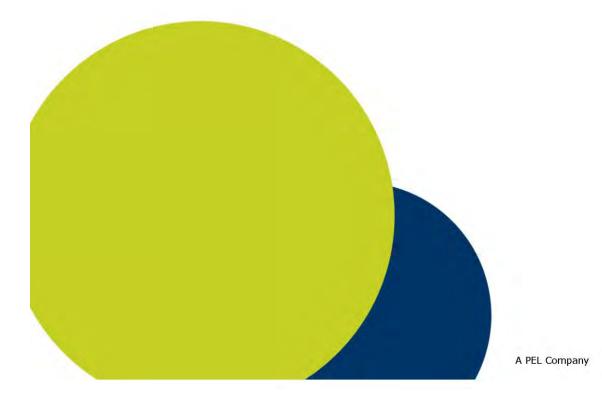
# REPORT

## **DUST AND METEOROLOGICAL DATA - AUGUST 2011**

### **Donaldson Coal**

Job No: 3003

29 September 2011



### 2011/2012 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT Report No. 737/07



### PROJECT TITLE: DUST AND METEOROLOGICAL DATA -AUGUST 2011 JOB NUMBER: 3003 Phil Brown PREPARED FOR: DONALDSON COAL PREPARED BY: Daniel Cullen APPROVED FOR RELEASE BY: Ronan Kellaghan DISCLAIMER & COPYRIGHT: This report is subject to the copyright statement located at <u>www.paeholmes.com</u> © Queensland Environment Pty Ltd trading as PAEHolmes ABN 86 127 101 642

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### **1** INTRODUCTION

As part of their Air Quality Management Plan, Donaldson Coal operate an ambient air quality monitoring network, including dust monitoring in the vicinity of the mining lease and meteorological monitoring at a single station on-site. This report has been prepared as a summary of the data collected throughout the network during August 2011.

The dust monitoring network includes continuous monitoring using TSI DustTrak, high volume air sampling (HVAS) on a one-day-in-six run cycle and dust deposition monitoring.

The continuous monitoring network consists of two DustTrak monitors measuring  $PM_{10}$  at two sites and an additional DustTrak monitor used for one week each quarter to measure  $PM_{2.5}$ .

There are two HVAS locations used to determine ambient concentrations of  $PM_{10}$  and TSP. These operate on a one-day-in-six run cycle, in line with similar measurements made by the NSW Office of Environment and Heritage (OEH)<sup>a</sup> at other locations throughout the state.

Monthly levels of dust deposition are also measured using twelve gauges placed at various locations in the vicinity of the mine. The locations of each of these monitors and gauges are shown in **Figure 1**.

Table 1 lists the instruments used and pollutants measured at these locations.

Monitaring Location	Instruments Used	Follutant Monitored
Beresfield	HVAS	PM <sub>10</sub>
Blackhill	HVAS	PMto
	HVAS	TSP
	DustTrak	PMLO
	DustTrak (1 week per quarter)	PM <sub>2.5</sub>
Weakleys Drive	DustTrak	PM <sub>10</sub>
DG1 - DG12	Deposition Gauges	Dust Deposition

Table 1: Summary of monitoring locations and instruments

Meteorological data are downloaded monthly and forwarded to PAEHolmes for processing. The meteorological station is situated at the site of the office buildings and measures the following parameters:

- wind speed;
- wind direction;
- temperature;
- solar radiation; and
- rainfall.

<sup>a</sup> The NSW EPA exists as a legal entity operated within the Office of Environment and Heritage (OEH) which came into existance in April 2011. OEH was previously part of the Department of Environment, Climate Change and Water (DECCW). The DECCW was also recently known as the Department of Environment and Climate Change (DECC), and prior to that the Department of Environment and Conservation (DEC). The terms NSW EPA, OEH, DECCW, DECC and DEC are interchangeable in this report.

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Annual average



25

# 2 HIGH VOLUME AIR SAMPLING

High Volume Air Sampling (HVAS) was carried out at Beresfield and Blackhill by RCA Laboratories.  $PM_{10}$  is measured at both sites while TSP is only measured at Blackhill. The data collected during August 2011 are summarised in **Table 2**. A graph consisting of all the data collected to date is shown in **Figure 2**.

Dete	Genes(jeld) ./hij . (jig/m ')	Ellarichill PML, (µg/m-)	Blackhill TaiP (µg/m )
6/08/2011	19	16	35
12/08/2011	9	8	23
18/08/2011	7	7	18
24/08/2011	13	11	22
30/08/2011	14	12	21

12

All measurements of  $PM_{10}$  for August are below the 24-hour OEH  $PM_{10}$  goal of 50 µg/m<sup>3</sup>. The highest 24-hour average  $PM_{10}$  concentration was 19 µg/m<sup>3</sup>, recorded at Beresfield on 6 August.

10

Figure 2 shows a seasonal trend in  $PM_{10}$  concentrations, peaking during the warmer months and decreasing during autumn and winter. This is a common trend and is seen consistently in the Hunter Valley.

The annual average  $PM_{10}$  concentrations for Beresfield and Blackhill were 12 µg/m<sup>3</sup> and 10 µg/m<sup>3</sup> respectively for the 12 months to August 2011. These values are below the OEH annual average  $PM_{10}$  goal of 30 µg/m<sup>3</sup>.

TSP measurements from the Blackhill site show that concentrations were below the OEH annual average TSP goal of 90  $\mu$ g/m<sup>3</sup>. It should be noted that the goal refers to an annual average and not a 24-hour average as measured by the high volume air sampler. The annual average TSP concentration for the 12 months to August 2011 was 25  $\mu$ g/m<sup>3</sup>.

These measurements will include all background sources relevant to that location, including contributions from the Donaldson mining operations.

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## **3 CONTINUOUS MONITORING**

### 3.1 DustTrak Monitoring at Blackhill

Monitoring data was not available for August 2011. During the measurement period, the instrument failed due to power loss.

## 3.2 DustTrak Monitoring at Weakleys Drive

Monitoring data was not available for August 2011. During the measurement period, the instrument failed due to power loss.

## 3.3 DustTrak PM2.5 Monitoring at Blackhill

PM<sub>2.5</sub> monitoring was not carried out in August 2011.



## 4 DUST DEPOSITION MONITORING

Dust deposition monitoring is carried out each month via a network consisting of twelve (12) gauges. The results for August 2011 are shown in **Table 3**, in conjunction with results for the previous eleven months in order to provide an annual average for that period.

A summary of the complete data set from June 2000 is provided in Appendix A.

Month				Monthly	/ dust de	position	rate (g/m	/month	)(			
	DG1	DG2	DG3	DG4	DG5A	DG6	DG7	DG8	DG9	DG10	DG11	DG12
Jun-10	0.3	2.2*	3.0*	0.6*	0.2	1.2*	0.5	0.5*	0.6	0.7*	0.7*	0.4*
Jul-10	0.6*	1.1#	0.7*	0.7	0.5	0.3	0.5*	0.6*	0.7	0.2*	0.8	0.5
Aug-10	0.4	0.5*	1.9"	0.8*	0.2*	0.7*	0.5*	0.5*	0.6	0.5*	0.7*	0.4*
Sep-10	0.6#	2.6*	1.6#	1.0*	0.5*	1.1#	0.5#	1.0#	0.9*	0.6#	0.8#	0.9*
Oct-10	0.9*	1.6*	0.9*	0.5*	0.4*	0.5	1.0*	1.3*	1.2"	2.0*	1.2*	0.4*
Nov-10	0.9*	3.5*	0.9*	1.4*	1.1*	0.9	0.6*	0.9*	*	0.9*	0.8*	1.1*
Dec-10	1.0*	0.7*	0.9#	1.1*	0.5*	0.4*	0.6*	2.4*	1.0*	0.5	1.0*	1.4*
Jan-11	1.0*	0.7*	1.8*	1.2*	0.6*	0.7	0.9*	1.3*	1.0*	0.5*	1.5*	1.0
Feb-11	0.7	4.1*	0.9	1.0	0.7	0.7	1.0*	1.2	*	0.6	1.4	1.4
Mar-11	0.5	2.9*	+	0.9	1.7*	0.8	0.9*	1.9*	*	0.8*	1.2*	1.3*
Apr-11	0.7	0.6*	4.9*	0.8*	1.1*	0.7	0.9*	2.1*	0.8*	1.0*	0.3*	0.7*
May-11	0.4	1.1*	5.4*	0.7*	0.4	0.5*	0.6*	1.5*	0.4	0.4*	0.6*	0.7*
Jun-11	0.7	1.1	1.7	0.9	0.7	0.8	0.6	1.2	0.7	0.9	0.8	1.1
Jul- 11	0.6	0.5	1.6	<0.1	0.4	0.3	0.3	1.8	0.8	0.5	0.9	0.7
Aug-11	0.4	0.1	0.6	0.7	0.5	0.4	0.5	2.4	1	1	0.6	0.8
Annual Average	0.7	1.6	1.9	0.9	0.7	0.7	0.7	1.6	0.9	0.8	0.9	1.0

Table 3: Dust deposition monitoring for the 12-month period to August 2011

Data supplied by RCA Laboratories. *\** Insects/bird droppings reported. *\**Invalid. *\** No recording, funnel damaged. Readings considered invalid have been removed when calculating the annual average.

The highest dust deposition measurement recorded in August 2011 was 2.4  $g/m^2/month$  at DG8.

It is noted that the OEH goal for dust deposition is expressed as an annual average and the annual average deposition rates for the gauges in the network are all significantly below the goal of 4 g/m<sup>2</sup>/month, indicating nuisance dust in the vicinity of the mine is not an issue.

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## 5 METEOROLOGICAL MONITORING

Monthly plots of the wind speed, temperature, solar radiation, and rainfail data collected in August 2011 are shown in **Figure 6** and a windrose plot is shown in **Figure 7**.

The graphs shown in **Figure 6** indicate that the instruments were recording appropriately. Data maxima and minima all appeared to be sensible for this site during August. Total rainfall for the month was 45 mm. This is consistent with permanent Bureau of Meteorology weather stations in the area.

A windrose (see **Figure 7**) created from the available 30-minute average wind data shows that winds were predominantly from the West and East-South East.

The site recorded calms (wind speed less than or equal to 0.5 m/s) for approximately 60.9% of the time. The relatively large fraction of calm winds is significantly higher than would be expected and may be as a result of the sheltered location of the weather station.

DONALDSON COAL PTY LTD Abel Underground Coal Mine Appendix 2



APPENDIX A

**Dust Deposition Data** 

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Month	D1	D2	D3	Dust D4	deposit D5A	lon (g/m D6	/month) D7	DS	D9	D10	D11	D12
Jun-00	0.7	0.5	0.5	0.7	0.8	0.4	3.8	3.2	0.5	0.7	-	-
Jul-00	0.4	0.4	0.5	0.7	0.8	0.5	0.8	1.5	0.4	0.4	-	-
Aug-00	0.9	0.6	1.0	1.2	1.1	1.0	3.4	0.7	0.7	0.6	4	-
Sep-00	0.8	0.9	1.1	0.9	1.3	1.0	2.2	1.0	1.0	0.8	-	2.
Oct-00	0.4	0.6	1.1	0.9	0.9	0.8	5.3	0.9	0.6	0.5	-	-
Nov-00	5.2	0.7	1.4	0.8	1.0	0.4	24.1	9.4	1.1	0.6		1.2
Dec-00	2.8	1.4	1.9	1.3	1.1	0.8	2.1	2.5	0.9	0.9	2	-
Jan-01	0.7	1.7	1.4	1.8	0.7	1.3	1.1	2.4	1.1	0.6	-	-
Feb-01	0.9	3.1	2.0	0.5	0.9	0.7	0.7	6.7	1.3	0.5	1.0	1
Mar-01	0.8	2.1	1.3	0.6	0.7	0.6	0.6	5.5	0.6	0.6	1.5	
Apr-01	0.8	0.7	1.3	0.5	0.7	0.4	0.3	5.1	0.7	0.6	0.8	-
May-01	0.2	0.2	0.4	0.4	0.3	0.3	0.6	1.8	0.6	0.8	0.9	4
Jun-01	0.5	0.4	0.5	1.0	1.0	0.4	0.4	8.8	0.7	0.6	0.6	-
Jul-01	0.5	0.3	1.8	0.5	0.8	-	16.3	4.9	0.9	0.7	0.7	-
Aug-01	0.4	0.4	0.8	0.8	1.0	1.7	1.0	-	1.0	1.8	1.1	-
Sep-01	0.7	1.0	1.7	1.1	1.7	0.7	-	6.0	1.1	1.3	1.7	0
Oct-01	1.1	0.6	4.6	0.9	0.7	0.9	1.2	1.9	0.9	0.6	1.7	-
Nov-01	0.9	1.0	1.1	1.1	0.8	1.1	6.0	5.5	1.3	1.9	2.3	6
Dec-01	4.9	0.9	4.2	0.9	1.3	1.9	1.2	3.1	1.2	9.7	1.8	Q
Jan-02	0.8	1.0	1.5	1.3	1.1	1.4	1.3	1.5	1.1	0.9	1.5	1
Feb-02	1.1	1.1	0.9	0.3	0.4	0.5	3.1	5.1	0.5	0.5	0.9	2
Mar-02	1.7	2.1	1.6	0.7	0.7	0.8	1.0	18	1.0	0.9	1.7	1.
Apr-02	1.0	0.4	1.0	0.8	0.8	0.6	0.9	10.1	0.5	0.7	1.0	-
	0.6	0.6	6.0	0.7	0.4	1.2	0.9	3.1	0.7	0.2	1.0	1
May-02 Jun-02	1.4	0.4	1.7	0.6	0.5	0.8	0.6	2.1	0.6	0.5		2
Jul-02	0.7	0.7	-	0.8	0.8	0.7	1.2	-	1.1	0.5	1.0	
		1.0.1		-					-			
Aug-02	1.3	0.8	1.4	1.2	1.1	0.7	1.5	9.3	1.5	0.9	1.6	×
Sep-02	0.5	1.2	1.1	0.8	0.5		5.1		1.6	0.6	1.0	2
Oct-02	2.2	1.4	5.2	1.5	1.5	1.4	1.4	3.4		1.5	3.1	-
Nov-02	2.8		3.7	1.6	0.1	1.8	2.1	3.5	2.1	-	1.9	-
Dec-02	2.0	- 15	2.5	1.5	3.0	1.5	1.8	4.1	1.6	1.2	1.9	-
Jan-03	1.4	1.5	2.6	1.5	1.0	1.9	2.2	2.5	1.1	1.0	1.6	2
Feb-03	0.8	0.5	1.2	1.1	0.9	1.2	1.7	3.4	1.2	1.0	9.5	-
Mar-03			0.6			2.1			-	3.6		5.
Apr-03	0.5	1.0	10.000	1.0	0.7	0.5	1.1	8.0	1.00	2.0	1.0	1
May-03	0.5	0.4	0.6	0.2	0.2	0.6	1.3	1.6	0.5	0.8	1.2	
Jun-03 Jul-03	0.5	0.6	0.8	0.8	0.4	0.6	0.8	0.7	0.9	0.7	0.7	-
	0.3	0.4	0.4	0.6	0.4	0.5	0.7	0.5	0.5	0.5	0.7	-
Aug-03	0.8	0.2	0.7	1.1	0.5	1.3	1.8	2.1	1.3	0.7	0.9	-
Sep-03	0.6	0.7	1.1	0.7	0.8	1.7	1.4	1.3	2.5	0.9	1.3	
Oct-03		0.9	1.4	0.9	0.7	1.9	1.0	1.4	0.6	0.8	1.3	4.4
Nov-03	2.6	0.8	1.0	1.1	0.4	1.3	1.5	1.5	-	0.8	1.3	-
Dec-03	1.0	1.0	1.4	1.3	1.1	1.5	1.6	2.0	1.8	0.9	1.4	-
Jan-04	8.5	1.5	2.1	1.5	1.3	2.6	1.4	2.2	1.7	1.5	1.7	-
Feb-04	1.2	1.0	1.7	1.4	0.7	3.1	1.6	2.2	-	1.5	2.3	1
Mar-04	0.4	0.6	6.6	1.2	0.7	1.9	1.1	12.1	4.8	1.5	1.1	-



