

Broken Hill Operations Pty Ltd

Rasp Mine

Environment Monitoring Results May 2014

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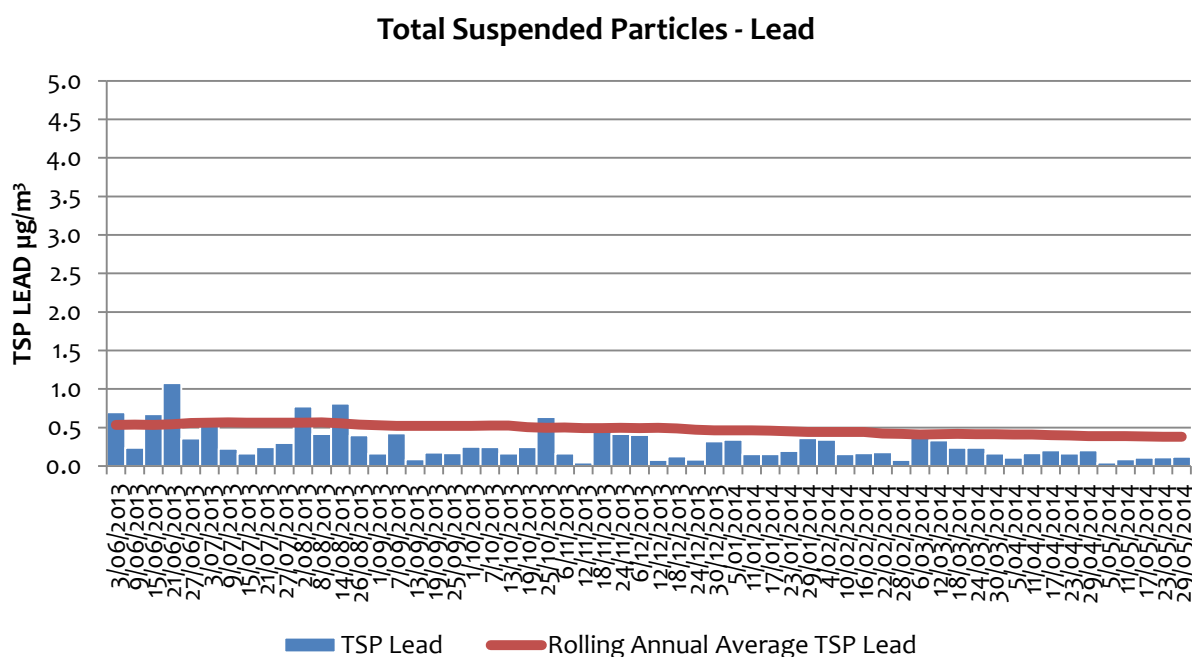
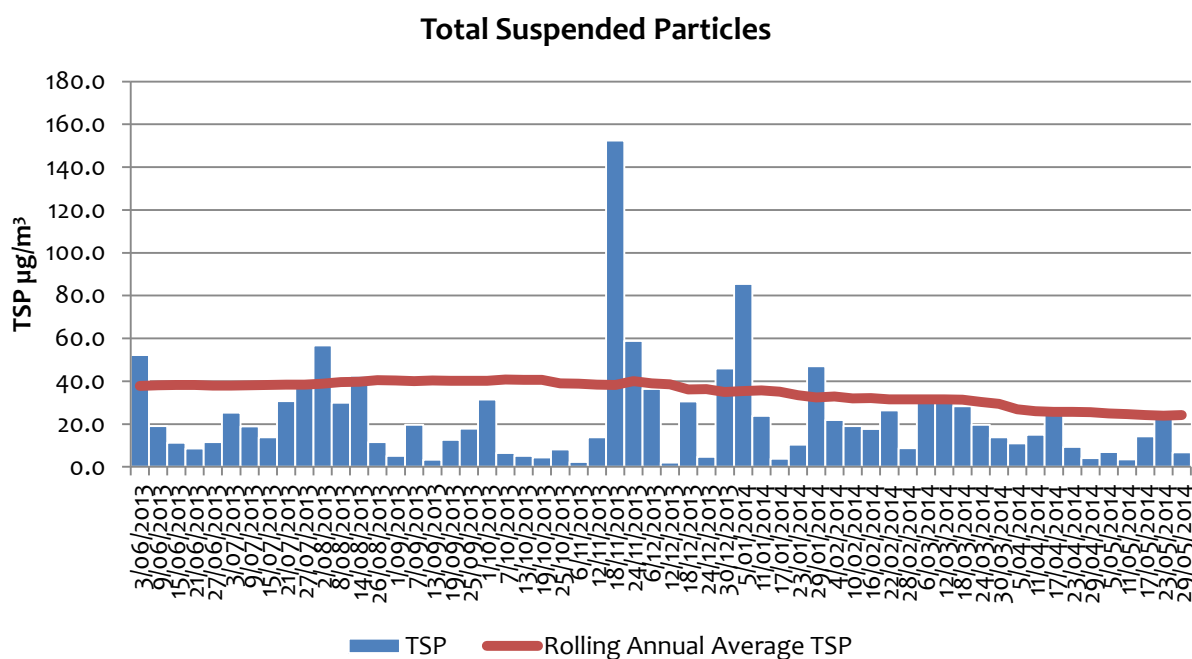
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1 Air Quality

