AIR, WATER AND METEOROLOGICAL MONITORING – NOVEMBER 2018

PINE DALE MINE, BLACKMANS FLAT

Prepared for Pine Dale Mine Community Consultative Committee

Prepared by RCA Australia

RCA ref 6880-1782/0

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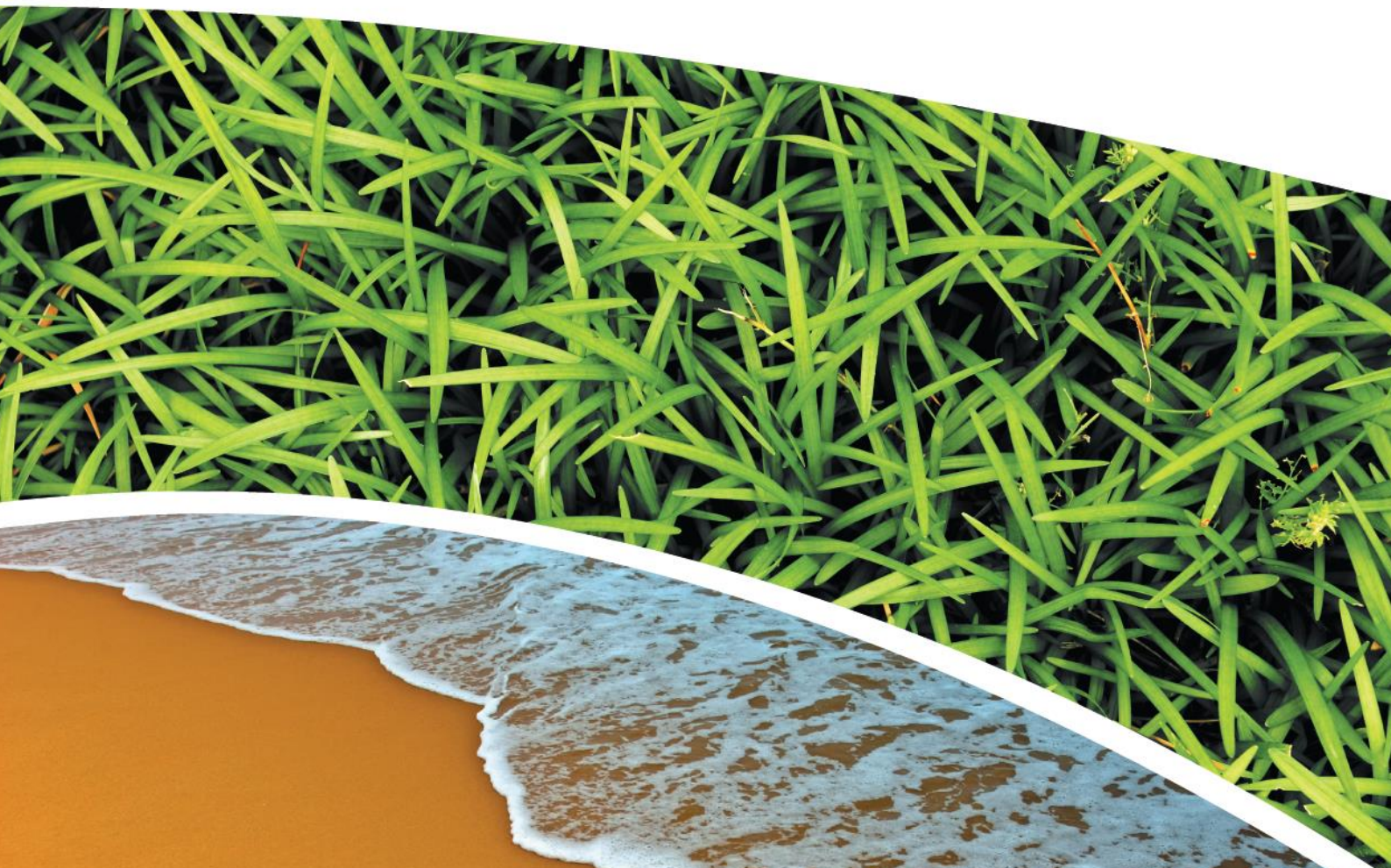

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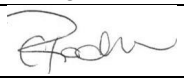
/0	Final	C Rocher	K Shaw	C Rocher		17.12.2018

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/0	1	Electronic (email)	Energy Australia- Mark Frewin mark.frewin@energyaustralia.com.au	17.12.2018
/0	1	Electronic (email)	Lithgow City Council – Andrew Muir andrew.muir@lithgow.nsw.gov.au	17.12.2018
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RCA ref 6880-1782/0

17 November 2018

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Attention: Mr Graham Goodwin

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REPORT COMPILED FOR COMMUNITY CONSULTATIVE COMMITTEE DETAILING AIR, WATER AND METEOROLOGICAL MONITORING AT PINE DALE MINE

NOVEMBER 2018

1 INTRODUCTION

This report presents the results of air, water and meteorological monitoring undertaken at Pine Dale Mine, Blackmans Flat during the month of November 2018.

Air and water samples were collected by RCA Laboratories – Environmental staff. Meteorological data was obtained from the site weather station.

This report satisfies the requirements to monitor environmental parameters as presented in the Pine Dale Mine Environmental Protection Licence (EPL 4911).

2 ANALYTICAL PROCEDURES

The analytical procedures used by RCA Laboratories – Environmental (NATA Accreditation number 9811) are based on established internationally recognised procedures such as APHA and Australian Standards. Analytical test methods are detailed in **Table 1**.

Table 1 *Analytical Test Methods*

Analysis	Method	Units	Analysing Laboratory	NATA Accreditation Status
Determination of Suspended Particulate Matter	ENV-LAB003	µg/m^3	RCA Laboratories – Environmental	NATA Analysis
Determination of Particulate Matter – Deposited Matter	ENV-LAB004	g/m^2.month	RCA Laboratories – Environmental	NATA Analysis
pH	ENV-LAB006	pH	RCA Laboratories – Environmental	NATA Analysis
Conductivity	ENV-LAB010	µS/cm	RCA Laboratories – Environmental	NATA Analysis
Total Suspended Solids	ENV-LAB009	mg/L	RCA Laboratories – Environmental	NATA Analysis
Turbidity	ENV-LAB037	NTU	RCA Laboratories - Environmental	NATA Analysis
Oil and Grease	ENV-LAB022	mg/L	RCA Laboratories - Environmental	Non-NATA Analysis
Major Anions (Alkalinity, Cl, SO_4)	ED037, ED041, ED045	mg/L	ALS	NATA Analysis
Major Cations (Ca, Mg, Na, K)	ED093	mg/L	ALS	NATA Analysis
Dissolved Metals	EG020F	mg/L	ALS	NATA Analysis

ALS Environmental has been used to obtain analysis of anions, cations and dissolved metals (NATA Accreditation number 825).

3 WATER MONITORING RESULTS

3.1 GROUNDWATER

A total of two (2) groundwater samples were collected from within the Pine Dale Mine site during November 2018. Water quality analysis results are shown in **Table 2**. Groundwater monitoring locations are shown in **Appendix A**.