Apr-04	0.6	1.0	0.8	0.8	0.6	1.9	0.8	1.4	0.9	1.2	1.1	-
May-04	0.2	0.9	2.2	0.9	0.8	0.7	0.9	1.4	1.2	0.9	1.5	-
Jun-04	0.4	0.6	0.7	0.9	0.6	1.4	1.0	0.9	1.0	1.0	0.8	4.1
Jul-04	0.4	0.6	5.3#	0.6	0.5	2.9	1.0	1.1	0.9	0.6	1.2	4
Aug-04	0.5	0.5	0.5	1.3	0.7	1.1	1.1	1.4	-	1.0	1.0	40
Sep-04	0.6	0.6	0.8	2.2	1.0	1.0	0.9	4.4	0.9	16.7	1.1	*
Oct-04	0.7	0.9	1.2	0.9	0.8	1.4	1.0	10.5	1.0	1.0	0.8	
Nov-04	0.8	0.7	1.3	1.9	0.7	0.9	1.0	3.0	1.1	1.1	1.6	*
Dec-04	2.0	1.4	3.6	1.5	1.3	2.2	3.2	7.9	1.8	5.5	2.5	-
Jan-05	1.2	1.0	3.7	1.6	1.4	4.0	2.3	2.7	2.6	2.5	2.8	÷
Feb-05	1.2	1.2	1.8	1.6	1.3	2.0	1.7	-	2.3	1.5	2.3	4.
Mar-05	1.3	0.9	1.4	0.9	0.9	3.0	1.2	7.7	-	0.8	1.3	. 4
Apr-05	1.1	0.7	0.9	0.8	0.7	0.9	1.4	3.3	1.1	0.8	0.9	-
May-05	0.7	8.6	1.1	0.8	0.7	0.8	0.9	4.4	1.2	0.8	1.1	-
Jun-05	1.3	0.8	1.3	1.3	0.8	1.2	1.2	1.3	1.5	2.5	0.9	-
Jul-05	1.0	0.5	0.5	0.7	0.4	1.6	0.7	1.2	0.8	4.3	1.1	
Aug-05	0.6	0.6	0.8	1.0	0.8	0.9	0.7	1.0	0.9	1.0	0.9	
Sep-05	0.6	0.7	0.8	0.7	0.7	1.2	1.3	1.3	1.0	0.9	1.1	-
Oct-05	0.8	0.9	1.3	0.9	0.8	1.4	1.2	1.9	1.3	1.1	1.3	4
Nov-05	2	2.3	2.3	2.0	1.7	1.2	2.0	3.2	1.6	1.4	2.2	4
Dec-05	1.9	3.2	2.3	3.3	2.6	3.4	2.3	-	1.3	2.1	3.9	120
Jan-06	1.0	2.1	1.7	1.0	23.	3.5	-	2.7	1.1	-	1.5	-
Feb-06	2.2	1.0	0.9	1.2	1.1	1.7	1.1	2.9	-	2.3	1.8	ы.
Mar-06	0.7	0.6	2.3	0.7	0.6	0.9	1.0	1.4	0.7	0.8	1.5	*
Apr-06	0.6	0.7	1.1	0.8	0.6	1.1	0.8	1.0	1.0	1.8	1.5	4
May-06	1.0	3.1	1.0	-	1.1	1.4	1.1	4.1	4	7.0	1.5	4
Jun-06	0.4	0.3	0.7	0.5	0.4	0.6	0.7	0.8	0.6	0.9	0.9	-
Jul-06	0.3	0.3	1	1.3	0.4	0.7	0.7	2.7	4	0.6	0.6	~
Aug-06	0.9	0.6	0.8	0.7	0.7	0.8	0.7	1.7	-	3.7	0.9	27.
Sep-06	1.6	0.7	1.1	1.7	0.7	1	0.9	1.3	1.2	0.8	1.6	-
Oct-06	2	1.4	1.6	1.8	0.9	1.8	1.2	1.8	1.5	1.8	1.9	-
Nov-06	4.3	2.2	3	2.3	2.3	5.3	2.4	3.3	2.3	2.3	2.9	2
Dec-06	1.2	3.4	1.9	2.3	2.3		2.1	2.1	-	4.9	3.9	÷
Jan-07	2	0.9	1.5	0.7	0.7	1.7	1.1		1.2	1.7	0.9	4
Feb-07	1.7	0.9	1.6	0.7	0.6	1	1.8	1.7	1.1	1.2	1.7	2
Mar-07	1.3	0.9	1.7	0.8	1.2	0.6	2.2	1.7	1	0.9	1.7	20
Apr-07	0.5	0.7	0.9	0.6	4.8	1.2	0.5	2.7	0.5	0.8	0.9	-
May-07	0.8	0.5	0.6	1.2	0.6	0.6	0.7	1.9	0.5	0.7	0.8	
Jun-07	0.6	0.5	0.7	1.1	0.1	0.5	0.1	0.5	0.1	0.4	0.3	-
Jul-07	0.5	0.4	0.6	2.1	0.5	0.8	0.6	0.6	0.4	0.5	0.7	-
Aug-07	1.5	0.4	0.7	1	0.7	0.7	0.5	1	0.6	0.6	0.7	-
Sep-07	1.3	0.5	1.8	1	0.7	0.9	0.9	1.3	1	0.7	1.6	A
Oct-07	4.2	0.9	1.1	1.4	1.1	1.7	1.8	1.7	1.6	1.4	2.2	-
Nov-07	0.8	0.8	1.1	0.9	1.1	1.1	1.1	1.7	0.6	0.8	1.5	12
Dec-07	1.3	0.8	3	0.7	0.5	0.8	0.5	1.1	0.3	0.8	0.6	
Jan-08	2.6	0.8	3.7	0.5	0.5	0.5	0.4	2.2	0.8	0.3	0.8	2
2011-00	2.0	0.0	2.1	0.5	0.5	0.5	0.4	4.4	0.0	0.5	0.0	

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A-3



Mar-08	4.5	0.6	9.2+	0.6	2.9	2.1	0.6	1.5	0.5	1	0.9	-
April-08	0.4"	0.4"	0.8"	0.4"	0.4*	0.8"	1.1"	1.7"	1.2	1.1*	1.1*	9
May-08	1.1	2.4"	0.9	1.4	0.9	0.9	0.7	2.7	1*	1.1	1.3*	80
June-08	0.2	0.4"	0.1	0.5	0.1"	0.1	0.3	0.5"	0.1	0.8	0.2	4
July-08	0.4	0.7"	1.3″	0.6	0.8"	0.9	0.8	1	0.7	0.5	1.1	-
Aug-08	1	0.5	0.7	0.6	0.5	1.9	0.8	1	1	0.9	1.4	*
Sep-08	0.6	1	1.3	0.7	0.6	0.9	0.6	0.9	0.9	0.9	1.8	¥
Oct-08	1	0.5	1	1.3	1.3	1.2	1	1.4	0.8	1.6	1.8	*
Nov-08	0.8	1.4	2.7	2.5	0.9	1.2	0.8	2.4	1.1	1	1.7	÷
Dec-08	0.4	0.4	0.6	0.5	0.3	1.1	0.6	15	0.9	0.7	1.2	Q. 1
Jan-09	1.1	3"	1.6	0.8	0.9	1.4	0.7	1.5	0.9	0.9	5+	4.
Feb-09	0.4	4.4	1.5	1.1	0.9	1.6	0.8	1.2	1.4	2.5	1.2	.4
Mar-09	2.8	5.8	2.7	2.4	1.9	2.1	2.5	2.4	2.3	5.7	2.7	4
Apr-09	2	0.8	0.8	0.6	0.6	3.2	1.1	1.1	1	0.6	0.9	-
May-09	0.6	1.6	0.8	2.4	0.9	5.6 +	1.4	1.1	1.3	0.7	1.5	-
Jun-09	0.4	1.3	0.8	0.5	0.5	3.3	0.9	0.6	1	3.4	0.7	1
Jul-09	0.2	1.0	0.6	0.4	0.3	3.8	0.5	0.6	0.6	0.3	0.6	-
Aug-09	0.8	3.6	0.8	1.2	1.0	1.8	0.8	1.8	1.3	0.8	1.0	-
Sep-09	1.0	1.8#	1.8	8.3 +	1	1.8	0.9*	1.8*	1.7*	0.7	1.4*	4
Oct-09+	4.3	9"	5.2"	11.3*	3.2	3.8"	2.4"	6.8"	3.0*	2.2	3.2"	5.7
Nov-09	0.8*	1.7"	1.4"	1.3"	0.7*	2.1*	1.3*	8.0*	*	1.0*	*	2.3
Dec-09	1.4"	4.0#	1.6#	2.4"	1.7*	1.8	1.6	2.6#	1.7*	1.7*	2.2#	1.7
Jan-10	0.6*	0.8#	5.6#	1.2*	2.4*	1.2*	0.8*	1.4*	1.3*	0.8*	1.3*	1.1
Feb-10	1.9*	11.3*	1.9*	1.4"	1.5*	1.1*	1.2#	1.6#	1.1*	0.8*	1.8*	1.3
Mar-10	0.6"	0.6*	3.2*	1"	4.1*	0.6*	0.6"	1.2	0.6	0.2*	0.8*	1.1
Apr-10	0.8*	1.8*	2.4#	0.7#	+	0.3	0.6*	0.9*	0.6*	0.4#	0.8*	0.8
May-10	0.8	4.9*	3.0*	1.1	1.2	1.0	0.7	1.3	1.0#	0.5	1.1*	0.8
Jun-10	0.3	2.2"	3.0*	0.6#	0.2	1.2*	0.5	0.5*	0.6	0.7#	0.7*	0.4
Jul-10	0.6"	1.1"	0.7"	0.7	0.5	0.3	0.5*	0.6"	0.7	0.2"	0.8	0.5
Aug-10	0.4	0.5*	1.9#	0.8#	0.2#	0.7#	0.5#	0.5*	0.6	0.5#	0.7*	0.4
Sep-10	0.6#	2.6#	1.6#	1.0#	0.5*	1.1"	0.5#	1.0#	0.9#	0.6#	0.8#	0.9
Oct-10	0.9*	1.6*	0.9*	0.5*	0.4*	0.5	1.0*	1.3*	1.2*	2.0*	1.2*	0.4
Nov-10	0.9*	3.5*	0.9*	1.4*	1.1"	0.9	0.6#	0.9*	*	0.9*	0.8*	1.1
Dec-10	1.0*	0.7*	0.9*	1.1*	0.5"	0.4"	0.6*	2.4*	1.0*	0.5	1.0*	1.4
Jan-11	1.0*	0.7*	1.8*	1.2*	0.6*	0.7	0.9*	1.3*	1.0*	0.5*	1.5*	1.0
Feb-11	0.7	4.1+	0.9	1.0	0.7	0.7	1.0*	1.2	*	0.6	1.4	1.4
Mar-11	0.5	2.9*	+	0.9	1.7"	0.8	0.9*	1.9*	*	0.8*	1.2*	1.3
Apr-11	0.7	0.6"	4.9"	0.8*	1.1*	0.7	0.9*	2.1*	0.8*	1.0"	0.3"	0.7
May-11	0.4	1.1"	5.4"	0.7*	0.4	0.5"	0.6*	1.5"	0.4	0.4*	0.6"	0.7
Jun-11	0.7	1.1	1.7	0.9	0.7	0.8	0.6	1.2	0.7	0.9	0.8	1.1
Aug-11	0.4	0.1	0.6	0.7	0.5	0.4	0.5	2.4	1	1	0.6	0.8

\* - sample contaminated| + - sample invalid|\*Broken funnel

[Note: Samples for October 2009 have been considered invalid, due to a widespread dust storm experienced on  $23^{\prime\prime}$  September 2009.]

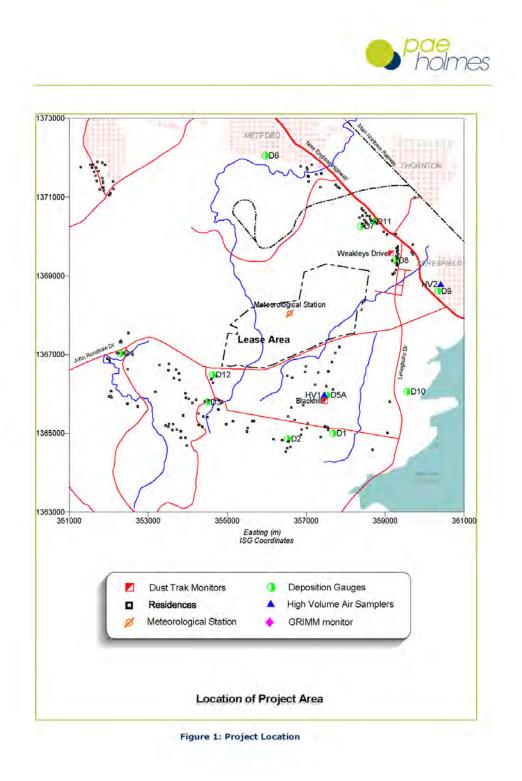
DONALDSON COAL PTY LTD Abel Underground Coal Mine Appendix 2



APPENDIX B

Figures

Dust and Meteorological Data - August 2011 Donaldson Coal | PAEHolmes Job 3003 B-1





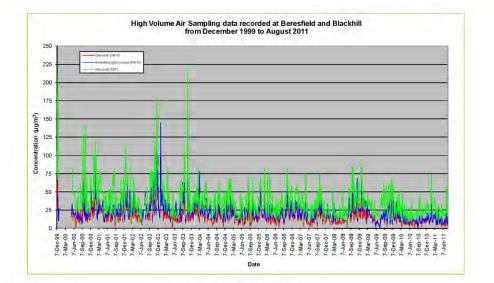


Figure 2: High Volume Air Sampling data

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No Monitoring was available for this site in August 2011 due to equipment failure caused by power loss.

Figure 3: DustTrak sampling data - Blackhill site

No Monitoring was available for this site in August 2011 due to equipment failure caused by power loss.