1.1 High Volume Air Samplers (HVAS)

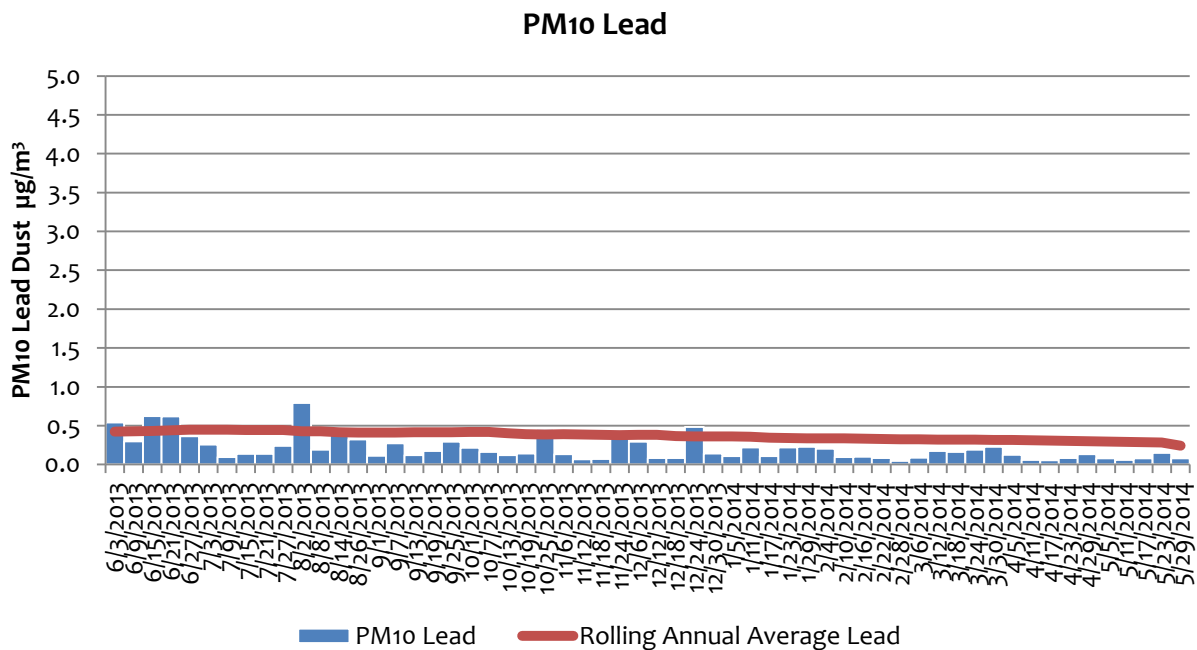
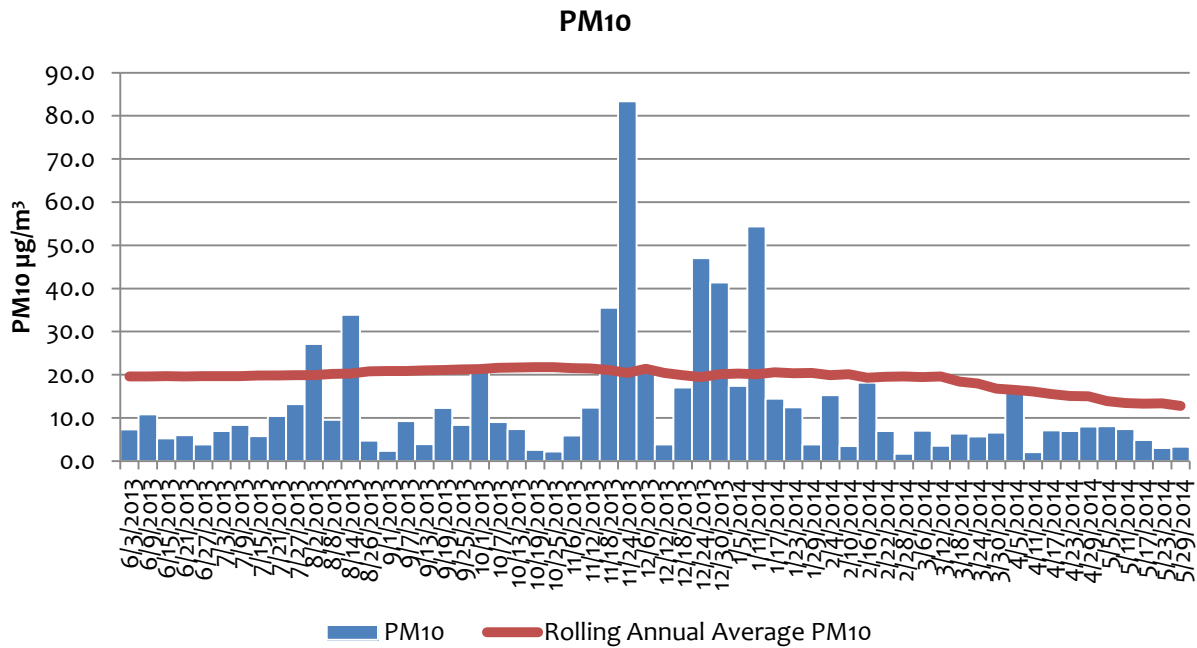
EPL10 - SILVER TANK - ON SITE

DATE	TSP ($\mu\text{g}/\text{m}^3$)	Lead ($\mu\text{g}/\text{m}^3$)
5/05/2014	7	0.12
11/05/2014	7	0.05
17/05/2014	4	0.09
23/05/2014	14	0.11
29/05/2014	24	0.11