Table 2 *Groundwater Analysis Results*

Analysis	Units	P6	P7
Sample Number	-	11186880011	11186880012
Date Sampled	-	08/11/18	08/11/18
Time Sampled	-	15:15	14:58
Depth to Water from Surface	m	25.38	7.24
Water Level (AHD)	m	891.57	887.16
Temperature	°C	18.0	18.0
pH	pH	6.22	6.40
Conductivity	µS/cm	**1520**	718
Turbidity	NTU	67	
Dissolved Oxygen	mg/L	2.0	
Total Suspended Solids	mg/L	71	
Oil and Grease	mg/L	<5	
Bicarbonate Alkalinity ($CaCO_3$)	mg/L	68	174
Total Alkalinity ($CaCO_3$)	mg/L	68	174
Sulphate (as SO_4)	mg/L	722	36
Chloride	mg/L	45	104
Calcium	mg/L	145	37
Magnesium	mg/L	63	35
Sodium	mg/L	61	43
Potassium	mg/L	19	7
Cobalt (dissolved)	mg/L	0.054	
Manganese (dissolved)	mg/L	2.59	
Nickel (dissolved)	mg/L	0.086	
Zinc (dissolved)	mg/L	0.03	
Iron (dissolved)	mg/L	34	<0.05
Trigger Levels			
pH trigger level ^	pH	6.2 – 8.0	6.3 – 8.0
Conductivity trigger level	µS/cm	1180	852
Water Level (AHD) #	m	887.90	883.28

Indicates analysis was not required.

^ pH trigger level is exceeded if the pH is outside the nominated range

Water Level trigger is exceeded if the AHD water level drops below the nominated trigger level.

Results shown in ***bold italics*** indicates exceedance of trigger level.

3.2 SURFACE WATER MONITORING

Quarterly surface water monitoring was undertaken in November 2018. Results are shown in **Table 3**.

Table 3 *Surface Water Results*

ANALYSIS	UNITS	EPA Point 2 Neubecks Ck Upstream	EPA Point 3 Neubecks Ck Downstream	EPA Point 14 Coxs River Downstream
Sample Number	-	11186880009	11186880004	11186880010
Date Sampled	-	8/11/2018	8/11/2018	7/11/2018
Time Sampled	-	11:47	11:15	13:30
Temperature	°C	16.0	16.9	20.1
pH	pH	7.22	7.55	***8.69***
Conductivity	µS/cm	130	121	113
Sulfate	NTU	482	465	57
Dissolved Iron	mg/L	0.07	0.14	<0.05
Total Suspended Solids	mg/L	<5	6	7
Turbidity	mg/L	<1	<1	20
Trigger Levels				
pH	pH	7.1 – 8.0	6.4 – 8.0	7.5 – 8.0
Conductivity	µS/cm	2055	2223	1166
Total Suspended Solids	mg/L	30	30	30

Results shown in ***bold italics*** indicates exceedance of trigger level.

4 AIR QUALITY RESULTS

4.1 HIGH VOLUME AIR SAMPLERS (HVAS)

Monitoring of particulate matter less than 10 micrometres (PM_{10}) and total suspended particulates (TSP) is undertaken at Pine Dale Mine using High Volume Air Samplers (HVAS). HVAS at this facility conform to AS/NZS 3580.9.3:2015, AS/NZS 3580.9.6:2015 and AS/NZS 3580.1.1:2016. The locations of these HVAS units are shown in **Appendix A**.

HVAS Total Suspended Particulate results are shown in **Table 4**. PM_{10} results are shown in **Table 5**. HVAS Monitoring locations are shown in **Appendix A**. Graphical HVAS result presentations are shown in **Appendix B**.

Table 4 *Total Suspended Particulates (TSP)*

Run Date	TSP (µg/m3)	Sample Number	Filter Number	Date Filter Off	Time Filter Off	Field Tech	Hours Run
03-Nov-18	38	11186880033	9589227	08-Nov-18	9:15	Client	24.10
09-Nov-18	40	11186880035	9589225	12-Nov-18	6:50	Client	24.36
15-Nov-18	15	11186880037	9589300	19-Nov-18	6:30	Client	24.00
21-Nov-18	70	11186880039	9589224	22-Nov-18	7:10	Client	24.00
27-Nov-18	38	11186880041	9589298	28-Nov-18	11:12	Client	24.00

Table 5 *Suspended Particulate Matter <10 µm (PM_{10})*

Run Date	PM_{10} (µg/m^3)	Sample Number	Filter Number	Date Filter Off	Time Filter Off	Field Tech	Hours Run
03-Nov-18	15	11186880034	9589228	08-Nov-18	9:16	Client	24.00
09-Nov-18	7	11186880036	9589226	12-Nov-18	6:53	Client	24.70
15-Nov-18	5	11186880038	9586301	19-Nov-18	6:35	Client	24.00
21-Nov-18	49	11186880040	9589293	22-Nov-18	7:15	Client	24.00
27-Nov-18	11	11186880042	9589299	28-Nov-18	11:15	Client	24.00

4.1.1 TSP SUMMARY

The NSW EPA Annual Mean TSP allowable limit is 90µg/m^3. All TSP HVAS results recorded during this monitoring period are in compliance with consent conditions, as the *current rolling annual mean* (December 2017 to November 2018) for the TSP unit is 23.5µg/m^3. The twelve monthly graph is provided in **Appendix B**.

4.1.2 PM_{10} SUMMARY

The NSW EPA twenty four hour maximum PM_{10} allowable limit is 50µg/m^3. The EPA Annual Mean PM_{10} allowable limit is 25µg/m^3. All PM_{10} HVAS results recorded during this monitoring period conform to consent conditions, as the *current rolling annual mean* for the PM_{10} unit is 10.5µg/m^3, which is below the allowable annual limit (refer **Appendix B**). The 24 hour maximum allowable limit of 50µg/m^3 was not exceeded on any run during the month of November 2018.

4.2 DEPOSITIONAL DUST MONITORING

The depositional dust monitoring exposure period for November 2018 was 8 October – 7 November 2018. Depositional dust gauges at this facility conform to AS/NZS 3580.10.1:2016 and AS/NZS 3580.1.1:2016. Depositional dust monitoring results are shown in **Table 6**. Depositional dust monitoring locations are shown in **Appendix A**.

Depositional dust gauge D2 is situated on private property; this gauge was removed at the request of the property owner in March 2018 and monitoring has therefore ceased at this location.

Table 6 *Depositional Dust Monitoring*

Deposit Gauge	Number of Days	Notes	Insoluble Solids	Ash	Combustible Matter
D1	30	IT	2.8	1.7	1.1
D3	30	I	2.1	1.3	0.8
D4	30	IT	2.2	1.2	1.0
D5	30	I	1.3	0.8	0.5
D6	30	I	2.1	1.6	0.5

All units are g/m^2/month

I indicates insects noted to be present in sample.
T indicates tree litter in samples (eg. leaves, twigs, gum nuts).
ND No data available

4.2.1 ALLOWABLE DEPOSITIONAL DUST LIMITS

The EPA long term (annual average) deposited dust limit is $4g/m^2$ per month. The rolling annual depositional dust results for all sites within the period (December 2017 – November 2018) are in compliance with consent conditions. The annual average for dust gauges D1, D3, D4, D5 and D6 are all less than or equal to $1.1g/m^2$ per month. The depositional dust gauge graphs are provided in **Appendix B**.

5 METEOROLOGICAL MONITORING

Pine Dale Mine records meteorological data continuously via an onsite weather station. Details of the weather data recorded during the period 1 to 30 November 2018 are shown in **Appendix C**.

Data availability during this period was 100%.

6 BLASTING RESULTS

No blasting was undertaken during this month as mining operations have ceased since the end of March 2014.

7 NOISE MONITORING RESULTS

Quarterly noise monitoring is required to be undertaken on a quarterly basis. The fourth quarter monitoring is required to be undertaken in the October – December 2018 period. Quarter 4 monitoring was undertaken in October 2018. Noise monitoring results are shown in RCA Australia Noise Monitoring Report *13856-402.0 Pine Dale Mine Operation Attended Noise – October 2018.*

8 OPERATIONAL ACTIVITIES

All of the approved minable reserves at the Pine Dale Mine have now been exhausted. Operational mining and the last coal sales ceased as of the end of March 2014.