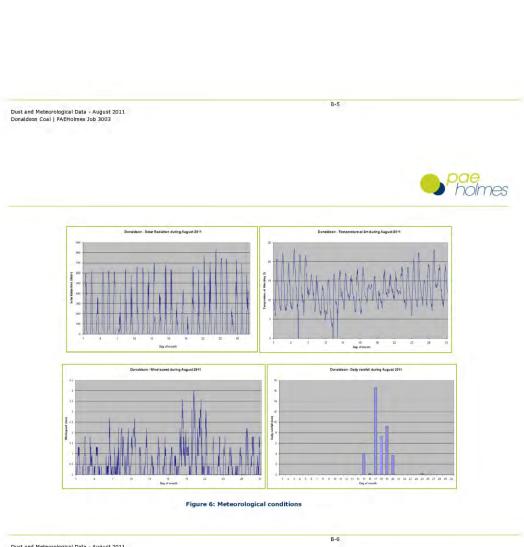
Figure 4: DustTrak sampling data - Weakleys Drive site

Dust and Meteorological Data - August 2011 Donaldson Coal | PAEHolmes Job 3003 B-4

B-3



No PM2.5 monitoring was conducted during this month Figure 5: DustTrak PM2.5 monitoring data



DONALDSON COAL PTY LTD Abel Underground Coal Mine Appendix 2



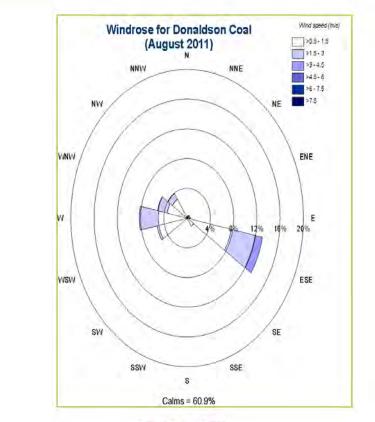


Figure 7: Windrose

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**DONALDSON COAL PTY LTD** Abel Underground Coal Mine Appendix 2



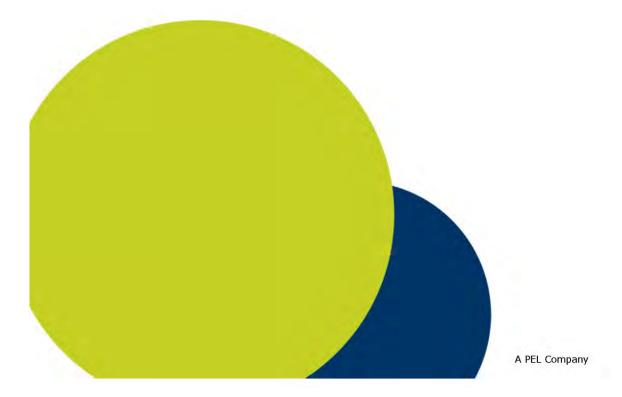
# REPORT

DUST AND METEOROLOGICAL DATA - SEPTEMBER 2011

**Donaldson Coal** 

Job No: 3003

1 December 2011





### PROJECT TITLE:

JOB NUMBER:

PREPARED FOR:

PREPARED BY:

APPROVED FOR RELEASE BY:

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DUST AND METEOROLOGICAL DATA -SEPTEMBER 2011

3003

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### DONALDSON COAL

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### **1** INTRODUCTION

As part of their Air Quality Management Plan, Donaldson Coal operate an ambient air quality monitoring network, including dust monitoring in the vicinity of the mining lease and meteorological monitoring at a single station on-site. This report has been prepared as a summary of the data collected throughout the network during September 2011.

The dust monitoring network includes continuous monitoring using TSI DustTrak, high volume air sampling (HVAS) on a one-day-in-six run cycle and dust deposition monitoring.

The continuous monitoring network consists of two DustTrak monitors measuring  $PM_{10}$  at two sites and an additional DustTrak monitor used for one week each quarter to measure  $PM_{2.5}$ .

There are two HVAS locations used to determine ambient concentrations of  $\mathsf{PM}_{10}$  and TSP. These operate on a one-day-in-six run cycle, in line with similar measurements made by the NSW Office of Environment and Heritage (OEH)<sup>3</sup> at other locations throughout the state.

Monthly levels of dust deposition are also measured using twelve gauges placed at various locations in the vicinity of the mine. The locations of each of these monitors and gauges are shown in **Figure 1**.

Table 1 lists the instruments used and pollutants measured at these locations.

Manitaring Location	Instruments Used	Pollutant Monitored
Beresfield	HVAS	PM <sub>10</sub>
Blackhill	HVAS	PMio
	HVAS	TSP
	DustTrak	PM <sub>L0</sub>
	DustTrak (1 week per quarter)	PM <sub>2.5</sub>
Weakleys Drive	DustTrak.	PMID
DG1 - DG12	Deposition Gauges	Dust Deposition

Table 1: Summary of monitoring locations and instruments

Meteorological data are downloaded monthly and forwarded to PAEHolmes for processing. The meteorological station is situated at the site of the office buildings and measures the following parameters:

- wind speed;
- wind direction;
- temperature;
- solar radiation; and
- rainfall.

<sup>a</sup> The NSW EPA exists as a legal entity operated within the Office of Environment and Heritage (OEH) which came into existence in April 2011. OEH was previously part of the Department of Environment, Climate Change and Water (DECCW). The DECCW was also recently known as the Department of Environment and Climate Change (DECC), and prior to that the Department of Environment and Conservation (DEC). The terms NSW EPA, OEH, DECCW, DECC and DEC are interchangeable in this report.

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### **2 HIGH VOLUME AIR SAMPLING**

High Volume Air Sampling (HVAS) was carried out at Beresfield and Blackhill by RCA Laboratories. PM<sub>10</sub> is measured at both sites while TSP is only measured at Blackhill. The data collected during September 2011 are summarised in Table 2. A graph consisting of all the data collected to date is shown in

#### Figure 2.

Date	Beresfield PM <sub>10</sub> (µg/m <sup>3</sup> )	Blackhill PM <sub>22</sub> (µg/m²)	Blackhill TSP (jig/m³)		
5/09/2011	20	15	35		
11/09/2011	9	10	23		
17/09/2011	26	23	18		
23/09/2011	38	34	22		
29/09/2011	10	15	21		
Annual average	14	11	27		

All measurements of PM10 for September are below the 24-hour OEH PM10 goal of 50 µg/m3. The highest 24-hour average PM10 concentration was 38 µg/m3, recorded at Beresfield on 23 September.

Figure 2 shows a seasonal trend in  $\ensuremath{\text{PM}_{10}}$  concentrations, peaking during the warmer months and decreasing during autumn and winter. This is a common trend and is seen consistently in the Hunter Valley.

The annual average  $\text{PM}_{10}$  concentrations for Beresfield and Blackhill were 14  $\mu\text{g}/\text{m}^3$  and 11 µg/m3 respectively for the 12 months to September 2011. These values are below the OEH annual average PM10 goal of 30 µg/m3.

TSP measurements from the Blackhill site show that concentrations were below the OEH annual average TSP goal of 90  $\mu$ g/m<sup>3</sup>. It should be noted that the goal refers to an annual average and not a 24-hour average as measured by the high volume air sampler. The annual average TSP concentration for the 12 months to September 2011 was 27 µg/m<sup>3</sup>.

These measurements will include all background sources relevant to that location, including contributions from the Donaldson mining operations.



# **3 CONTINUOUS MONITORING**

### 3.1 DustTrak Monitoring at Blackhill

Monitoring data was not available for September 2011. During the measurement period, access to the site was unable to be obtained.

### 3.2 DustTrak Monitoring at Weakleys Drive

Monitoring data was available for September 2011 and is shown in **Figure 4**. Of the available data, the measured 24-hour average  $PM_{10}$  concentrations did not exceed the OEH goal of 50  $\mu$ g/m<sup>3</sup>. A maximum 24-hour average  $PM_{10}$  concentration of 17  $\mu$ g/m<sup>3</sup> was recorded on 19 September 2011.

## 3.3 DustTrak PM<sub>2.5</sub> Monitoring at Blackhill

PM<sub>2.5</sub> monitoring was not carried out in September 2011.

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### 4 DUST DEPOSITION MONITORING

Dust deposition monitoring is carried out each month via a network consisting of twelve (12) gauges. The results for September 2011 are shown in **Table 3**, in conjunction with results for the previous eleven months in order to provide an annual average for that period.

A summary of the complete data set from June 2000 is provided in Appendix A.

Month	Monthly dust deposition rate (g/m²/month)												
	DG1	DG2	DG3	DG4	DG5A	DG6	DG7	DG8	DG9	DG10	DG11	DG12	
Jul-10	0.6*	1.1*	0.7*	0.7	0.5	0.3	0.5*	0.6*	0.7	0.2*	0.8	0.5	
Aug-10	0.4	0.5*	1.9*	0.8*	0.2*	0.7*	0.5*	0.5*	0.6	0.5*	0.7*	0.4*	
Sep-10	0.6*	2.6*	1.6*	1.0*	0.5*	1.1*	0.5*	1.0*	0.9*	0.6*	0.8*	0.9*	
Oct-10	0.9#	1.6*	0.9*	0.5#	0.4*	0.5	1.0*	1.3*	1.2*	2.0#	1.2*	0.4#	
Nov-10	0.9*	3.5*	0.9*	1.4*	1.1*	0.9	0.6*	0.9*	*	0.9*	0.8*	1.1*	
Dec-10	1.0*	0.7*	0.9*	1.1*	0.5*	0.4*	0.6*	2.4=	1.0*	0.5	1.0*	1.4*	
Jan-11	1.0*	0.7*	1.8*	1.2*	0.6*	0.7	0.9*	1.3*	1.0*	0.5*	1.5*	1.0	
Feb-11	0.7	4.1*	0.9	1.0	0.7	0.7	1.0*	1.2	*	0.6	1.4	1.4	
Mar-11	0.5	2.9*	+	0.9	1.7*	0.8	0.9*	1.9*	*	0.8#	1.2*	1.3*	
Apr-11	0.7	0.6*	4.9*	0.8*	1.1*	0.7	0.9*	2.1*	0.8*	1.0*	0.3#	0.7*	
May-11	0.4	1.1*	5.4*	0.7*	0.4	0.5*	0.6*	1.5*	0.4	0.4*	0.6*	0.7*	
Jun-11	0.7	1.1	1.7	0.9	0.7	0.8	0.6	1.2	0.7	0.9	0.8	1.1	
Jul- 11	0.6	0.5	1.6	<0.1	0.4	0.3	0.3	1.8	0.8	0.5	0.9	0.7	
Aug-11	0.4	0.1	0.6	0.7	0.5	0.4	0.5	2.4	1	1	0.6	0.8	
Sep-11	1.3"	0.4*	0.8*	0.5	0.6*	+	0.6*	1.5*	0.6*	2.3"	0.7*	0.7*	
Annual Average	0.7	1.5	2.0	0.9	0.7	0.6	0.7	1.6	0.9	0.8	0.9	1.0	

Table 3: Dust deposition monitoring for the 12-month period to September 2011

Data supplied by RCA Laboratories. <sup>#</sup> Insects/bird droppings reported. <sup>+</sup>Invalid. \* No recording, funnel damaged. Readings considered invalid have been removed when calculating the annual average.

The highest dust deposition measurement recorded in September 2011 was 2.3 g/m²/month at DG10.

It is noted that the OEH goal for dust deposition is expressed as an annual average and the annual average deposition rates for the gauges in the network are all significantly below the goal of 4 g/m<sup>2</sup>/month, indicating nuisance dust in the vicinity of the mine is not an issue.



## 5 METEOROLOGICAL MONITORING

Monthly plots of the wind speed, temperature, solar radiation, and rainfall data collected in September 2011 are shown in **Figure 6** and a windrose plot is shown in **Figure 7**.

The graphs shown in **Figure 6** indicate that the instruments were recording appropriately. Data maxima and minima all appeared to be sensible for this site during September. Total rainfall for the month was 91.4 mm. This is consistent with permanent Bureau of Meteorology weather stations in the area.

A windrose (see **Figure 7**) created from the available 30-minute average wind data shows that winds were predominantly from the West and East-South East.

The site recorded calms (wind speed less than or equal to 0.5 m/s) for approximately 54.1% of the time. The relatively large fraction of calm winds is significantly higher than would be expected and may be as a result of the sheltered location of the weather station.

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APPENDIX A

**Dust Deposition Data** 



Month	D1	D2	D3	Dust D4	depositi D5A	on (g/r D6	n²/mont D7	:h) D8	D9	D10	D11	D12
Jun-00	0.7	0.5	0.5	0.7	0.8	0.4	3.8	3.2	0.5	0.7	-	×.
Jul-00	0.4	0.4	0.5	0.7	0.8	0.5	0.8	1.5	0.4	0.4	-	4
Aug-00	0.9	0.6	1.0	1.2	1.1	1.0	3.4	0.7	0.7	0.6	-	Q. 1
Sep-00	0.8	0.9	1.1	0.9	1.3	1.0	2.2	1.0	1.0	0.8		80
Oct-00	0.4	0.6	1.1	0.9	0.9	0.8	5.3	0.9	0.6	0.5	-	-
Nov-00	5.2	0.7	1.4	0.8	1.0	0.4	24.1	9.4	1.1	0.6	-	4
Dec-00	2.8	1.4	1.9	1.3	1.1	0.8	2.1	2.5	0.9	0.9	4	-
Jan-01	0.7	1.7	1.4	1.8	0.7	1.3	1.1	2.4	1.1	0.6	4	-
Feb-01	0.9	3.1	2.0	0.5	0.9	0.7	0.7	6.7	1.3	0.5	1.0	1.2
Mar-01	0.8	2.1	1.3	0.6	0.7	0.6	0.6	5.5	0.6	0.6	1.5	-
Apr-01	0.8	0.7	1.3	0.5	0.7	0.4	0.3	5.1	0.7	0.6	0.8	-
May-01	0.2	0.2	0.4	0.4	0.3	0.3	0.6	1.8	0.6	0.8	0.9	4
Jun-01	0.5	0.4	0.5	1.0	1.0	0.4	0.4	8.8	0.7	0.6	0.6	-
Jul-01	0.5	0.3	1.8	0.5	0.8	-	16.3	4.9	0.9	0.7	0.7	-
Aug-01	0.4	0.4	0.8	0.8	1.0	1.7	1.0	-	1.0	1.8	1.1	-
Sep-01	0.7	1.0	1.7	1.1	1.7	0.7	-	6.0	1.1	1.3	1.7	4
Oct-01	1.1	0.6	4.6	0.9	0.7	0.9	1.2	1.9	0.9	0.6	1.7	-
Nov-01	0.9	1.0	1.1	1.1	0.8	1.1	6.0	5.5	1.3	1.9	2.3	4
Dec-01	4.9	0.9	4.2	0.9	1.3	1.9	1.2	3.1	1.2	9.7	1.8	Q
Jan-02	0.8	1.0	1.5	1.3	1.1	1.4	1.3	1.5	1.1	0.9	1.5	14
Feb-02	1.1	1.1	0.9	0.3	0.4	0.5	3.1	5.1	0.5	0.5	0.9	2
Mar-02	1.7	2.1	1.6	0.7	0.7	0.8	1.0	18	1.0	0.9	1.7	1.2
Apr-02	1.0	0.4	1.0	0.8	0.8	0.6	0.9	10.1	0.5	0.7	1.0	-
May-02	0.6	0.6	6.0	0.7	0.4	1.2	0.9	3.1	0.7	0.2	1.0	-
Jun-02	1.4	0.4	1.7	0.6	0.5	0.8	0.6	2.1	0.6	0.5	1.0	2.
Jul-02	0.7	0.7	-	0.8	0.8	0.7	1.2	-	1.1	0.5	1.0	
Aug-02	1.3	0.8	1.4	1.2	1.1	1.2	1.5	4	1.5	0.9	1.6	9
Sep-02	0.5	1.2	1.1	0.8	0.5	0.7	5.1	9.3	1.6	0.6	1.0	-
Oct-02	2.2	1.4	5.2	1.5	1.5	1.4	1.4	3.4	-	1.5	3.1	4
Nov-02	2.8	1.8	3.7	1.6	0.1	1.8	2.1	3.5	2.1	2	1.9	-
Dec-02	2.0	-	2.5	1.5	3.0	1.5	1.8	4.1	1.6	1.2	1.9	-
Jan-03	2.1	1.5	2.7	1.5	1.0	1.9	2.2	2.5	1.1	1.0	1.6	-
Feb-03	1.4	1.1	2.6	1.1	0.9	1.2	1.7	5.9	1.1	1.0	1.5	Ê.
Mar-03	0.8	0.5	1.2	1.1	0.9	2.1	1.5	3.4	-	3.6	9.5	-
Apr-03	0.5	1.0	0.6	1.2	0.6	0.5	1.5	8.0	-	2.0	1.0	5.
and the second	1.0.0	1000	1.1	0.2		1000			1.000	1000		
May-03	0.5	0.4	0.6		0.2	0.6	1.3	1.6	0.5	0.8	1.2	-
Jun-03	0.5	0.6	0.8	0.8	0.4	0.6	0.8	0.7	0.9	0.7	0.7	-
Jul-03	0.3	0.4	0.4	0.6	0.4	0.5	0.7	0.5	0.5	0.5	0.7	-
Aug-03	0.8	0.2	0.7	1.1	0.5	1.3	1.8	2.1	1.3	0.7	0.9	-
Sep-03	0.6	0.7	1.1	0.7	0.8	1.7	1.4	1.3	2.5	0.9	1.3	-
Oct-03	-	0.9	1.4	0.9	0.7	1.9	1.0	1.4	0.6	0.8	1.3	-
Nov-03	2.6	0.8	1.0	1.1	0.4	1.3	1.5	1.5	-	0.8	1.3	-
Dec-03	1.0	1.0	1.4	1.3	1.1	1.5	1.6	2.0	1.8	0.9	1.4	18
Jan-04	8.5	1.5	2.1	1.5	1.3	2.6	1.4	2.2	1.7	1.5	1.7	-
Feb-04	1.2	1.0	1.7	1.4	0.7	3.1	1.6	2.2	-	1.5	2.3	-
Mar-04	0.4	0.6	6.6	1.2	0.7	1.9	1.1	12.1	4.8	1.5	1.1	÷ .