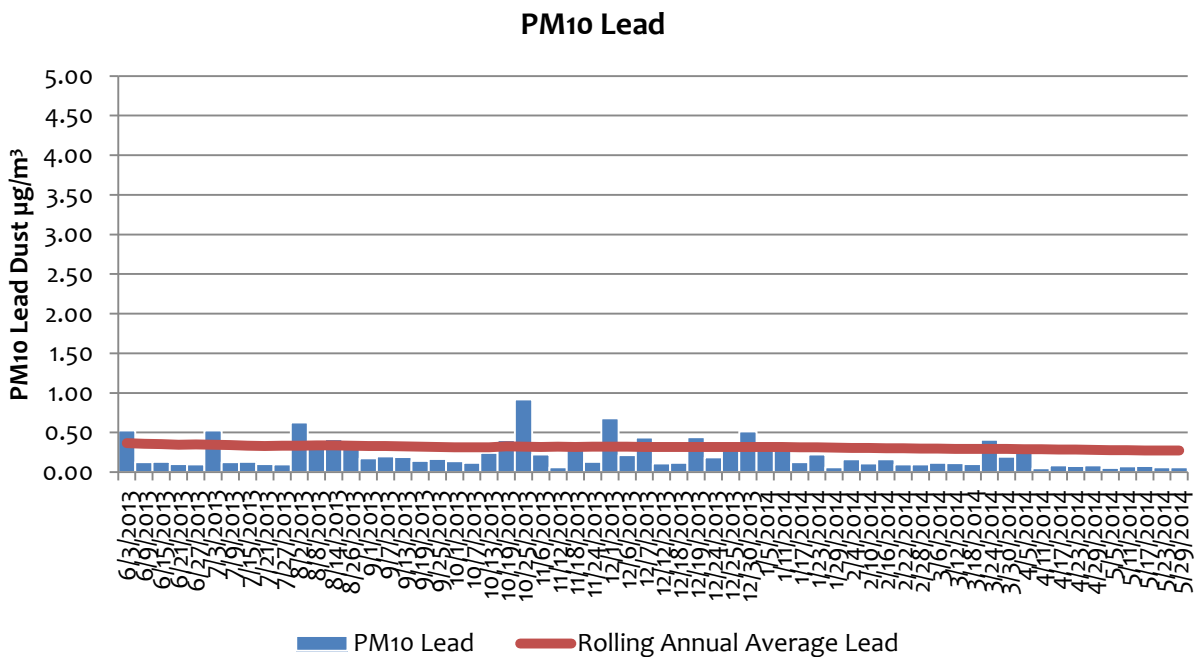
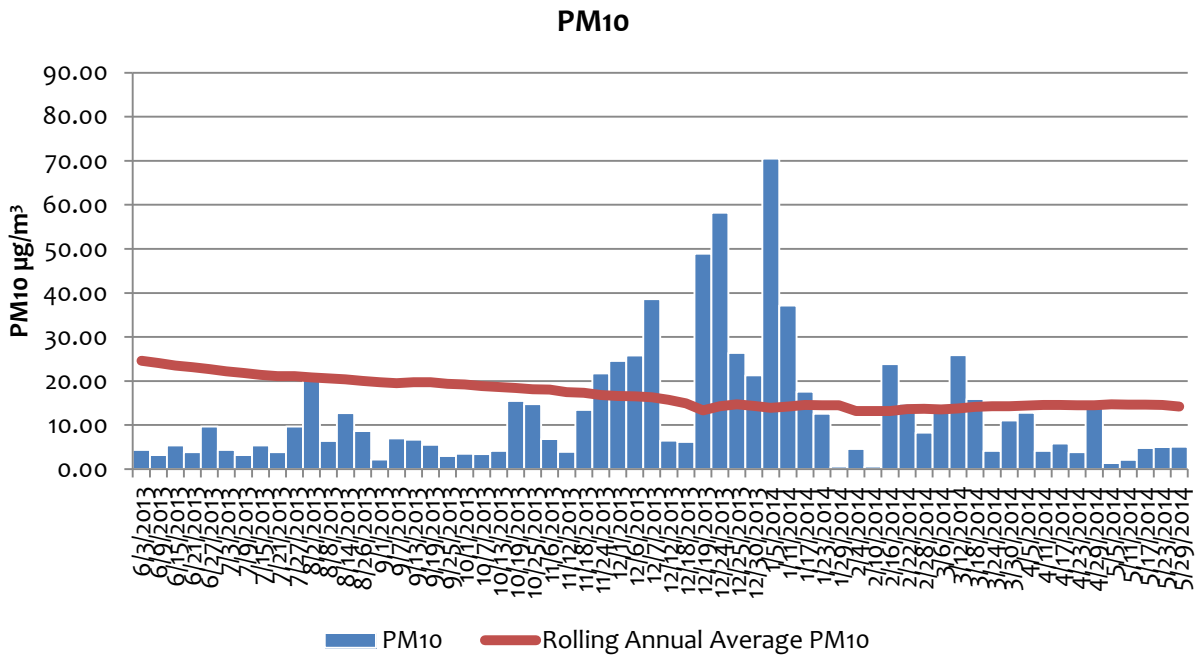
EPL11 - Silver Tank - On Site

DATE	PM10 ($\mu\text{g}/\text{m}^3$)	Lead ($\mu\text{g}/\text{m}^3$)
5/05/2014	8.1	0.1
11/05/2014	7.4	0.1
17/05/2014	4.9	0.1
23/05/2014	3.0	0.1
29/05/2014	3.3	0.1



EPL12 - Blackwoods Pit – On Site

DATE	PM10 ($\mu\text{g}/\text{m}^3$)	Lead ($\mu\text{g}/\text{m}^3$)
5/05/2014	1.37	0.05
11/05/2014	2.08	0.07
17/05/2014	4.82	0.08
23/05/2014	5.00	0.06
29/05/2014	5.06	0.06



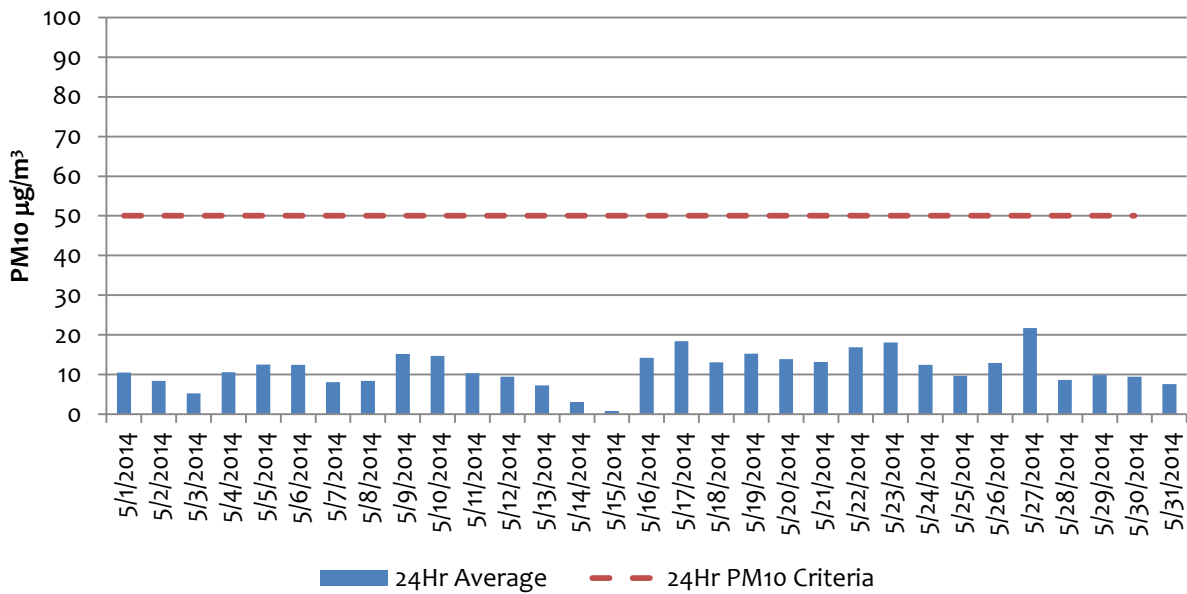
1.2 Tapered Element Oscillating Microbalance Sampling (TEOM)

