



WE CARE. WE DELIVER.

Bloomfield Colliery

Annual Review Report

2018

Bloomfield Collieries Pty Ltd

Annual Review Report 2018

Table 1: Title Block

Name of Mine	Bloomfield Colliery		
Titles/Mining Leases	ML1738, CCL761, ANA1001		
Name of leaseholder	Bloomfield Collieries Pty Limited		
Name of Mine Operator	Bloomfield Collieries Pty Limited		
MOP Commencement Date	July 2018	MOP Completion Date	December 2020
Annual Review Commencement Date	1/1/2018	Annual Review End Date	31/12/2018
Water Licence	20AL217062 WAL 41506		
Name of Licence holder	Bloomfield Collieries Pty Limited		
<p>I, Greg Lamb, certify that this audit report is a true and accurate record of the compliance status of Bloomfield Colliery for the period 1/1/18 – 31/12/18 and that I am authorised to make this statement on behalf of Bloomfield Collieries Pty Ltd.</p> <p><i>Note.</i></p> <p>a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.</p> <p>b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or \$22,000, or both).</p>			
Name of Authorised Reporting Officer	Greg Lamb		
Title of Authorised Reporting Officer	Environmental Advisor		
Signature of Authorised Reporting Officer			
Date	20/3/19.		

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1 STATEMENT OF COMPLIANCE

Table 2: Statement of Compliance

Were all conditions of the relevant approvals complied with?	
PA 07_0087	Yes
ML 1738	Yes

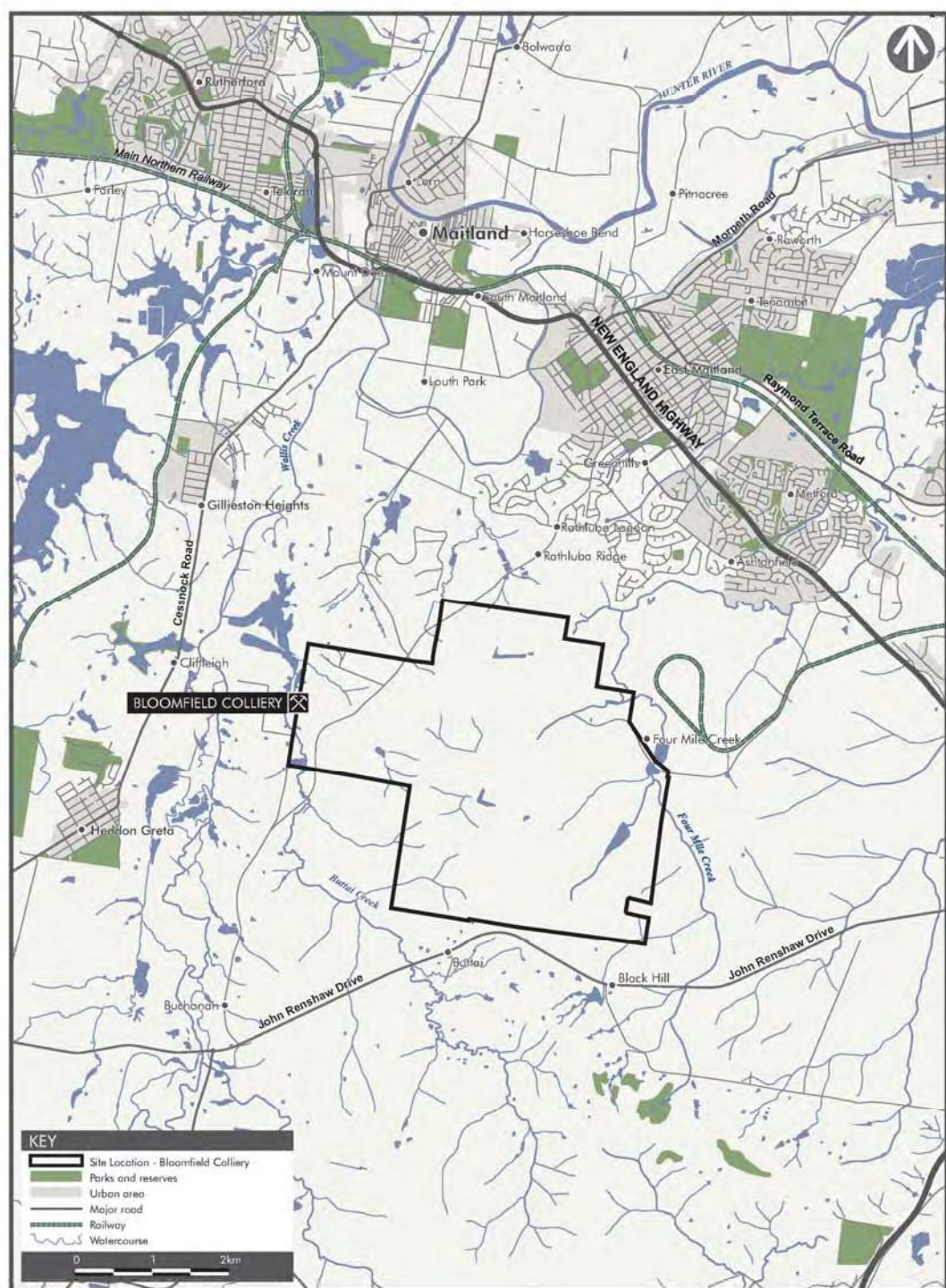
During the reporting period an Independent Environmental Audit was conducted in accordance the Project Approval and covered a three year period. A number of non-compliances were identified during the independent audit that related to events prior to the 2018 Annual Review period. For further details regarding these non-compliances refer to Section 10.

2 INTRODUCTION

Bloomfield Collieries (Bloomfield) is one of two open cut coal mines which a part of the Bloomfield Group of Companies (TBG). Bloomfield Colliery is located at Ashtonfield, NSW, and produces approximately 0.6 million tonnes of product coal by open cut methods per year. Coal has been mined on the property for over 100 years. Underground mining by the current owner commenced in 1937 and the last coal extracted from underground operations was in May 1992. The open cut commenced operations in 1966. Bloomfield produces mainly thermal coal with some semi soft coking coal, principally for the Asian export market. The parent company also owns Rix's Creek Mine which is located north of Singleton. Rix's Creek currently produces approximately 2 million tonnes of product coal per year.

This report covers 1 January 2018 till 31 December 2018.

This report is prepared to meet the requirements for the production of Annual Environmental Management Reports (AEMR), as outlined by the NSW Department of Primary Industries - Mineral Resources (DPI-MR) in the Guidelines to the Mining, Rehabilitation and Environmental Management Reporting Process (edg03 V3, DPI-MR, 2006). It is also prepared to meet the requirements for the Annual Review, as outlined by the NSW Department of Planning & Environment (DPE) in the *Annual Review Guideline, October 2015*.



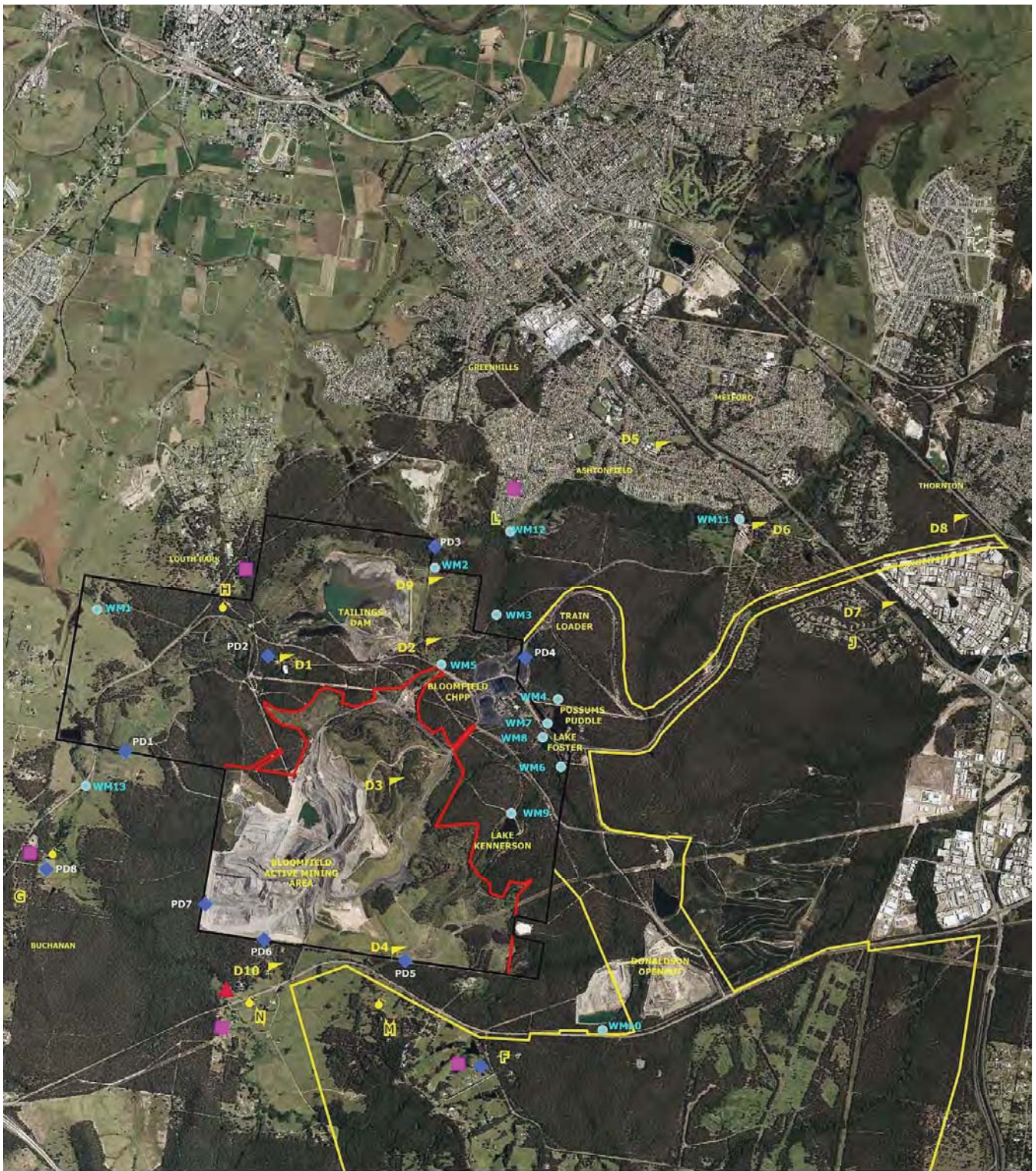
2.1 Consents, Leases and Licences


The lease area for ML1738 and the PA 07_0087 boundary are shown on Plan 1.

Project Approval (05_0136) for the Abel Underground Mine allows for the operation of the Bloomfield Coal Handling and Preparation Plant (CHPP), Rail Loading Facility (RLF) and other related facilities required for the handling and processing of coal.

Project Approval (07_0087) was granted by the Minister for Planning under Part 3A of the *Environment Planning & Assessment Act 1979* (EP&A Act) to allow for the completion of open cut mining operations and rehabilitation. The approval was issued 3 September, 2009 and is subject to a number of conditions. A variation to modify the Project Approval under s75W of the EP&A Act was granted on 16 May 2011 (07_0087_Mod 1). An additional variation to modify the Project Approval under s75W of the EP&A Act was granted on 29 March 2012 (07_0087_Mod 2). A further variation to modify the Project Approval under s75W of the EP&A Act was granted on 20 February 2013 (07_0087_Mod 3). During 2018 a variation to modify the Project Approval under s75W of the EP&A Act was granted on 16 August 2018 (07_0087_Mod 4).

A Mining Operations Plan (MOP) has been prepared under DRE's ESG3: MOP Guidelines September 2013. The MOP covers the period 2018 – 2020.



 Bloomfield Colliery Annual Review 2018		
Plan 1 Environmental Monitoring Sites		
Scale: 1:33,333	Date: January 2019 Photo: December 2018	Drawing: A3

2.2 Mine Contacts

The Bloomfield Colliery Mine Manager, Mr Brad Donoghue, is the primary mining contact and is responsible for regulatory compliance. The Environmental Advisor is Mr Greg Lamb who coordinates environmental management and rehabilitation operations at Bloomfield Colliery.

Mr Brad Donoghue	Mine Manager	Tel: 02 4930 2641 Mob: 0418 923 058 bdonoghue@bloomcoll.com.au
Mr Greg Lamb	Environmental Advisor	Tel: 02 4930 2689 Mob: 0457 819 211 glamb@bloomcoll.com.au
Environmental / Community Hotline		24hr: 02 4930 2680

3 APPROVALS

Bloomfield Colliery operates under the following approvals, leases and licenses as presented in Table 3.

Table 3: Approvals, Leases and Licences

Approval/Lease/License	Issue Date	Expiry Date
Project Approval 07_0087	3 September 2009	31 December 2021
Project Approval 07_0087_ Mod 1	16 May 2011	31 December 2021
Project Approval 07_0087_ Mod 2	29 March 2012	31 December 2021
Project Approval 07_0087_ Mod 3	20 February 2013	31 December 2021
Project Approval 07_0087_ Mod 4	16 August 2018	31 December 2030
Mining Lease 1738	29 June 2016	29 June 2037
Ancillary Mining Activity AMA1001	3 August 2018	29 June 2037
Consolidated Coal Lease (CCL) 761	20 October 1991	8 October 2029
Project Approval 05_0136 (Abel Mine)	7 June 2007	31 December 2030
Environmental Protection License 396	31 December 2007	-
Notification of Dangerous Goods NDG028550	29 July 2018	-
Licence No. 20AL217062 WAL 41506	7 June 2016	6 June 2039

4 OPERATIONS DURING THE REPORTING PERIOD

4.1 Exploration

There were no exploration activities at Bloomfield during the reporting period.

4.2 Land Preparation

Approximately 5 Ha of land was prepared for mining during the reporting period. This area was to the west of Creek Cut and had been cleared of vegetation in previous years. Groundcover was removed and the soil material stripped. The soil material was removed and stockpiled for later use.

4.3 Construction

No construction was undertaken on the site during the reporting period.

4.4 Mining

During the reporting period, Bloomfield operated 15 shifts a week for 48 weeks employing 93 personnel. Production was 1,083,000 tonnes of raw coal, 609,000 tonnes of saleable coal and 5.7 million cubic metres of overburden moved primarily using a Hitachi 5500 excavator and Caterpillar rear dump trucks.

Mining operations continued in S Cut and Creek Cut throughout the year, generally in accordance with the mining methods described in the 2018-2020 MOP. During the next reporting period, Mining in S Cut will continue towards the west and Creek Cut will continue towards the south and west.

4.5 Mineral Processing

The Coal Handling and Preparation Plant (CHPP) has a throughput of up to 8.5 Mtpa, as approved under the Abel Consent. The throughput capacity is rated at 1000 tonnes per hour. ROM coal and clean coal volumes are presented in Table 4.

Table 4: Production and Waste Summary

Material	Approved limit	Previous reporting period	This reporting period	Next reporting period (forecast)
Overburden	N/A	5,861,000	5,699,000	6,400,000
ROM Coal	1,300,000	978,000	1,083,000	1,100,000
Coarse reject	N/A	290,000	308,000	340,000
Tailings	N/A	156,000	166,000	160,000
Saleable product	N/A	532,000	609,000	600,000

4.6 Waste Management

Process Waste

Process Waste from the CHPP consists of breaker reject, coarse rejects and fine rejects (tailings). Breaker reject consists of large diameter (>150mm) rocks and coal rejects, and is hauled by truck to operational open cut pits and placed under advancing overburden dumps. Coarse rejects which are separated out during processing, and are currently disposed of under advancing overburden dumps. Fine tailings are currently pumped as 20% solids slurry to Tailings Dam, a disused open cut pit in north of the mine site. Reject fines settle out of the slurry, gradually backfilling the pit, whilst the decant water is returned to the CHPP for re-use in processing. Process waste volumes are provided in Table 4.

Waste Oil

Waste oil from scheduled maintenance of mining equipment and the workshop oil separator is collected in a storage tank and periodically evacuated for reprocessing and re-use by a licensed waste oil contractor. In 2018 a total of 55,000 litres of waste oil was collected for recycling.

Waste Oil Filters

During the reporting period a recycling bin was installed for disposal of used oil filters. Used oil filters are placed in a 1.5m³ bin and collected by licensed waste contractor for disposal. In 2018 a total of 4.3 tonnes of used filters was collected for disposal.

Waste Metal

Bloomfield has a well implemented scrap metal recycling program, and has a high rate of on-site re-use of suitable steel. If no longer suitable for re-use, scrap metal is collected in designated skips and sold for recycling. In 2018 a total of 78 tonnes of scrap metal was collected for recycling.

General Waste

General waste is placed in 1.5m³ and 3m³ bins and collected by licensed waste contractor for disposal. In 2018 a total of 103 tonnes of general waste was collected for disposal.

Waste Paper

During the reporting period recycling bins were installed for disposal of paper and cardboard. Waste paper and cardboard waste is placed in 1.5m³ and 3.0m³ bins and collected by licensed waste contractor for disposal. In 2018 a total of 7 tonnes of waste paper and cardboard was collected for recycling.

4.7 Product Stockpiles

The ROM stockpile pad has a capacity of 150,000 tonnes and the clean coal stockpiles have a capacity of approximately 500,000 tonnes.

4.8 Hazardous Materials Management

Bloomfield held dangerous goods notification and a licence to store and handle explosives in accordance with WorkCover legislation for substances stored on site. The notification covers depots for explosives, distillate, gas cylinder stores, sodium hydroxide and MIBC reagent.

Explosives are stored in an explosive magazine located on site. The magazine complies with the relevant standards for storage of explosives. Bulk materials are also stored on site in a hopper for loading into a mobile mixing unit. This area is enclosed within concrete bunding and any spillage from this area is directed into a collection tank for periodic removal by a licensed contractor.

A bunded fuel farm, designed in accordance with AS1940, is used for bulk distillate storage at the open cut workshop. Spill protected racks are used for small volumes of oil and lubricant storage. Distillate, MIBC and sodium hydroxide used for coal processing in the CHPP are stored in tanks contained in bunded enclosures.

ChemAlert is an online Safety Data Sheet (SDS) database service and is used to provide up to date SDS information. If new chemicals are introduced to site they must comply with system requirements and be approved by the Mine Manager.