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Apr-04	0.6	1.0	0.8	0.8	0.6	1.9	0.8	1.4	0.9	1.2	1.1	-
May-04	0.2	0.9	2.2	0.9	0.8	0.7	0.9	1.4	1.2	0.9	1.5	-
Jun-04	0.4	0.6	0.7	0.9	0.6	1.4	1.0	0.9	1.0	1.0	0.8	9.1
Jul-04	0.4	0.6	5.3#	0.6	0.5	2.9	1.0	1.1	0.9	0.6	1.2	4
Aug-04	0.5	0.5	0.5	1.3	0.7	1.1	1.1	1.4	-	1.0	1.0	-
Sep-04	0.6	0.6	0.8	2.2	1.0	1.0	0.9	4.4	0.9	16.7	1.1	*
Oct-04	0.7	0.9	1.2	0.9	0.8	1.4	1.0	10.5	1.0	1.0	0.8	4
Nov-04	0.8	0.7	1.3	1.9	0.7	0.9	1.0	3.0	1.1	1.1	1.6	*
Dec-04	2.0	1.4	3.6	1.5	1.3	2.2	3.2	7.9	1.8	5.5	2.5	-
Jan-05	1.2	1.0	3.7	1.6	1.4	4.0	2.3	2.7	2.6	2.5	2.8	÷.
Feb-05	1.2	1.2	1.8	1.6	1.3	2.0	1.7	-	2.3	1.5	2.3	4.
Mar-05	1.3	0.9	1.4	0.9	0.9	3.0	1.2	7.7	-	0.8	1.3	
Apr-05	1.1	0.7	0.9	0.8	0.7	0.9	1.4	3.3	1.1	0.8	0.9	12
May-05	0.7	8.6	1.1	0.8	0.7	0.8	0.9	4.4	1.2	0.8	1.1	-
Jun-05	1.3	0.8	1.3	1.3	0.8	1.2	1.2	1.3	1.5	2.5	0.9	-
Jul-05	1.0	0.5	0.5	0.7	0.4	1.6	0.7	1.2	0.8	4.3	1.1	1.
Aug-05	0.6	0.6	0.8	1.0	0.8	0.9	0.7	1.0	0.9	1.0	0.9	
Sep-05	0.6	0.7	0.8	0.7	0.7	1.2	1.3	1.3	1.0	0.9	1.1	-
Oct-05	0.8	0.9	1.3	0.9	0.8	1.4	1.2	1.9	1.3	1.1	1.3	4
Nov-05	-	2.3	2.3	2.0	1.7	1.2	2.0	3.2	1.6	1.4	2.2	4
Dec-05	1.9	3.2	2.3	3.3	2.6	3.4	2.3	-	1.3	2.1	3.9	140
Jan-06	1.0	2.1	1.7	1.0	23.	3.5	-	2.7	1.1	-	1.5	-
Feb-06	2.2	1.0	0.9	1.2	1.1	1.7		2.9	-	2.3	1.8	
	12.2	1.1.1		1.1.1		100	1.1				1.1.1	
Mar-06	0.7	0.6	2.3	0.7	0.6	0.9	1.0	1.4	0.7	0.8	1.5	
Apr-06	0.6	0.7	1.1	0.8	0.6	1.1	0.8	1.0	1.0	1.8	1.5	-
May-06	1.0	3.1	1.0	-	1.1	1.4	1.1	4.1	-	7.0	1.5	-
Jun-06	0.4	0.3	0.7	0.5	0.4	0.6	0.7	0.8	0.6	0.9	0.9	-
Jul-06	0.3	0.3	1	1.3	0.4	0.7	0.7	2.7		0.6	0.6	-
Aug-06	0.9	0.6	0.8	0.7	0.7	0.8	0.7	1.7		3.7	0.9	
Sep-06	1.6	0.7	1.1	1.7	0.7	1	0.9	1.3	1.2	0.8	1.6	-
Oct-06	2	1.4	1.6	1.8	0.9	1.8	1.2	1.8	1.5	1.8	1.9	10
Nov-06	4.3	2.2	3	2.3	2.3	5.3	2.4	3.3	2.3	2.3	2.9	10
Dec-06	1.2	3,4	1.9	2.3	2.3		2.1	2.1	-	4.9	3.9	-
Jan-07	2	0.9	1.5	0.7	0.7	1.7	1.1		1.2	1.7	0.9	8
Feb-07	1.7	0.9	1.6	0.7	0.6	1	1.8	1.7	1.1	1.2	1.7	-
Mar-07	1.3	0.9	1.7	0.8	1.2	0.6	2.2	1.7	1	0.9	1.7	-
Apr-07	0.5	0.7	0.9	0.6	4.8	1.2	0.5	2.7	0.5	0.8	0.9	-
May-07	0.8	0.5	0.6	1.2	0.6	0.6	0.7	1.9	0.5	0.7	0.8	
Jun-07	0.6	0.5	0.7	1.1	0.1	0.5	0.1	0.5	0.1	0.4	0.3	
Jul-07	0.5	0.4	0.6	2.1	0.5	0.8	0.6	0.6	0.4	0.5	0.7	*
Aug-07	1.5	0.4	0.7	1	0.7	0.7	0.5	1	0.6	0.6	0.7	-
Sep-07	1.3	0.5	1.8	1	0.7	0.9	0.9	1.3	1	0.7	1.6	8
Oct-07	4.2	0.9	1.1	1.4	1.1	1.7	1.8	1.7	1.6	1.4	2.2	-
Nov-07	0.8	0.8	1.1	0.9	1.1	1.1	1.1	1.7	0.6	0.8	1.5	-
Dec-07	1.3	0.8	3	0.7	0.5	0.8	0.5	1.1	0.3	0.8	0.6	-
Jan-08	2.6	0.8	3.7	0.5	0.5	0.5	0.4	2.2	0.8	0.3	0.8	4
Feb-08	0.4	0.1	14	0.1	0.1	0.3	0.1	0.3	0.2	0.2	0.3	



Mar-08	4.5	0.6	9.2+	0.6	2.9	2.1	0.6	1.5	0.5	1	0.9	-
April-08	0.4"	0.4"	0.8"	0.4"	0.4*	0.8"	1.1"	1.7"	1.2	1.1*	1.1*	4
May-08	1.1	2.4"	0.9	1.4	0.9	0.9	0.7	2.7	1#	1.1	1.3*	9
June-08	0.2	0.4"	0.1	0.5	0.1"	0.1	0.3	0.5"	0.1	0.8	0.2	4
July-08	0.4	0.7"	1.3"	0.6	0.8*	0.9	0.8	1	0.7	0.5	1.1	-
Aug-08	1	0.5	0.7	0.6	0.5	1.9	0.8	1	1	0.9	1.4	*
Sep-08	0.6	1	1.3	0.7	0.6	0.9	0.6	0.9	0.9	0.9	1.8	
Oct-08	1	0.5	1	1.3	1.3	1.2	1	1.4	0.8	1.6	1.8	*
Nov-08	0.8	1.4	2.7	2.5	0.9	1.2	0.8	2.4	1.1	1	1.7	÷ -
Dec-08	0.4	0.4	0.6	0.5	0.3	1.1	0.6	15	0.9	0.7	1.2	Q. 1
Jan-09	1.1	3"	1.6	0.8	0.9	1.4	0.7	1.5	0.9	0.9	5+	4.
Feb-09	0.4	4.4	1.5	1.1	0.9	1.6	0.8	1.2	1.4	2.5	1.2	.4
Mar-09	2.8	5.8	2.7	2.4	1.9	2.1	2.5	2.4	2.3	5.7	2.7	2
Apr-09	2	0.8	0.8	0.6	0.6	3.2	1.1	1.1	1	0.6	0.9	-
May-09	0.6	1.6	0.8	2.4	0.9	5.6 +	1.4	1.1	1.3	0.7	1.5	-
Jun-09	0.4	1.3	0.8	0.5	0.5	3.3	0.9	0.6	1	3.4	0.7	~
Jul-09	0.2	1.0	0.6	0.4	0.3	3.8	0.5	0.6	0.6	0.3	0.6	
Aug-09	0.8	3.6	0.8	1.2	1.0	1.8	0.8	1.8	1.3	0.8	1.0	-
Sep-09	1.0	1.8#	1.8	8.3 +	1	1.8	0.9*	1.8*	1.7*	0.7	1.4*	4
Oct-09+	4.3	9"	5.2"	11.3"	3.2	3.8"	2.4"	6.8"	3.0*	2.2	3.2"	5.7
Nov-09	0.8*	1.7*	1.4#	1.3*	0.7#	2.1*	1.3*	8.0#	*	1.0*	*	2.3
Dec-09	1.4"	4.0#	1.6*	2.4"	1.7*	1.8	1.6	2.6#	1.7"	1.7*	2.2#	1.7
Jan-10	0.6*	0.8#	5.6#	1.2*	2.4*	1.2*	0.8*	1.4*	1.3*	0.8*	1.3*	1.14
Feb-10	1.9*	11.3*	1.9*	1.4"	1.5*	1.1*	1.2*	1.6#	1.1*	0.8*	1.8*	1.34
Mar-10	0.6"	0.6*	3.2*	1"	4.1*	0.6*	0.6"	1.2	0.6	0.2*	0.8*	1.1*
Apr-10	0.8*	1.8*	2.4#	0.7*	+	0.3	0.6*	0.9*	0.6*	0.4*	0.8*	0.8
May-10	0.8	4.9*	3.0*	1.1	1.2	1.0	0.7	1.3	1.0#	0.5	1.1*	0.8
Jun-10	0.3	2.2*	3.0#	0.6#	0.2	1.2#	0.5	0.5*	0.6	0.7*	0.7*	0.4
Jul-10	0.6"	1.1"	0.7"	0.7	0.5	0.3	0.5*	0.6"	0.7	0.2"	0.8	0.5
Aug-10	0.4	0.5*	1.9#	0.8#	0.2#	0.7#	0.5#	0.5*	0.6	0.5*	0.7*	0.4*
Sep-10	0.6#	2.6#	1.6#	1.0#	0.5*	1.1"	0.5#	1.0*	0.9#	0.6#	0.8*	0.9*
Oct-10	0.9*	1.6*	0.9*	0.5*	0.4*	0.5	1.0*	1.3*	1.2#	2.0*	1.2*	0.4
Nov-10	0.9#	3.5*	0.9*	1.4*	1.1"	0.9	0.6#	0.9*	*	0.9*	0.8*	1.1*
Dec-10	1.0*	0.7*	0.9*	1.1*	0.5"	0.4"	0.6*	2.4*	1.0*	0.5	1.0"	1.4
Jan-11	1.0*	0.7*	1.8*	1.2*	0.6*	0.7	0.9*	1.3*	1.0*	0.5*	1.5*	1.0
Feb-11	0.7	4.1+	0.9	1.0	0.7	0.7	1.0*	1.2	*	0.6	1.4	1.4
Mar-11	0.5	2.9*	+	0.9	1.7"	0.8	0.9*	1.9*	*	0.8*	1.2*	1.3
Apr-11	0.7	0.6*	4.9*	0.8*	1.1*	0.7	0.9*	2.1*	0.8*	1.0*	0.3*	0.7
May-11	0.4	1.1"	5.4"	0.7*	0.4	0.5*	0.6*	1.5"	0.4	0.4*	0.6"	0.7
Jun-11	0.7	1.1	1.7	0.9	0.7	0.8	0.6	1.2	0.7	0.9	0,8	1.1
Aug-11	0.4	0.1	0.6	0.7	0.5	0.4	0.5	2.4	1	1	0.6	0.8
Sep-11	1.3*	0.4*	0.8*	0.5	0.6*	+	0.6*	1.5*	0.6*	2.3*	0.7*	0.7

\* - sample contaminated + - sample invalid \*Broken funnel

[Note: Samples for October 2009 have been considered invalid, due to a widespread dust storm experienced on 23<sup>rd</sup> September 2009.]

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APPENDIX B

Figures

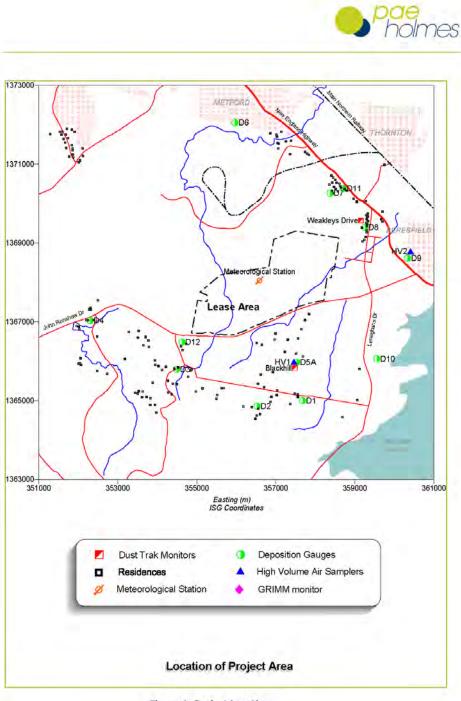


Figure 1: Project Location

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**DONALDSON COAL PTY LTD** Abel Underground Coal Mine Appendix 2



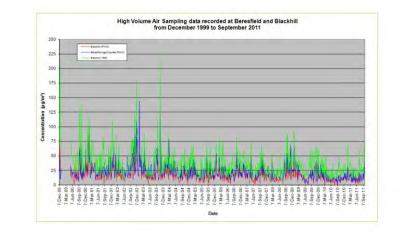


Figure 2: High Volume Air Sampling data

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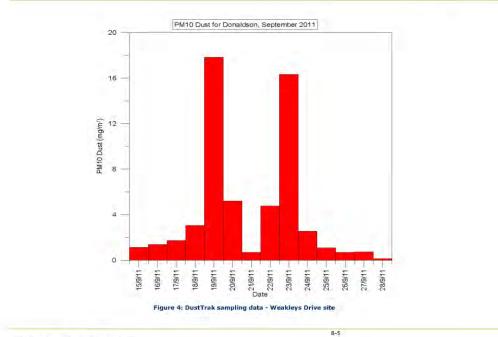
No Monitoring was available for this site in September 2011 due to equipment failure caused by power loss.