Particulate Matter <10 Microns 24Hr Average		
Date	TEOM 1 - EPL 13 ($\mu\text{g}/\text{m}^3$) Essential Water – Off Site	TEOM 2 – EPL 14 ($\mu\text{g}/\text{m}^3$) Blackwoods Pit – On Site
1/05/2014	10.52	Invalid data due to power outage
2/05/2014	8.45	6.54
3/05/2014	5.25	4.55
4/05/2014	10.56	10.18
5/05/2014	12.54	11.63
6/05/2014	12.47	12.9
7/05/2014	8.12	11.17
8/05/2014	8.41	10.81
9/05/2014	15.22	10.89
10/05/2014	14.74	11.22
11/05/2014	10.38	16.92
12/05/2014	9.44	11.79
13/05/2014	7.25	9.95
14/05/2014	3.12	10.84
15/05/2014	0.8	4.25
16/05/2014	14.24	5.5
17/05/2014	18.39	12.08
18/05/2014	13.11	11.8
19/05/2014	15.3	11.67
20/05/2014	13.88	12.46
21/05/2014	13.18	12.5
22/05/2014	16.86	12.05
23/05/2014	18.07	12.62
24/05/2014	12.43	12.75
25/05/2014	9.75	8.72
26/05/2014	12.97	10.91
27/05/2014	21.73	14.37
28/05/2014	8.67	8.03
29/05/2014	9.84	10.48
30/05/2014	9.49	8.33
31/05/2014	7.58	6.87

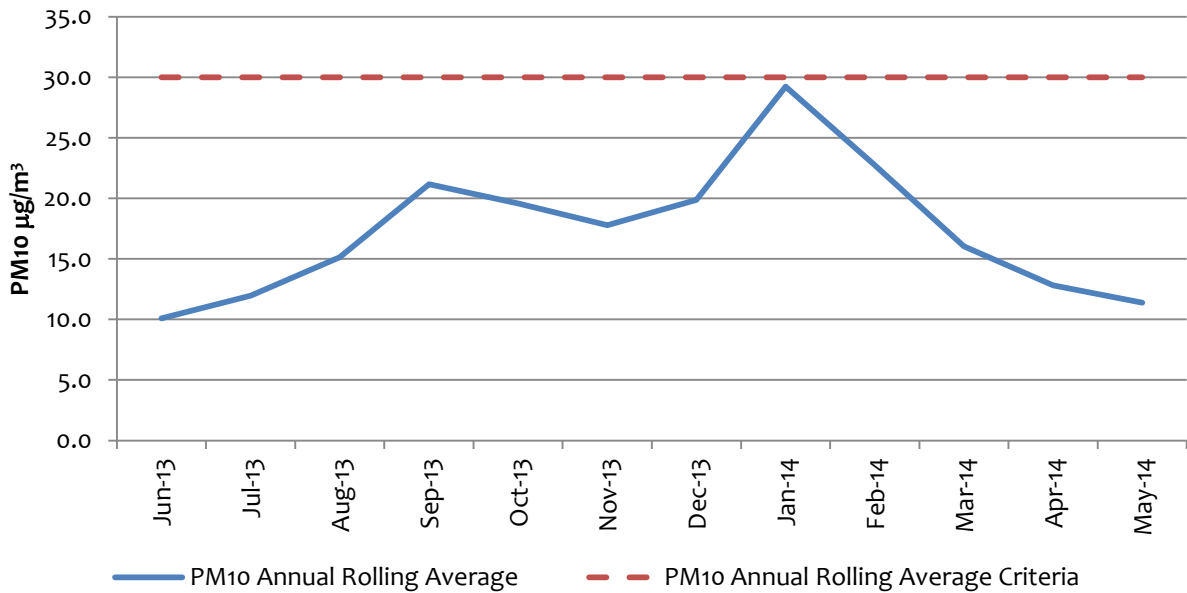
PM10 $\mu\text{g}/\text{m}^3$ 12 Month Rolling Average												
	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14
TEOM 1 EPL13 Essential Water Off Site	10.1	12.0	15.1	21.2	19.6	17.8	19.9	29.2	22.7	16.0	12.8	11.4
TEOM 2 EPL14 Blackwoods Pit On Site	7.8	12.0	15.2	23.4	32.6	22.5	22.0	32.0	23.7	17.6	14.4	10.2