All former operators have been made redundant; however some statutory positions still remain. Pine Dale Mine has been placed in care and maintenance since April 2014.

9 SUMMARY

During the month of November 2018 environmental monitoring results were found to be generally in compliance with EPL 4911 with the exception of:

- Electrical conductivity in groundwater sample P6 was in excess of the of the site specific trigger level.

Rolling annual averages from both the TSP and PM_{10} High Volume Air Samplers are currently well below the EPA Annual Mean TSP and PM_{10} criterion of 90µg/m^3 and 25µg/m^3 respectively. Currently there are no depositional dust gauge results which are greater than the EPA Long Term (annual average) criteria of 4g/m^2.month based upon a rolling average of the past 12 months.

Meteorological monitoring was undertaken for the entire month of November with 100% data capture.

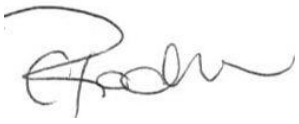
Pine Dale Mine ceased operation in March 2014 and therefore no blasting occurred at the site. No noise monitoring was undertaken during November 2018.

This report shall only be presented in full and may not be used to support objectives other than those stated in the report without written permission from RCA Australia.

The information in this report is considered accurate at the date of issue with regard to the current conditions of the site. Conditions can vary across any site that cannot be explicitly defined by investigation.

Yours faithfully

RCA AUSTRALIA



Carmen Rocher
Environmental Engineer

Katy Shaw
Senior Environmental Scientist

Appendix A

Monitoring Locations

EP PDH7/GW Site E

EP DDH7/GW Site A

EP DDH5/GW Site B

EP DDH1/GW Site C

EP DDH4/GW Site D

Bong Water

EPL Site 2

S1

Weather Station

S2

S3

Old Shaft

P6

S4

S5

S6

EPL Site 13

P7

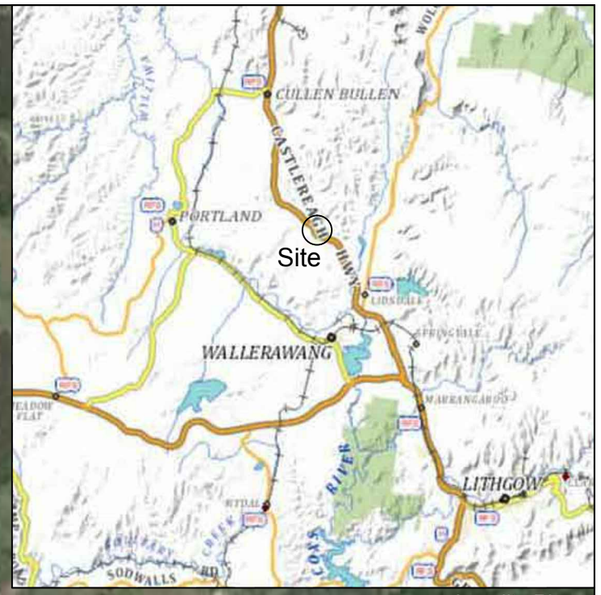
S7

EP PDH4/GW

EP PDH3GW

EPL Site 14

EPL Site 14



Locality Plan
N.T.S.

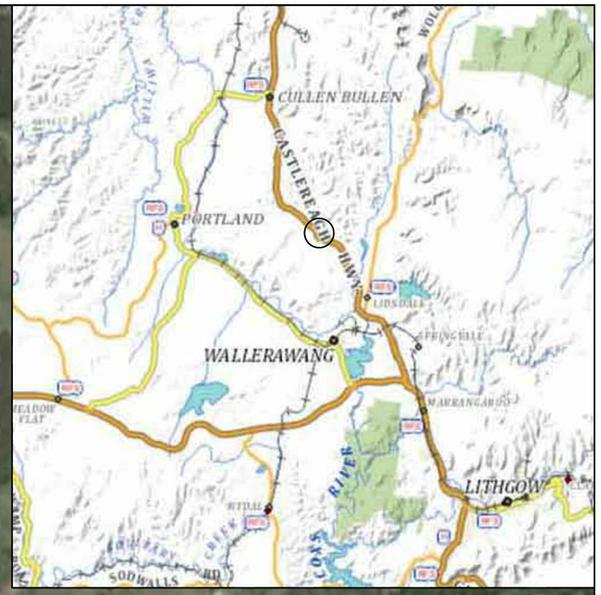
LEGEND

- Surface water monitoring location
- Groundwater monitoring location
- Enhance groundwater monitoring location
- Meteorological monitoring location

Aerial image taken from Google Earth, November 12 2014

0 200 400 600 800 1000
metres

CDT-DWG-A3H-001/1



Locality Plan
N.T.S.

PCB1
PCB7
Weather Station
HVAS
D1
PCB2
PCB3
D2
D3
D4
D5
D6

LEGEND

- Depositional dust monitoring location
- High volume air sampling location
- Meteorological monitoring location

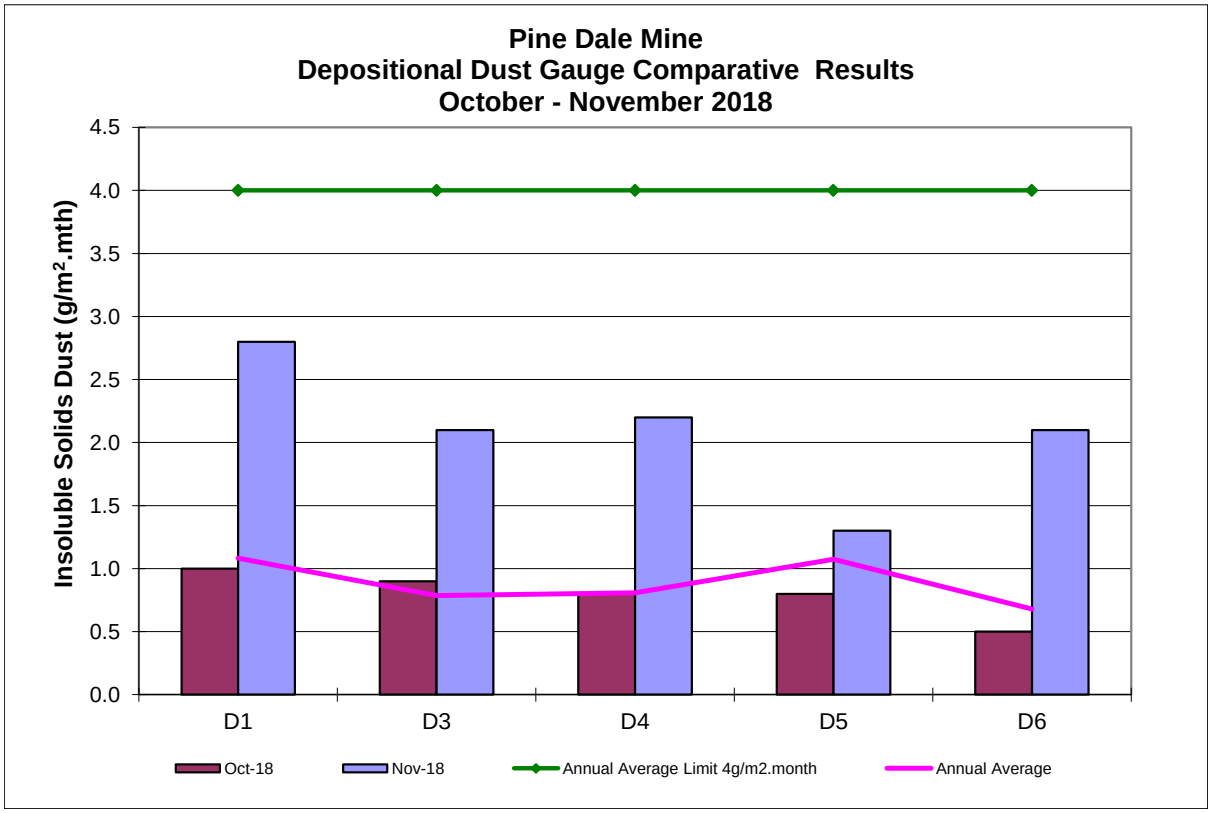
Aerial image taken from Google Earth, November 12 2014