No hazardous materials-related environmental incidents were reported during the reporting period.

4.9 Other Infrastructure Management

Silt traps along the edges of haul roads and hard stand areas are cleaned at regular intervals. They have been designed to capture surface run off during rain events and allow sediment to settle. All silt traps, dams, drains, bunds, lines, valves and other infrastructure used to manage runoff are inspected on a quarterly basis as part of the site Environmental Management System (EMS). Issues identified during the inspections are reported and appropriate actions taken to address these matters.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Listed in Table 5 below are the actions required from the review of the 2017 Annual Review. Also listed are the relevant sections of the report that describe the measures taken in response to these actions. The review of the 2017 Annual Review report, by the Resources Regulator, included a site inspection that was conducted on the 5th July 2018.

Table 5: Action Required from 2017 Annual Review

Action Required	Requested by	Status	Report Section
Future annual reviews to describe actions undertaken as an outcome from complaints received	DPE	Complete	Section 4.1
Future annual reviews to re-name the document as an Annual Review, rather than an Annual Environmental Management Report (AEMR) as it is referred to throughout the document	DPE	Complete	Whole document

6 ENVIRONMENTAL PERFORMANCE

6.1 Meteorological Monitoring

Bloomfield Colliery has installed a continuously operating meteorological station in accordance with Project Approval requirements for the operation of the mine. The weather station has real-time capabilities for all personnel to access via computer or phone. The station records the following environmental parameters:

- wind speed;
- wind direction;
- temperature;
- relative humidity;
- rainfall
- solar radiation; and
- evaporation.

A comparison of monthly recorded rainfall for the 2018 reporting period and annual average data is shown in Figure 2. The total rainfall for the twelve month period was 850 mm. This was 59 mm below the annual average of 909 mm. The middle part of 2018 was extremely dry with the mine site only receiving 55% of the average rainfall for that period.

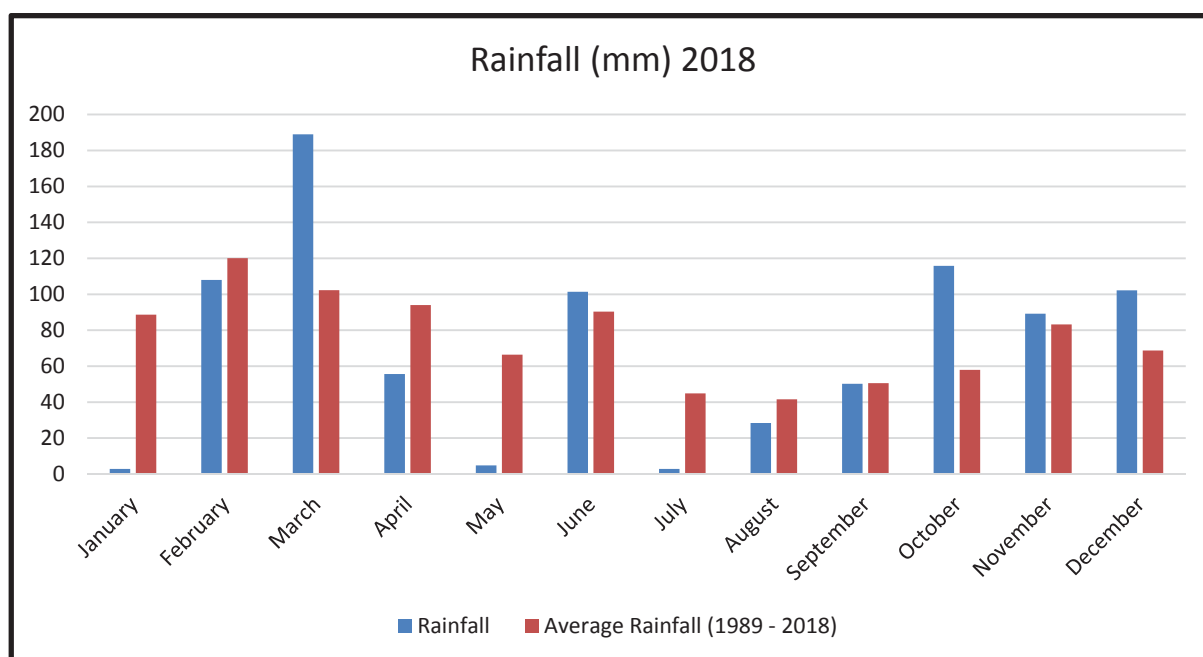


Figure 2: Rainfall 2018

A summary of the rainfall data for the past 30 years is presented in Table 6..

Table 6: Monthly Rainfall Records

Period	Average Monthly Rainfall (mm)												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	
1989	177	62	168	133	95	208	52	6	15	33	48	43	1038
1990	42	448	80	190	80	58	71	135	73	57	6	39	1278
1991	83	14	4	12	90	104	39	9	6	30	37	167	593
1992	64	235	91	86	23	72	12	22	20	25	87	175	911
1993	125	53	65	16	29	81	109	64	36	31	72	33	713
1994	30	102	89	76	53	36	4	11	0	36	64	13	514
1995	162	48	171	0	129	51	1	0	78	37	184	80	942
1996	70	71	28	7	106	74	50	59	48	24	59	30	625
1997	105	101	63	0	85	78	65	28	50	34	25	56	688
1998	89	81	3	45	203	90	84	155	73	63	108	121	1114
1999	66	74	64	129	8	122	156	47	64	173	36	58	997
2000	95	34	281	149	44	12	51	36	31	58	93	28	912
2001	44	163	174	113	156	7	44	21	21	30	124	46	941
2002	54	235	172	48	55	28	31	26	25	10	43	129	856
2003	1	93	53	72	133	13	42	42	0	112	102	39	701
2004	76	163	72	45	18	10	27	44	64	154	59	38	769
2005	64	135	153	27	112	67	10	1	40	81	72	14	775
2006	38	66	39	23	11	62	50	58	194	21	53	24	635
2007	24	101	103	87	66	377	20	75	28	32	144	94	1150
2008	139	173	46	240	4	131	33	32	195	65	70	59	1184
2009	6	340	107	129	83	66	33	2	31	60	40	48	943
2010	78	35	75	28	75	118	62	43	27	66	151	70	826
2011	32	41	73	125	100	162	127	54	109	100	179	81	1182
2012	65	205	137	122	7	179	57	20	19	6	58	40	915
2013	180	184	121	101	59	99	18	11	22	43	288	22	1147
2014	16	83	138	106	30	47	22	102	38	68	23	169	844
2015	208	53	46	513	111	43	18	34	81	53	86	132	1378
2016	467	32	48	47	12	89	55	77	69	46	33	67	1041
2017	60	72	216	97	14	126	2	6	12	78	65	48	795
2018	3	108	189	56	5	101	3	28	50	116	89	102	850
Average	89	120	102	94	66	90	45	42	51	58	83	69	909

The results of wind speed and direction monitoring shows a pattern typical in the Hunter Valley. During summer the winds predominate from the south east and winter the west-northwest. Autumn and spring are transitional seasons with winds distributed between both northwest and south-easterly directions. Figure 3 shows the annual windrose generated for the site on an annual basis.

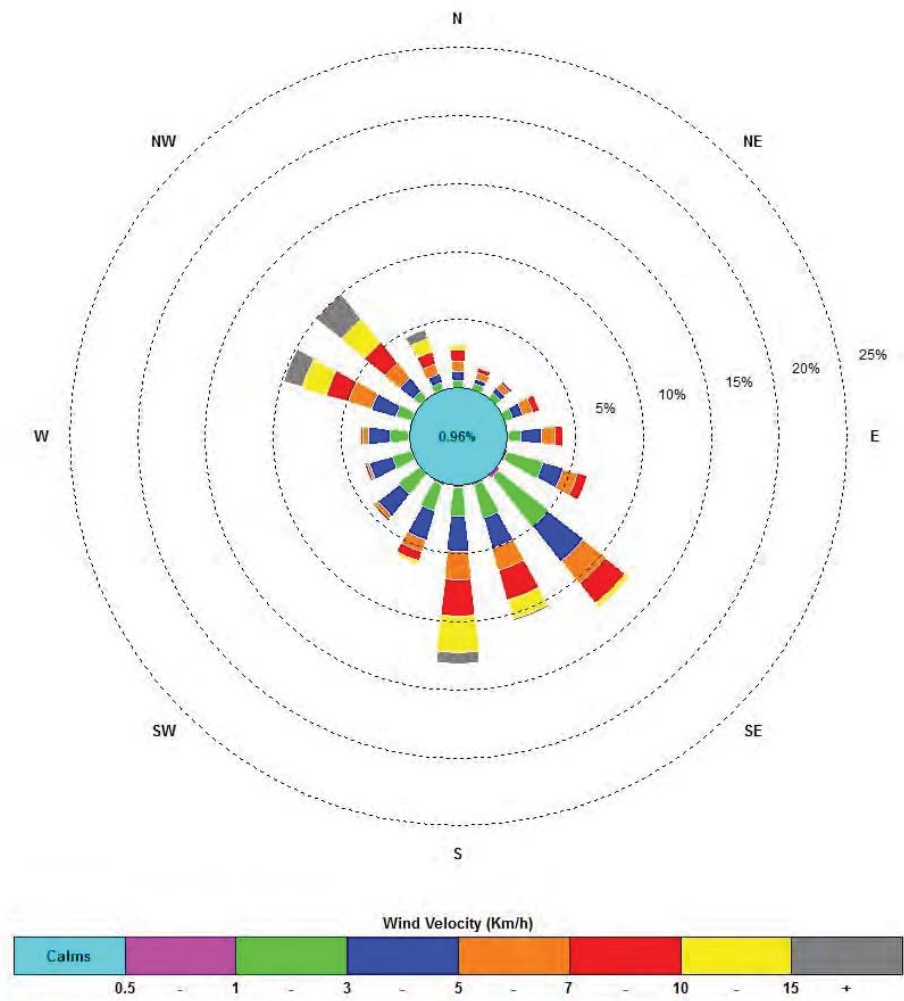


Figure 3: Windrose for Bloomfield 2018

6.2 Air Quality

6.2.1 Environmental Management

An Air Quality Monitoring Program has been prepared and approved by DPE in accordance with Project Approval requirements for the operation of the mine.

Dust can be generated by the operation of mobile plant on unsealed surfaces, loading and handling of coal and overburden in dry and windy conditions, or by blasting. Operational procedures are in place to minimise dust impacts on the surrounding environment and community. Vehicular generated dust is controlled through the use of water carts on all internal roads and high traffic areas. The company provides a fleet of three water trucks to allow for greater coverage and flexibility in dry and/or windy conditions.

Sprinkler systems operate on coal stockpile areas and the surrounds of the washing plant. Conveyor systems at the washing plant and rail loader are enclosed on at least two sides. Operational practices such as not dumping to exposed locations, minimizing the drop height into trucks during loading are also employed.

The use of a predictive meteorological modeling software program is utilised to assist in planning mine operations. The software incorporates regional weather station data to predict daily weather events that may exacerbate dust impacts from operations.

A dust monitoring program is in place with 10 dust deposition gauges and 2 High Volume Air Samplers (HVOL) located on and around the mine lease area. The locations are listed in Table 7 and are shown in Plan 1. Samples are collected by independent environmental consultants and analysed by a NATA registered laboratory.

During 2018 the modified Project Approval (07_0087_Mod 4) included a new condition to monitor for PM_{2.5} dust emissions. PM_{2.5} monitoring commenced in November 2018.

Table 7: Dust Monitoring Sites

Site	Location
On Lease	
D1	Adjacent to Buttai Reservoir
D2	Adjacent to Main Haul Road
D3	Communications Tower
D4	Adjacent John Renshaw Drive
D9	Shamrock Lane
Off Lease	
D5	Bali Close Ashtonfield
D6	Off Four Mile Creek Road
D7	Off New England Highway, Avalon Estate
D8	Adjacent of Main North Rail line at Rail Loop
D10	Private property adjacent to John Renshaw Drive
HVOLs	Private property adjacent to John Renshaw Drive

6.2.2 Environmental Performance

Dust Deposition

Table 8 summarises the monthly deposition rates for insoluble solids during the reporting period and includes long-term averages for the site and the EPA guideline of 4 g/m²/month.

Table 8: Annual Average Dust Deposition

Insoluble Solids (g/m ² /month)										
Site	D1	D2	D3	D4#	D5	D6	D7	D8	D9	D10
Jan-18	0.9	1.7	0.9	1.6	2.5	1.2	1.9	2.2	1.0	1.5
Feb-18	1.5	1.3	1.2	1.6	1.0	1.7	3.1	2.1	1.0	1.2
Mar-18	0.9	0.9	1.0	1.0	1.1	1.1	1.8	1.0	D	0.9
Apr-18	1.0	1.4	0.8	1.4	1.6	0.7	1.3	1.6	0.6	1.7
May-18	0.4	0.9	0.6	1.3	1.6	1.1	1.1	1.1	0.7	1.3
Jun-18	0.6	0.5	0.7	0.7	2.1	1.8	1.0	0.9	0.8	1.7
Jul-18	0.8	0.7	0.4	1.0	1.4	1.1	0.7	0.7	0.6	1.2
Aug-18	0.3	1.5	0.8	1.9	1.9	1.5	1.4	1.2	1.3	2.5
Sep-18	0.9	1.4	1.3	1.0	1.5	1.6	0.8	0.8	0.9	1.7
Oct-18	0.6	0.5	0.8	0.8	1.3	2.7c	1.2	0.9	0.5	1.1
Nov-18	0.7	1.0	0.9	1.2	1.5	4.2c	1.0	1.0	0.9	1.4
Dec-18	1.9	2.7	2.1	2.6	2.3	4.3	3.1	2.3	2.0	2.7
Annual Averages										
1997-1998	1.2	1.8	1.8	1.5	1.1	1.9	1.6	1.5	1.8	1.7
1998-1999	1.5	2.1	1.8	1.6	1.3	2.4	1.6	1.1	1.8	0.9
1999-2000	1.8	2.6	1.8	1.1	1.5	1.9	2.0	1.3		
2000-2001	1.2	1.6	1.3	1.4	1.2	3.1	1.8	1.1		
2001-2002	1.1	1.8	1.4	6.6	1.3	2.0	2.4	1.3	1.4	1.7
2002-2003	1.7	2.0	1.2	4.3	1.9	2.3	1.9	1.8	1.4	2.2
2003-2004	2.4	1.6	0.8	6.5	1.2	1.5	1.4	1.3	1.0	1.0
2004-2005	1.6	1.5	1.1	3.2	1.1	2.2	1.4	1.4	0.9	1.1
2005-2006	3.4	1.9	1.2	3.1	1.0	1.4	1.5	1.4	1.2	1.9
2006-2007	2.8	2.2	1.5	3.9	3.0	1.7	1.8	1.7	1.2	1.8
2007-2008	2.7	1.9	1.6	5.2	2.1	2.0	1.9	2.2	1.2	2.3
2008-2009	1.8	1.9	3.3	6.0	1.3	1.7	2.0	1.9	1.5	2.9
2009-2010	1.8	2.4	3.2	3.1	1.4	1.6	2.3	1.8	1.5	2.8
2010-2011	1.1	1.6	1.8	1.6	0.9	2.4	1.4	1.4	1.1	2.1
2011-2012	1.6	1.5	1.3	3.4	1.5	3.8	1.2	3.2	1.0	1.9
2012	1.5	1.7	1.9	3.1	1.4	3.4	1.8	1.6	1.1	2.2
2013	1.7	1.6	2.5	1.3	1.5	2.5	1.7	1.7	1.3	1.5
2014	1.2	1.4	1.6	1.5	1.5	2.5	1.4	1.7	1.1	1.5
2015	1.3	1.3	1.5	1.4	1.3	1.3	1.1	1.3	0.9	1.5
2016	0.7	1.3	1.1	1.3	1.3	1.5	1.1	1.4	0.8	2.2
2017	0.6	1.4	1.0	1.3	1.4	1.2	1.4	1.9	0.9	1.6
2018	0.9	1.2	1.0	1.3	1.7	1.6	1.5	1.3	0.9	1.6
Overall*	1.6	1.7	1.6	2.7	1.4	2.1	1.6	1.6	1.1	1.9
EPA Licence Limit	4									

Notes: * - Overall annual average since 1997.

D - Dust gauge damaged. No result.

#- Site D4 was located adjacent to operational areas and was repositioned in December 2012 to the southern mining lease boundary, adjacent to John Renshaw Drive.

All dust deposition gauges recorded annual averages below the 4g/m²/month limit for 2018. The long term average annual dust deposition rates are all below the required impact assessment criteria.

Results are graphically provided in Appendix A. Figure A1 in Appendix A shows yearly results since PA 07_0087 approval. The results show a slight trend downwards. Sites D2 and D3 are located adjacent to operational areas well within lease boundaries. Results from these sites indicate the level of dust generated by mining operations and are unlikely to impact off site.

PM2.5, PM10 and TSP

Table 9 summarises the PM2.5, PM10 and TSP monitoring results during the reporting period and detailed results are provided in Table A1 in Appendix A.

Table 9: PM2.5, PM10 and TSP Results Summary 2018

	PM2.5 24hr (ug/m ³)	PM10 24hr (ug/m ³)	TSP (ug/m ³)
Maximum 24hr Average result 2018	24	42	-
Project Approval Impact Assessment Criteria 24hr Average	25	50	-
Annual Average 2018	12*	19	40
Project Approval Impact Assessment Criteria Annual Average	8	25	90

* Note: Sampling commenced in November. Not a full year average.

All PM10 results recorded 24-hour averages below the 50 ug/m³ limit for 2018. The annual average PM10 result recorded was below the 25 ug/m³ limit for 2018. The annual average TSP result recorded was below the 90 ug/m³ limit for 2018.

All PM2.5 results recorded 24-hour averages below the 25 ug/m³ limit for 2018. The highest result recorded was 24 ug/m³. PM2.5 monitoring did not commence until November 2018 and therefore the result shown in Table 9 is not a full year result. The annual average PM2.5 partial result recorded was 12 and above the 8 ug/m³ limit however this value is expected to reduce with ongoing monitoring.

Figures A2, A3 and A4 in Appendix A shows yearly results of TSP, PM10 and PM2.5 dust levels. The results show seasonal trends as well as rolling averages. In general higher results occur in the summer months and lower results occur in the winter months. All results are below Project Approval impact assessment criteria.