Figure 3: DustTrak sampling data - Blackhill site

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B-3



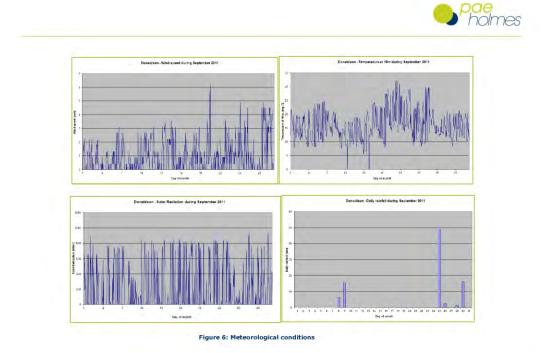


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No PM2.5 monitoring was conducted during this month Figure 5: DustTrak PM2.5 monitoring data

**DONALDSON COAL PTY LTD** Abel Underground Coal Mine Appendix 2



B-7

DONALDSON COAL PTY LTD Abel Underground Coal Mine Appendix 2



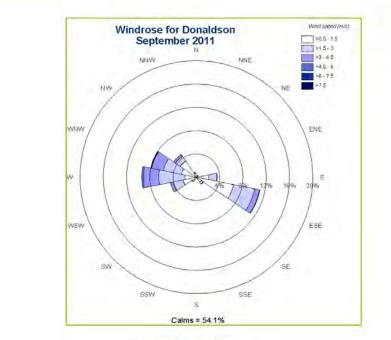


Figure 7: Windrose

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DONALDSON COAL PTY LTD Abel Underground Coal Mine Appendix 2



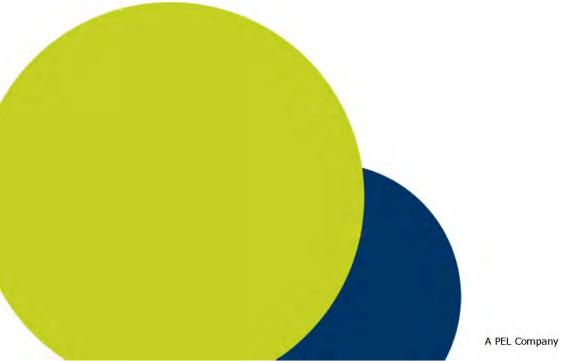
# REPORT

**DUST AND METEOROLOGICAL DATA - OCTOBER** 2011

**Donaldson Coal** 

Job No: 3003

8 March 2012





## PROJECT TITLE:

JOB NUMBER:

PREPARED FOR:

PREPARED BY:

APPROVED FOR RELEASE BY:

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DUST AND METEOROLOGICAL DATA - OCTOBER 2011

3003

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### DONALDSON COAL

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## **1** INTRODUCTION

As part of their Air Quality Management Plan, Donaldson Coal operate an ambient air quality monitoring network, including dust monitoring in the vicinity of the mining lease and meteorological monitoring at a single station on-site. This report has been prepared as a summary of the data collected throughout the network during October 2011.

The dust monitoring network includes continuous monitoring using TSI DustTrak, high volume air sampling (HVAS) on a one-day-in-six run cycle and dust deposition monitoring.

The continuous monitoring network consists of two DustTrak monitors measuring  $PM_{10}$  at two sites and an additional DustTrak monitor used for one week each quarter to measure  $PM_{2.5}$ .

There are two HVAS locations used to determine ambient concentrations of  $PM_{10}$  and TSP. These operate on a one-day-in-six run cycle, in line with similar measurements made by the NSW Office of Environment and Heritage (OEH)<sup>a</sup> at other locations throughout the state.

Monthly levels of dust deposition are also measured using twelve gauges placed at various locations in the vicinity of the mine. The locations of each of these monitors and gauges are shown in **Figure 1**.

Table 1 lists the instruments used and pollutants measured at these locations.

Manitaring Location	Instrumenta Used	Pollutant Monitored
Beresfield	HVAS	PMIO
Blackhill	HVAS	PMto
	HVAS	TSP
	DustTrak	PM <sub>L0</sub>
	DustTrak (1 week per quarter)	PM <sub>2.5</sub>
Weakleys Drive	DustTrak.	PM <sub>10</sub>
DG1 - DG12	Deposition Gauges	Dust Deposition

Table 1: Summary of monitoring locations and instruments

Meteorological data are downloaded monthly and forwarded to PAEHolmes for processing. The meteorological station is situated at the site of the office buildings and measures the following parameters:

- wind speed;
- wind direction;
- temperature;
- solar radiation; and
- rainfall.

<sup>a</sup> The NSW EPA exists as a legal entity operated within the Office of Environment and Heritage (OEH) which came into existence in April 2011. OEH was previously part of the Department of Environment, Climate Change and Water (DECCW). The DECCW was also recently known as the Department of Environment and Climate Change (DECC), and prior to that the Department of Environment and Conservation (DEC). The terms NSW EPA, OEH, DECCW, DECC and DEC are interchangeable in this report.

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## 2 HIGH VOLUME AIR SAMPLING

High Volume Air Sampling (HVAS) was carried out at Beresfield and Blackhill by RCA Laboratories.  $PM_{10}$  is measured at both sites while TSP is only measured at Blackhill. The data collected during October 2011 are summarised in **Table 2**. A graph consisting of all the data collected to date is shown in

### Figure 2.

Date	Beresfield PM <sub>10</sub> (µg/m²)	Blackhill PM <sub>22</sub> (µg/m²)	Blackhill TSP (µg/m <sup>3</sup> )
5/10/2011	12	21	21
11/10/2011	14	30	30
17/10/2011	16	35	35
23/10/2011	26	32	32
29/10/2011	14	33	33
Annual average	14	12	27

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All measurements of  $PM_{10}$  for October are below the 24-hour OEH  $PM_{10}$  goal of 50 µg/m<sup>3</sup>. The highest 24-hour average  $PM_{10}$  concentration was 35 µg/m<sup>3</sup>, recorded at Blackhill on 17 October.

Figure 2 shows a seasonal trend in  $PM_{10}$  concentrations, peaking during the warmer months and decreasing during autumn and winter. This is a common trend and is seen consistently in the Hunter Valley.

The annual average  $PM_{10}$  concentrations for Beresfield and Blackhill were 14  $\mu g/m^3$  and 12  $\mu g/m^3$  respectively for the 12 months to October 2011. These values are below the OEH annual average  $PM_{10}$  goal of 30  $\mu g/m^3$ .

TSP measurements from the Blackhill site show that concentrations were below the OEH annual average TSP goal of 90  $\mu$ g/m<sup>3</sup>. It should be noted that the goal refers to an annual average and not a 24-hour average as measured by the high volume air sampler. The annual average TSP concentration for the 12 months to October 2011 was 27  $\mu$ g/m<sup>3</sup>.

These measurements will include all background sources relevant to that location, including contributions from the Donaldson mining operations.

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# **3 CONTINUOUS MONITORING**

## 3.1 DustTrak Monitoring at Blackhill

Monitoring data was not available for October 2011. During the measurement period, access to the site was unable to be obtained.

## 3.2 DustTrak Monitoring at Weakleys Drive

Monitoring data was not available for October 2011 due to equipment malfunction.

## 3.3 DustTrak PM<sub>2.5</sub> Monitoring at Blackhill

PM<sub>2.5</sub> monitoring was not carried out in October 2011.

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# 4 DUST DEPOSITION MONITORING

Dust deposition monitoring is carried out each month via a network consisting of twelve (12) gauges. The results for October 2011 are shown in **Table 3**, in conjunction with results for the previous eleven months in order to provide an annual average for that period.

A summary of the complete data set from June 2000 is provided in Appendix A.

Month			M	onthly i	dust dep	osition	rate (g/	m²/mon	th)			
	DG1	DG2	DG3	DG4	DG5A	DG6	DG7	DG8	DG9	DG10	DG11	DG12
Oct-10	0.9#	1.6*	0.9"	0.5#	0.4*	0.5	1.0*	1.3*	1.2"	2.0*	1.2"	0.4*
Nov-10	0.9*	3.5*	0.9#	1.4*	1.1*	0.9	0.6*	0.9*	*	0.9*	0.8*	1.1*
Dec-10	1.0#	0.7*	0.9"	1.1*	0.5*	0.4*	0.6*	2.4*	1.0*	0.5	1.0*	1.4*
Jan-11	1.0#	0.7#	1.8*	1.2*	0.6*	0.7	0.9#	1.3*	1.0"	0.5#	1.5#	1.0
Feb-11	0.7	4.1*	0.9	1.0	0.7	0.7	1.0*	1.2	*	0.6	1.4	1.4
Mar-11	0.5	2.9*	+	0.9	1.7*	0.8	0.9*	1.9*	*	0.8*	1.2*	1.3*
Apr-11	0.7	0.6*	4.9*	0.8*	1.1*	0.7	0.9*	2.1*	0.8"	1.0*	0.3*	0.7*
May-11	0.4	1.1"	5.4"	0.7*	0.4	0.5*	0.6*	1.5*	0.4	0.4*	0.6*	0.7*
Jun-11	0.7	1.1	1.7	0.9	0.7	0.8	0.6	1.2	0.7	0.9	0.8	1.1
Jul- 11	0.6	0.5	1.6	<0.1	0.4	0.3	0.3	1.8	0.8	0.5	0.9	0.7
Aug-11	0.4	0.1	0.6	0.7	0.5	0.4	0.5	2.4	1	1	0.6	0.8
Sep-11	1.3*	0.4*	0.8*	0.5	0.6*	+	0.6*	1.5*	0.6*	2.3*	0.7*	0.7*
Oct-11	1	1.2	0.6	1.3	-	1	1.4	1.5	1.4	1.3	1.4	1.1
Annual Average	0.7	1.5	1.9	1.0	0.8	0.7	0.8	1.7	0.9	0.8	1.0	1.0

Table 3: Dust deposition monitoring for the 12-month period	d to October 2011
---	-------------------

Data supplied by RCA Laboratories. <sup>#</sup>Insects/bird droppings reported. <sup>+</sup>Invalid. \* No recording, funnel damaged. Readings considered invalid have been removed when calculating the annual average.

The highest dust deposition measurement recorded in October 2011 was 1.5  $g/m^2/month$  at DG8.

It is noted that the OEH goal for dust deposition is expressed as an annual average and the annual average deposition rates for the gauges in the network are all significantly below the goal of 4 g/m<sup>2</sup>/month, indicating nuisance dust in the vicinity of the mine is not an issue.

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# 5 METEOROLOGICAL MONITORING

Monthly plots of the wind speed, temperature, solar radiation, and rainfall data collected in October 2011 are shown in **Figure 6** and a windrose plot is shown in **Figure 7**.

The graphs shown in **Figure 6** indicate that the instruments were recording appropriately. Data maxima and minima all appeared to be sensible for this site during October. Total rainfall for the month was 98.8 mm. This is consistent with permanent Bureau of Meteorology weather stations in the area.

A windrose (see **Figure 7**) created from the available 30-minute average wind data shows that winds were predominantly from the Northwest and East-South East.

The site recorded calms (wind speed less than or equal to 0.5 m/s) for approximately 50.9% of the time. The relatively large fraction of calm winds is significantly higher than would be expected and may be as a result of the sheltered location of the weather station.

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APPENDIX A

Dust Deposition Data

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Month	D1	D2	D3	Dust D4	depositi D5A	on (g/r D6	n²/mont D7	:h) D8	D9	D10	D11	D12
Jun-00	0.7	0.5	0.5	0.7	0.8	0.4	3.8	3.2	0.5	0.7	-	1. C
Jul-00	0.4	0.4	0.5	0.7	0.8	0.5	0.8	1.5	0.4	0.4	-	4
Aug-00	0.9	0.6	1.0	1.2	1.1	1.0	3.4	0.7	0.7	0.6	-	0
Sep-00	0.8	0.9	1.1	0.9	1.3	1.0	2.2	1.0	1.0	0.8	-	80
Oct-00	0.4	0.6	1.1	0.9	0.9	0.8	5.3	0.9	0.6	0.5	-	-
Nov-00	5.2	0.7	1.4	0.8	1.0	0.4	24.1	9.4	1.1	0.6	-	12
Dec-00	2.8	1.4	1.9	1.3	1.1	0.8	2.1	2.5	0.9	0.9	1.20	-
Jan-01	0.7	1.7	1.4	1.8	0.7	1.3	1.1	2.4	1.1	0.6		-
Feb-01	0.9	3.1	2.0	0.5	0.9	0.7	0.7	6.7	1.3	0.5	1.0	-
Mar-01	0.8	2.1	1.3	0.6	0.7	0.6	0.6	5.5	0.6	0.6	1.5	-
Apr-01	0.8	0.7	1.3	0.5	0.7	0.4	0.3	5.1	0.7	0.6	0.8	-
May-01	0.2	0.2	0.4	0.4	0.3	0.3	0.6	1.8	0.6	0.8	0.9	4
Jun-01	0.5	0.4	0.5	1.0	1.0	0.4	0.4	8.8	0.7	0.6	0.6	-
Jul-01	0.5	0.3	1.8	0.5	0.8	-	16.3	4.9	0.9	0.7	0.7	-
Aug-01	0.4	0.4	0.8	0.8	1.0	1.7	1.0	-	1.0	1.8	1.1	2
Sep-01	0.4	1.0	1.7	1.1	1.7	0.7	-	6.0	1.1	1.3	1.7	0
Oct-01	1.1	0.6	4.6	0.9	0.7	0.9	1.2	1.9	0.9	0.6	1.7	-
Nov-01	0.9	1.0	1.1	1.1	0.8	1.1	6.0	5.5	1.3	1.9	2.3	2
	1			1			-					
Dec-01	4.9	0.9	4.2	0.9	1.3	1.9	1.2	3.1	1.2	9.7	1.8	-
Jan-02	0.8	1.0	1.5	1.3	1.1	1.4	1.3	1.5	1.1	0.9	1.5	8
Feb-02	1.1	1.1	0.9	0.3	0.4	0.5	3.1	5.1	0.5	0.5	0.9	*
Mar-02	1.7	2.1	1.6	0.7	0.7	0.8	1.0	18	1.0	0.9	1.7	
Apr-02	1.0	0.4	1.0	0.8	0.8	0.6	0.9	10.1	0.5	0.7	1.0	~
May-02	0.6	0.6	6.0	0.7	0.4	1.2	0.9	3.1	0.7	0.2	1.0	. *
Jun-02	1.4	0.4	1.7	0.6	0.5	0.8	0.6	2.1	0.6	0.5	1.0	-
Jul-02	0.7	0.7	-	0.8	0.8	0.7	1.2		1.1	0.5	1.0	-
Aug-02	1.3	0.8	1.4	1.2	1.1	1.2	1.5	-	1.5	0.9	1.6	
Sep-02	0.5	1.2	1.1	0.8	0.5	0.7	5.1	9.3	1.6	0.6	1.0	1.
Oct-02	2.2	1.4	5.2	1.5	1.5	1.4	1.4	3.4	-	1.5	3.1	- 4
Nov-02	2.8	1.8	3.7	1.6	0.1	1.8	2.1	3.5	2.1	2	1.9	-
Dec-02	2.0	. 4	2.5	1.5	3.0	1.5	1.8	4.1	1.6	1.2	1.9	+
Jan-03	2.1	1.5	2.7	1.5	1.0	1.9	2.2	2.5	1.1	1.0	1.6	8
Feb-03	1.4	1.1	2.6	1.1	0.9	1.2	1.7	5.9	1.2	1.0	1.5	-
Mar-03	0.8	0.5	1.2	1.2	0.6	2.1	1.5	3.4	-	3.6	9.5	4
Apr-03	0.5	1.0	0.6	1.0	0.7	0.5	1.1	8.0	4	2.0	1.0	4.1
May-03	0.5	0.4	0.6	0.2	0.2	0.6	1.3	1.6	0.5	0.8	1.2	4
Jun-03	0.5	0.6	0.8	0.8	0.4	0.6	0.8	0.7	0.9	0.7	0.7	-
Jul-03	0.3	0.4	0.4	0.6	0.4	0.5	0.7	0.5	0.5	0.5	0.7	40
Aug-03	0.8	0.2	0.7	1.1	0.5	1.3	1.8	2.1	1.3	0.7	0.9	4
Sep-03	0.6	0.7	1.1	0.7	0.8	1.7	1.4	1.3	2.5	0.9	1.3	-
Oct-03	-	0.9	1.4	0.9	0.7	1.9	1.0	1.4	0.6	0.8	1.3	4.
Nov-03	2.6	0.8	1.0	1.1	0.4	1.3	1.5	1.5		0.8	1.3	-
Dec-03	1.0	1.0	1.4	1.3	1.1	1.5	1.6	2.0	1.8	0.9	1.4	2.
Jan-04	8.5	1.5	2.1	1.5	1.3	2.6	1.4	2.2	1.7	1.5	1.7	4
Feb-04	1.2	1.0	1.7	1.4	0.7	3.1	1.6	2.2	-	1.5	2.3	4
Mar-04	0.4	0.6	6.6	1.2	0.7	1.9	1.1	12.1	4.8	1.5	1.1	12