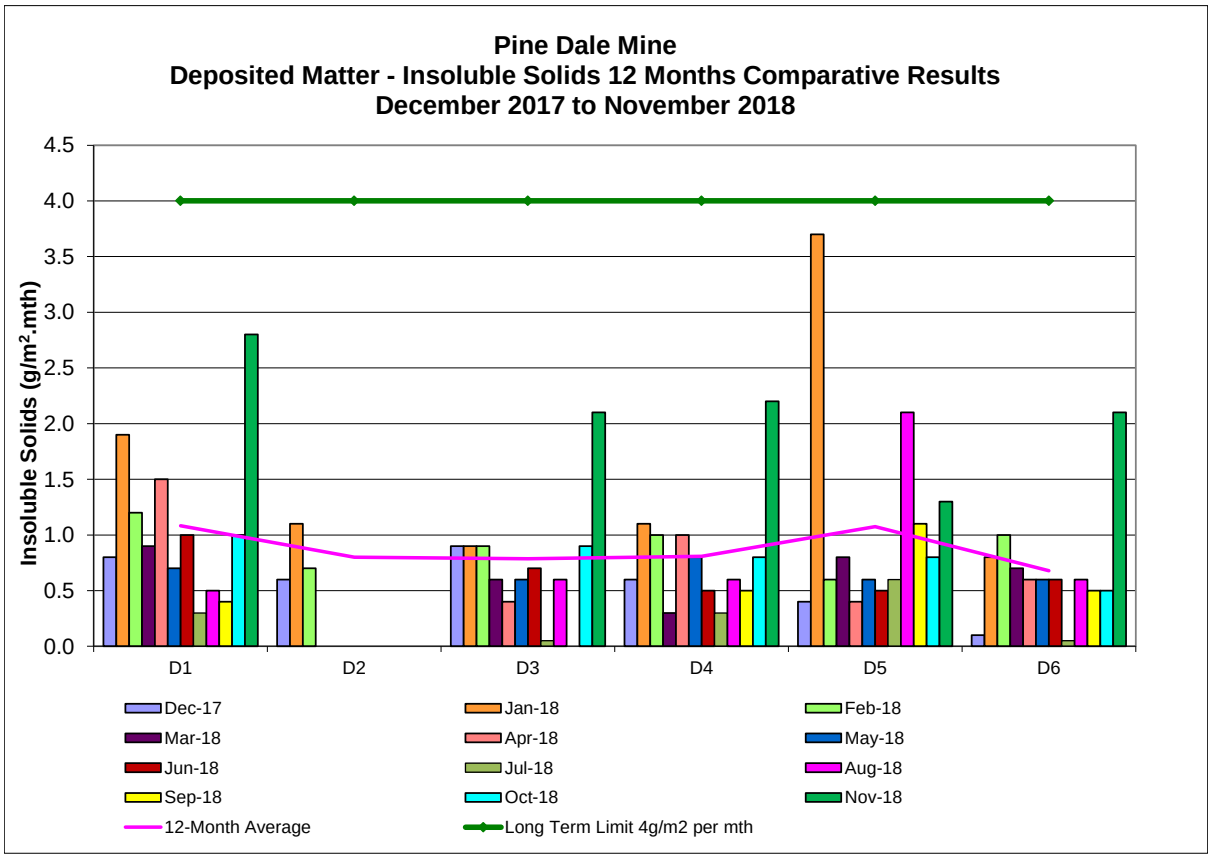
0 200 400 600 800 1000
metres

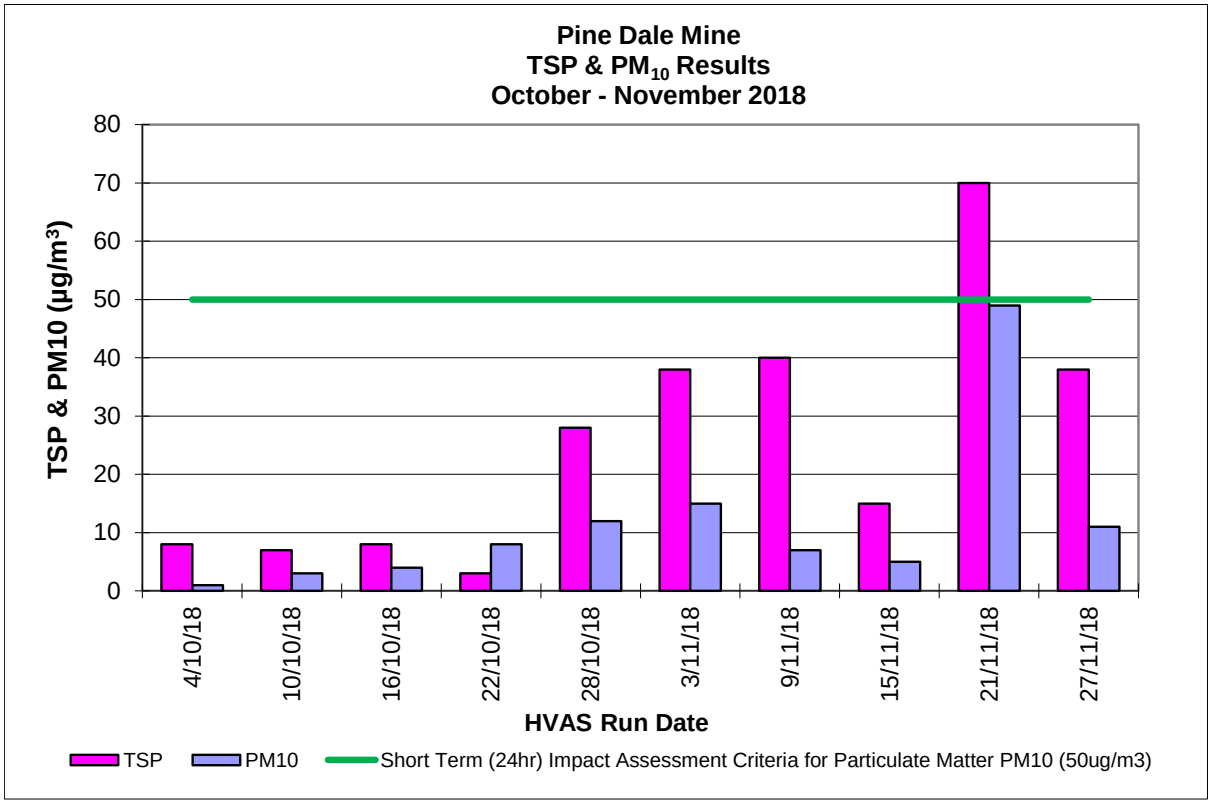
CDT-DWG-A3H-001/1

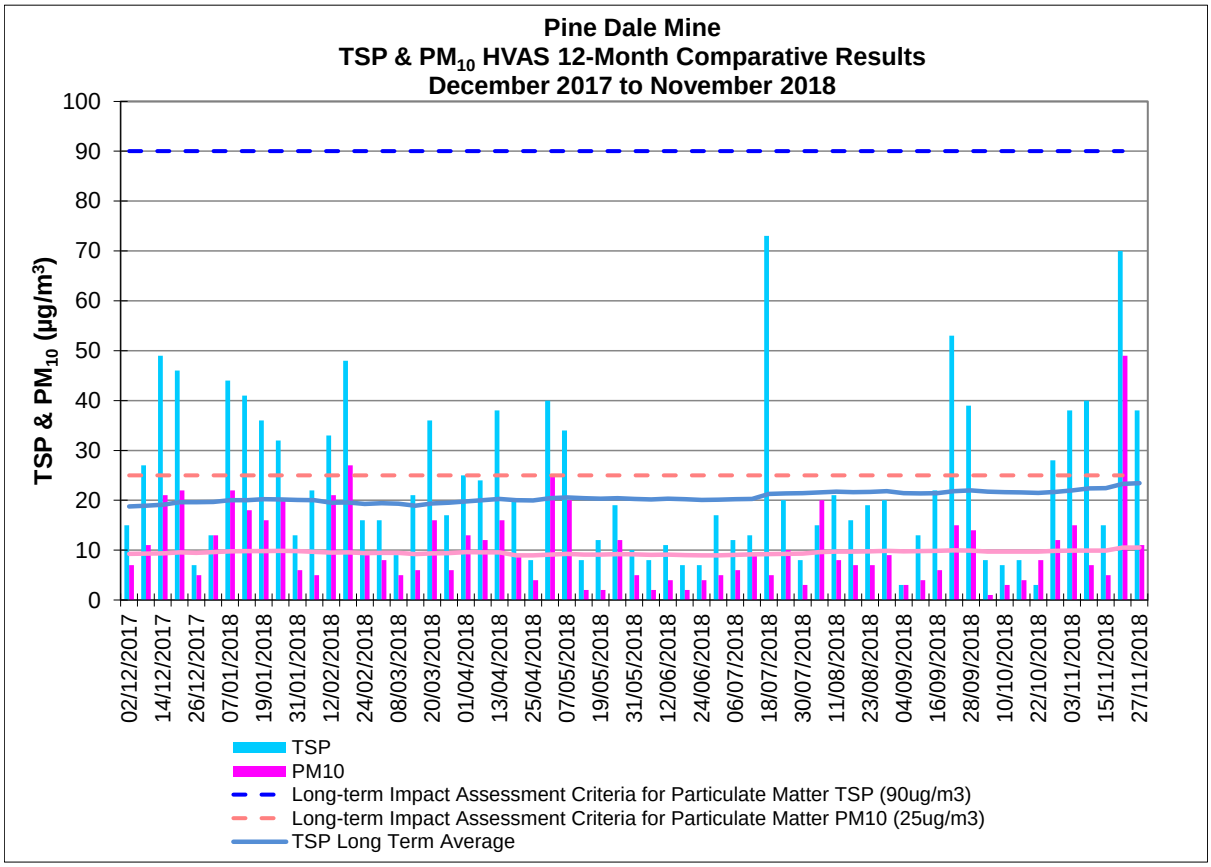
Appendix B

Depositional Dust and HVAS Graphs


Pine Dale Mine
Depositional Dust Gauge Comparative Results
October - November 2018
Insoluble Solids Dust (g/m².mth)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
D1
D3
D4
D5
D6
Oct-18
Nov-18