Dust Predictions

Dust modelling predictions conducted as part of the Environmental Assessment (PA 07_0087 Mod 4) are shown in Table 10. Monitoring during the reporting period indicates that dust results are close to predicted levels. As shown in Plan 1, the nearest modelled resident to the monitoring locations is Resident N. The dust monitoring locations are actually situated closer to the mine site than Resident N (refer Plan 1) and as a result the dust results are slightly higher.

Table 10: Dust Prediction

Resident ID: N	EA Predictions	2018 Actual
Dust Deposition D10 (g/m ² /month)	1.5	1.6
PM2.5 (ug/m ³) (Annual Average)	6	12*
PM10 (ug/m ³) (Annual Average)	16	19
TSP (ug/m ³) (Annual Average)	33	40

* Note: Sampling commenced in November. Not a full year average.

6.2.3 Reportable Incidents

No reportable incidents relating to air quality occurred within the reporting period.

6.2.4 Further Improvements

The air quality monitoring program will be continued in accordance with Air Quality Monitoring Plan requirements. The PM2.5 results and location of the HVOL (refer Plan 1) will be reviewed throughout 2019 to assess impacts on the results from vehicle traffic along John Renshaw Drive.

6.3 Contaminated Land

6.3.1 Environmental Management

No contaminated or polluted land has been identified at Bloomfield. No significant hydrocarbon or chemical spills occurred within the Lease requiring special response, clean-up or ongoing management. Prior to closure a stage 1 site assessment will be conducted to determine if any contaminated areas exist.

6.3.2 Environmental Performance

Regular inspections of hydrocarbon storage facilities are completed as part of the site EMS. No areas of contamination were noted during these inspections.

6.3.3 Reportable Incidents

No reportable incidents relating to land contamination occurred during the reporting period.

6.3.4 Further Improvements

As no areas of land contamination have been identified, no improvements to the current management system are planned. Regular inspections will be maintained.

6.4 Threatened Flora and Fauna

6.4.1 Environmental Management

The Environmental Assessment included an assessment of the potential impacts associated with the clearance vegetation. Any clearing of vegetation within the project area must be undertaken in accordance with the requirements of the Project Approval.

6.4.2 Environmental Performance

No vegetation was cleared for within ML1738 for mining or coal washing operations during the reporting period. Biodiversity enhancement has also been considered during the planning and implementation of land rehabilitation.

A Biodiversity Offset Management Plan has been prepared and approved by DPE in accordance with Project Approval requirements for the operation of the mine. A Biodiversity Offset Area has been established to compensate for future land clearance at the mine. The land was purchased by Bloomfield in December 2011 and consists of 40 Ha of remnant vegetation adjacent to the Watagan State Forest. The western boundary abuts a part of Watagan State Forest on the eastern side of the Corrabare Range.

Consultation is underway with the NSW Biodiversity Conservation Trust regarding entering into a conservation agreement over the Biodiversity Offset land under Part 4, Division 12 of the *National Parks and Wildlife Act 1974*.

In accordance with the Biodiversity Offset Management Plan a monitoring program is being implemented to assess weeds infestations and feral animals. During 2018 a visual inspection for weeds was undertaken and no weeds were present at the time of the inspection. Three motion cameras were installed for a 10 day period to determine the presence of feral animals. No pest species were recorded during the program

6.4.3 Reportable Incidents

No reportable incidents relating to flora and fauna management occurred during the reporting period.

6.4.4 Further Improvements

Further details on progress of the implementation measures of the Biodiversity Offset Area will be provided in the next Annual Review. Further consultation is underway with the NSW Biodiversity Conservation Trust regarding entering into a conservation agreement.

6.5 Weeds & Pests

6.5.1 Environmental Management

A Weed Management Plan has been developed to provide a plan for weed management at Bloomfield Colliery. The purpose of the Weed Management Plan is to conduct regular surveys to identify weed species requiring control, identify and map weed infestation locations, and implement a weed control priority action plan to control weeds. Bloomfield undertakes regular inspections and has a treatment program to control weeds across the site. A contract weed-sprayer is employed in addition to mechanical support from a slasher when required.

Periodic feral animal control programs are undertaken in conjunction with neighboring mines and landowners. Activities include feral dog baiting programs. These programs are conducted annually in consultation with Local Land Services.

6.5.2 Environmental Performance

Approximately \$104,000 was spent across the site on weed control during the reporting period. This consisted of a combination of spraying and slashing. Weed control works included rehabilitation areas and remnant vegetation within ML 1738 as well as land outside the mining lease under the control of Bloomfield. No Class 1 or Class 2 declared weeds were identified onsite. Table 11 lists the weed species identified and treated on site.

Table 11: Weed Priority Level

Common Name	Scientific Name	Priority Level
African Daisy	<i>Senecio pterophorus</i>	Medium
Blackberry	<i>Rubus fruticosus</i>	Medium
Castor Oil	<i>Ricinus communis</i>	Low
Crofton Weed	<i>Ageratina adenophora</i>	Low
Farmers Friend	<i>Bidens pilosa</i>	Low
Giant Parramatta Grass	<i>Sporobolus fertilis</i>	Low
Lantana	<i>Lantana camara</i>	High
Mother of Millions	<i>Bryophyllum delagoense</i>	Low
Pampas Grass	<i>Cortaderia selloana</i>	High
Morning Glory	<i>Ipomoea indica</i>	Low
Tobacco Bush	<i>Solanum mauritianum</i>	Low

During the reporting period a wild dog and fox baiting program was undertaken in conjunction with local landholders and the Hunter Local Land Services. This was conducted in December 2018. The baiting program proved to be successful with 27 out of 27 baits taken.

6.5.3 Reportable Incidents

No reportable incidents relating to weed management occurred during the reporting period.

6.5.4 Further Improvements

The weed management budget for the upcoming reporting period will be maintained at a similar level to previous years. The control of pampass grass and African daisy remains the priority for the next reporting period in addition to the ongoing management of Lantana.

6.6 Blasting

6.6.1 Environmental Management

A Blast Monitoring Plan (BMP) has been prepared and approved by DPE in accordance with Project Approval requirements for the operation of the mine. Blasting activities are licensed under EPL 396. Both the EPL and Project Approval stipulates monitoring requirements, restricts blasting hours, as well as limiting airblast overpressure and ground vibration impacts at the nearest residences.

Blasting techniques have been developed in conjunction with ORICA, utilising the “nonel” initiation system and implemented to achieve maximum fragmentation and maintain levels of ground vibration and overpressure levels within the approved criteria for the site.

Each blast is monitored at four nearby residences for ground vibration and overpressure. Monitors are located at residences to the south, south-east, west and north-west of current open cut operations. The location of the blast monitors is shown on Plan 1.

Also the use of a predictive meteorological modeling software program is utilised to assist in planning blast operations. The software incorporates regional weather station data to predict daily weather events that may exacerbate overpressure impacts from blasting operations.

6.6.2 Environmental Performance

All blast results for the reporting period are included in Appendix B and are summarised in Table 12 and Table 13.

During the reporting period a total of 41 blasts were initiated on the site. No blasts exceeded 115 dB or 120 dB blast overpressure limits. No blasts exceeded the 5mm/sec or 10mm/sec ground vibration limits.

Table 12: Blast Monitoring Summary

Blasting Criteria Limits	Allowable Exceedance¹	Results 2018
Airblast Overpressure Level dB (Lin Peak)		
115	5 %	0 %
120	0 %	0 %
Ground Vibration Peak Particle Velocity (mm/s)		
5	5 %	0 %
10	0 %	0 %

Note: 1. Percentage of the total number of blasts over a period of 12 months

Blast modelling predictions conducted as part of the Environmental Assessment (PA 07_0087 Modification 4) are shown in Table 13. The approach of the assessment was to determine the limiting factors to the blast design with the aim of achieving the relevant criteria at all locations. Calculations were conducted using the respective 5% site law equations in order to determine the Maximum Instantaneous Charge (MIC).

For each site law, using statistical analysis of the measured data and assuming a log-normal distribution of data, a 95% confidence line and 50% confidence levels were determined. The ground vibration and airblast criteria cater for the inherent variation in emission levels from a given blast design by allowing a five percent exceedance of a general criterion up to a (never to be exceeded) maximum. Correspondingly, the "5% exceedance" (95% confidence) levels have been used in the blast emission site laws.

The levels of airblast and ground vibration have been predicted using the developed site laws for Bloomfield Colliery. The maximum instantaneous charge (MIC) may exceed (or be less than) the values in Table 13, depending on the location of the area being mined and its relation to the nearest affected receiver.

Table 13: 5% MIC and Blast Predictions

Year	Approximate Distance to Nearest Receiver (m)	MIC Based on Ground Vibration or Airblast (kg)	Blast Emission Prediction Based on MIC	
			Predictive PVS Ground Vibration (mm/s)	Predicted Airblast Level (dB Linear)
2018	1500	280	1.7	115
2021	1200	145	1.4	115
2025	1500	280	1.7	115

Monitoring results summarised in Table 14 for the reporting period indicates that the maximum and mean results are below predicted levels at the nearest receivers.

Table 14: Blast Results Summary

Location	N – Elliotts		M - MacNaughtons		H - Mt Vincent Rd		G - Richards	
	Airblast dBL	Vibration mm/s	Airblast dBL	Vibration mm/s	Airblast dBL	Vibration mm/s	Airblast dBL	Vibration mm/s
Max	113.8	1.2	109.7	1.3	110.0	0.9	112.3	1.0
Mean	103.5	0.6	101.4	0.5	92.9	0.3	100.9	0.4

6.6.3 Reportable Incidents

No reportable incidents relating to blasting occurred during the reporting period.

6.6.4 Further Improvements

Monitoring of blasts will continue in accordance with EPL and Project Approval requirements.

6.7 Operational Noise

6.7.1 Environmental Management

A Noise Monitoring Plan (NMP) has been prepared in accordance with the conditions of the Project Approval. The noise monitoring plan has been endorsed by the DPE. Quarterly noise monitoring has been undertaken in accordance with the monitoring plan.

The use of a predictive meteorological modeling software program is utilised to assist in planning mine operations. The software incorporates weather models and regional weather station data to predict daily weather events that may exacerbate noise impacts from operations.

During 2016 the existing predictive meteorological modelling software program was upgraded to a predictive noise emissions management tool for the mine. In addition to meteorological data it also incorporates terrain data, mining equipment locations and aerial photographs.

6.7.2 Environmental Performance

Attended and unattended quarterly noise monitoring was undertaken during the reporting period which assessed noise impacts from Bloomfield Colliery against relevant criteria detailed within PA 07_0087 at five monitoring locations (see Plan 1). Monitoring results are summarised in Tables 15 and 16 and copies of the monitoring reports can be viewed on the Bloomfield website (www.bloomcoll.com.au).

All noise monitoring indicated that compliance with consent criteria was met at all locations during day, evening and the night-time periods. Night time sleep disturbance criteria (LA1_(1min)) were in compliance during all monitoring events.

Table 15: Summary of Attended Noise Monitoring Results

Location	Estimated Bloomfield LAeq(15minute) Contribution			Consent Conditions LAeq(15 minute)			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
March Quarter Results									
F – Black Hill Road, Black Hill ¹	Inaudible at all times			35	35	35	Yes	Yes	Yes
G – Buchanan Road, Buchanan	<35	38	Inaudible	39	42	37	Yes	Yes	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible at all times			35	35	35	Yes	Yes	Yes
M – John Renshaw Drive, Buttai	Inaudible at all times			39	39	37	Yes	Yes	Yes
N – Lings Road, Buttai	Inaudible at all times			42	42	35	Yes	Yes	Yes
June Quarter Results									
F – Black Hill Road, Black Hill ¹	Inaudible at all times			35	35	35	Yes	Yes	Yes
G – Buchanan Road, Buchanan	Inaudible	31	30	39	42	37	Yes	Yes	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible at all times			35	35	35	Yes	Yes	Yes
M – John Renshaw Drive, Buttai	Inaudible at all times			39	39	37	Yes	Yes	Yes
N – Lings Road, Buttai	Inaudible	Inaudible	<30	42	42	35	Yes	Yes	Yes
September Quarter Results									
F – Black Hill Road, Black Hill ¹	Inaudible at all times			35	35	35	Yes	Yes	Yes
G – Buchanan Road, Buchanan	Inaudible	41	31	39	42	37	Yes	Yes	Yes
L – Kilshanny Ave, Ashtonfield	<30	<30	Inaudible	35	35	35	Yes	Yes	Yes
M – John Renshaw Drive, Buttai	Inaudible at all times			39	39	37	Yes	Yes	Yes
N – Lings Road, Buttai	Inaudible	34	30	42	42	35	Yes	Yes	Yes
December Quarter Results									
F – Black Hill Road, Black Hill ¹	Inaudible at all times			35	35	35	Yes	Yes	Yes
G – Buchanan Road, Buchanan	35	Inaudible	34	39	42	37	Yes	Yes	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible	Inaudible	32	35	35	35	Yes	Yes	Yes
M – John Renshaw Drive, Buttai	Inaudible			39	39	37	Yes	Yes	Yes
N – Lings Road, Buttai	Inaudible	Inaudible	<30	42	42	35	Yes	Yes	Yes

1 – Mine owned property

Table 16: Summary of Sleep Disturbance Results

Location	Estimated Bloomfield LA1(1 minute) Contribution	Consent Conditions LA1(1 minute)	Compliance
March Quarter Results			
F – Black Hill Road, Black Hill ¹	Inaudible	45	Yes
G – Buchanan Road, Buchanan	Inaudible	45	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible	45	Yes
M – John Renshaw Drive, Buttai	Inaudible	46	Yes
N – Lings Road, Buttai	Inaudible	46	Yes
June Quarter Results			
F – Black Hill Road, Black Hill ¹	Inaudible	45	Yes
G – Buchanan Road, Buchanan	36	45	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible	45	Yes
M – John Renshaw Drive, Buttai	Inaudible	46	Yes
N – Lings Road, Buttai	<30	46	Yes
September Quarter Results			
F – Black Hill Road, Black Hill ¹	Inaudible	45	Yes
G – Buchanan Road, Buchanan	37	45	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible	45	Yes
M – John Renshaw Drive, Buttai	Inaudible	46	Yes
N – Lings Road, Buttai	33	46	Yes
December Quarter Results			
F – Black Hill Road, Black Hill ¹	Inaudible	45	Yes
G – Buchanan Road, Buchanan	38	45	Yes
L – Kilshanny Ave, Ashtonfield	34	45	Yes
M – John Renshaw Drive, Buttai	Inaudible	46	Yes
N – Lings Road, Buttai	<30	46	Yes

¹ – Mine owned property

6.7.3 Reportable Incidents

No reportable incidents relating to operational noise occurred during the reporting period.

6.7.4 Further Improvements

The noise monitoring program will be continued in accordance with Noise Monitoring Plan requirements.

6.8 Visual, Stray Light

6.8.1 Environmental Management

Progressive rehabilitation of disturbed land is the main strategy for minimising visual impacts. In addition to providing a safe and stable landform, one of the key objectives of rehabilitation planning is to provide vegetated landforms that blend with the surrounding landscape.

Fixed lighting around the site has been positioned and/or shielded where possible to minimise light shed. Consideration is also given to the location and alignment of mobile light to minimise stray light.

6.8.2 Environmental Performance

The visual assessment of the Bloomfield open cut conducted as part of the Environmental Assessment noted that the main visual impacts are on residences to the south of John Renshaw Drive, to the south of the mine. Priority has been given to the completion of rehabilitation along the southern boundary of the site. This would reduce any potential visual impact, especially for residents in the Buttai Valley and users of John Renshaw Drive.

6.8.3 Reportable Incidents

No reportable incidents relating to visual amenity or stray light occurred during the reporting period.

6.8.4 Further Improvements

Rehabilitation of areas visible from nearby residences or road traffic will be given priority during mine planning and rehabilitation scheduling.

6.9 Aboriginal Heritage

6.9.1 Environmental Management

An Aboriginal Cultural Heritage Management Plan (ACHMP) was prepared in consultation with Mindaribba LALC. The plan was endorsed by OEH and approved by DPE.

6.9.2 Environmental Performance

A number of Aboriginal sites identified during the Project Approval process were previously salvaged in 2010 in accordance with the ACHMP. Representatives from Mindaribba LALC participated and monitored the process ahead of preparation for mining activities. In all, 80 artefacts were salvaged and are being stored at Bloomfield Colliery.

In 2014 an additional 3 Ha was stripped of topsoil in preparation for mining activities. In accordance with the approved ACHMP Bloomfield engaged an archaeologist and the Mindaribba LALC to monitor the ground disturbance works and salvage identified artefacts. In all a further 6 artefacts were salvaged and are being stored at Bloomfield Colliery.

In 2016 an additional 3 Ha was cleared of vegetation and stripped of topsoil in preparation for mining activities. In accordance with the approved ACHMP Bloomfield engaged an archaeologist and the Mindaribba LALC to monitor the ground disturbance works and salvage identified artefacts. An additional artefact was salvaged and is being stored at Bloomfield Colliery.

6.9.3 Reportable Incidents

No reportable incidents relating to Aboriginal heritage occurred during the reporting period.

6.9.4 Further Improvements

Any Aboriginal heritage evidence that is identified will be managed in accordance with the ACHMP and reported in the 2019 Annual Review. The Aboriginal Cultural Heritage Management Plan (ACHMP) is under review in consultation with Mindaribba LALC and is expected to be finalised in the 2019 reporting period.

6.10 Natural Heritage

6.10.1 Environmental Management

No National Parks, nature reserves, or other areas of protected natural heritage are located near Bloomfield. The nearest, Pambalong Nature Reserve, is located approximately 6km to the south-east of Bloomfield mining operations. Therefore, natural heritage management is not considered a significant environmental risk.

6.10.2 Environmental Performance

Not applicable.

6.10.3 Reportable Incidents

No reportable incidents relating to natural heritage occurred during the reporting period.

6.10.4 Further Improvements

No improvements are planned with regards to natural heritage management.

6.11 Spontaneous Combustion

6.11.1 Environmental Management

There was no major spontaneous combustion incidents recorded during the reporting period.