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A-2



Apr-04	0.6	1.0	0.8	0.8	0.6	1.9	0.8	1.4	0.9	1.2	1.1	-
May-04	0.2	0.9	2.2	0.9	0.8	0.7	0.9	1.4	1.2	0.9	1.5	10
Jun-04	0.4	0.6	0.7	0.9	0.6	1.4	1.0	0.9	1.0	1.0	0.8	2.1
Jul-04	0.4	0.6	5.3#	0.6	0.5	2.9	1.0	1.1	0.9	0.6	1.2	4
Aug-04	0.5	0.5	0.5	1.3	0.7	1.1	1.1	1.4	-	1.0	1.0	4
Sep-04	0.6	0.6	0.8	2.2	1.0	1.0	0.9	4.4	0.9	16.7	1.1	*
Oct-04	0.7	0.9	1.2	0.9	0.8	1.4	1.0	10.5	1.0	1.0	0.8	Ψ.
Nov-04	0.8	0.7	1.3	1.9	0.7	0.9	1.0	3.0	1.1	1.1	1.6	×
Dec-04	2.0	1.4	3.6	1.5	1.3	2.2	3.2	7.9	1.8	5.5	2.5	4
Jan-05	1.2	1.0	3.7	1.6	1.4	4.0	2.3	2.7	2.6	2.5	2.8	ý.
Feb-05	1.2	1.2	1.8	1.6	1.3	2.0	1.7	-	2.3	1.5	2.3	4.
Mar-05	1.3	0.9	1.4	0.9	0.9	3.0	1.2	7.7	1.	0.8	1.3	. 4
Apr-05	1.1	0.7	0.9	0.8	0.7	0.9	1.4	3.3	1.1	0.8	0.9	12
May-05	0.7	8.6	1.1	0.8	0.7	0.8	0.9	4.4	1.2	0.8	1.1	-
Jun-05	1.3	0.8	1.3	1.3	0.8	1.2	1.2	1.3	1.5	2.5	0.9	
Jul-05	1.0	0.5	0.5	0.7	0.4	1.6	0.7	1.2	0.8	4.3	1.1	~
Aug-05	0.6	0.6	0.8	1.0	0.8	0.9	0.7	1.0	0.9	1.0	0.9	-
Sep-05	0.6	0.7	0.8	0.7	0.7	1.2	1.3	1.3	1.0	0.9	1.1	-
Oct-05	0.8	0.9	1.3	0.9	0.8	1.4	1.2	1.9	1.3	1.1	1.3	4
Nov-05	4	2.3	2.3	2.0	1.7	1.2	2.0	3.2	1.6	1.4	2.2	4
Dec-05	1.9	3.2	2.3	3.3	2.6	3.4	2.3	-	1.3	2.1	3.9	140
Jan-06	1.0	2.1	1.7	1.0	23.	3.5	-	2.7	1.1	-	1.5	-
Feb-06	2.2	1.0	0.9	1.2	1.1	1.7	1.1	2.9		2.3	1.8	ω.
Mar-06	0.7	0.6	2.3	0.7	0.6	0.9	1.0	1.4	0.7	0.8	1.5	-
Apr-06	0.6	0.7	1.1	0.8	0.6	1.1	0.8	1.0	1.0	1.8	1.5	
May-06	1.0	3.1	1.0	-	1.1	1.4	1.1	4.1	1	7.0	1.5	9
Jun-06	0.4	0.3	0.7	0.5	0.4	0.6	0.7	0.8	0.6	0.9	0.9	-
Jul-06	0.3	0.3	1	1.3	0.4	0.7	0.7	2.7	4	0.6	0.6	~
Aug-06	0.9	0.6	0.8	0.7	0.7	0.8	0.7	1.7	-	3.7	0.9	
Sep-06	1.6	0.7	1.1	1.7	0.7	1	0.9	1.3	1.2	0.8	1.6	-
Oct-06	2	1.4	1.6	1.8	0.9	1.8	1.2	1.8	1.5	1.8	1.9	-
Nov-06	4.3	2.2	3	2.3	2.3	5.3	2.4	3.3	2.3	2.3	2.9	3
Dec-06	1.2	3,4	1.9	2.3	2.3	2.5	2.1	2.1	2.0	4.9	3.9	
Jan-07	2	0.9	1.5	0.7	0.7	1.7	1.1		1.2	1.7	0.9	4
Feb-07	1.7	0.9	1.6	0.7	0.6	1	1.8	1.7	1.1	1.2	1.7	1
Mar-07	1.3	0.9	1.7	0.8	1.2	0.6	2.2	1.7	1	0.9	1.7	2
Apr-07	0.5	0.7	0.9	0.6	4.8	1.2	0.5	2.7	0.5	0.8	0.9	2
May-07	0.8	0.5	0.6	1.2	0.6	0.6	0.7	1.9	0.5	0.7	0.8	1.
Jun-07	0.6	0.5	0.7	1.1	0.1	0.5	0.1	0.5	0.1	0.4	0.3	
Jul-07	0.5	0.4	0.6	2.1	0.5	0.8	0.6	0.6	0.4	0.5	0.7	-
Aug-07	1.5	0.4	0.7	1	0.7	0.7	0.5	1	0.6	0.6	0.7	-
Sep-07	1.3	0.5	1.8	1	0.7	0.9	0.9	1.3	1	0.7	1.6	1.4
Oct-07	4.2	0.9	1.1	1.4	1.1	1.7	1.8	1.7	1.6	1.4	2.2	1.
Nov-07	0.8	0.8	1.1	0.9	1.1	1.1	1.0	1.7	0.6	0.8	1.5	1.2
Dec-07	-		3									
	1.3	0.8		0.7	0.5	0.8	0.5	1.1	0.3	0.8	0.6	1.0
Jan-08 Feb-08	2.6	0.8	3.7 14	0.5	0.5	0.5	0.4	0.3	0.8	0.3	0.8	-

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Mar-08	4.5	0.6	9.2+	0.6	2.9	2.1	0.6	1.5	0.5	1	0.9	-
April-08	0.4"	0.4"	0.8"	0.4"	0.4*	0.8"	1.1"	1.7"	1.2	1.1*	1.1*	9
May-08	1.1	2.4"	0.9	1.4	0.9	0.9	0.7	2.7	1#	1.1	1.3*	8.
June-08	0.2	0.4"	0.1	0.5	0.1"	0.1	0.3	0.5"	0.1	0.8	0.2	4
July-08	0.4	0.7"	1.3"	0.6	0.8*	0.9	0.8	1	0.7	0.5	1.1	-
Aug-08	1	0.5	0.7	0.6	0.5	1.9	0.8	1	1	0.9	1.4	*
Sep-08	0.6	1	1.3	0.7	0.6	0.9	0.6	0.9	0.9	0.9	1.8	Ψ
Oct-08	1	0.5	1	1.3	1.3	1.2	1	1.4	0.8	1.6	1.8	*
Nov-08	0.8	1.4	2.7	2.5	0.9	1.2	0.8	2.4	1.1	1	1.7	÷ .
Dec-08	0.4	0.4	0.6	0.5	0.3	1.1	0.6	15	0.9	0.7	1.2	Q.
Jan-09	1.1	3"	1.6	0.8	0.9	1.4	0.7	1.5	0.9	0.9	5*	4.
Feb-09	0.4	4.4	1.5	1.1	0.9	1.6	0.8	1.2	1.4	2.5	1.2	4
Mar-09	2.8	5.8	2.7	2.4	1.9	2.1	2.5	2.4	2.3	5.7	2.7	4
Apr-09	2	0.8	0.8	0.6	0.6	3.2	1.1	1.1	1	0.6	0.9	-
May-09	0.6	1.6	0.8	2.4	0.9	5.6 +	1.4	1.1	1.3	0.7	1.5	-
Jun-09	0.4	1.3	0.8	0.5	0.5	3.3	0.9	0.6	1	3.4	0.7	-
Jul-09	0.2	1.0	0.6	0.4	0.3	3.8	0.5	0.6	0.6	0.3	0.6	
Aug-09	0.8	3.6	0.8	1.2	1.0	1.8	0.8	1.8	1.3	0.8	1.0	-
Sep-09	1.0	1.8#	1.8	8.3 +	1	1.8	0.9*	1.8*	1.7*	0.7	1.4*	4
Oct-09+	4.3	9#	5.2"	11.3"	3.2	3.8"	2.4"	6.8"	3.0*	2.2	3.2"	5.7"
Nov-09	0.8*	1.7*	1.4#	1.3#	0.7*	2.1*	1.3*	8.0*	*	1.0*	*	2.3
Dec-09	1.4"	4.0#	1.6#	2.4	1.7*	1.8	1.6	2.6#	1.7*	1.7*	2.2#	1.7
Jan-10	0.6*	0.8#	5.6#	1.2#	2.4*	1.2*	0.8*	1.4*	1.3*	0.8*	1.3*	1.1"
Feb-10	1.9*	11.3*	1.9*	1.4#	1.5*	1.1*	1.2*	1.6#	1.1*	0.8*	1.8*	1.3"
Mar-10	0.6"	0.6*	3.2*	1"	4.1"	0.6*	0.6"	1.2	0.6	0.2*	0.8*	1.1"
Apr-10	0.8*	1.8*	2.4#	0.7#	+	0.3	0.6*	0.9*	0.6*	0.4*	0.8*	0.84
May-10	0.8	4.9*	3.0*	1.1	1.2	1.0	0.7	1.3	1.0#	0.5	1.1*	0.8
Jun-10	0.3	2.2*	3.0*	0.6#	0.2	1.2*	0.5	0.5*	0.6	0.7*	0.7*	0.4"
Jul-10	0.6"	1.1"	0.7"	0.7	0.5	0.3	0.5*	0.6"	0.7	0.2"	0.8	0.5
Aug-10	0.4	0.5*	1.9#	0.8#	0.2#	0.7#	0.5#	0.5*	0.6	0.5#	0.7*	0.4*
Sep-10	0.6#	2.6#	1.6#	1.0#	0.5*	1.1*	0.5#	1.0#	0.9#	0.6#	0.8#	0.9*
Oct-10	0.9*	1.6*	0.9*	0.5*	0.4*	0.5	1.0*	1.3*	1.2#	2.0#	1.2*	0.4*
Nov-10	0.9*	3.5*	0.9*	1.4#	1.1"	0.9	0.6#	0.9*	*	0.9*	0.8*	1.1*
Dec-10	1.0*	0.7"	0.9*	1.1*	0.5"	0.4"	0.6*	2.4*	1.0*	0.5	1.0"	1.4"
Jan-11	1.0*	0.7#	1.8*	1.2*	0.6*	0.7	0.9*	1.3*	1.0*	0.5*	1.5*	1.0
Feb-11	0.7	4.1*	0.9	1.0	0.7	0.7	1.0*	1.2	*	0.6	1.4	1.4
Mar-11	0.5	2.9*	+	0.9	1.7*	0.8	0.9#	1.9*	*	0.8*	1.2*	1.3*
Apr-11	0.7	0.6*	4.9*	0.8*	1.1*	0.7	0.9*	2.1*	0.8*	1.0*	0.3*	0.7*
May-11	0.4	1.1"	5.4″	0.7*	0.4	0.5"	0.6*	1.5"	0.4	0.4"	0.6"	0.7"
Jun-11	0.7	1.1	1.7	0.9	0.7	0.8	0.6	1.2	0.7	0.9	0,8	1.1
Aug-11	0.4	0.1	0.6	0.7	0.5	0.4	0.5	2.4	1	1	0.6	0.8
Sep-11	1.3*	0.4*	0.8*	0.5	0.6*	+	0.6*	1.5*	0.6*	2.3*	0.7*	0.7*
Oct-11	11	11.2	0.6	1.3	~	1	1.4	1.5	1.4	1.3	1.4	1.1

 $^{\#}$  - sample contaminated] + - sample invalid]\*-Broken funnel] ~ - Site inaccessible

[Note: Samples for October 2009 have been considered invalid, due to a widespread dust storm experienced on 23<sup>rd</sup> October 2009.]

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APPENDIX B

Figures

Dust and Meteorological Data – October 2011 Donaldson Coal | PAEHolmes Job 3003

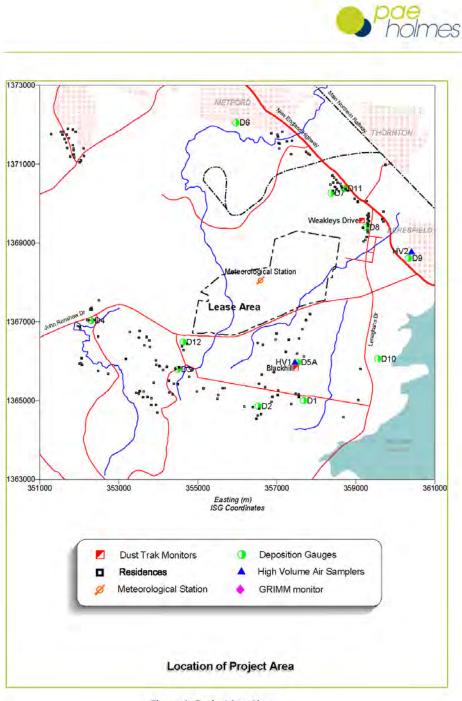


Figure 1: Project Location

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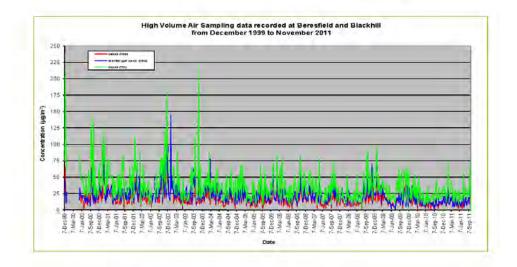


Figure 2: High Volume Air Sampling data

No Monitoring was available for this site in October 2011 due to inability to access the site.