Annual Average Limit 4g/m2.month
Annual Average

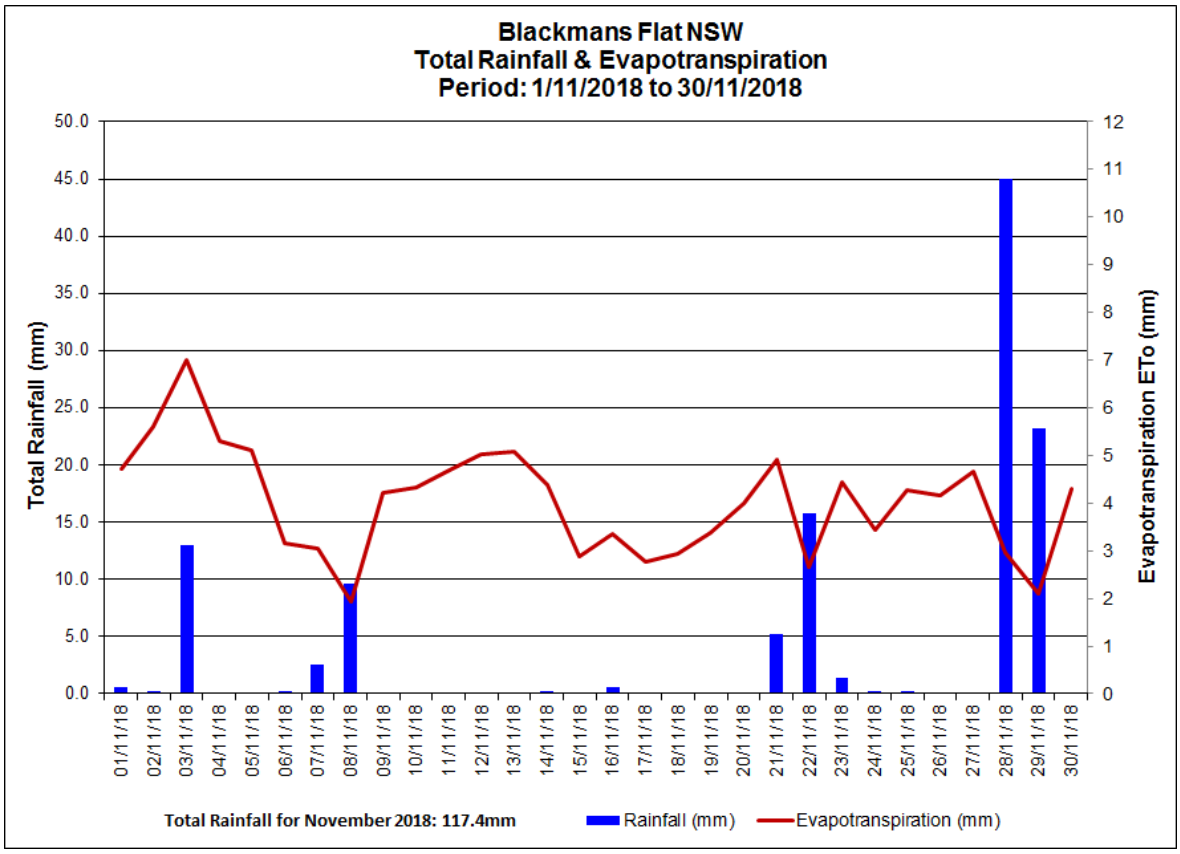

Pine Dale Mine
Deposited Matter - Insoluble Solids 12 Months Comparative Results
December 2017 to November 2018
Insoluble Solids (g/m².mth)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
D1
D2
D3
D4
D5
D6
Dec-17
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Jul-18
Aug-18
Sep-18
Oct-18
Nov-18
12-Month Average
Long Term Limit 4g/m2 per mth