6.11.2 Environmental Performance

During 2018 a small area of spontaneous combustion was identified in an overburden dump that required removal of material and capping with clay to seal off the available air supply.

6.11.3 Reportable Incidents

No reportable environmental incidents relating to spontaneous combustion occurred during the reporting period.

In April 2018 an Improvement Notice was issued to Bloomfield by DPE Resources Regulatory under the Work Health and Safety Act for failing to notify of the works mentioned in Section 6.11.2. Under the Notice, Bloomfield was required to review and update Spontaneous Combustion Risk Assessment and develop safe work procedures for management of spontaneous combustion.

6.11.4 Further Improvements

The Spontaneous Combustion Principal Mining Hazard Management Plan will be revised and updated to reflect the practice of providing a minimum of 10 metres of suitable inert overburden over higher spontaneous combustion risk carbonaceous material. A new gas monitor will be purchased specifically for use in spontaneous combustion testing. A procedure will be developed for measurement of gas and temperature data that will be incorporated into the existing TARP.

6.12 Bushfire

6.12.1 Environmental Management

A Bushfire Management Plan for Bloomfield Colliery was prepared in consultation with representatives of the NSW Rural Fire Service (RFS). The plan divides the site into 44 fire management Sectors, describes fire risk levels across the site, and outlines site features relevant to fire management such as vegetation type, access trail locations, asset locations, and water supplies.

Weather conditions permitting, hazard reduction burns are conducted periodically by the RFS. Selection of burn location is based on risk levels, as determined by fuel load assessment and location of assets/asset protection zones. Hazard reduction clearing/slashing was also undertaken by Bloomfield along fire trails, asset protection zones and the mine boundary.

6.12.2 Environmental Performance

An asset protection zone adjacent to residential areas near Ashtonfield and Buchanan was slashed and maintenance work carried out on a number of tracks to enable access for hazard reduction activities by the RFS.

During 2018 a meeting was held with the RFS to discuss future hazard reduction burns within land surrounding the mine. Four areas were identified however due to adverse weather conditions no hazard reduction burns were undertaken in 2018.

6.12.3 Reportable Incidents

No reportable incidents relating to bushfire management occurred during the reporting period.

6.12.4 Further Improvements

No improvements to the Bushfire Management Plan are planned, however, ongoing hazard reduction burning and clearing will continue in consultation with the RFS. Hazard reduction burns are planned for winter 2019.

6.13 Mine Subsidence

6.13.1 Environmental Management

Areas of the Bloomfield mine site are undermined by historic underground workings, some relatively shallow. Sink holes associated with shallow workings are infrequent, but have previously been identified. If identified, the standard management procedure is to flag off and isolate the sink holes from access, back fill the holes and monitor for further subsidence. Once deemed stable, the area will then be rehabilitated and periodical inspections will continue.

6.13.2 Environmental Performance

A sink hole previously filled and rehabilitated in X-Cut near Buchanan Road has been monitored throughout during 2018. The area appears stable.

6.13.3 Reportable Incidents

No reportable incidents relating to subsidence management occurred during the reporting period.

6.13.4 Further Improvements

Other than the remediation and rehabilitation of sink holes as identified, no improvements to subsidence management are planned.

6.14 Hydrocarbon Contamination

6.14.1 Environmental Management

As no areas of hydrocarbon contamination have been identified within the Bloomfield lease area, management is geared to contamination prevention. Bulk hydrocarbon storages (including flocculents) are located within bunded areas. The volumes of these bunded areas are capable of containing greater than 110% of the largest storage tank.

All machinery is fitted with quick fill mechanisms. The inlets and outlets, at the refueling bay and mobile tanker are positively closed with an automatic cut off when full. This refueling method is quick and minimises any potential for spillage during the refueling operation.

Hydrocarbon storage infrastructure at the CHPP and open cut is inspected regularly and documented maintenance check sheets are completed quarterly.

A dedicated contaminated soil bioremediation area is established on-site to treat any hydrocarbon contaminated due to accidental spills.

6.14.2 Environmental Performance

No major areas of hydrocarbon contamination were identified during the reporting period. Soil from minor spills were collected and deposited within the contaminated soil bioremediation area.

6.14.3 Reportable Incidents

No reportable incidents relating to hydrocarbon contamination occurred during the reporting period.

6.14.4 Further Improvements

No improvements are planned for hydrocarbon management.

6.15 Public Safety

6.15.1 Environmental Management

Being situated close to urban areas, Bloomfield has historically had a problem with dumping of rubbish, theft and vandalism on the site. A major fencing and exclusion barrier program has greatly reduced these occurrences. Bloomfield continues to invest significant time and resources into keeping the site closed to unauthorised access, including fencing along all public roads, installing lockable gates and other temporary barriers (such as logs, rocks and concrete blocks) on major access tracks and ensuring clear signage is placed covering likely approaches.

6.15.2 Environmental Performance

No public safety incidents were recorded or reported during the reporting period.

6.15.3 Reportable Incidents

No reportable incidents relating to public safety during the reporting period.

6.15.4 Further Improvements

No overall improvements are planned to manage public safety; however, Bloomfield will continue to maintain existing fencing, gates, barriers and signage.

7 WATER MANAGEMENT

The water management system has been designed with three primary goals and objectives:

- separation of clean water and mine water;
- safe storage and priority use of mine water on-site;
- management of water that is discharged so as to preserve the environmental values of Four Mile Creek and comply with the conditions of EPL 396.

In meeting these objectives, the following components of the system have been constructed or implemented.

Mine Water

Bloomfield has two major mine water storage facilities referred to as Lake Kennerson and Lake Foster (see Plan 1). Water pumped from the open cuts (S Cut and Creek Cut) reports via open drains to Lake Kennerson. Run off from disturbed areas (i.e. high wall, haul roads, overburden dumps awaiting rehabilitation) which has the potential to carry suspended solids, is also directed to Lake Kennerson. Lake Kennerson dissipates velocity and allows the settlement of suspended solids.

Lake Kennerson has a valve controlled pipe which, when opened, feeds to Lake Foster. Lake Foster also receives decant water from the tailings storage facility (U Cut) and water from the stockpile dam, which collects the runoff from the CHPP and coal stockpile pads. Mine water is pumped, primarily from Lake Foster, to the CHPP for use in coal processing and for dust suppression spraying on the coal stockpile pads.

Mine water is discharged, via lockable valve pipes, into an open drain that flows to Four Mile Creek. Discharges are undertaken in accordance with conditions of the Environmental Protection Licence (EPL 396). Water samples are collected during discharge for independent water quality analysis. A monitoring station located downstream in Four Mile Creek continuously measures electrical conductivity (EC) and water level. Monthly background sampling is conducted in Lake Kennerson, Lake Foster and various upstream and downstream watercourses (see Section 7.2 for details).

During the reporting period, fine coal rejects (tailings) was transferred for disposal to an approved prescribed tailings dam located within a disused open cut pit (U Cut). Water from the historic underground workings is used in dust suppression and coal processing. Water storage volumes are presented in Table 17.

Table 17: Stored Water

	Volumes held (ML)		
	Start of Reporting Period	End of Reporting Period	Storage Capacity
Clean Water	90	90	90
Dirty Water			
Lake Kennerson	90	100	190
Lake Foster	30	30	45
Tailings Dam	120	200	600
S Cut (operational pit)	NIL	NIL	-
Creek Cut (operational pit)	80	130	-
Controlled Discharge Water (EPL 396)		1,010	
Contaminated Water	NIL	NIL	NIL

A water balance was calculated for 2018 providing information on inputs and outputs for the site in accordance with the Water Accounting Framework. The results are shown in Table 18.

Clean Water

Run off from undisturbed and rehabilitated areas is directed away from operational areas and mine water storages via diversion banks and channels. These banks and channels direct this run off into clean water dams or natural watercourses. The major clean water storage dam is Possums Puddle. No clean water is accessed for operational purposes and these dams overflow into natural drainage systems. Further isolation of smaller rehabilitated catchment areas from the mine water system will continue as rehabilitation work progresses.

The major natural creek running through the site is Four Mile Creek. Most of the operational mining areas at Bloomfield are located within the catchment of Four Mile Creek. A series of drains and levees direct Four Mile Creek around Lake Foster (mine water storage) and into Possums Puddle (clean water storage). From Possums Puddle clean water overflows back into Four Mile Creek.

Waste Water

Wastewater generated on site, consisting of domestic waste from bathhouses, administration offices and associated amenity areas, passes through a Cessnock City Council approved anaerobic waste water treatment system.

Table 18: Input – Output Statement Data

Reporting Period Details	Date	Storage (ML)
Start	01-January-2018	320
Finish	31-December-2018	460

INPUTS-OUTPUTS

Input-Output	Source/Destination	Inputs/Outputs	Total (ML)
Input	Surface Water	Precipitation and Runoff	766
		Rivers and Streams	
		External Surface Water Storages	
	Groundwater	Aquifer Interception	271
		Bore Fields	
		Entrainment	87
	Sea Water	Estuary	
		Sea/Ocean	
	Third Party Water	Contract/Municipal	
		Waste Water	695
TOTAL INPUTS			1819
Output	Surface Water	Discharge	1010
		Environmental Flows	
	Groundwater	Seepage	
		Reinjection	
	Sea Water	Discharge to Estuary	
		Discharge to Sea/Ocean	
	Supply to Third Party		
	Other	Evaporation	374
		Entrainment	73
		Dust Suppression	240
TOTAL OUTPUTS			1697

7.1 Erosion and Sediment

7.1.1 Environmental Management

Erosion and sedimentation control is an integral part of the site's water management system. The design of rehabilitated areas incorporates water management structures to effectively shed run-off water, whilst minimising erosion and sediment load. Progressive rehabilitation of disturbed areas as soon as is practicable also reduces the potential for erosion and downstream sedimentation.

There are a number of sediment basins around the site that are positioned to intercept run-off from other disturbed areas on-site, such as along haul roads, stockpile pads, infrastructure

areas, and recently rehabilitated areas. These structures are inspected as part of the site EMS and cleaned as necessary.

Site drains used to transport mine water, or natural catchment flow, are inspected for erosion or damage as part of the site EMS, and remedial maintenance works conducted as necessary.

7.1.2 Environmental Performance

No other major erosion or problems with erosion and sediment control were observed during the reporting period. Rehabilitated areas are regularly inspected in addition to quarterly inspections of erosion and sediment controls across the site.

7.1.3 Environmental Incidents

No reportable incidents relating to erosion and sediment occurred during the reporting period.

7.1.4 Further Improvements

An erosion and sediment control plan has been prepared in accordance with the conditions of the Project Approval. As mining and rehabilitation progresses the recommendations will be followed including ongoing quarterly inspections of erosion and sediment control structures.

7.2 Surface Water

7.2.1 Environmental Management

A Water Management Plan (WMP) has been prepared and approved by DPE in accordance with Project Approval requirements for the operation of the mine. The Plans prescribe the process water source and supply requirements, site-water balance, storage, impact management and monitoring of surface water in the vicinity of the mining operations.

Bloomfield has several sources of surface water (mine water) that require management to avoid pollution, or a non-compliance with the site EPL.

In addition to the physical, or infrastructure, components of the mine water management system, the two major management controls for surface water pollution are *water quality monitoring* and *licensed mine water discharge*.

Water Quality Monitoring

The water monitoring program at Bloomfield consists of discharge sampling, which is under *licensed mine water discharge*, and background monitoring. The background monitoring sites are centred on Four Mile Creek and its tributaries and Wallis Creek tributaries to the west of the mining lease. Plan 1 shows the location of the monitoring sites and Table 19 lists the monitoring sites.

Table 19: Background Water Sample Locations

Creek	ID	Location
Four Mile Creek	WM10	John Renshaw Drive
	WM6	Upstream from Lake Foster
	WM7	Possums Puddle
	WM4	Possums Puddle Overflow
	WM3	Elwells Creek & Four Mile Creek junction
	WM12	Shamrocks Creek & Four Mile Creek junction
	WM11	New England Highway
Four Mile Creek tributary	WM2	Shamrock Creek
	WM5	Elwells Creek
Wallis Creek tributary	WM1	Adjacent old Rathluba Colliery
	WM13	Buttai Creek
On-site water storage	WM8	Lake Foster
	WM9	Lake Kennerson

Table 20 outlines the background surface water analysis program undertaken at Bloomfield Colliery.

Table 20 Background Water Analysis

Analyte	Monthly	Quarterly	6 Monthly
pH	✓	✓	✓
Electrical Conductivity	✓	✓	✓
Dissolved Oxygen	✓	✓	✓
Turbidity	✓	✓	✓
Total Suspended Solids		✓	✓
Total Dissolved Solids		✓	✓
Filterable Iron		✓	✓
Chloride			✓
Sulphate			✓
Alkalinity			✓
Calcium			✓
Magnesium			✓
Sodium			✓
Potassium			✓

These results are reviewed and, if required, remedial action or further investigation initiated to identify the cause of anomalies.

Mine Water Discharge

Mine water is discharged in accordance with conditions P1, L2 and L3 of EPL 396. These conditions allow discharge of 40ML of mine water per day, within water quality limits, dependent on rainfall. Representative samples are collected at the discharge point and at the Four Mile Creek monitoring station during each day of discharge. Samples are tested on site to ensure discharge water is within the allowed water quality limits, before being dispatched to an independent NATA accredited laboratory for analysis. Discharge samples are tested for:

- pH;
- EC;
- Total Suspended Solids (TSS);
- Total Dissolved Solids (TDS); and
- Filterable Iron (for discharge point samples).

A permanent monitoring station is located on Four Mile Creek, approximately 500m upstream of the New England Highway. It records EC and water level (via pressure sensor and V-notch weir) every 15 minutes and logs the results every hour.

Other Management

All infrastructure (i.e. drains, dams, spillways, discharge pipes and valves) used for the separation of clean water and mine water, or the discharge of mine water, are inspected as part of the site EMS, with a documented quarterly check sheet being completed.

7.2.2 Environmental Performance

Background Monitoring Results

The background surface water monitoring results for the reporting period are shown in Figures 4 to 8 below. Figures 4 to 8 provide a graphical presentation of EC and pH which are the main surface water parameters, with the full data set provided in Appendix C.

Figure 4 and 5 shows EC and pH results for the Four Mile Creek sites. Figure 4 shows salinity levels are slightly elevated in the lower end the catchment. Four Mile Creek is ephemeral and the EC level varies due to rainfall and mine discharge. The higher salinity results along Four Mile Creek (Elwells Creek and Shamrock Creek junctions and New England Hwy) reflect concentration of solutes in ponds during low flow periods and from licensed discharges in addition to offsite sources such as historic underground workings.

As outlined later, there were 16 licensed discharges throughout the reporting period. The monthly sample collected in August and November coincided with a licensed discharge event. EC levels vary due to rainfall and mine discharge therefore monthly and yearly trends cannot be assessed.

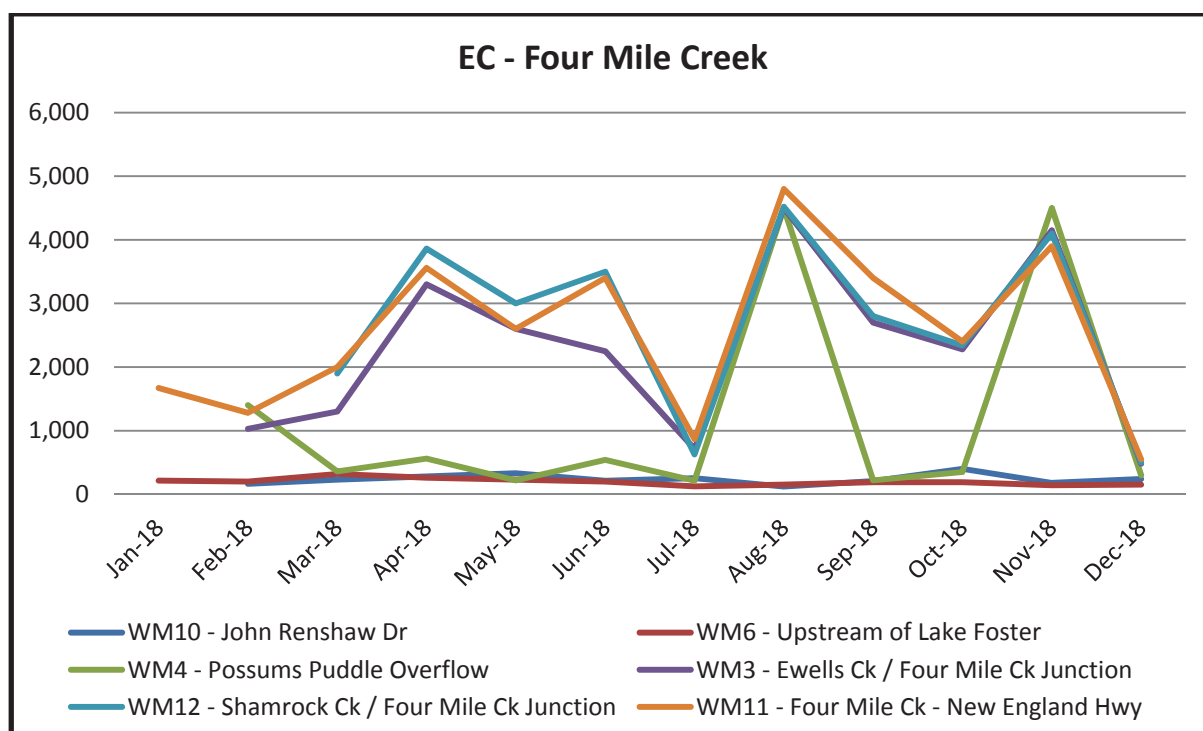


Figure 4: Four Mile Creek Catchment Electrical Conductivity

Figure 5 shows the pH levels in Four Mile Creek are generally consistent with ANZECC water quality guidelines (pH 6.5-8.5). pH levels vary due to rainfall and mine discharge therefore monthly and yearly trends cannot be assessed.