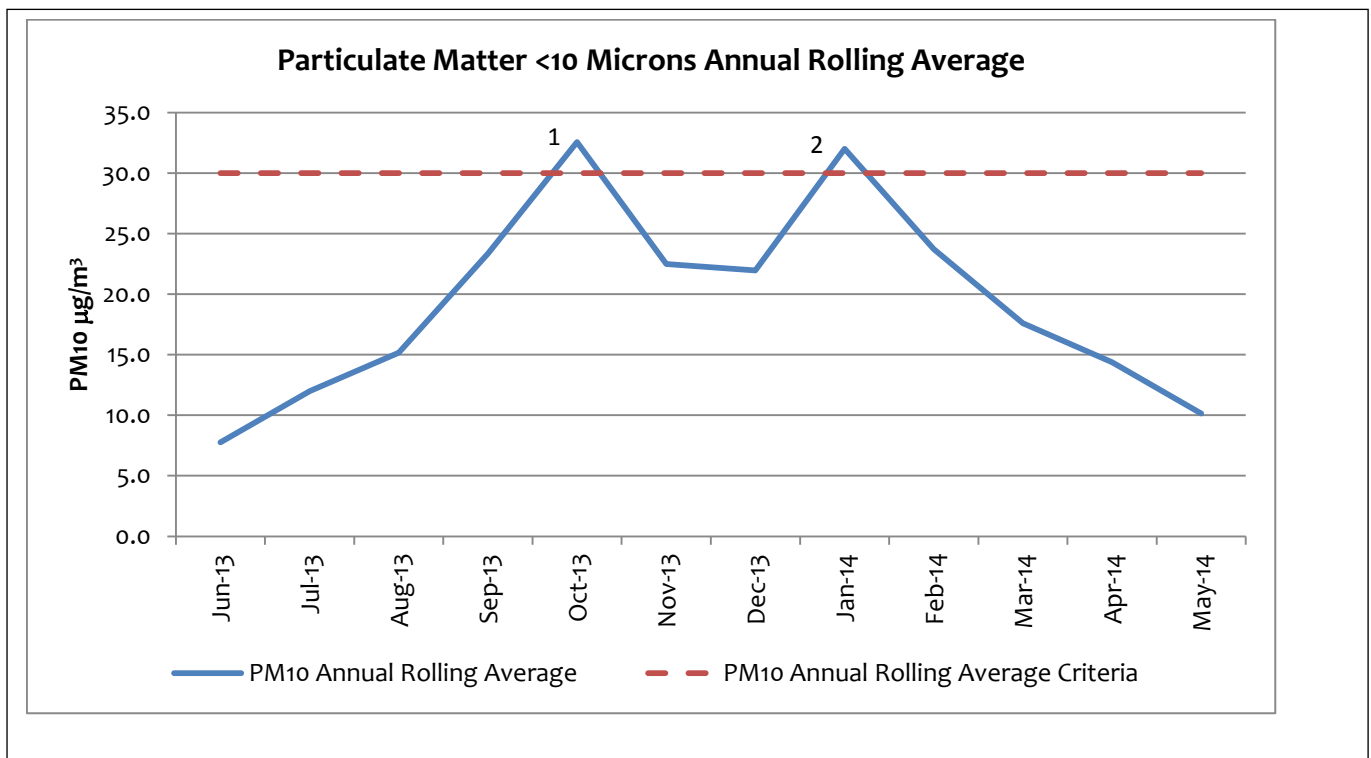
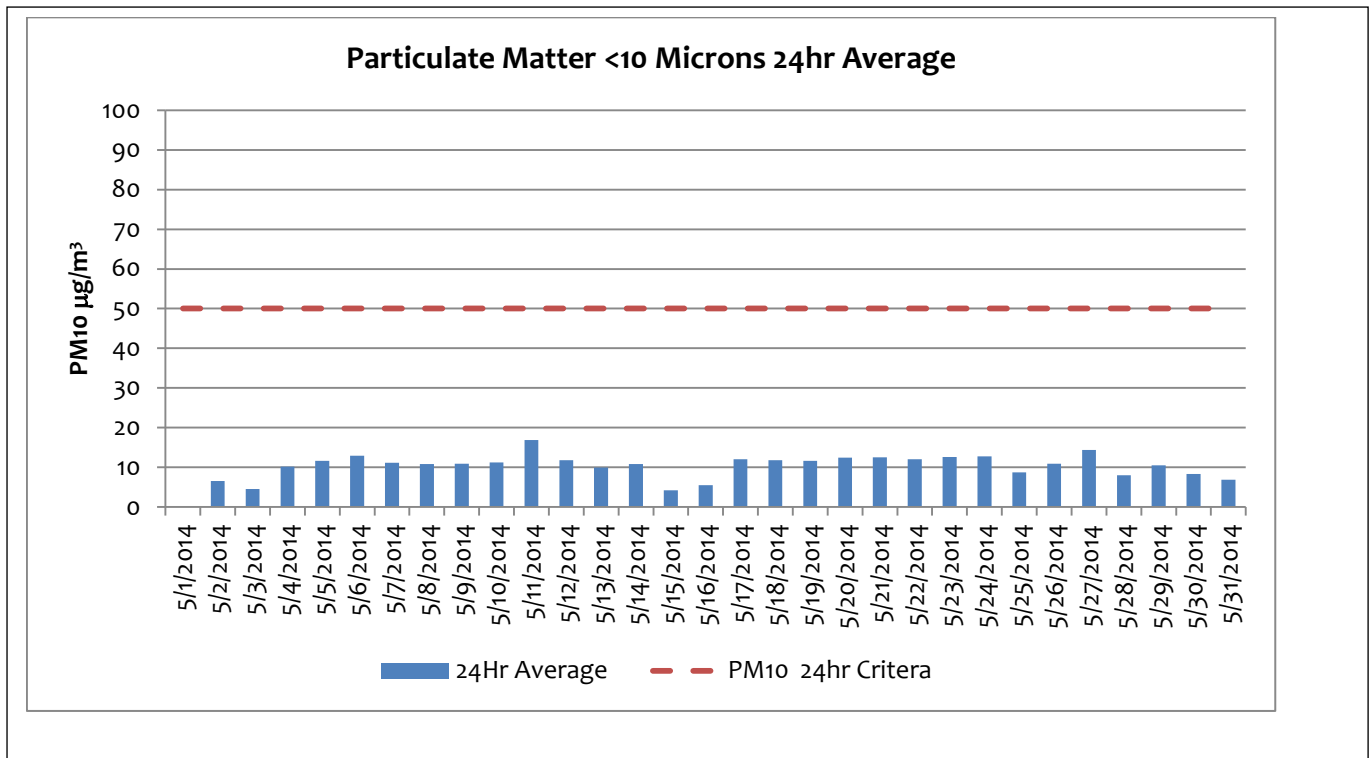
EPL13 – Essential Water – Off Site

Particulate Matter <10 Microns 24hr Average



Particulate Matter <10 Microns Annual Rolling Average





Note:

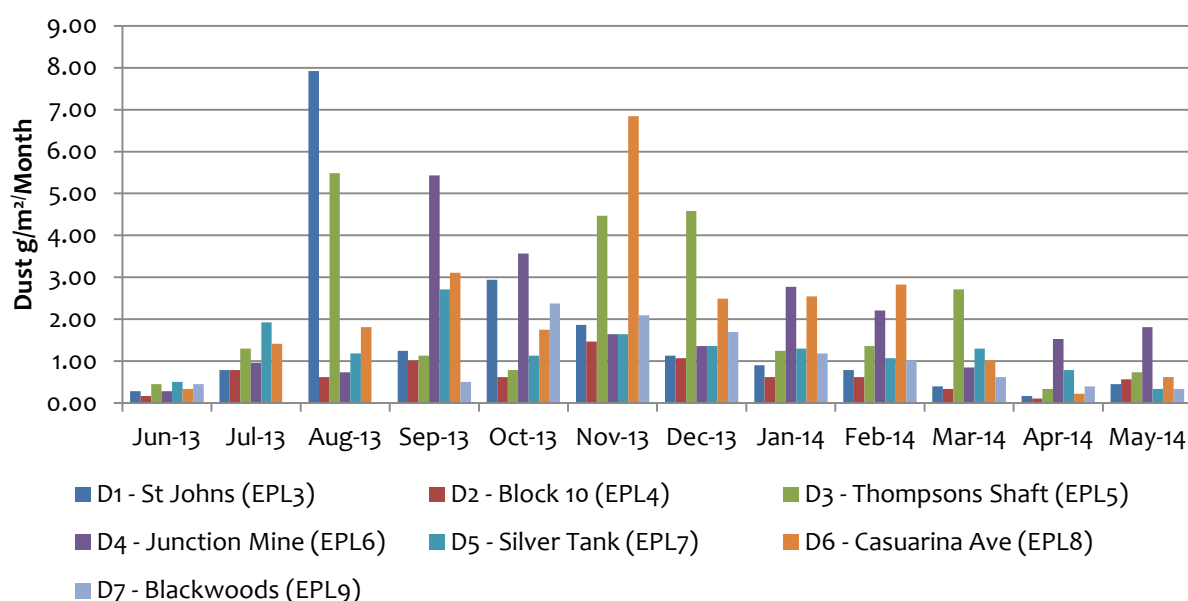
- 1 SW Winds of up to 81Km/h During the month of October 2013 with an Average Temp of 27°C.
- 2 S Winds of up to 72km/h during the month of January 2014 with an average Temperature of 36°C.
Dust suppression was reapplied during the month of January 2013.

1.3 Dust Deposition Sampling

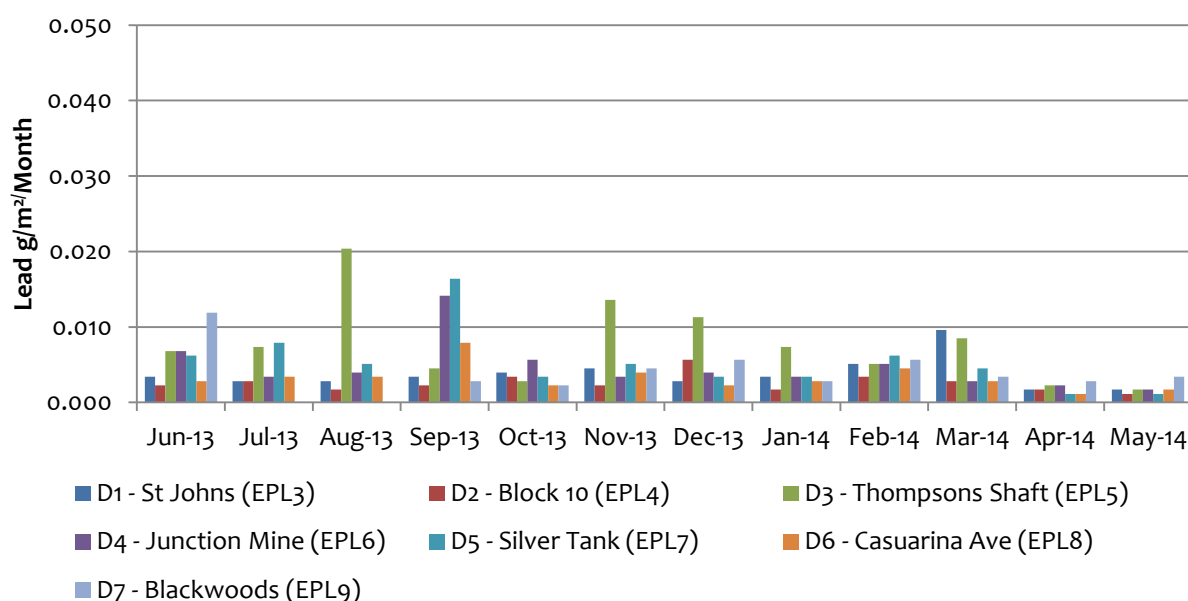
Total Deposited Dust (g/m ² /Month)							
Date	D1 (off site)	D2	D3	D4	D5	D6 (off site)	D7
May 2014	0.45	0.57	0.74	1.81	.034	0.62	0.34
Background Average	4.0	3.1	4.3	5.7	n/a	5.8	n/a

Total Deposited Lead (g/m ² /Month)							
Date	D1 (Off Site)	D2	D3	D4	D5	D6 (Off Site)	D7
May 2014	0.002	0.001	0.002	0.002	0.001	0.002	0.003
Background Average	0.0034	0.0045	0.0046	0.0060	n/a	0.0036	n/a

Monthly Total Deposited Dust



Monthly Total Deposited Lead



2 Blasting (Vibration and Overpressure)

During the month of May blasting occurred daily there was a total number of 74 blasts 17 of which were production firings all inside licensing criteria:

- 57 blast were below a ppv of 0.75mm/s and did not trigger an event
- 2 Blasts recorded a ppv of >5mm/s
- 0 Blasts recorded a ppv of >10mm/s
- All overpressure readings were inside limits.

Date / Location	Peak Vibration (PPV mm/s)	Peak Over Pressure (dBL)
1/05/2014		
V1	>0.75	No Event Triggered
V2	>0.75	No Event Triggered
V3	1.24	88
3/05/2014		
V1	>0.75	No Event Triggered
V2	1.37	110.2
V3	5.48	102.8
8/05/2014		
V1	>0.75	No Event Triggered
V2	>0.75	No Event Triggered
V3	1.44	91.5
9/05/2014		
V1	>0.75	No Event Triggered
V2	1.27	91.5
V3	5.14	102.8
11/05/2014		
V1	>0.75	No Event Triggered
V2	0.937	94
V3	4.1	101
14/05/2014		
V1	>0.75	No Event Triggered
V2	>0.75	No Event Triggered
V3	1.46	91.5
16/05/2014		
V1	>0.75	No Event Triggered
V2	0.904	91.5
V3	3.37	98.8
17/05/2014		
V1	>0.75	No Event Triggered
V2	>0.75	No Event Triggered
V3	1.13	88
18/05/2014		
V1	>0.75	No Event Triggered
V2	0.675	88
V3	3.22	95.9
19/05/2014		
V1	>0.75	No Event Triggered
V2	>0.75	No Event Triggered
V3	1.07	91.5
20/05/2014		
V1	>0.75	No Event Triggered
V2	1.42	94
V3	2.16	95.9
21/05/2014		
V1	>0.75	No Event Triggered
V2	1.19	91.5
V3	2.26	94
22/05/2014		
V1	>0.75	No Event Triggered
V2	0.731	91.5
V3	2.27	94
27/05/2014		
V1	>0.75	No Event Triggered
V2	1.1	94
V3	>0.75	No Event Triggered
29/05/2014		
V1	>0.75	No Event Triggered
V2	1.03	97.5