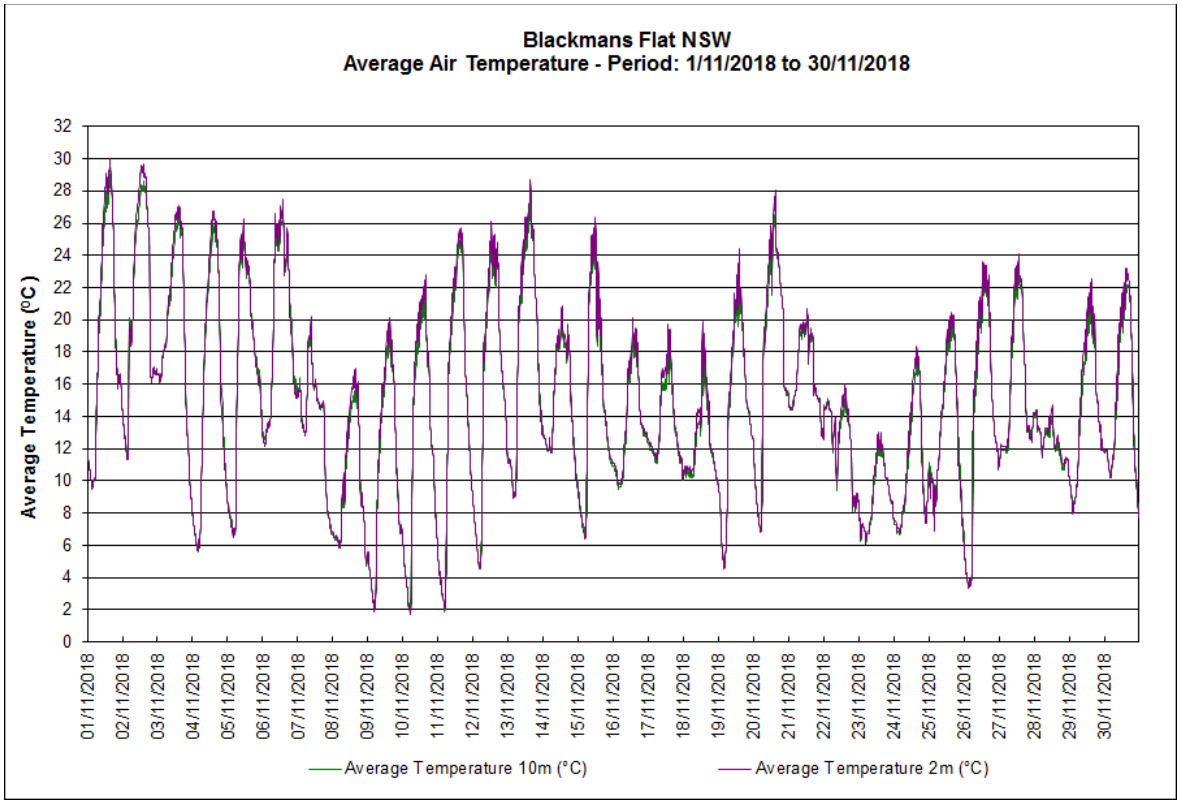

Pine Dale Mine
TSP & PM10 Results
October - November 2018
TSP & PM10 (µg/m3)
80
70
60
50
40
30
20
10
0
4/10/18
10/10/18
16/10/18
22/10/18
28/10/18
3/11/18
9/11/18
15/11/18
21/11/18
27/11/18
HVAS Run Date
TSP
PM10
Short Term (24hr) Impact Assessment Criteria for Particulate Matter PM10 (50ug/m3)

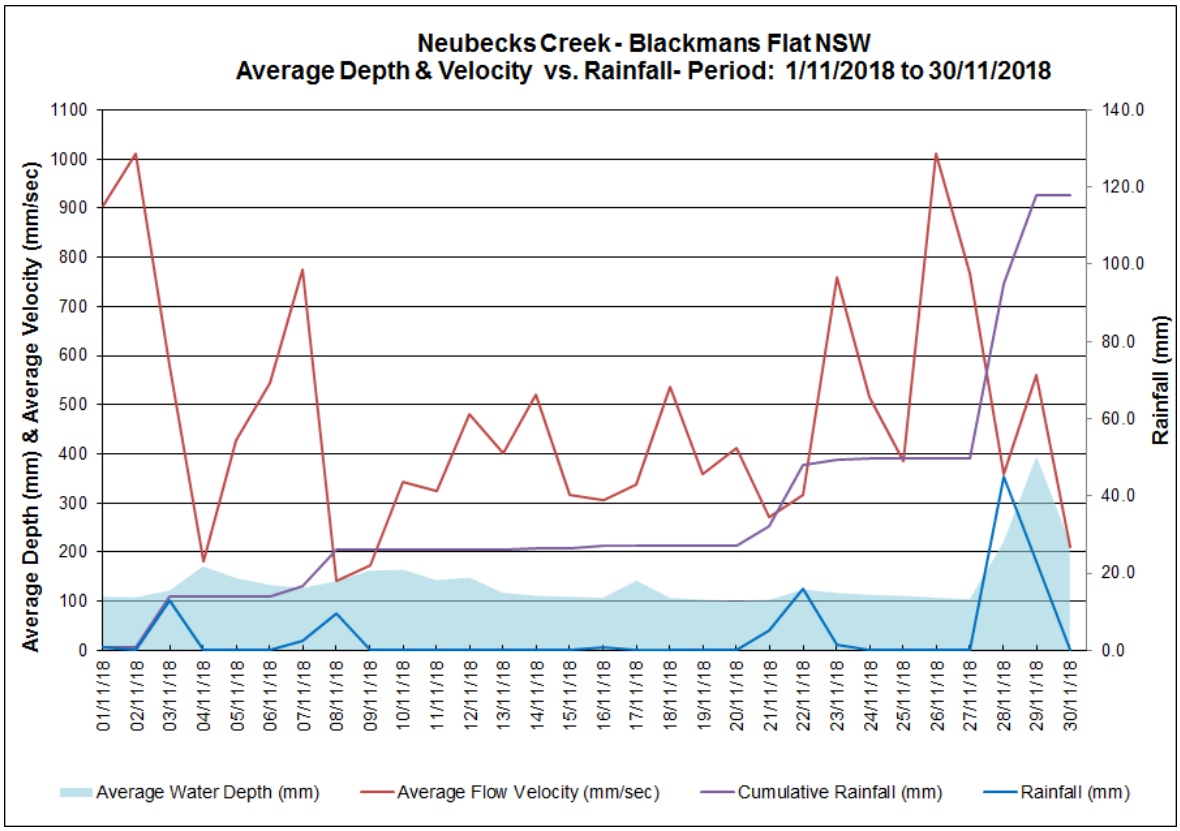

Pine Dale Mine
TSP & PM10 HVAS 12-Month Comparative Results
December 2017 to November 2018
TSP & PM10 (µg/m3)
100
90
80
70
60
50
40
30
20
10
0
02/12/2017
14/12/2017
26/12/2017
07/01/2018
19/01/2018
31/01/2018
12/02/2018
24/02/2018
08/03/2018
20/03/2018
01/04/2018
13/04/2018
25/04/2018
07/05/2018
19/05/2018
31/05/2018
12/06/2018
24/06/2018
06/07/2018
18/07/2018
30/07/2018
11/08/2018
23/08/2018
04/09/2018
16/09/2018
28/09/2018
10/10/2018
22/10/2018
03/11/2018
15/11/2018
27/11/2018
TSP
PM10
Long-term Impact Assessment Criteria for Particulate Matter TSP (90ug/m3)
Long-term Impact Assessment Criteria for Particulate Matter PM10 (25ug/m3)
TSP Long Term Average