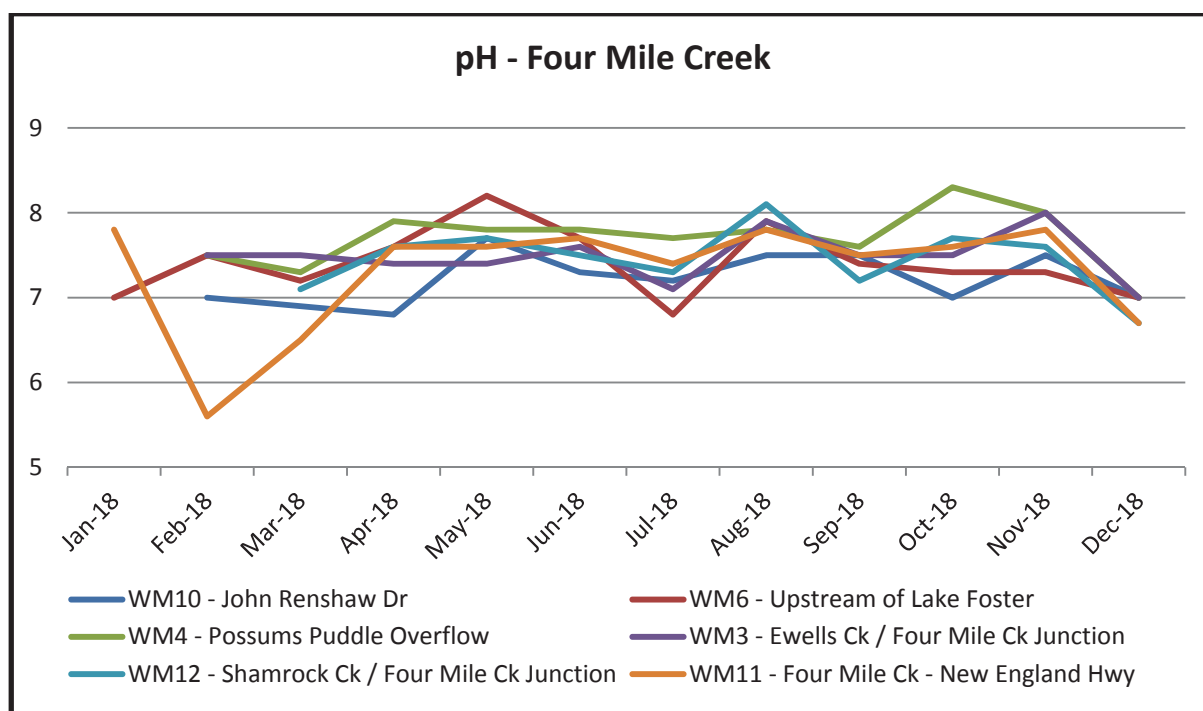


Figure 5: pH of Four Mile Creek

Figure 6 shows EC and pH results for water storage dams. Water quality within the mine water storage dams (Lake Kennerson and Lake Foster) varies throughout the year depending on rainfall capture in the open cut pits, CHPP water usage and frequency of licensed discharge events, which are also rainfall dependent. The freshwater dam (Possums Puddle) remains fairly constant throughout the year as it is separate from mining influences.

Figure 7 shows the pH and salinity levels in Four Mile Creek tributaries are generally consistent with ANZECC water quality guidelines. These tributaries are ephemeral streams and are often dry or not flowing (evaporating) resulting in gaps in the graphed data. The low pH levels are attributed to stagnate evaporating pools during dryer periods.

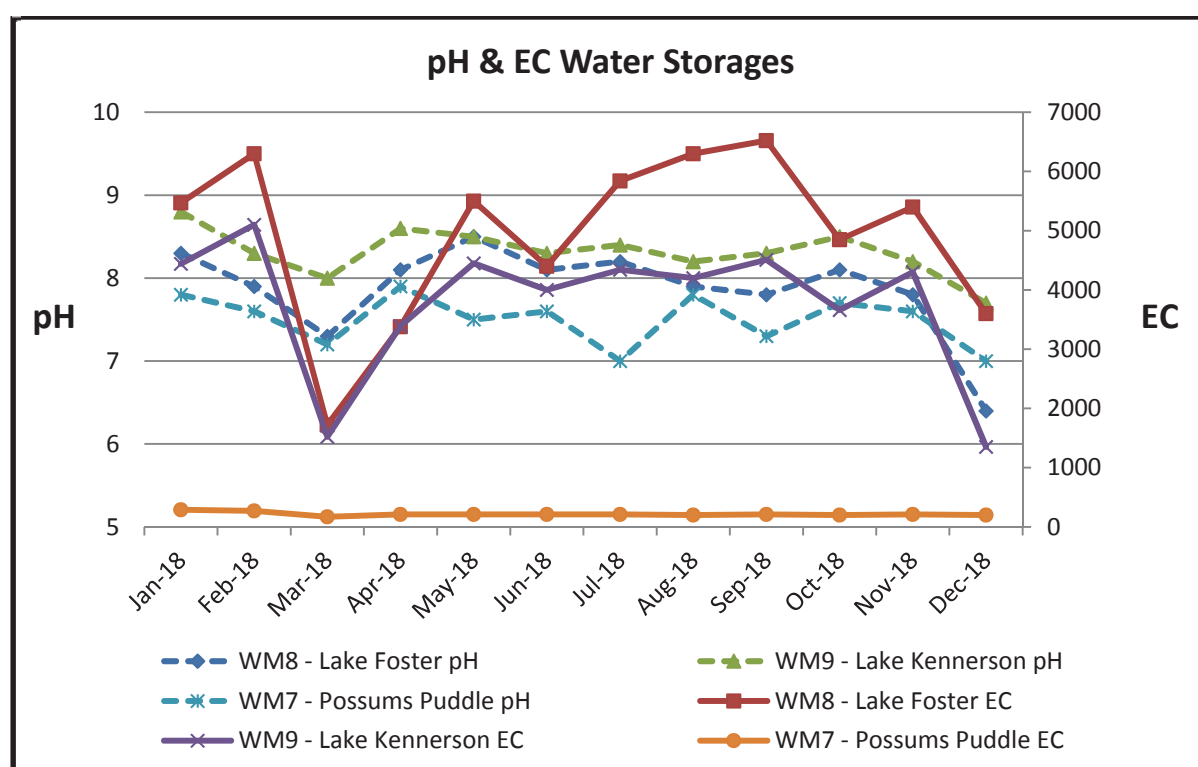


Figure 6: pH and EC in Site Water Storages

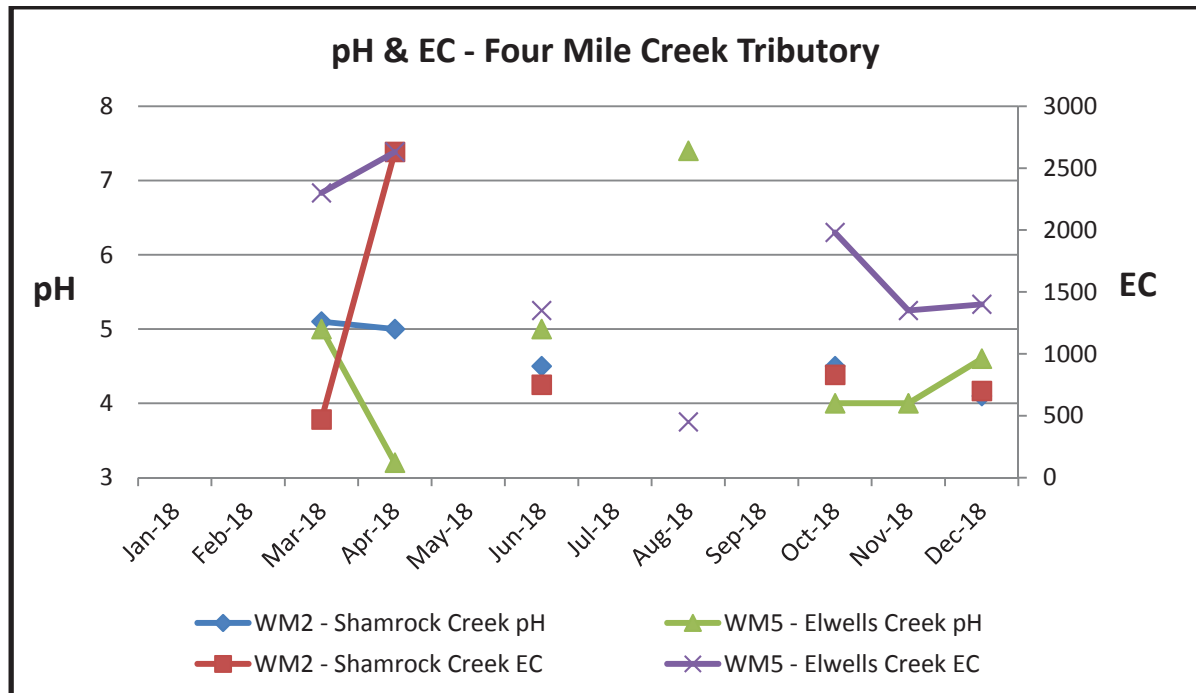


Figure 7: pH & EC in Four Mile Creek Tributary

Figure 8 shows the pH and salinity levels in Wallis Creek tributaries are generally consistent with ANZECC water quality guidelines (pH 6.5-8.5 & EC 125-2200).

Previous results indicate that the surface flow adjacent to Rathluba has historically been of low pH, regardless of mining impacts. Prior to 2006 pH results were less than 4 however pH levels have been steadily increasing since then. This drainage line carries surface flow from non-mining land and rehabilitated mining land, indicating that other off-site effects may be influencing the water quality in the area. The drainage line is ephemeral and is usually dry or evaporating resulting in gaps in the graphed data.

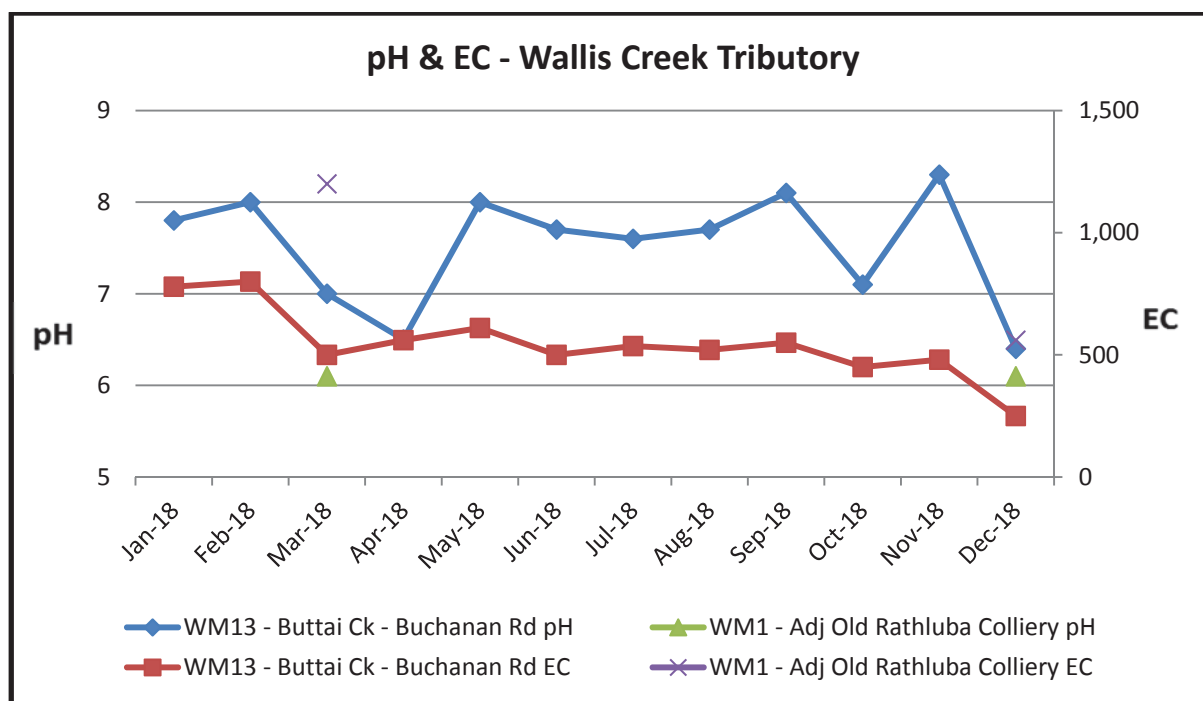


Figure 8: pH & EC in Wallis Creek Tributary

The WMP proposed water quality trigger values for Buttai Creek (WM13) and Elwells Creek (WM5). Table 21 summarises the results, with the full data set provided in Appendix C. EC results were within either WMP or ANZECC 2000 trigger. The low pH levels at WM5 are attributed to stagnate evaporating pools throughout a dryer than normal year.

Table 21: Trigger Values

Sampling Site	pH	EC	TSS
WM5 – Elwells Creek	3.2 to 7.4	450 to 2630	2 to 19
WMP Trigger Level	5.2 - 8.0	430 - 4000	4 - 85
WM13 – Buttai Creek	6.4 to 8.3	250 to 800	2 to 22
WMP Trigger Level	6.4 – 7.8	380 - 1100	5 - 45
ANZECC 2000 Trigger Level	6.5 - 8.5	125 - 2200	50*

* Standard Industry Criterion

Discharge Monitoring Results

There were 16 licensed discharge events conducted during the reporting period, with a total discharge volume of 1010 ML. Table 22 shows the average, maximum and minimum water quality results at the discharge point, compared to EPA discharge water quality thresholds. Detailed daily discharge results are provided in Table C1 in Appendix C.

Table 22: Discharge Sampling Analytical Results

DATE	pH	TOTAL SUSPENDED SOLIDS (mg/L)	TOTAL DISSOLVED SOLIDS (mg/L)	CONDUCTIVITY (uS/cm)	IRON (mg/L)	DISCHARGE VOLUME (ML/day)
EPA Limits	6.5-8.5	30	-	6,000	1	40
Average	8.1	6	3,914	4,351	<0.02	30
Maximum	8.5	18	5,470	5,900	0.02	40
Minimum	7.5	2	1,460	2,010	<0.01	10

7.2.3 Environmental Incidents

There were no reportable surface water incidents during the 2018 reporting period.

7.2.4 Further Improvements

The surface water monitoring program will be continued in accordance with WMP requirements.

7.3 Ground Water

7.3.1 Environmental Management

A Water Management Plan (WMP) has been prepared and approved by DPE in accordance with Project Approval requirements for the operation of the mine. The WMP prescribes the process water source and supply requirements, site-water balance, storage, impact management and monitoring of groundwater in the vicinity of the mining operations.

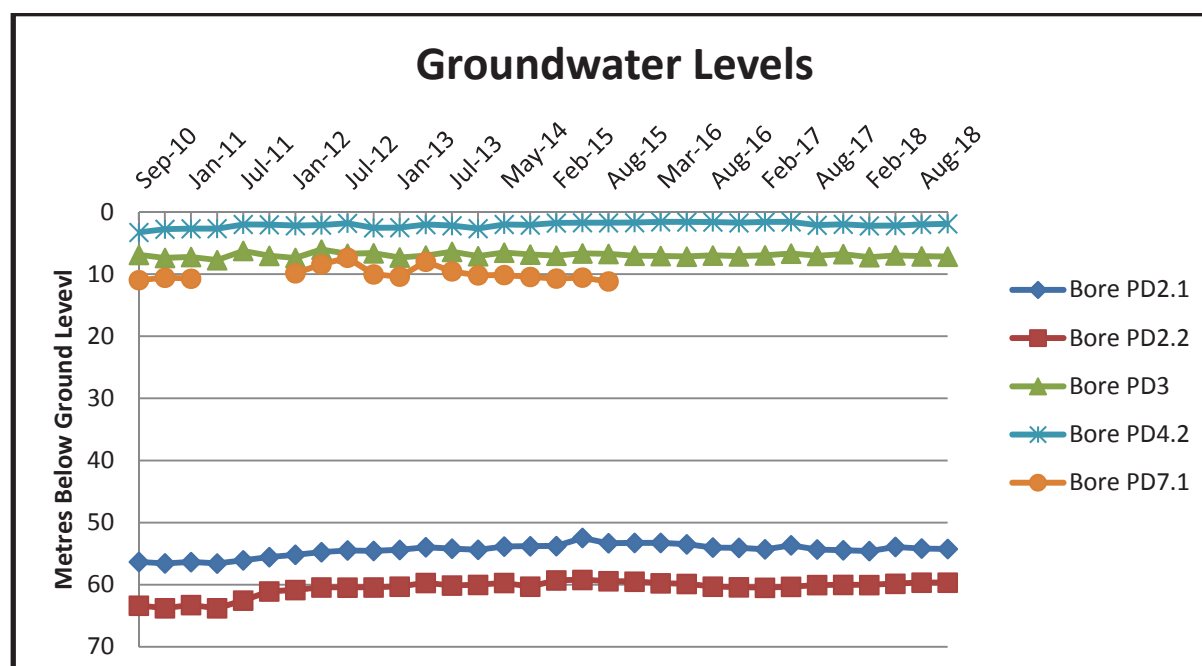
Table 23 outlines the groundwater monitoring program undertaken at Bloomfield Colliery.

Table 23: Groundwater Monitoring Program

Analyte	Quarterly	6 Monthly	Annual
Water Levels	✓	✓	✓
pH		✓	✓
Electrical Conductivity		✓	✓
Total Dissolved Solids		✓	✓
Filterable Iron			✓
Chloride			✓
Sulphate			✓
Alkalinity			✓
Calcium			✓
Magnesium			✓
Sodium			✓
Potassium			✓

7.3.2 Environmental Performance

Monitoring was undertaken during the period and the results for 2018 and previous years are summarised in Figures 9 – 11, with the full data set provided in Appendix D. The results are fairly consistent. The S Cut high wall moved west in 2015 and within a few metres of Bore PD7.1 Due to this the bore has been dry since August 2015.