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Figure 3: DustTrak sampling data - Blackhill site

No Monitoring was available for this site in October 2011 due to equipment malfunction

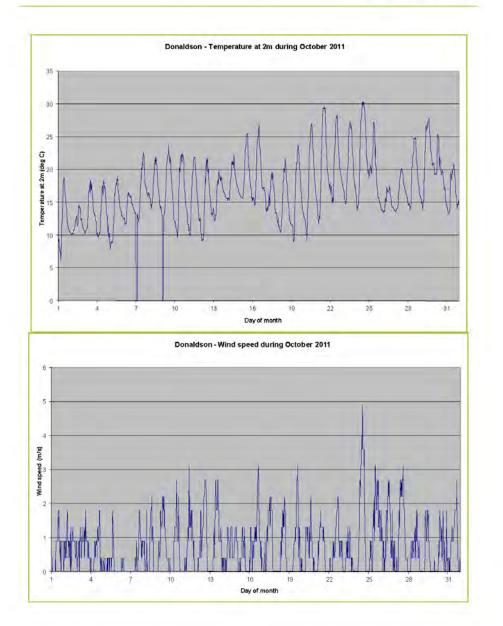
Figure 4: DustTrak sampling data - Weakleys Drive site

No PM2.5 monitoring was conducted during this month

Figure 5: DustTrak PM2.5 monitoring data

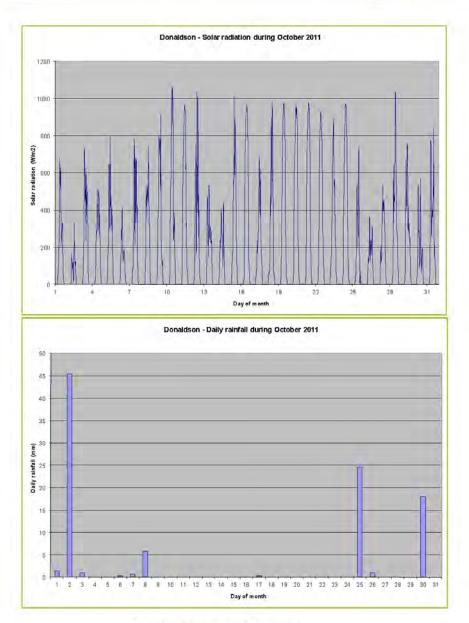
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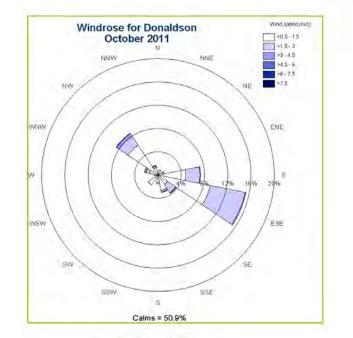


Figure 7: Windrose

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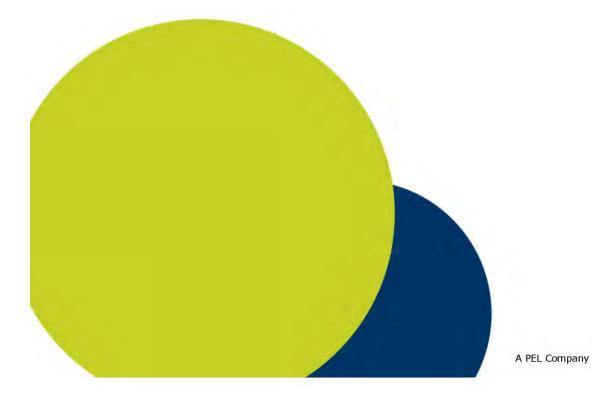
# REPORT

DUST AND METEOROLOGICAL DATA – NOVEMBER 2011

**Donaldson Coal** 

Job No: 3003

8 March 2012



## 2011/2012 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT Report No. 737/07



### PROJECT TITLE: DUST AND METEOROLOGICAL DATA -**NOVEMBER 2011** JOB NUMBER: 3003 Phil Brown PREPARED FOR: DONALDSON COAL PREPARED BY: Daniel Cullen APPROVED FOR RELEASE BY: Jane Barnett **DISCLAIMER & COPYRIGHT:** This report is subject to the copyright statement located at <u>www.paeholmes.com</u> © Queensland Environment Pty Ltd trading as PAEHolmes ABN 86 127 101 642

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Dust and Meteorological Data – November 2011 Donaldson Coal | PAEHolmes Job 3003



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## **1** INTRODUCTION

As part of their Air Quality Management Plan, Donaldson Coal operate an ambient air quality monitoring network, including dust monitoring in the vicinity of the mining lease and meteorological monitoring at a single station on-site. This report has been prepared as a summary of the data collected throughout the network during November 2011.

The dust monitoring network includes continuous monitoring using TSI DustTrak, high volume air sampling (HVAS) on a one-day-in-six run cycle and dust deposition monitoring.

The continuous monitoring network consists of two DustTrak monitors measuring  $PM_{10}$  at two sites and an additional DustTrak monitor used for one week each quarter to measure  $PM_{2.5}$ .

There are two HVAS locations used to determine ambient concentrations of  $PM_{10}$  and TSP. These operate on a one-day-in-six run cycle, in line with similar measurements made by the NSW Office of Environment and Heritage (OEH)<sup>a</sup> at other locations throughout the state.

Monthly levels of dust deposition are also measured using twelve gauges placed at various locations in the vicinity of the mine. The locations of each of these monitors and gauges are shown in **Figure 1**.

Table 1 lists the instruments used and pollutants measured at these locations.

Monitoring Location	Instruments Used	Pollutant Monitored			
Beresfield	HVAS	PM <sub>10</sub>			
Blackhill	HVAS	PMIG			
	HVAS	TSP			
	DustTrak	PMIG			
	DustTrak (1 week per quarter)	PM <sub>25</sub>			
Weakleys Drive	DustTrak	PM <sub>10</sub>			
DG1 - DG12	Deposition Gauges	Dust Deposition			

Table 1: Summary of monitoring locations and instruments

Meteorological data are downloaded monthly and forwarded to PAEHolmes for processing. The meteorological station is situated at the site of the office buildings and measures the following parameters:

- wind speed
- wind direction
- temperature
- solar radiation
- rainfall

<sup>a</sup> The NSW EPA exists as a legal entity operated within the Office of Environment and Heritage (OEH) which came into existence in April 2011. OEH was previously part of the Department of Environment, Climate Change and Water (DECCW). The DECCW was also recently known as the Department of Environment and Climate Change (DECC), and prior to that the Department of Environment and Conservation (DEC). The terms NSW EPA, OEH, DECCW, DECC and DEC are interchangeable in this report.

Dust and Meteorological Data – November 2011 Donaldson Coal | PAEHolmes Job 3003



# 2 HIGH VOLUME AIR SAMPLING

High Volume Air Sampling (HVAS) was carried out at Beresfield and Blackhill by RCA Laboratories.  $PM_{10}$  is measured at both sites while TSP is only measured at Blackhill. The data collected during November 2011 are summarised in **Table 2**. A graph consisting of all the data collected to date is shown in **Figure 2**.

Date	Barresfield PMas (pg/m²)	Blackhill PMac(pg/m²)	Bleckhill TSP (µg/m²)		
4/11/2011	16	13	17		
10/11/2011	26	34	65		
16/11/2011	28	27	31		
22/11/2011	14	15	21		
28/11/2011	13	20	29		
Annual average	15	13	28		

Table 2: HVAS data from Beresfield and Blackhill for November 2011
--

All measurements of  $PM_{10}$  for November are below the 24-hour OEH  $PM_{10}$  goal of 50  $\mu g/m^3$ . The highest 24-hour average  $PM_{10}$  concentration was 34  $\mu g/m^3$ , recorded at Blackhill on 17 November.

**Figure 2** shows a seasonal trend in  $PM_{10}$  concentrations, peaking during the warmer months and decreasing during autumn and winter. This is a common trend and is seen consistently in the Hunter Valley.

The annual average  $PM_{10}$  concentrations for Beresfield and Blackhill were 15  $\mu$ g/m<sup>3</sup> and 13  $\mu$ g/m<sup>3</sup> respectively for the 12 months to November 2011. These values are below the OEH annual average  $PM_{10}$  goal of 30  $\mu$ g/m<sup>3</sup>.

TSP measurements from the Blackhill site show that concentrations were below the OEH annual average TSP goal of 90  $\mu$ g/m<sup>3</sup>. It should be noted that the goal refers to an annual average and not a 24-hour average as measured by the high volume air sampler. The annual average TSP concentration for the 12 months to November 2011 was 28  $\mu$ g/m<sup>3</sup>.

These measurements will include all background sources relevant to that location, including contributions from the Donaldson mining operations.

Dust and Meteorological Data – November 2011 Donaldson Coal | PAEHolmes Job 3003



# **3 CONTINUOUS MONITORING**

## 3.1 DustTrak Monitoring at Blackhill

Monitoring data was not available for November 2011. During the measurement period, access to the site was unable to be obtained.

# 3.2 DustTrak Monitoring at Weakleys Drive

Monitoring data was not available for November 2011 due to equipment malfunction.

### 3.3 DustTrak PM<sub>2.5</sub> Monitoring at Blackhill

PM<sub>2.5</sub> monitoring was not carried out in November 2011.

Dust and Meteorological Data - November 2011 Donaldson Coal | PAEHolmes Job 3003



# 4 DUST DEPOSITION MONITORING

Dust deposition monitoring is carried out each month via a network consisting of twelve (12) gauges. The results for November 2011 are shown in **Table 3**, in conjunction with results for the previous eleven months in order to provide an annual average for that period.

A summary of the complete data set from June 2000 is provided in Appendix A.

Month	Monthly dust deposition rate (g/m²/month)													
	DG1	DG2	DG3	DG4	DG5A	DG6	DG7	DG8	DG9	DG10	DG11	DG12		
Nov-10	0.9″	3.5"	0.9"	1.4"	1.1*	0.9	0.6"	0.9*	*	0.9*	0.8*	1.1"		
Dec-10	1.0*	0.7*	0.9*	1.1*	0.5*	0.4*	0.6*	2.4*	1.0*	0.5	1.0*	1.4*		
Jan-11	1.0"	0.7"	1.8"	1.2"	0.6*	0.7	0.9"	1.3*	1.0"	0.5*	1.5*	1.0		
Feb-11	0.7	4.1*	0.9	1.0	0.7	0.7	1.0#	1.2	*	0.6	1.4	1.4		
Mar-11	0.5	2.9#	+	0.9	1.7*	0.8	0.9*	1.9*	*	0.8*	1.2*	1.3*		
Apr-11	0.7	0.6*	4.9*	0.8*	1.1*	0.7	0.9*	2.1*	0.8*	1.0*	0.3*	0.7*		
May-11	0.4	1.1*	5.4*	0.7*	0.4	0.5*	0.6#	1.5*	0.4	0.4*	0.6*	0.7*		
Jun-11	0.7	1.1	1.7	0.9	0.7	0.8	0.6	1.2	0.7	0.9	0.8	1.1		
Jul-11	0.6	0.5	1.6	<0.1	0.4	0.3	0.3	1.8	0.8	0.5	0.9	0.7		
Aug-11	0.4	0.1	0.6	0.7	0.5	0.4	0.5	2.4	1	1	0.6	0.8		
Sep-11	1.3*	0.4*	0.8"	0.5	0.6"	+	0.6"	1.5*	0.6#	2.3*	0.7*	0.7"		
Oct-11	1	1.2	0.6	1.3	~	1	1.4	1.5	1.4	1.3	1.4	1.1		
Nov-11	0.5	1	0.8	0.5	~	0.4	*	1.1	0.5	0.4	0.9	0.9		
Annual Average	0.7	1.3	2.0	0.9	0.8	0.6	0.8	1.6	0.8	0.7	1.0	1.0		

Table 3: Dust deposition monitoring for the 12	2-month period to November 2011
--	---------------------------------

Data supplied by RCA Laboratories. \* Insects/bird droppings reported. "Invalid. \* No recording, funnel damaged.  $\sim$  Unable to access site. Readings considered invalid have been removed when calculating the annual average.

The highest dust deposition measurement recorded in November 2011 was 1.6 g/m²/month at DG8.

It is noted that the OEH goal for dust deposition is expressed as an annual average and the annual average deposition rates for the gauges in the network are all significantly below the goal of 4  $g/m^2/month$ , indicating nuisance dust in the vicinity of the mine is not an issue.

Dust and Meteorological Data – November 2011 Donaldson Coal | PAEHolmes Job 3003



# 5 METEOROLOGICAL MONITORING

Monthly plots of the wind speed, temperature, solar radiation, and rainfall data collected in November 2011 are shown in **Figure 6** and a windrose plot is shown in **Figure 7**.

The graphs shown in **Figure 6** indicate that the instruments were recording appropriately. Data maxima and minima all appeared to be sensible for this site during November. Total rainfall for the month was 156.4 mm. This is consistent with permanent Bureau of Meteorology weather stations in the area.

A windrose (see **Figure 7**) created from the available 30-minute average wind data shows that winds were predominantly from the east-southeast and northwest.

The site recorded calms (wind speed less than or equal to 0.5 m/s) for approximately 45.8% of the time. The relatively large fraction of calm winds is significantly higher than would be expected and may be as a result of the sheltered location of the weather station.

Dust and Meteorological Data – November 2011 Donaldson Coal | PAEHolmes Job 3003

DONALDSON COAL PTY LTD Abel Underground Coal Mine Appendix 2



APPENDIX A

**Dust Deposition Data** 

Dust and Meteorological Data - November 2011 Donaldson Coal | PAEHolmes Job 3003 A-1