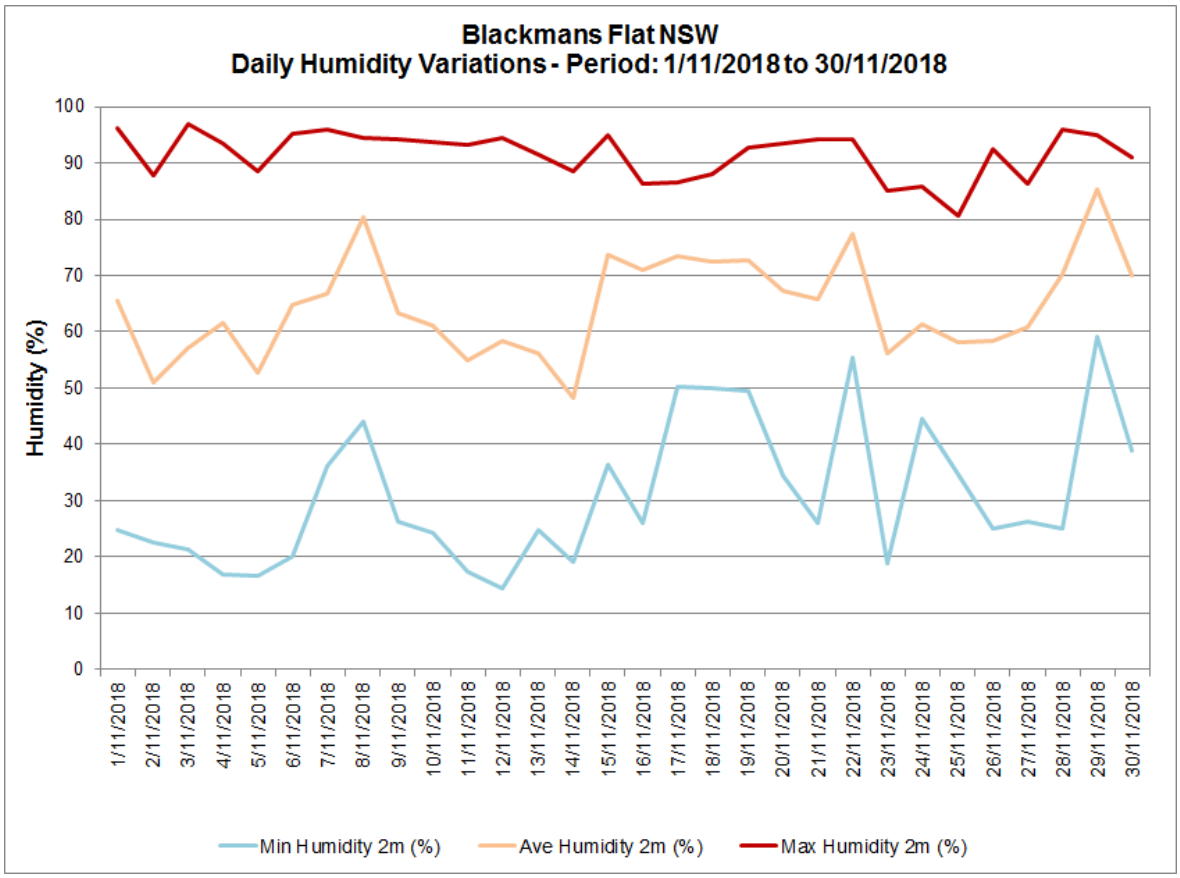
Appendix C

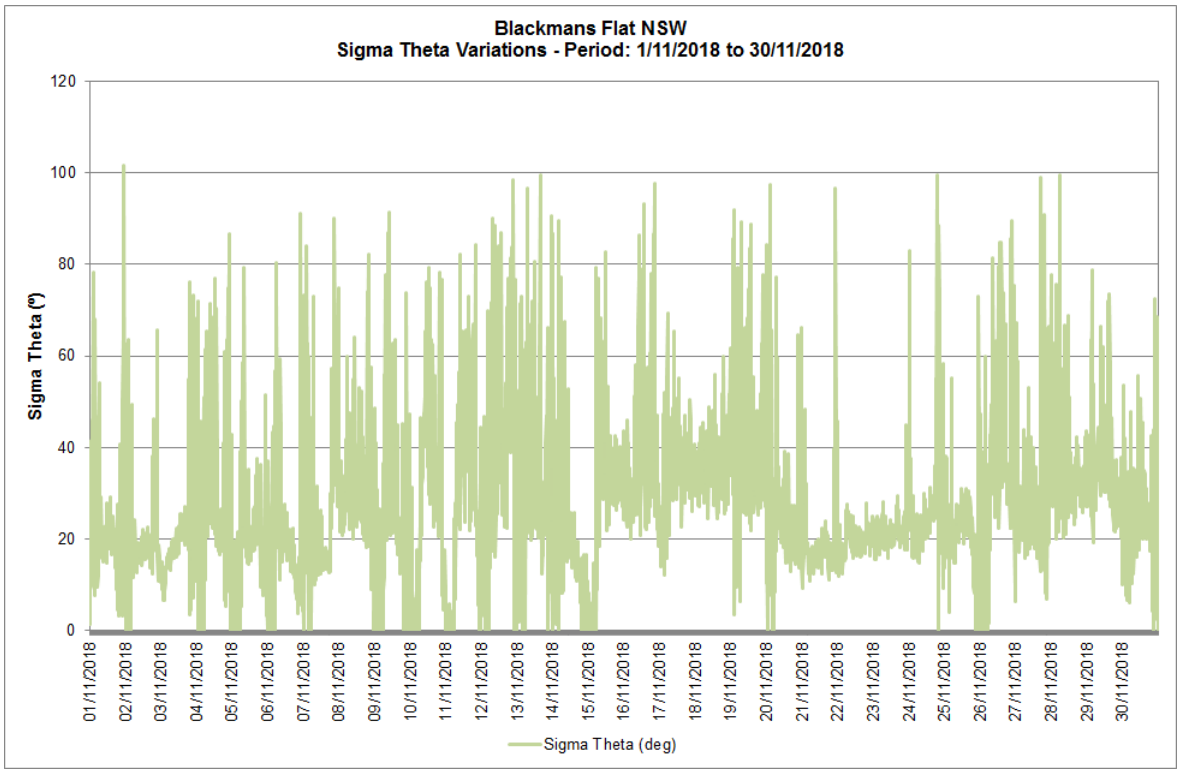
Meteorological Data


Blackmans Flat NSW
Total Rainfall & Evapotranspiration
Period: 1/11/2018 to 30/11/2018
Total Rainfall (mm)
Evapotranspiration ETo (mm)
Total Rainfall for November 2018: 117.4mm
Rainfall (mm)
Evapotranspiration (mm)


Blackmans Flat NSW
Average Air Temperature - Period: 1/11/2018 to 30/11/2018
Average Temperature (ºC)
Average Temperature 10m (°C)
Average Temperature 2m (°C)


Neubecks Creek - Blackmans Flat NSW
Average Depth & Velocity vs. Rainfall- Period: 1/11/2018 to 30/11/2018
Average Depth (mm) & Average Velocity (mm/sec)
Rainfall (mm)
Average Water Depth (mm)
Average Flow Velocity (mm/sec)
Cumulative Rainfall (mm)
Rainfall (mm)


Blackmans Flat NSW
Daily Humidity Variations - Period: 1/11/2018 to 30/11/2018
Humidity (%)
Min Humidity 2m (%)
Ave Humidity 2m (%)
Max Humidity 2m (%)