**Figure 9: Groundwater Levels**

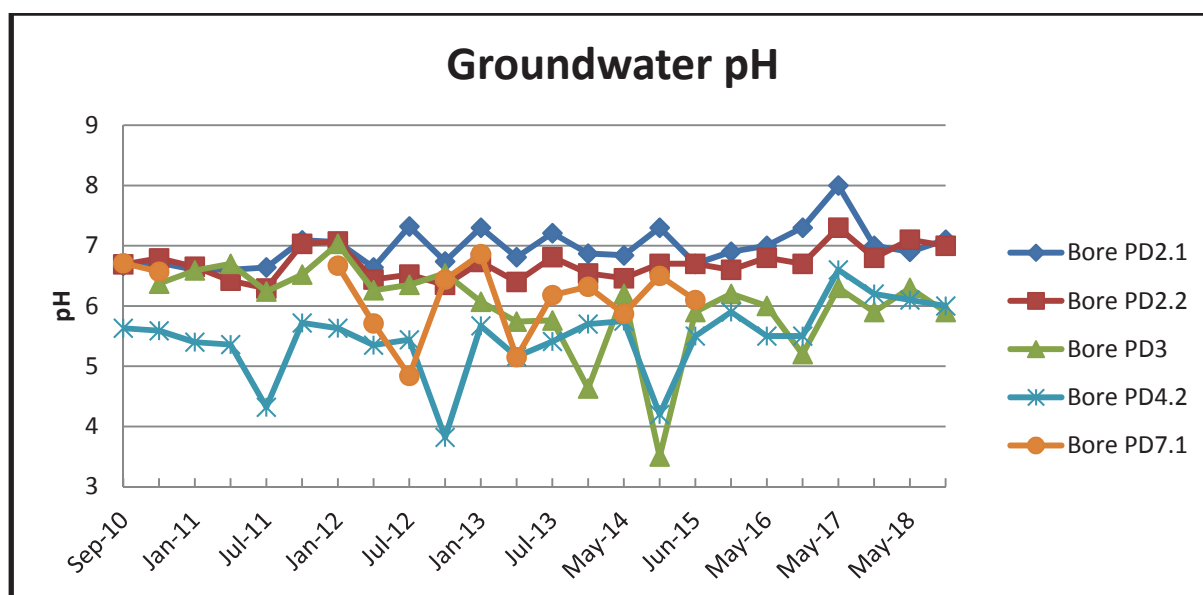


Figure 10: Groundwater pH

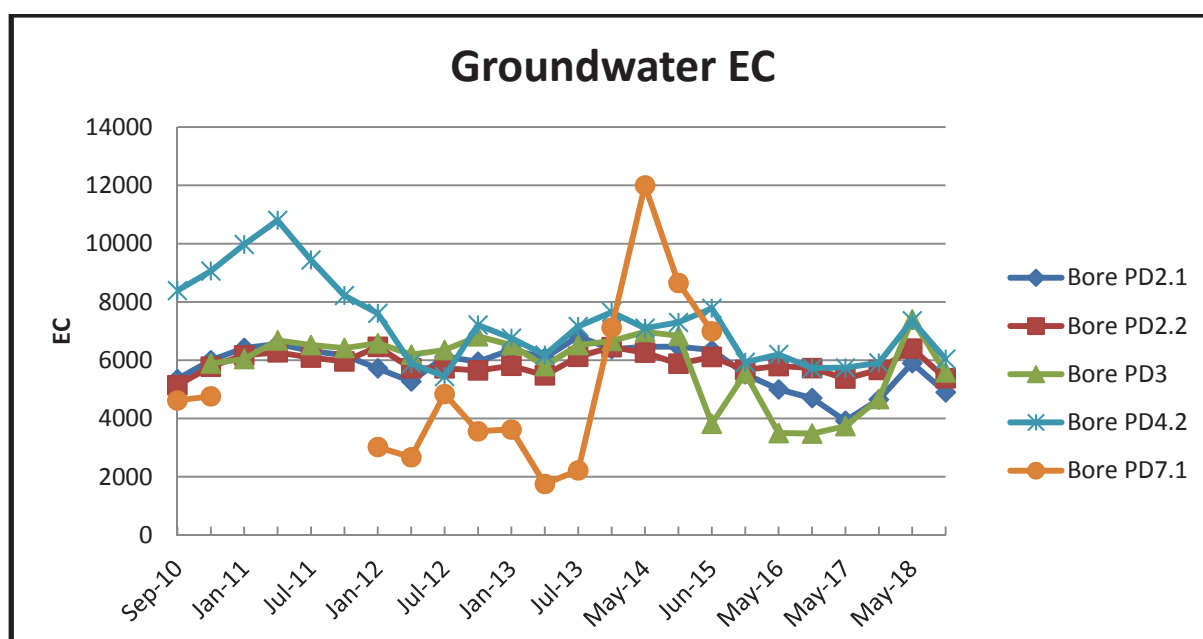


Figure 11: Groundwater EC

7.3.3 Environmental Incidents

No reportable incidents relating to groundwater occurred during the reporting period.

7.3.4 Further Improvements

The groundwater monitoring program will be continued in accordance with WMP requirements. As more groundwater data is collected any long-term trends may be identified.

8 REHABILITATION

8.1 Buildings

There have been no buildings or structures decommissioned over the site during the reporting period.

8.2 Rehabilitation of Disturbed Land

Landscape re-contouring, topsoil handling and revegetation techniques are well established at Bloomfield. The objectives of the rehabilitation program being:

- To establish post-mining surfaces and vegetation cover which ensure a safe and stable landform of land capability class equal to that which existed prior to mining disturbance.
- Return the land to a condition suitable for a range of post-mining landuses, which take into account the proximity of the site to the urban areas of Maitland and possible future development demands.
- Create landforms that can accommodate overburden and waste products produced during coal mining and processing, and merge with adjoining undisturbed landforms.
- Reinststate a surface drainage network on the rehabilitated landforms that is hydrologically stable and incorporates adequate erosion and sediment control structures so as to effectively protect adjoining areas from potential water-borne impacts.
- Undertake a maintenance program to ensure the continued sustainability of previously rehabilitated areas.

Rehabilitation is carried out throughout the year, with the aim of timing vegetation seeding operations in spring and autumn. The majority of the lease area is relatively undisturbed remnant native bushland and no other activities are carried out on the area other than the mining operation. To date 488 Ha has been rehabilitated.

As reported in the previous Annual Review, the major rehabilitation program undertaken over the past decade has now resulted in only relatively small areas becoming available for rehabilitation each year. Combined with this was an expansion of dumping area over areas previously categorised as rehabilitated.

During 2018 there was no rehabilitation undertaken as per the rehabilitation schedule in the MOP 2018-2020. Throughout 2018 overburden emplacement operations were carried out within the mine void. This involved backfilling the lower areas of the void and against existing highwalls towards the final landform. The highwalls on the southern and western lease boundary will eventually be backfilled to ground level. Shaping and rehabilitation of existing overburden emplacement areas will not be able to continue until backfilling areas within the void has reached the final landform.

Plan 2 provides an overview of the site showing areas previously rehabilitated, shaped and unshaped areas (active dumps), and active mining areas.

Table 24 provides a summary of the disturbed and rehabilitated areas at Bloomfield Colliery.

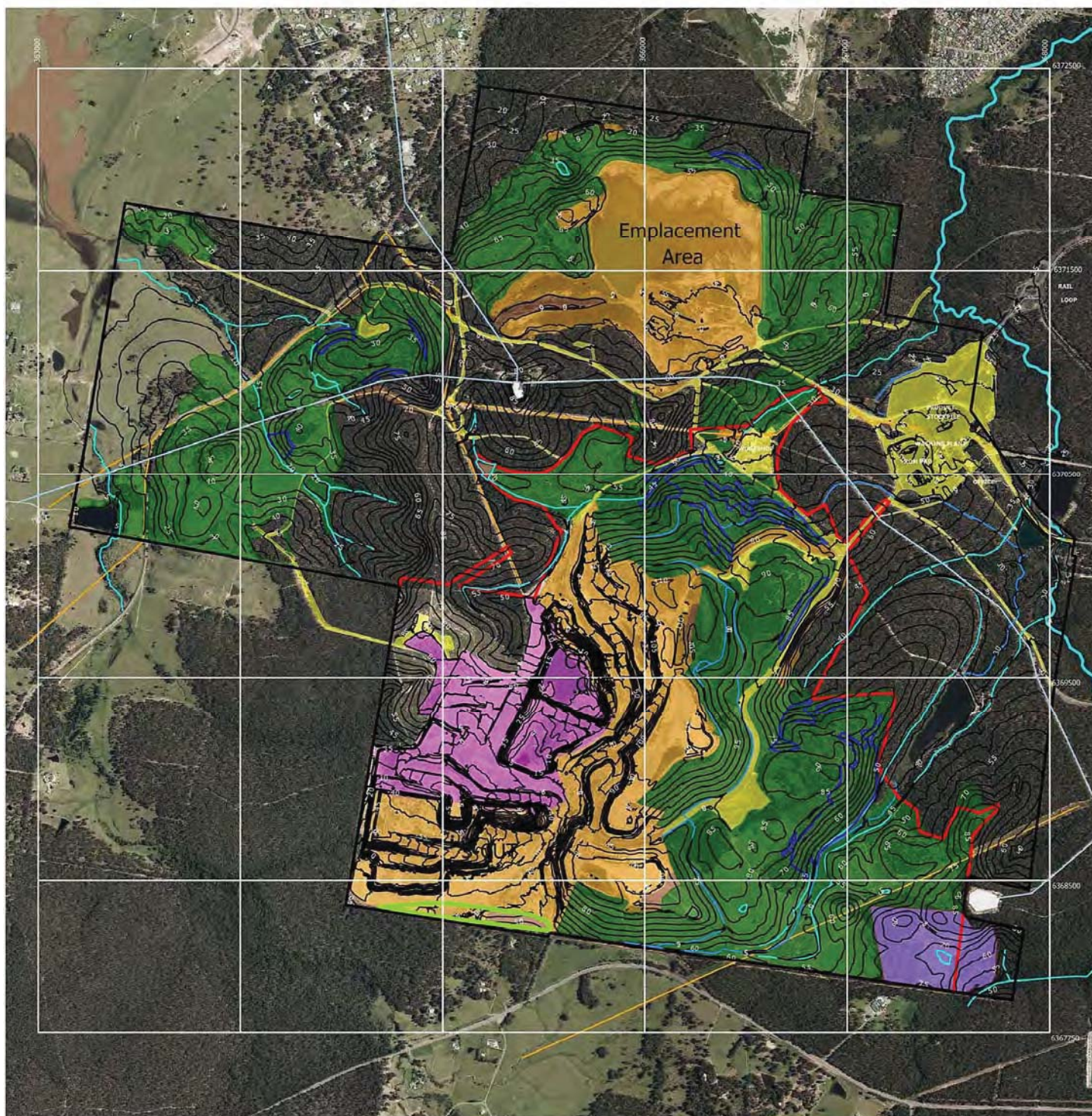
Table 24: Rehabilitation Summary

		Area Affected/Rehabilitated (hectares)		
		To date	Last report	Next Report (estimated)
A: MINE LEASE AREA				
A1	Mine Lease(s) Area	1,453		
B: DISTURBED AREAS				
B1	Infrastructure area (other disturbed areas to be rehabilitated at closure including facilities, roads)	72	73	73
B2:	Active Mining Area (excluding items B3 – B5 below)	68	73	73
B3	Waste emplacements, (active/unshaped/in or out-of-pit)	169	159	169
B4	Tailings emplacements, (active/unshaped/uncapped)	79	79	79
B5	Shaped waste emplacement (awaits final vegetation)	8	8	6
ALL DISTURBED AREAS		396	392	400
C REHABILITATION PROGRESS				
C1	Total Rehabilitated area (except for maintenance)	488	488	493
D: REHABILITATION ON SLOPES				
D1	10 to 18 degrees	28	28	28
D2	Greater than 18 degrees	-	-	-
E: SURFACE OF REHABILITATED LAND				
E1	Pasture and grasses	483	483	488
E2	Native forest/ecosystems	-	-	-
E3	Plantations and crops	5	5	5
E4	Other (include nonvegetative outcomes)	-	-	-

F1

F2

The 488 Ha total rehabilitated area includes 21 Ha of rehabilitated and relinquished lands.



LEGEND

0 1 km
Contour Interval 5m



— Contour (m AHD)	— Slopes 10 to 18 Degrees	— Unshaped Areas
— Clean Water	— Power Lines	— Shaped Areas
— Dirty Water	— Relinquished	— Active Areas
— Approval Area	— Previous Rehabilitation	— Infrastructure
— Colliery Holding	— 2019 Rehabilitation	



Bloomfield Colliery

Annual Review 2018

Plan 2

Rehabilitation Plan 2018

Scale: 1:20000

Date: February 2019
Photo: December 2018

Drawing: A3

Table 25 provides a summary of the maintenance activities during the period and activities proposed for the next reporting period.

Table 25 Maintenance Activities on Rehabilitated Land

NATURE OF TREATMENT	Area Treated (ha)		Comment/control strategies/ treatment detail
	Report period	Next period	
Additional erosion control works (drains re-contouring, rock protection)	-	-	Repair and rehabilitation of drain and gully erosion.
Re-covering (detail – further topsoil, subsoil sealing etc)	40	10	Areas treated with fertiliser and re-seeded during the next reporting period. Actual areas small and difficult to calculate.
Soil treatment (detail – fertiliser, lime, gypsum etc)	-	-	See "Re-covering" above.
Treatment/Management (detail – grazing, cropping, slashing etc)	-	50 5	The northern area of K Cut fenced and cattle grazing introduced to maintain pasture. Slashing of established rehabilitation to encourage nutrient recycling and, where needed, fertiliser application.
Re-seeding/Replanting (detail – species density, season etc)	-	-	See "Re-covering" above.
Adversely Affected by Weeds (detail - type and treatment)	ML1738	ML1738	Continual localised areas of weed treatment across all disturbed and undisturbed areas (see Section 3.7), but no specific areas of intensive treatment.
Feral animal control (detail – additional fencing, trapping, baiting etc)	1500	1500	Feral dog baiting undertaken during the reporting period in consultation with other large land holders in the area and Local Land Services.

8.2.1 Rehabilitation Monitoring

Rehabilitation monitoring at Bloomfield is undertaken in accordance with the Rehabilitation Management Plan, which was developed to satisfy the requirements of the Project Approval for the operation.

The monitoring program is based on the Landscape Function Analysis (LFA) tool developed by the CSIRO. LFA is the core of the monitoring procedures and uses visually assessed indicators of soil surface processes that gauge how effectively a hillslope is operating as a biophysical system. It is mainly based on processes involved in surface hydrology: rainfall, infiltration, runoff, erosion, plant growth and nutrient cycling. In addition to LFA monitoring, the monitoring program also assesses the performance of rehabilitated lands in terms of ground cover protection, erosion, vegetation community composition and structure, soil properties and pasture productivity.

Rehabilitation monitoring at Bloomfield is carried on a biennial basis (i.e. every 2 years) and did not commence until 2008, at the time where much of the existing rehabilitated areas were already established. Monitoring events were subsequently conducted in 2011, 2013, 2015 and 2017. The monitoring program currently includes a total of 26 monitoring sites, comprised of 24 sites within the rehabilitated areas plus two analogue sites. The 2018 reporting period was

not one of the monitoring years therefore no monitoring results are reported in this Annual Review. The next round of monitoring will be conducted in 2019 and the results will be presented in the 2019 Annual Review.

8.3 Other Infrastructure

No infrastructure was decommissioned during the reporting period.

8.4 Rehabilitation Trials and Research

No trials or research were undertaken during the reporting period.

8.5 Further Development of the Final Rehabilitation Plan

Under the current mine plan coal extraction is expected to continue until 2025 depending on rates of mining. Under Project Approval 07_0087 mining operations can continue to 2030. The Bloomfield washery, rail loader and tailings facility will continue to operate after the mining operations are scheduled to be completed. The continued use of the washery, rail loader and tailings facility is approved under Project Approval 05_0136 for the Abel Underground Mine. These items associated with the operation of the washery are approved to process coal from Bloomfield, Abel or the Tasman extended mines. When mining is completed at Bloomfield Colliery, the washery may continue processing coal from the Abel and or Tasman mines. Project Approval 05_0136 permits operations until 2030.

The final void remaining at the end of mining will be used as the tailings facility for the washery operations. An estimated 20 M m³ of storage capacity will be required for the final void as a tailings facility. This will be used for the disposal of approximately 18 M m³ of waste rejects and a further 2 M m³ of overburden capping. The tailings material will be capped with 2 metres of overburden material, soil spread and the area rehabilitated. Overburden material and topsoil will be stockpiled adjacent to the final void towards the end of Bloomfield mining operations to be utilised for final closure when washery operations are completed in 2030.

The current MOP expires at the end of 2020. A new MOP will be prepared and submitted to the NSW Resources Regulator towards the end of 2020 to cover the next MOP period.

9 COMMUNITY RELATIONS

9.1 Environmental Complaints

Six community complaints were received during the reporting period and a summary is provided below in Table 26. The complaints register for the reporting period is presented in Appendix E.

Table 26: Community Complaints Summary

Date	Issue	Type	Location
16-Jan-18	Blasting	Resident	Louth Park
04-Apr-18	Noise	Resident	Ashtonfield
19-Apr-18	Spontaneous Combustion	Resources Regulator	-
14-Jun-18	Odour	Resident	Black Hill
03-Sep-18	Noise	Resident	Buttai
21-Nov-18	Noise	Resident	Ashtonfield

Figure 12 displays a comparison of complaints with previous reporting periods, which demonstrates a decline in the number of complaints received.