					depositi	on (g/r	n²/mont					
Month	D1	D2	D3	D4	DSA	D6	D7	D8	D9	D10	D11	D12
Jun-00	0.7	0.5	0.5	0.7	0.8	0.4	3.8	3.2	0.5	0.7	10	-
Jul-00	0.4	0.4	0.5	0.7	0.8	0.5	0.8	1.5	0.4	0.4	-	14
Aug-00	0.9	0.6	1.0	1.2	1.1	1.0	3.4	0.7	0.7	0.6		-
Sep-00	0.8	0.9	1.1	0.9	1.3	1.0	2.2	1.0	1.0	0.8	-	+
Oct-00	0.4	0.6	1.1	0.9	0.9	0.8	5.3	0.9	0.6	0.5	-	-
Nov-00	5.2	0.7	1.4	0.8	1.0	0.4	24.1	9.4	1.1	0.6	-	*
Dec-00	2.8	1.4	1.9	1.3	1.1	0.8	2.1	2.5	0.9	0.9	4	25
Jan-01	0.7	1.7	1.4	1.8	0.7	1.3	1.1	2.4	1.1	0.6	2	-
Feb-01	0.9	3.1	2.0	0.5	0.9	0.7	0.7	6.7	1.3	0.5	1.0	4
Mar-01	0.8	2.1	1.3	0.6	0.7	0.6	0.6	5.5	0.6	0.6	1.5	2
Apr-01	0.8	0.7	1.3	0.5	0.7	0.4	0.3	5.1	0.7	0.6	0.8	-
May-01	0.2	0.2	0.4	0.4	0.3	0.3	0.6	1.8	0.6	0.8	0.9	-
Jun-01	0.5	0.4	0.5	1.0	1.0	0.4	0.4	8.8	0.7	0.6	0.6	4
Jul-01	0.5	0.3	1.8	0.5	0.8	4	16.3	4.9	0.9	0.7	0.7	2
Aug-01	0.4	0.4	0.8	0.8	1.0	1.7	1.0		1.0	1.8	1.1	4
Sep-01	0.7	1.0	1.7	1.1	1.7	0.7	1.0	6.0	1.1	1.3	1.7	4
Oct-01	1.1	0.6	4.6	0.9	0.7	0.9	1.2	1.9	0.9	0.6	1.7	2
Nov-01	0.9	1.0	1.1	1.1	0.8	1.1	6.0	5.5	1.3	1.9	2.3	-
Dec-01	4.9	0.9	4.2	0.9	1.3	1.9	1.2	3.1	1.2	9.7	1.8	
Jan-02	0.8	1.0	1.5	1.3	1.1	1.4	1.3	1.5	1.1	0.9	1.5	
Feb-02	1.1	1.1	0.9	0.3	0.4	0.5	3.1	5.1	0.5	0.5	0.9	1.
Mar-02	1.7	2.1	1.6	0.7	0.7	0.8	1.0	18	1.0	0.9	1.7	*
Apr-02	1.0	0.4	1.0	0.8	0.8	0.6	0.9	10.1	0.5	0.7	1.0	-
May-02	0.6	0.6	6.0	0.7	0.4	1.2	0.9	3.1	0.7	0.2	1.0	0
Jun-02	1.4	0.4	1.7	0.6	0.5	0.8	0.6	2.1	0.6	0.5	1.0	41
Jul-02	0.7	0.7	-	0.8	0.8	0.7	1.2	-	1.1	0.5	1.0	4
Aug-02	1.3	0.8	1.4	1.2	1.1	1.2	1.5	4	1.5	0.9	1.6	4
Sep-02	0.5	1.2	1.1	0.8	0.5	0.7	5.1	9.3	1.6	0.6	1.0	-
Oct-02	2.2	1.4	5.2	1.5	1.5	1.4	1.4	3.4	-	1.5	3.1	-
Nov-02	2.8	1.8	3.7	1.6	0.1	1.8	2.1	3.5	2.1	2	1.9	1
Dec-02	2.0	-	2.5	1.5	3.0	1.5	1.8	4.1	1.6	1.2	1.9	
Jan-03	2.1	1.5	2.7	1.5	1.0	1.9	2.2	2.5	1.1	1.0	1.6	9
Feb-03	1.4	1.1	2.6	1.1	0.9	1.2	1.7	5.9	1.2	1.0	1.5	-
Mar-03	0.8	0.5	1.2	1.2	0.6	2.1	1.5	3.4	-	3.6	9.5	4
Apr-03	0.5	1.0	0.6	1.0	0.7	0.5	1.1	8.0	1	2.0	1.0	4
May-03	0.5	0.4	0.6	0.2	0.2	0.6	1.3	1.6	0.5	0.8	1.2	-
Jun-03	0.5	0.4	0.8	0.2	0.4	0.6	0.8	0.7	0.9	0.7	0.7	2
Jul-03	0.3	0.4	0.4	0.6	0.4	0.5	0.7	0.5	0.5	0.5	0.7	2
			-			-				-		-
Aug-03	0.8	0.2	0.7	1.1	0.5	1.3	1.8	2.1	1.3	0.7	0.9	-
Sep-03	0.6	0.7	1.1	0.7	0.8	1.7	1.4	1.3	2.5	0.9	1.3	×
Oct-03		0.9	1.4	0.9	0.7	1.9	1.0	1.4	0.6	8.0	1.3	1
Nov-03	2.6	0.8	1.0	1.1	0.4	1.3	1.5	1.5	-	8.0	1.3	-
Dec-03	1.0	1.0	1.4	1.3	1.1	1.5	1.6	2.0	1.8	0.9	1.4	
Jan-04	8.5	1.5	2.1	1.5	1.3	2.6	1.4	2.2	1.7	1.5	1.7	
Feb-04	1.2	1.0	1.7	1.4	0.7	3.1	1.6	2.2	-	1.5	2.3	8
Mar-04	0.4	0.6	6.6	1.2	0.7	1.9	1.1	12.1	4.8	1.5	1.1	19

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Apr-04	0.6	1.0	0.8	0.8	0.6	1.9	0.8	1.4	0.9	1.2	1.1	
May-04	0.2	0.9	2.2	0.9	0.8	0.7	0.9	1.4	1.2	0.9	1.5	12
Jun-04	0.4	0.6	0.7	0.9	0.6	1.4	1.0	0.9	1.0	1.0	0.8	-
Jul-04	0.4	0.6	5.3#	0.6	0.5	2.9	1.0	1.1	0.9	0.6	1.2	4
Aug-04	0.5	0.5	0.5	1.3	0.7	1.1	1.1	1.4	-	1.0	1.0	-
Sep-04	0.6	0.6	0.8	2.2	1.0	1.0	0.9	4.4	0.9	16.7	1.1	*
Oct-04	0.7	0.9	1.2	0.9	0.8	1.4	1.0	10.5	1.0	1.0	0.8	
Nov-04	0.8	0.7	1.3	1.9	0.7	0.9	1.0	3.0	1.1	1.1	1.6	*
Dec-04	2.0	1.4	3.6	1.5	1.3	2.2	3.2	7.9	1.8	5.5	2.5	-
Jan-05	1.2	1.0	3.7	1.6	1.4	4.0	2.3	2.7	2.6	2.5	2.8	Q 1
Feb-05	1.2	1.2	1.8	1.6	1.3	2.0	1.7	-	2.3	1.5	2.3	1.
Mar-05	1.3	0.9	1.4	0.9	0.9	3.0	1.2	7.7	-	0.8	1.3	
Apr-05	1.1	0.7	0.9	0.8	0.7	0.9	1.4	3.3	1.1	0.8	0.9	12
May-05	0.7	8.6	1.1	0.8	0.7	0.8	0.9	4.4	1.2	0.8	1.1	-
Jun-05	1.3	0.8	1.3	1.3	0.8	1.2	1.2	1.3	1.5	2.5	0.9	-
Jul-05	1.0	0.5	0.5	0.7	0.4	1.6	0.7	1.2	0.8	4.3	1.1	-
Aug-05	0.6	0.6	0.8	1.0	0.8	0.9	0.7	1.0	0.9	1.0	0.9	
Sep-05	0.6	0.7	0.8	0.7	0.7	1.2	1.3	1.3	1.0	0.9	1.1	-
Oct-05	0.8	0.9	1.3	0.9	0.8	1.4	1.2	1.9	1.3	1.1	1.3	4
Nov-05	-	2.3	2.3	2.0	1.7	1.2	2.0	3.2	1.6	1.4	2.2	4
Dec-05	1.9	3.2	2.3	3.3	2.6	3.4	2.3	-	1.3	2.1	3.9	20
Jan-06	1.0	2.1	1.7	1.0	23.	3.5	-	2.7	1.1	-	1.5	-
Feb-06	2.2	1.0	0.9	1.2	1.1	1.7	1.1	2.9	-	2.3	1.8	
Mar-06	0.7	0.6	2.3	0.7	0.6	0.9	1.0	1.4	0.7	0.8	1.5	41
Apr-06	0.6	0.7	1.1	0.8	0.6	1.1	0.8	1.0	1.0	1.8	1.5	4
May-06	1.0	3.1	1.0	-	1.1	1.4	1.1	4.1	-	7.0	1.5	÷
Jun-06	0.4	0.3	0.7	0.5	0.4	0.6	0.7	0.8	0.6	0.9	0.9	-
Jul-06	0.3	0.3	1	1.3	0.4	0.7	0.7	2.7	-	0.6	0.6	2
Aug-06	0.9	0.6	0.8	0.7	0.7	0.8	0.7	1.7		3.7	0.9	-
	1	1.00		1.7	0.7	1		1.3	1.2	-	1	
Sep-06	1.6	0.7	1.1	3.2	100.00		0.9	1.0		0.8	1.6	-
Oct-06	2	1.4	1.6	1.8	2.3	1.8	2.4	1.8	1.5	1.8	2.9	12
Nov-06	1	2.2				5.5			2.3	2.3		÷
Dec-06	1.2	3,4	1.9	2.3	2.3	12	2.1	2.1	12	4.9	3.9	2
Jan-07	2	0.9	1.5	0.7	0.7	1.7	1.1	1.7	1.2	1.7	0.9	
Feb-07	1.7	0.9	1.6	0.7	0.6	1	1.8	1.7	1.1	1.2	1.7	4
Mar-07	1.3	0.9	1.7	0.8	1.2	0.6	2.2	1.7		0.9	1.7	2
Apr-07	0.5	0.7	0.9	0.6	4.8	1.2	0.5	2.7	0.5	0.8	0.9	
May-07	0.8	0.5	0.6	1.2	0.6	0.6	0.7	1.9	0.5	0.7	0.8	
Jun-07	0.6	0.5	0.7	1.1	0.1	0.5	0.1	0.5	0.1	0.4	0.3	
Jul-07	0.5	0.4	0.6	2.1	0.5	0.8	0.6	0.6	0.4	0.5	0.7	
Aug-07	1.5	0.4	0.7	1	0.7	0.7	0.5	1	0.6	0.6	0.7	
Sep-07	1.3	0.5	1.8	1	0.7	0.9	0.9	1.3	1	0.7	1.6	
Oct-07	4.2	0.9	1.1	1.4	1.1	1.7	1.8	1.7	1.6	1.4	2.2	-
Nov-07	0.8	0.8	1.1	0.9	1.1	1.1	1.1	1.7	0.6	0.8	1.5	
Dec-07	1.3	0.8	3	0.7	0.5	0.8	0.5	1.1	0.3	0.8	0.6	1.0
Jan-08	2.6	0.8	3.7	0.5	0.5	0.5	0.4	2.2	0.8	0.3	0.8	-
Feb-08	0.4	0.1	14	0.1	0.1	0.3	0.1	0.3	0.2	0.2	0.3	1.4

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Mar-08	4.5	0.6	9.2+	0.6	2.9	2.1	0.6	1.5	0.5	1	0.9	-
April-08	0.4"	0.4"	0.8"	0.4"	0.4*	0.8"	1.1"	1.7"	1.2	1.1*	1.1*	9
May-08	1.1	2.4"	0.9	1.4	0.9	0.9	0.7	2.7	1"	1.1	1.3"	9.5
June-08	0.2	0.4"	0.1	0.5	0.1"	0.1	0.3	0.5"	0.1	0.8	0.2	4
July-08	0.4	0.7"	1.3″	0.6	0.8"	0.9	0.8	1	0.7	0.5	1.1	-
Aug-08	1	0.5	0.7	0.6	0.5	1.9	0.8	1	1	0.9	1.4	*
Sep-08	0.6	1	1.3	0.7	0.6	0.9	0.6	0.9	0.9	0.9	1.8	θ.
Oct-08	1	0.5	1	1.3	1.3	1.2	1	1.4	0.8	1.6	1.8	*
Nov-08	0.8	1.4	2.7	2.5	0.9	1.2	0.8	2.4	1.1	1	1.7	4
Dec-08	0.4	0.4	0.6	0.5	0.3	1.1	0.6	15	0.9	0.7	1.2	Q
Jan-09	1.1	3"	1.6	0.8	0.9	1.4	0.7	1.5	0.9	0.9	5*	1.
Feb-09	0.4	4.4	1.5	1.1	0.9	1.6	0.8	1.2	1.4	2.5	1.2	
Mar-09	2.8	5.8	2.7	2.4	1.9	2.1	2.5	2.4	2.3	5.7	2.7	2
Apr-09	2	0.8	0.8	0.6	0.6	3.2	1.1	1.1	1	0.6	0.9	-
May-09	0.6	1.6	0.8	2.4	0.9	5.6 +	1.4	1.1	1.3	0.7	1.5	-
Jun-09	0.4	1.3	0.8	0.5	0.5	3.3	0.9	0.6	1	3.4	0.7	1.4
Jul-09	0.2	1.0	0.6	0.4	0.3	3.8	0.5	0.6	0.6	0.3	0.6	-
Aug-09	0.8	3.6	0.8	1.2	1.0	1.8	0.8	1.8	1.3	0.8	1.0	~
Sep-09	1.0	1.8#	1.8	8.3 +	1	1.8	0.9*	1.8*	1.7*	0.7	1.4*	4
Oct-09+	4.3	9"	5.2*	11.3"	3.2	3.8"	2.4"	6.8"	3.0*	2.2	3.2"	5.7
Nov-09	0.8*	1.7*	1.4#	1.3"	0.7*	2.1*	1.3*	8.0*	*	1.0*	*	2.3
Dec-09	1.4"	4.0#	1.6#	2.4"	1.7*	1.8	1.6	2.6#	1.7*	1.7*	2.2#	1.7
Jan-10	0.6*	0.8#	5.6#	1.2*	2.4*	1.2*	0.8*	1.4*	1.3*	0.8*	1.3*	1.1
Feb-10	1.9*	11.3*	1.9*	1.4"	1.5*	1.1*	1.2*	1.6#	1.1*	0.8*	1.8*	1.3
Mar-10	0.6"	0.6*	3.2*	1"	4.1"	0.6#	0.6"	1.2	0.6	0.2*	0.8*	1.1
Apr-10	0.8*	1.8*	2.4*	0.7#	+	0.3	0.6*	0.9*	0.6*	0.4#	0.8*	0.8
May-10	0.8	4.9*	3.0*	1.1	1.2	1.0	0.7	1.3	1.0*	0.5	1.1*	0.8
Jun-10	0.3	2.2*	3.0*	0.6#	0.2	1.2#	0.5	0.5*	0.6	0.7*	0.7*	0.4
Jul-10	0.6"	1.1"	0.7"	0.7	0.5	0.3	0.5#	0.6"	0.7	0.2"	0.8	0.5
Aug-10	0.4	0.5*	1.9#	0.8#	0.2#	0.7#	0.5*	0.5*	0.6	0.5#	0.7*	0.4
Sep-10	0.6#	2.6#	1.6#	1.0#	0.5*	1.1"	0.5#	1.0*	0.9*	0.6#	0.8*	0.9
Oct-10	0.9*	1.6*	0.9#	0.5*	0.4*	0.5	1.0*	1.3*	1.2#	2.0#	1.2*	0.4
Nov-10	0.9*	3.5*	0.9*	1.4*	1.1"	0.9	0.6#	0.9*	*	0.9*	0.8*	1.1
Dec-10	1.0*	0.7*	0.9*	1.1*	0.5"	0.4"	0.6*	2.4*	1.0*	0.5	1.0"	1.4
Jan-11	1.0*	0.7#	1.8*	1.2*	0.6*	0.7	0.9*	1.3*	1.0*	0.5*	1.5*	1.0
Feb-11	0.7	4.1+	0.9	1.0	0.7	0.7	1.0*	1.2	*	0.6	1.4	1.4
Mar-11	0.5	2.9*	+	0.9	1.7*	0.8	0.9*	1.9*	*	0.8*	1.2*	1.3
Apr-11	0.7	0.6*	4.9*	0.8*	1.1*	0.7	0.9*	2.1*	0.8*	1.0*	0.3*	0.7
May-11	0.4	1.1"	5.4"	0.7*	0.4	0.5"	0.6*	1.5"	0.4	0.4"	0.6"	0.7
	0.4	1	1.7	0.9	0.4	0.8	0.6	1.2	0.7	0.9	0.8	1.1
Jun-11	-	1.1	-			-		-		-		1
Aug-11	0.4	0.1	0.6	0.7	0.5	0.4	0.5	2.4	1	1	0.6	0.8
Sep-11	1.3*	0.4*	0.8*	0.5	0.6*	+	0.6*	1.5*	0.6*	2.3*	0.7*	0.7
Oct-11	11	11.2	0.6	1.3	N	1	1.4	1.5	1.4	1.3	1.4	1.1
Nov-11	0.5	1	0.8	0.5	~	0.4	*	1.1	0.5	0.4	0.9	0.9

" - sample contaminated | + - sample invalid |\*-Broken funnel |  $\sim$  - Site inaccessible

[Note: Samples for November 2009 have been considered invalid, due to a widespread dust storm experienced on 23<sup>rd</sup> November 2009.]

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