Blackmans Flat NSW
Sigma Theta Variations - Period: 1/11/2018 to 30/11/2018
Sigma Theta (°)
120
100
80
60
40
20
0
01/11/2018
02/11/2018
03/11/2018
04/11/2018
05/11/2018
06/11/2018
07/11/2018
08/11/2018
09/11/2018
10/11/2018
11/11/2018
12/11/2018
13/11/2018
14/11/2018
15/11/2018
16/11/2018
17/11/2018
18/11/2018
19/11/2018
20/11/2018
21/11/2018
22/11/2018
23/11/2018
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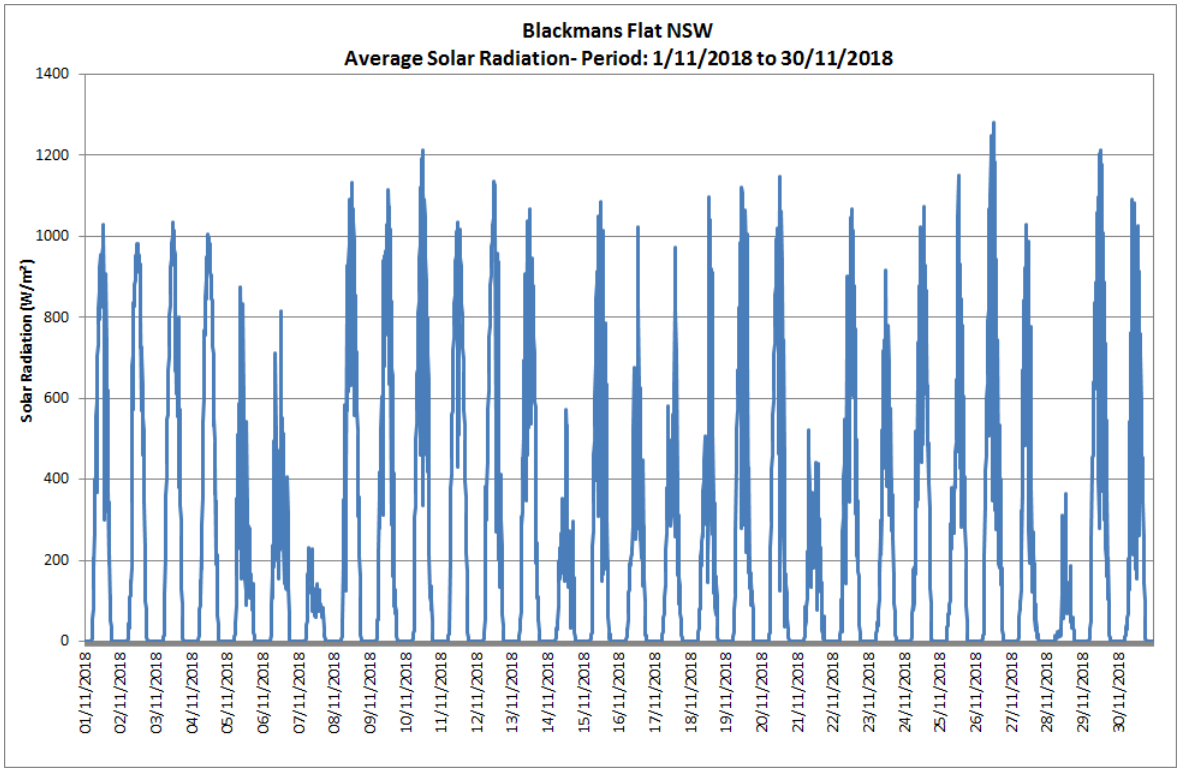
29/11/2018
30/11/2018
Sigma Theta (deg)


Blackmans Flat NSW
Average Solar Radiation- Period: 1/11/2018 to 30/11/2018
Solar Radiation (W/m²)
1400
1200
1000
800
600
400
200
0
01/11/2018
02/11/2018
03/11/2018
04/11/2018
05/11/2018
06/11/2018
07/11/2018
08/11/2018
09/11/2018
10/11/2018
11/11/2018
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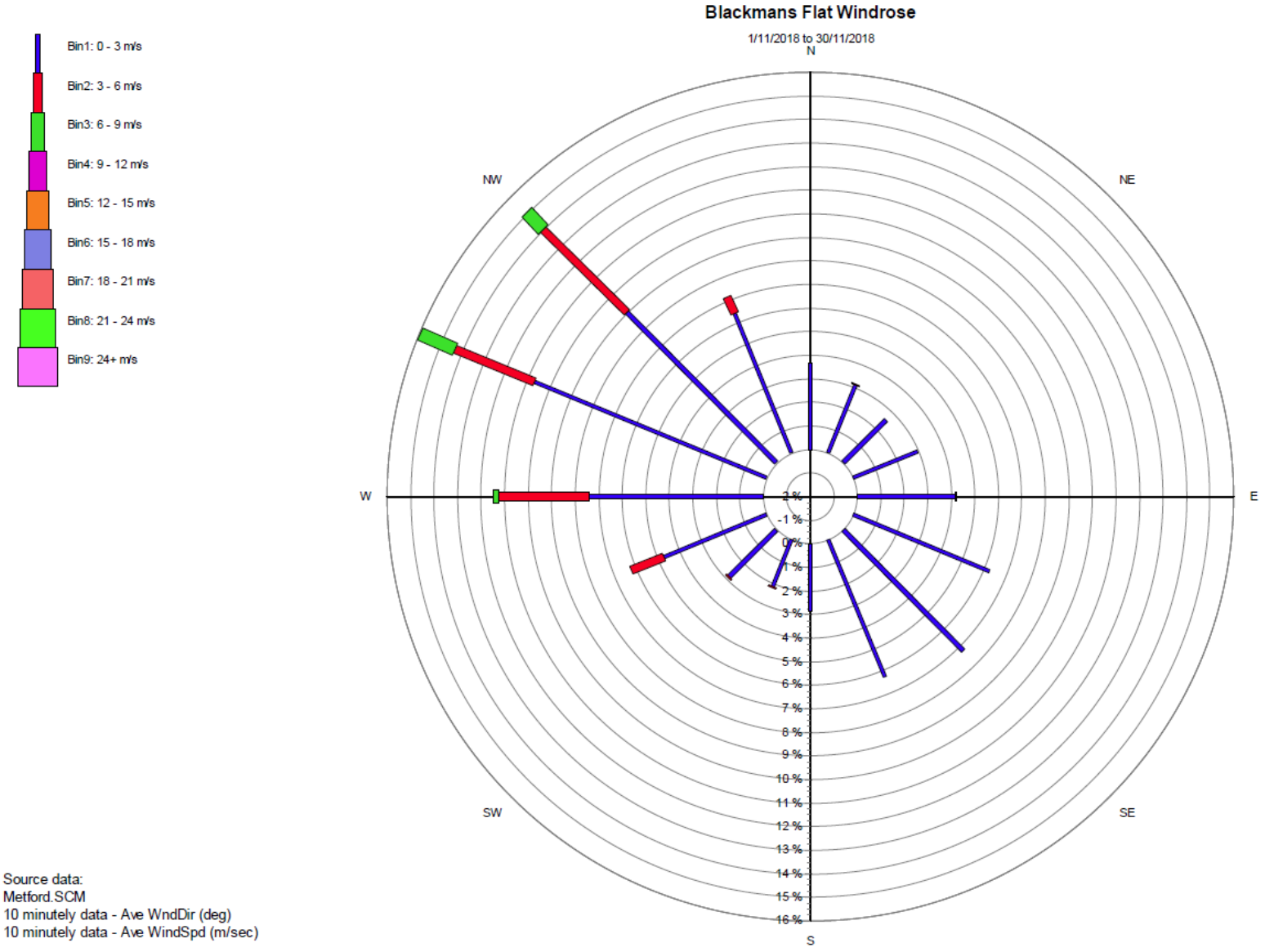

Source data:
Metford.SCM
10 minutely data - Ave WndDir (deg)
10 minutely data - Ave WindSpd (m/sec)