V3	1.67	94
30/05/2014		
V1	>0.75	No Event Triggered
V2	0.981	88
V3	1.65	94
31/05/2014		
V1	>0.75	No Event Triggered
V2	1.02	101.9
V3	2.84	98.8

Note: Vibration is recorded in Peak Particle Velocity (ppv), Overpressure is recorded in Decibels (dBL)

3 Noise

- *No noise monitoring was scheduled for the month of May 2014*
- *Last sampled March 2014 by EMM consultants for crusher project approval modification*

4 Water

4.1 Ground Water

Date sampled: 27 May 2014, next scheduled sampling is August 2014 for EPL37 to EPL 52 and June 2014 for EPLs 53 and 54.

Sample ID mg/L unless specified pH Value (pH)	GW16 EPL52	GW15 EPL51	GW14 EPL50	GW13 EPL49	GW12 EPL48	GW11 EPL47	GW10 EPL46	GW09 EPL45	GW08 EPL44	GW07 EPL43	GW06 EPL42	GW05 EPL41	GW04 EPL40	GW03 EPL39	GW02 EPL38	GW01 EPL37	U/G EPL54	Sh 7 EPL53
Electrical conductivity (uS/cm)	INSUFFICIENT WATER FOR SAMPLE	INSUFFICIENT WATER FOR SAMPLE	INSUFFICIENT WATER FOR SAMPLE	INSUFFICIENT WATER FOR SAMPLE	INSUFFICIENT WATER FOR SAMPLE	7	7.22	7.5	6.22	6.34	6.31	6.32	7	5.72	INSUFFICIENT WATER FOR SAMPLE	5.15	6.5	6.34
Total Dissolved Solids						2840	12800	10000	8730	13200	14300	16600	14400	15000		12000	10900	11200
Hydroxide Alkalinity as CaCO3						1950	10200	8340	8510	11100	12400	15300	11500	13000		11200	11300	11900
Carbonate Alkalinity CaCO3						0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5
Bicarbonate Alkalinity as CaCO3						0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5
Total Alkalinity						96	251	295	14	41	48	118	226	5		2	26	22
Sulphate as SO4						96	251	295	14	41	48	118	226	5		2	26	22
Chloride						1100	4790	3440	3710	5530	5560	6720	4420	5430		4660	4730	6340
Calcium						273	1730	1550	1310	1820	2640	2870	2730	3010		1400	1130	1140
Magnesium						87	521	680	626	629	550	526	564	586		340	528	699
Sodium						91	515	544	268	446	538	736	533	438		579	271	346
Cadmium						371	2010	1050	835	2340	2340	2950	2560	2510		1920	1540	1820
Manganese						0.001	0.39	0.017	2.27	4.74	0.929	1.03	0.219	2.13		0.273	5.01	5.24
Lead						0.001	43.9	0.551	439	359	344	386	59.4	447		402	434	479
Zinc						16.3	0.121	0.009	1.22	1.34	0.16	0.169	0.157	2.17		0.514	1.38	1.31
Iron						15.9	64	1.88	536	346	211	332	32.8	374		294	1170	1320
						0.05	0.05	0.05	0.5	0.05	0.5	0.5	0.5	0.5		0.5	0.5	0.05

4.2 Surface Water

EPA Identification Number	Frequency	Comment
EPL29 / S31-1	2 x Per year when contains water	Insufficient water for sample
EPL30 / S44	2 x Per year when contains water	Insufficient water for sample
EPL31 / S49	2 x Per year when contains water	Insufficient water for sample
EPL32 / S1-A	2 x Per year when contains water	Insufficient water for sample
EPL33 / S9B-2	2 x Per year when contains water	Insufficient water for sample
EPL34 / Horwood Dam	2 x Per year when contains water	Due for sampling in July
EPL35 / Upstream	2 x Per year when contains water	Insufficient water for sample
EPL36 / Downstream	2 x Per year when contains water	Insufficient water for sample

5 Weather Data

(BHOP – Automatic Weather Station was unavailable for the month of May, repairs are scheduled for June 2014.

The following data was obtained from the Bureau of Meteorology Broken Hill)