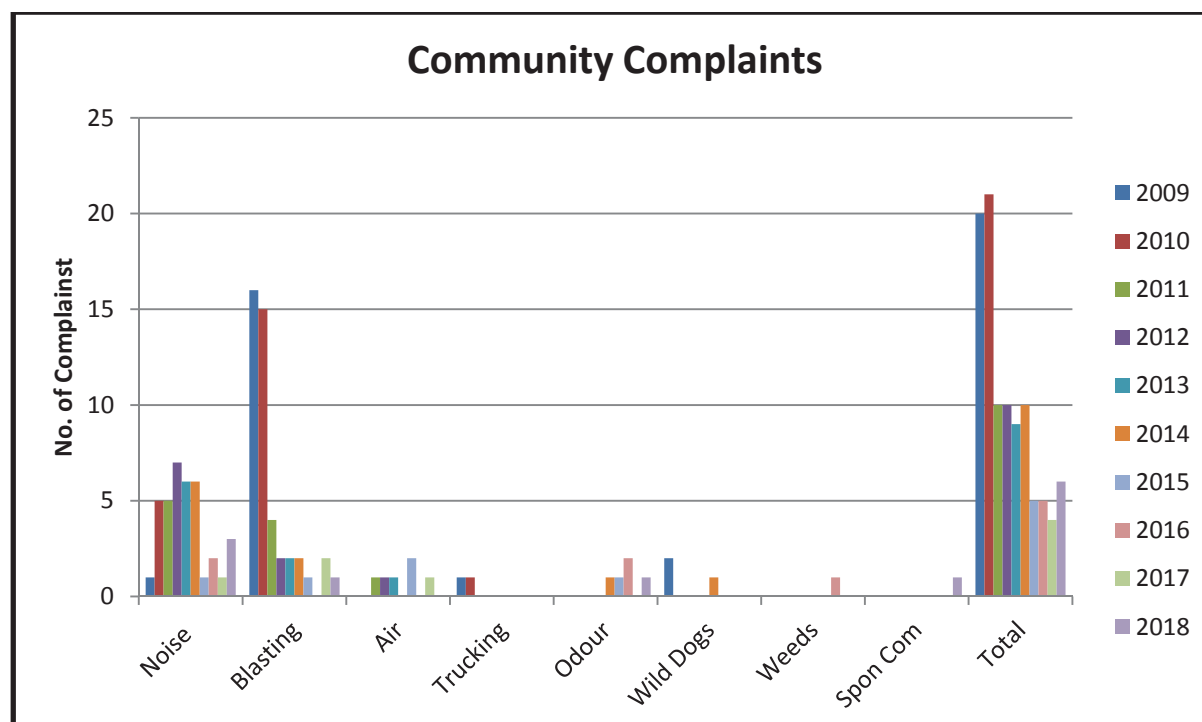


Figure 12: Community Complaints

9.2 Community Liaison

9.2.1 Community Consultative Committee

In accordance with the Project Approval, a Community Consultative Committee (CCC) has been established. The CCC meets three times a year. The minutes of the CCC meetings can be viewed on the Bloomfield website (www.bloomcoll.com.au).

Additional information about the operation has been included on the company website (www.bloomcoll.com.au) and information about blasting schedules advertised quarterly in local newspapers.

9.2.2 Adopt-a-Road Program

Bloomfield is a participant in Cessnock City Council's Adopt-a-Road program. Bloomfield has entered into an agreement with the Council to undertake litter collection campaigns along Buchanan Road, between John Renshaw Drive and Louth Park Road, Buchanan, including Valley View Lane. Bloomfield has contracted the Kurri Kurri Community Center Inc to conduct quarterly litter collection programs.

9.2.3 Community Sponsorship

The Bloomfield Group has a commitment to support local community projects and activities. As part of this commitment, during 2018 financial sponsorship and donations were provided for the following local community groups, schools, charities and community events:

- Australian Kidney Foundation
- Australian Red Cross
- Biraban Public School
- Breast Cancer Network Australia
- Camp Quality
- Cancer Council NSW
- Carries Place
- Cessnock Calvary Retirement Community
- Darlington Rural Fire Service
- Early Links Inclusion Support Services
- East Maitland Public School P&C
- Ellerston Public School
- Heart Foundation
- Hunter Medical Research Institute
- Hunter River Agricultural Show
- Hunter Valley Junior Cricket
- Iona Public School
- Largs Public School
- Leukaemia Foundation
- Maitland Grossman High School

- Maitland Junior Football Club Inc
- Maitland Junior Rugby Club
- Maitland Polocrosse
- Maitland Regional Museum
- Mark Hughes Foundation
- Mentor Support Network
- Mount Olive Community Centre
- Multiple Sclerosis Australia
- Newcastle & Hunter Combined Schools ANZAC Service - Singleton
- Newcastle Legacy Fund (Singleton Branch)
- NSW Mining
- Ourcare Services
- Riding Develops Abilities NSW (Riding for the Disabled)
- Rural Aid / Buy a Bale
- Salvation Army
- Samaritans
- Sculpture on the Farm - Dungog
- Singleton Business Chamber
- Singleton Fire Brigade
- Singleton Hospital
- Singleton Show
- St Johns College Lochinvar
- St Philips Nulkaba / Cessnock
- State Emergency Service - Singleton
- Maitland City Council - Steamfest
- Tarro 454 Fire Station
- Town with Hearts Inc Kurri Kurri
- University of Newcastle
- Wean Amateur Picnic Race Club
- Westpac Rescue Helicopter
- Youth off the Streets

10 INDEPENDENT AUDIT

In accordance with the Bloomfield Project Approval (PA 07_0087) every three years Bloomfield is required to undertake an Independent Environmental Audit of the project. During the reporting period Umwelt (Australia) Pty Limited (Umwelt) was commissioned by Bloomfield to conduct the Independent Environmental Audit against Project Approval 07_0087 for Bloomfield Colliery and covered the period 1 November 2015 to 30 October 2018.

The audit was conducted by Daniel Sullivan (Exemplar Global International Certified Auditor 113202) and Clare Naylor (Environmental Auditor) from Umwelt. Additional input was also provided on spontaneous combustion management by Mr Ian Pankhurst from Mining Operations Services Pty Ltd. The field visit component of the audit was completed on 30 October 2018.

The audit consisted of a detailed desktop review of documentation, interviews with key Bloomfield staff and a field inspection of the mining and rehabilitation areas. The audit was conducted generally consistent with '*ISO 14010 - Guidelines and General Principles for Environmental Auditing*', '*ISO 14011 - Procedures for Environmental Auditing*' and the '*Independent Audit Guideline. Post-approval requirements for State significant developments* (Department of Planning and Environment, 2015)'.

Table 27 outlines the recommendations arising from the audit and an update on progress made in implementing the action plan developed as an outcome of the audit.

The next Independent Environmental Audit of Project Approval 07_0087 will be conducted in 2021.

ANNUAL ENVIRONMENTAL MANAGEMENT REPORT 2017

Table 27: Audit Recommendations

Auditors Conclusions and Recommendation		Bloomfield Response	Timeline
Sched 2 Cond 5 Evidence of Consultation	The revision of management plans going forward will need to consider the outcomes of the required consultation in further detail to ensure compliance with this condition. Further for future revisions of management plans it should be confirmed with DPE upfront whether additional consultation is required with listed agencies (in addition to consultation that has occurred for the original versions of the management plans).	When future revisions of management plans are required Bloomfield will confirm with DPE upfront whether additional consultation is required with listed agencies.	As and when required.
Sched 3 Cond 19 Water Management Plan	It is recommended that during the next revision of the Water Management Plan that Bloomfield consults with DoI.	The Water Management Plan is currently being reviewed / updated by AECOM, as approved by DPE. Consultation with relevant agencies will be undertaken before submission of the final revised Plan to DPE for approval.	In progress. February 2019.
Sched 3 Cond 26 Landscape Management Plan	During the next revision of the Landscape Management Plan (and subsequent plans required within it) consultation with DoI and Council should be undertaken.	When the Landscape Management Plan is required to be revised in the future consultation with DoI and Council will be undertaken.	As and when required.
Sched 5 Cond 6	Bloomfield should continue to ensure that all staff are aware of the requirements to report incidents to DPE and other relevant regulatory agencies under the project approval, mining authorities and EPL.	The employee induction presentation will be reviewed and updated to better highlight the requirement to report incidents to external agencies.	Completed.
Spontaneous Combustion Management	Revise documented dumping procedures in the "Spontaneous Combustion Principal Mining Hazard Management Plan" to reflect actual practice of providing a minimum of 10 metres of suitable inert overburden over higher spontaneous combustion risk carbonaceous material.	The Spontaneous Combustion Principal Mining Hazard Management Plan will be revised and updated to reflect actual practice of providing a minimum of 10 metres of suitable inert overburden over higher spontaneous combustion risk carbonaceous material.	In progress. February 2019
	Upgrade existing or purchase gas monitors with both SO ₂ and H ₂ S capability with resolution to 0.1 ppm to allow monitoring of very low levels of gases and better assess any deterioration.	A new gas monitor will be purchased specifically for use in spontaneous combustion testing.	March 2019
	Purchase heat gun/s to determine strata temperature (this is best done in the early morning).	Bloomfield owns heat guns that can be utilised to determine strata temperature.	Completed.

ANNUAL ENVIRONMENTAL MANAGEMENT REPORT 2017

Auditors Conclusions and Recommendation		Bloomfield Response	Timeline
	Develop a procedure for measurement of gas and temperature data to be incorporated into the existing TARP to better identify and manage potential odour issues.	A procedure will be developed for measurement of gas and temperature data that will be incorporated into the existing TARP.	July 2019
	Provide personnel with relevant information on SO ₂ and H ₂ S gases, odour impacts and relevant concentration levels, particularly for public annoyance affection.	Information and training provided for relevant personnel.	April 2019
Water Licence	The groundwater management plan, which is part of the Water Management Plan should be updated to meet the specific requirements of Condition 6 of the water licence. The revised groundwater management plan should be provided to DPI Water for review and approval as required by Condition 5 of the water licence.	The Water Management Plan is currently being reviewed / updated by AECOM, as approved by DPE. Consultation with relevant agencies will be undertaken before submission of the final revised Plan to DPE for approval.	In progress. February 2019
	It is recommended that Bloomfield conduct a thorough review of the specific conditions attached to 20BL172035 and any other water licences that might be required and granted in future and develop a compliance database to ensure that all requirements are adequately addressed as required.	Bloomfield will develop a compliance database to ensure that all requirements are adequately addressed.	March 2019

11 INCIDENTS AND NON-COMPLIANCE

As mentioned in Section 1 there was no non-compliances during the reporting period. During the reporting period an Independent Environmental Audit was conducted in accordance with the Project Approval and covered a three year period. A number of non-compliances were identified during the audit that related to events prior to the 2018 Annual Review period. For further details regarding the non-compliances refer to Section 10.

12 ACTIVITIES PROPOSED IN THE NEXT AEMR PERIOD

The activities for the ensuing year will generally be in accordance with the rehabilitation and landscape management strategy outlined in the Environmental Assessment and the MOP schedule. Environmental activities proposed for the next Annual Review period have been previously reported within relevant sections of this document.

In accordance with the rehabilitation and landscape management strategy outlined in the Environmental Assessment and the MOP, an approximately 50 Ha area of the established rehabilitation area will be fenced and stock introduced for grazing purposes. The area will be located on the eastern side of the mining operations. Further details will be provided in the next Annual Review.

APPENDIX A

DUST MONITORING RESULTS

Table A1: PM2.5, PM10 and TSP Results 2018

Date	TSP Concentration (ug/m³)	PM₁₀ Concentration (ug/m³)	PM_{2.5} Concentration (ug/m³)
1/01/2018	29	18	
7/01/2018	-	26	
10/01/2018	35	-	
13/01/2018	49	32	
19/01/2018	55	26	
25/01/2018	45	22	
31/01/2018	45	23	
6/02/2018	24	11	
12/02/2018	51	24	
18/02/2018	47	26	
24/02/2018	25	12	
2/03/2018	27	14	
8/03/2018	15	6	
14/03/2018	36	15	
20/03/2018	80	42	
26/03/2018	23	12	
1/04/2018	31	16	
7/04/2018	31	16	
13/04/2018	92	39	
19/04/2018	33	15	
25/04/2018	14	8	
1/05/2018	22	9	
7/05/2018	38	15	
13/05/2018	14	5	
19/05/2018	59	33	
25/05/2018	36	17	
31/05/2018	20	8	
6/06/2018	10	5	
12/06/2018	12	7	
18/06/2018	16	6	
24/06/2018	18	11	
30/06/2018	20	9	
6/07/2018	35	13	
12/07/2018	27	12	
18/07/2018	79	39	
24/07/2018	70	33	
30/07/2018	36	14	
5/08/2018	-	22	
11/08/2018	40	15	
15/08/2018	51	-	
17/08/2018	40	20	
23/08/2018	62	19	
30/08/2018	29	15	
4/09/2018	13	5	
10/09/2018	30	15	
16/09/2018	42	22	
22/09/2018	99	26	

Date	TSP Concentration (ug/m3)	PM10 Concentration (ug/m3)	PM2.5 Concentration (ug/m3)
28/09/2018	37	17	
4/10/2018	25	16	
10/10/2018	21	20	
16/10/2018	18	15	
22/10/2018	70*	28	
28/10/2018	29	19	
3/11/2018	75	34	24
9/11/2018	37	17	8
15/11/2018	35	16	9
21/11/2018	92	42	24
27/11/2018	55	25	9
3/12/2018	59	27	13
9/12/2018	57	26	15
15/12/2018	53	24	4
21/12/2018	44	20	6
27/12/2018	35	16	7
Maximum 24 hr Average	-	42	24
Project Approval Impact Assessment Criteria 24hr Average	-	50	25
Annual Average	40	19	12**
Project Approval Impact Assessment Criteria Annual Average	90	25	8

* Note: Sample not included due to lawn mowing activities likely influencing results.