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	CLD	Dir	Spd	MSLP	Temp	RH	CLD	Dir	Spd	MSLP
		°C	°C				km/h	local		°C	%	g th	km/h		hPa	°C	%	g th	km/h		hPa
1	Th	8.0	15.8	0.2			WSW	24	15:47	11.3	66	8	Calm		1019.8	15.1	49	8	SW	13	1015.9
2	Fr	11.1	13.4	0			WSW	59	16:03	13.1	84	8	NW	28	1008.7	9.1	96	8	W	22	1004.7
3	Sa	3.8	13.4	13.2			WSW	50	14:57	8.1	81	2	WSW	30	1009.2	12.4	55	6	WSW	37	1008.6
4	Su	5.2	14.8	0.2			WSW	37	11:18	8.6	83	1	WSW	19	1017.6	13.7	53	5	SW	19	1016.9
5	Mo	7.4	18.6	0			WNW	26	13:14	10.3	73	7	Calm		1023.5	17.7	50	1	W	11	1021.4
6	Tu	10.2	18.1	0			SSE	30	21:14	12.9	81	8	SSW	7	1025.5	16.4	79	8	S	9	1023.5
7	We	5.6	15.8	0.2			ESE	31	13:15	9.3	83	1	SE	17	1026.7	15.3	53	3	SSE	20	1023.4
8	Th	5.9	18.3	0			ENE	26	14:59	9.7	77	0	E	9	1024.1	17.3	48	3	ENE	15	1020.4
9	Fr	9.7	20.7	0			N	39	12:27	14.3	67	8	NE	19	1018.7	19.8	40	8	NNW	13	1016.8
10	Sa	12.4	20.7	1.4			SW	30	15:08	13.9	88	7	WNW	13	1021.2	20.1	58	2	SSW	13	1019.4
11	Su	9.8	20.0	0.2			SE	26	14:57	14.4	85	0	SSW	9	1026.7	19.3	54	4	SE	19	1025.5
12	Mo	10.4	19.9	0			ESE	31	15:47	14.3	77	2	ENE	13	1029.6	19.3	47	3	ESE	19	1026.2
13	Tu	9.2	22.2	0			NE	26	12:10	13.7	74	1	Calm		1026.9	21.3	32	2	NNE	7	1023.6
14	We	12.0	25.7	0			N	46	11:54	13.1	75	4	NNE	15	1024.3	24.1	15	4	NNW	19	1021.2
15	Th	12.9	25.6	0			NNW	37	11:14	19.1	43	4	N	19	1025.0	24.9	28	1	NNE	19	1022.4
16	Fr	12.6	24.7	0			N	31	12:02	18.3	48	1	NE	20	1026.6	23.3	37	7	N	15	1024.4
17	Sa	13.2	25.2	0			NNE	33	10:55	21.7	44	7	NNE	19	1026.8	24.3	33	8	NNE	13	1024.0
18	Su	15.9	26.4	0			N	31	10:35	17.7	53	6	NE	15	1024.9	25.8	35	1	NW	13	1021.6
19	Mo	14.0	27.3	0			NW	31	11:21	20.0	51	5	N	13	1023.7	26.7	33	6	NW	17	1021.4
20	Tu	17.1	27.3	0			NW	24	13:29	17.4	77	8	NE	2	1023.8	24.7	41	6	WNW	9	1021.2
21	We	15.9	27.1	0			NNW	28	10:52	20.0	51	2	N	17	1024.0	26.5	36	1	N	13	1021.1
22	Th	16.4	26.6	0			NNW	44	11:32	18.2	55	6	NNE	15	1021.5	25.7	33	5	NNW	20	1017.3
23	Fr	16.4	26.8	0			NNW	31	10:05	18.7	51	7	NNE	13	1017.8	25.0	40	3	WNW	17	1014.5
24	Sa	14.5	26.6	0			WNW	28	13:44	16.5	67	5	NE	11	1017.4	25.8	44	3	WNW	19	1014.9
25	Su	16.3	25.5	0			NW	31	12:04	18.2	67	8	NNE	7	1019.7	25.3	40	7	NW	20	1018.5
26	Mo	15.4	26.4	0			WNW	69	23:04	16.6	61	7	NNE	24	1018.2	25.7	36	7	N	22	1013.2
27	Tu	14.3	20.0	6.8			WNW	61	12:03	16.1	91	1	NW	24	1011.3	16.3	83	5	NW	35	1008.9
28	We	9.9	20.1	1.4			W	30	12:22	13.3	85	1	W	17	1018.3	19.7	53	4	WSW	7	1018.0
29	Th	6.0	20.2	0			N	31	11:23	13.2	76	1	NE	9	1024.2	18.3	53	4	ENE	15	1021.6
30	Fr	6.2	20.8	0			ENE	31	19:03	13.2	72	1	NE	22	1023.4	19.5	48	2	E	17	1019.8
31	Sa	10.2	15.5	4.6			NNE	41	08:32	12.1	88	8	NNE	22	1019.1	14.3	89	7	SSE	6	1015.3
Statistics for May 2014																					
Mean		11.2	21.6							14.8	70	4	14		1021.6	20.4	48	4	16		1018.9
Lowest		3.8	13.4	0						8.1	43	0	Calm		1008.7	9.1	15	1	SSE	6	1004.7
Highest		17.1	27.3	13.2			WNW	69		21.7	91	8	WSW	30	1029.6	26.7	96	8	WSW	37	1026.2
Total				28.2																	

Legend

Dir = Direction, Spd=Wind Speed, Temp=Temperature, RH=Relative Humidity, CLD=Cloud, MSLP=Mean Sea Level Pressure

6 Data Log

Sample	Date sent to lab	Result Received	Date Published
Hi Volume Samples	06/06/2014	25/06/2014	14/07/2014
TEOM	Real time	01/07/2014	14/07/2014
Dust Deposition	06/06/2014	25/06/2014	14/07/2014
Water	05/06/2014	25/06/2014	14/07/2014
Blast Vibration and overpressure	Real Time	01/07/2014	14/07/2014

7 Correction Log June 2013 to May 2014

Sample	Original Data	Corrected Data		Date Corrected		Date Originally Published	Reason	
EPL10	3/06/2013	TSP	Lead	TSP	Lead	07/05/2014	14/06/2013	Contamination during analysis at lab
		52.26	2.90	52.26	0.70			
EPL10	9/06/2013	TSP	Lead	TSP	Lead	07/05/2014	14/06/2013	Contamination during analysis at lab
		18.99	1.43	18.99	0.24			
EPL11	3/06/2013	TSP	Lead	TSP	Lead	07/05/2014	14/06/2013	Contamination during analysis at lab
		7.3	3.1	7.32	0.54			
EPL11	9/06/2013	TSP	Lead	TSP	Lead	07/05/2014	14/06/2013	Contamination during analysis at lab
		10.8	2.2	10.83	0.30			
EPL12	3/06/2013	TSP	Lead	TSP	Lead	07/05/2014	14/06/2013	Contamination during analysis at lab
		11.43	5.05	4.35	0.52			
EPL12	9/06/2013	TSP	Lead	TSP	Lead	07/05/2014	14/06/2013	Contamination during analysis at lab
		5.30	0.25	3.21	0.13			
EPL12	15/06/2013	TSP	Lead	TSP	Lead	07/05/2014	14/06/2013	Contamination during analysis at lab
		2.86	.024	5.36	0.13			
EPL12	21/06/2013	TSP	Lead	TSP	Lead	07/05/2014	14/06/2013	Contamination during analysis at lab
		3.10	0.48	3.87	0.10			
EPL12	27/06/2013	TSP	Lead	TSP	Lead	07/05/2014	14/06/2013	Contamination during analysis at lab
		3.27	0.25	9.64	0.10			