** Note: Sampling commenced in November. Not a full year average.

Figure A1

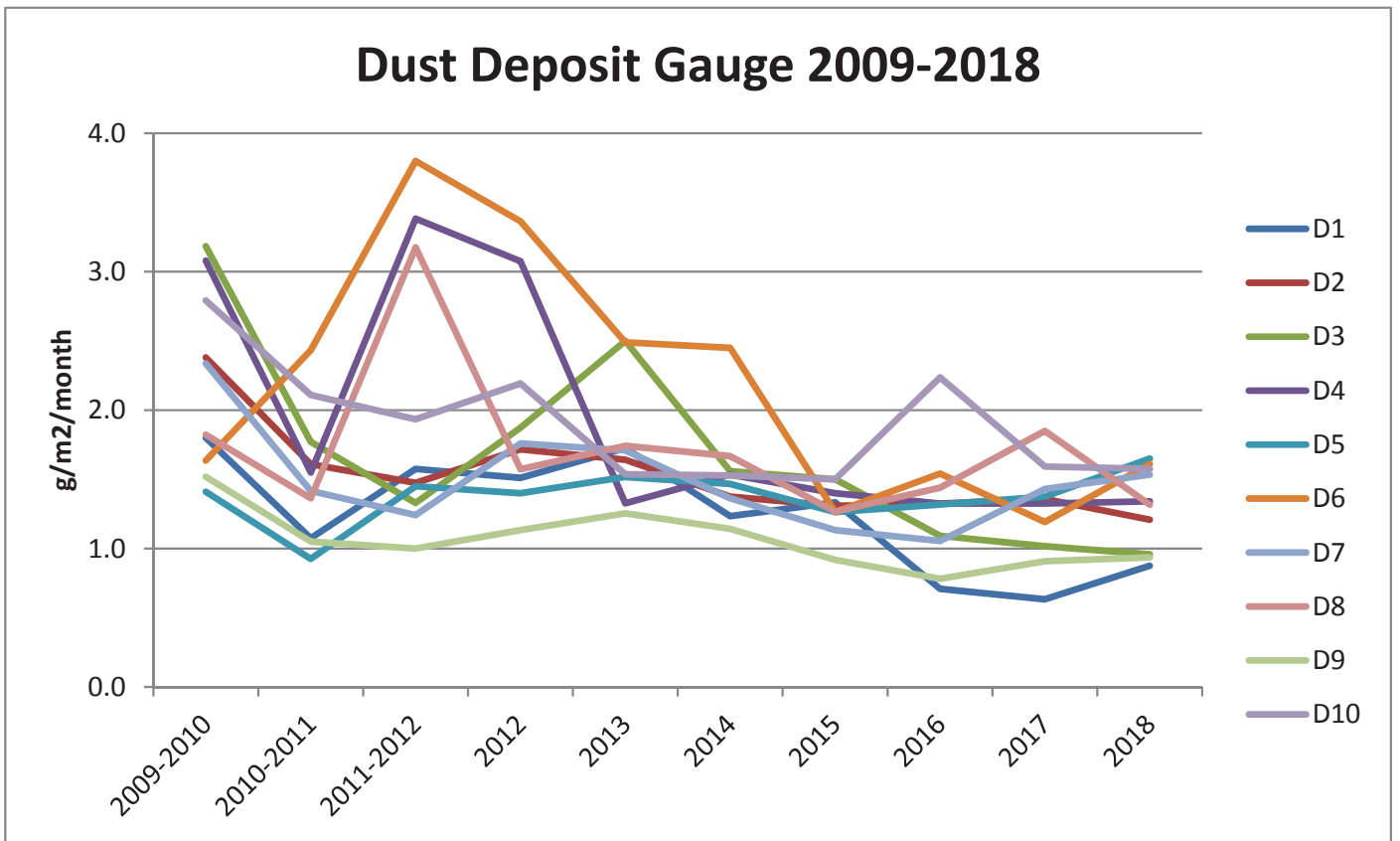


Figure A2

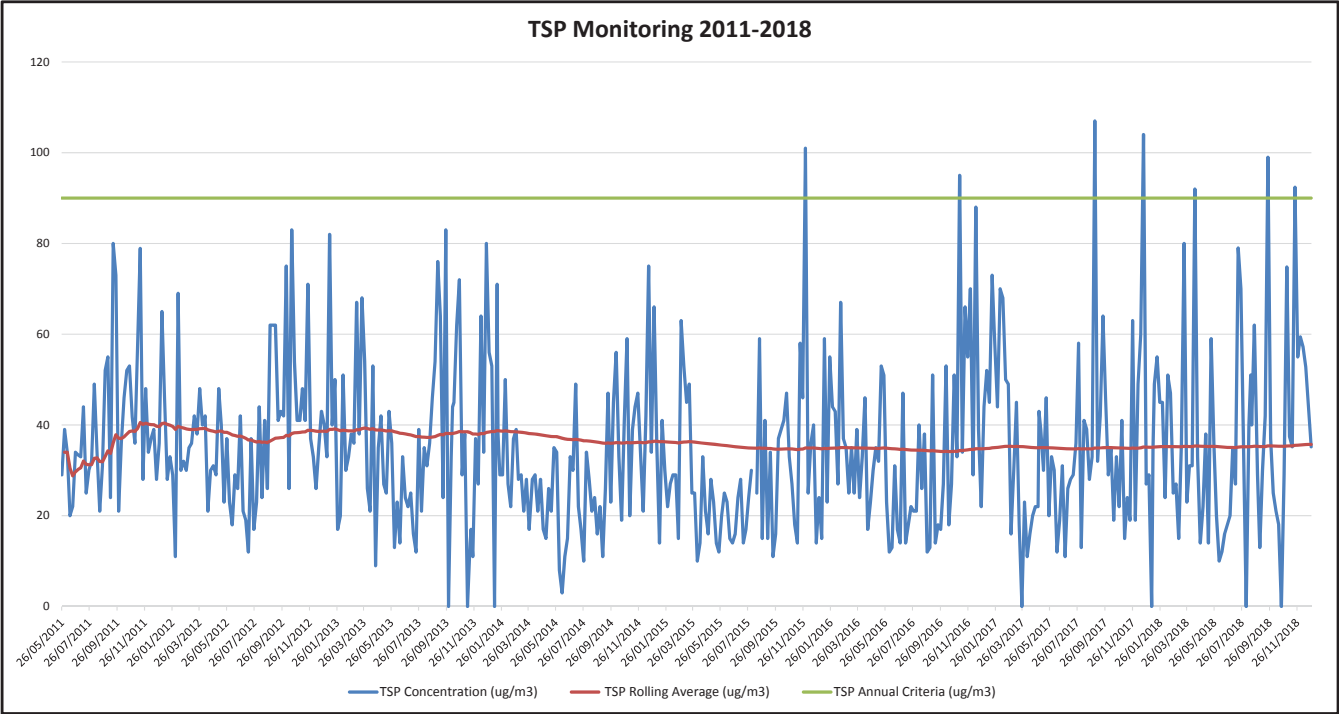


Figure A3

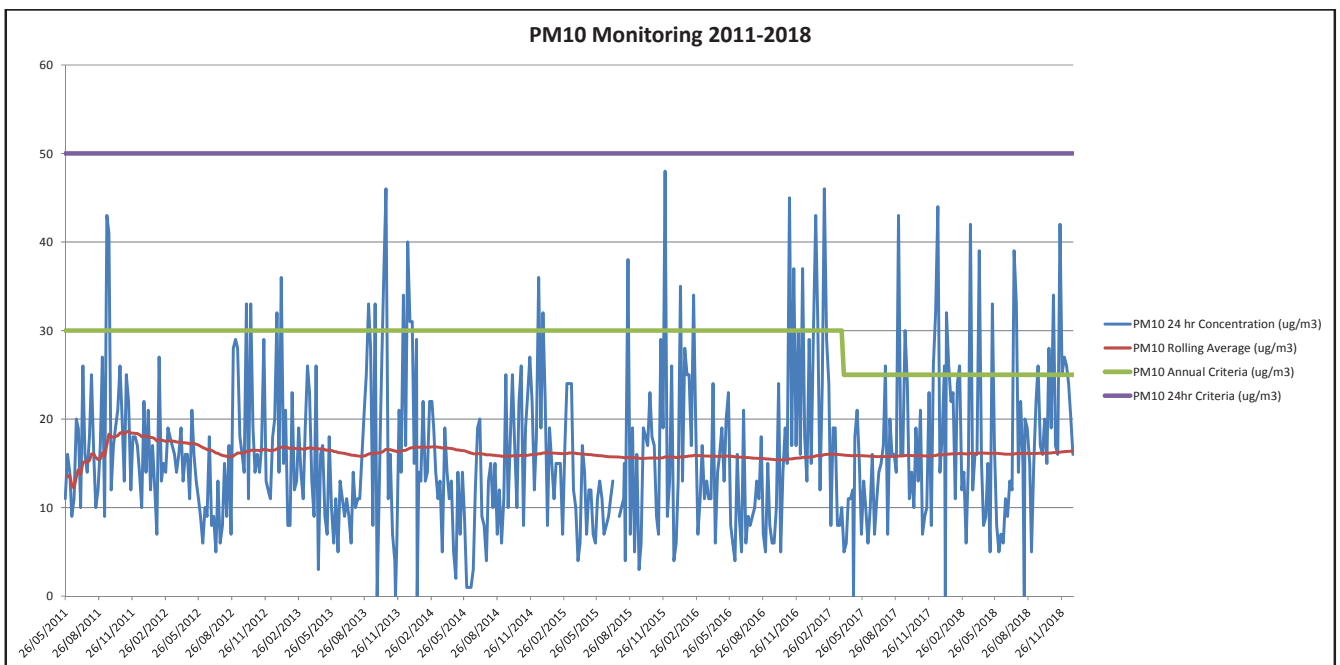
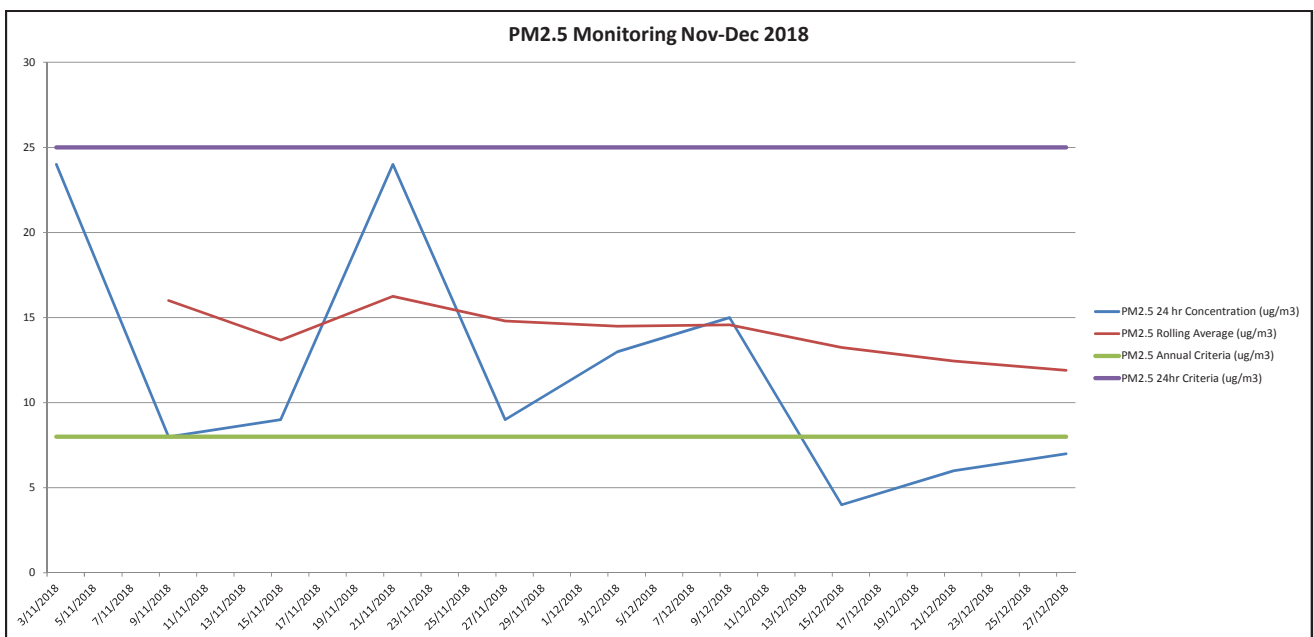


Figure A4



APPENDIX B

BLAST MONITORING RESULTS

BLAST RESULTS 2018

EPL No. 396
Licencee: Bloomfield Collieries Pty Ltd
Premises: Bloomfield Colliery
Four Mile Creek Rd
Astonfield NSW 2323

Monitoring Frequency: Every blast
Airblast Overpressure Limit: 120 dB(Lin Peak)
Ground Vibration Limit: 10 mm/s



Shot No.		Blast Monitor Location											
		EPA ID No. 5 - Elliot's			EPA ID No. 4 - McNaughton's			EPA ID No. 3 - Mt Vincent Rd			EPA ID No. 6 - Richards		
		Vibration (mm/s)	Airblast (dB)	Distance (m)	Vibration (mm/s)	Airblast (dB)	Distance (m)	Vibration (mm/s)	Airblast (dB)	Distance (m)	Vibration (mm/s)	Airblast (dB)	Distance (m)
6770	12/01/2018 1:52pm	0.32	97.4	1197	0.18	96.2	1789	0.14	87.1	2856	0.18	99.2	2073
6771	1/02/2018 1:50pm	0.26	99.8	1183	0.19	101.5	1988	0.12	90.4	2925	0.24	95.4	1759
6772	7/02/2018 1:55pm	0.84	106.3	1425	0.82	98.2	1927	0.56	95.3	2631	0.58	110.6	2116
6773	15/02/2018 1:53pm	0.16	100.4	1208	0.14	99.9	1998	0.08	88.3	2896	0.13	97.2	1764
6774	26/02/2018 12:24pm	0.43	105.2	1105	0.31	97.5	1795	0.17	89	2953	0.21	100.9	1983
6775	20/03/2018 2:10pm	0.85	112.8	1503	0.78	102.3	2008	0.6	90	2551	0.76	104.8	2088
6776	29/03/2018 1:58pm	1.16	106.9	1502	1.3	101.5	1941	0.9	91.1	2564	1.01	112.3	2194
6777	12/04/2018 2:03pm	0.5	105.9	1550	0.64	104.5	2016	0.52	85.1	2508	0.61	101.7	2141
6778	18/04/2018 12:15pm	0.33	104.1	1226	0.25	101.5	1952	0.18	95.1	2850	0.25	108.1	1854
6779	2/05/2018 1:58pm	0.37	105.2	1159	0.2	103.2	1746	0.12	88.2	2895	0.18	97.7	2098
6780	9/05/2018 1:59pm	0.06	102.1	1245	0.03	88.3	2064	0.03	88.3	2885	0.06	94.5	1693
6781	9/05/2018 2:06pm	0.54	105.4	1560	0.72	102.4	1973	0.44	91.6	2510	0.38	103.2	2223
6782	15/05/2018 1:56pm	0.05	99.4	1194	0.04	101.5	1965	0.03	89.1	2897	0.04	99	1804
6783	17/05/2018 1:54pm	0.66	106.8	1574	0.5	103.5	2056	0.43	87.3	2481	0.45	98.3	2109
6784	18/05/2018 1:57pm	0.03	100.1	1202	0.01	96.6	1931	0.01	82.9	2873	0.02	94.8	1864
6785	24/05/2018 1:52pm	0.18	98.3	1176	0.06	96.4	2004	0.06	87.7	2947	0.1	99.6	1727
6786	30/05/2018 1:25pm	0.03	105.7	1257	0.01	104.9	2035	0.01	92.8	2849	0.03	87.4	1751
6787	30/05/2018 2:02pm	0.69	101.5	1595	0.94	100	2017	0.48	96.5	2471	0.52	92.1	2204
6788	6/05/2018 12:58pm	0.17	102.6	1207	0.1	101.3	1837	0.05	88.8	2846	0.07	96.4	2012
6789	14/06/2018 12:14pm	0.24	103.2	1078	0.16	101.5	1725	0.07	85.1	2975	0.09	93.9	2060
6790	20/06/2018 12:29pm	0.11	103.7	1129	0.08	103	1861	0.03	99.8	2939	0.06	101.3	1906
6791	25/06/2018 1:50pm	1.2	102.6	1254	0.92	101.9	2045	0.35	87.8	2859	0.66	97	1731
6792	2/07/2018 11:45pm	0.48	100.5	1169	0.41	99.7	1851	0.2	91.5	2890	0.37	96	1955
6793	4/07/2018 1:58pm	1.19	104.2	1106	0.92	99.9	1842	0.35	87.1	2961	0.44	102.2	1916
6794	10/07/2018 12:35pm	0.61	100.2	1118	0.37	104.9	1724	0.25	87.2	2936	0.37	95.2	2095
6795	11/07/2018 1:49pm	0.53	102.9	1190	0.38	99.7	1873	0.26	86.3	2870	0.39	96.7	1942
6796	26/07/2018 1:56pm	0.54	110.4	1335	0.48	108.7	1967	0.49	92.3	2723	0.46	103.8	1945
6797	30/08/2018 10:45am	0.19	103	1801	0.14	104.9	2199	0.1	97.4	2264	0.11	101.5	2221
6798	13/09/2018 11:09am	0.61	106.7	1579	0.56	108.5	2113	0.65	97.9	2474	0.99	110.9	2021
6799	20/09/2018 1:54pm	0.76	113.8	1566	0.35	109.7	2131	0.5	101	2489	0.82	110.4	1969
6800	26/09/2018 11:07am	0.58	97.6	1621	0.61	93.6	2150	0.47	96.8	2432	0.71	102.4	2018
6801	18/10/2018 2:00pm	1.13	107.7	1627	0.82	101.2	2037	0.8	91.6	2441	0.71	103.1	2218
6802	26/10/2018 11:07am	0.95	104.4	1672	0.74	103.4	2074	0.78	99.2	2397	0.79	101.7	2224

BLAST RESULTS 2018

EPL No. 396
Licencee: Bloomfield Collieries Pty Ltd
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 Four Mile Creek Rd
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Shot No.		Blast Monitor Location											
		EPA ID No. 5 - Elliot's			EPA ID No. 4 - McNaughton's			EPA ID No. 3 - Mt Vincent Rd			EPA ID No. 6 - Richards		
		Vibration (mm/s)	Airblast (dB)	Distance (m)	Vibration (mm/s)	Airblast (dB)	Distance (m)	Vibration (mm/s)	Airblast (dB)	Distance (m)	Vibration (mm/s)	Airblast (dB)	Distance (m)
6803	1/11/2018 3:12pm	0.84	102.5	1717	0.81	102.2	2137	0.72	93.7	2345	0.82	102.4	2190
6804	13/11/2018 1:55pm	1.01	108.4	1757	0.98	102.7	2145	0.83	98.7	2313	0.72	108.6	2240
6805	19/11/2018 1:55pm	0.56	100.1	1813	0.63	102.1	2232	0.5	99.7	2246	0.56	99.7	2183
6806	26/11/2018 10:07am	0.48	100.8	1433	0.48	103.2	1867	0.22	101.6	2638	0.2	99.9	2219
6807	4/12/2018 2:12pm	0.69	102.10	1629	1.02	101.90	1947	0.50	101.60	2476	0.58	106.00	2362
6808	11/12/2018 2:10pm	0.68	100.40	1824	0.49	105.70	2104	0.44	110.00	2292	0.40	107.10	2418
6809	14/12/2018 10:04am	1.13	102.70	1447	0.93	101.80	1868	0.34	94.20	2627	0.32	103.30	2236
6810	19/12/2018 2:05pm	0.51	99.20	1827	0.48	95.30	2161	0.42	0.42	2260	0.41	102.20	2328

APPENDIX C

WATER MONITORING RESULTS

**Site
WM1**

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09														Dry
13-Oct-09														Dry
03-Nov-09														Dry
13-Dec-09														Dry
13-Jan-10														Dry
09-Feb-10														Dry
04-Mar-10														Dry
08-Apr-10														Dry
14-May-10														Dry
10-Jun-10														Dry
07-Jul-10														Dry
25-Aug-10														Dry
20-Sep-10	4.22	4,820	18	3,940	0.38		1	1710	837	195	186	788	15	
19-Oct-10														Dry
19-Nov-10	4.61	1,990	4	1,360	0.06									
21-Dec-10														Dry
14-Jan-11														Dry
22-Feb-11														Dry
24-Mar-11														Dry
27-Apr-11														Dry
26-May-11														Dry
27-Jun-11	5.00	1,980	18	1,330	0.15									Dry
25-Jul-11	5.76	952	16	650	0.16		5	254	85	36	28	85	8	
26-Aug-11	5.41	1,820	5	1,220	0.06									
21-Sep-11	5.68	2224	16	1540	0.09									
26-Oct-11	6.24	2002	17	1350	0.28		2	544	256	79	68	247	9	
22-Nov-11	5.75	1508	12	1050	0.4									
15-Dec-11														Dry
25-Jan-12														Dry
17-Feb-12														Dry
30-Mar-12	6.58	1490	12	1010	0.05									
02-May-12	6.17	1,440	5	1,030	0.05		1	443	178	66	53	181	7	
24-May-12														Dry
27-Jun-12	6.67	1351	38	908	0.17									
27-Jul-12	5.82	1516	78	1140	0.1		16	580	183	79	62	214	7	
30-Aug-12														Dry
25-Sep-12														Dry
25-Oct-12														Dry
29-Nov-12														Dry
20-Dec-12														Dry
24-Jan-13														Dry
25-Feb-13	7.73	2530	52	1590	0.15									
22-Mar-13	7.39	900	56	582	4.44									
22-Apr-13	6.64	1580	17	1080	0.25		18	424	208	50	48	219	11	
17-May-13														Dry
21-Jun-13														Dry
24-Jul-13														Dry
28-Aug-13														Dry
17-Sep-13	7.71	1340	8	831	0.13									
22-Oct-13														Dry
14-Nov-13														Dry
11-Dec-13														Dry
24-Jan-14														Dry
20-Feb-14														Dry
25-Mar-14														Dry
30-Apr-14														Dry
28-May-14														Dry
26-Jun-14														Dry
28-Jul-14														Dry
31-Aug-14	7.14	336	12		2.3									
22-Sep-14														Dry
27-Oct-14														Dry
21-Nov-14														Dry
22-Dec-14														Dry

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	6.4	730	9	530	0.09	14.5								
23-Feb-15														Dry
30-Mar-15														Dry
28-Apr-15	6.4	116	79	86	0.62	190	17	12	17	2.7	2.8	14	6	Floodwater
28-May-15	6	1500				4								Floodwater
24-Jun-15	5.9	1900				4								
29-Jul-15														Dry
27-Aug-15														Dry
28-Sep-15	6.7	2300				4								
22-Oct-15														Dry
30-Nov-15														Dry
21-Dec-15														Dry
29-Jan-16	5.6	1450	2	1050	0.01	2								
26-Feb-16														Dry
31-Mar-16														Dry
28-Apr-16														Dry
26-May-16														Dry
29-Jun-16														Dry
19-Jul-16														Dry
23-Aug-16	6.2	1700				13								Not flowing
28-Sep-16	6.3	1800				8								Not flowing
20-Oct-16														Dry
24-Nov-16														Dry
21-Dec-16														Dry
31-Jan-17														Dry
27-Feb-17														Dry
31-Mar-17	6.3	900				6								Not flowing
26-Apr-17														Dry
30-May-17														Dry
28-Jun-17	5	1380				4								Not flowing
26-Jul-17														Dry
30-Aug-17														Dry
28-Sep-17														Dry
24-Oct-17														Dry
28-Nov-17														Dry
13-Dec-17														Dry
29-Jan-18														Dry
22-Feb-18														Dry
29-Mar-18	6.1	1200				7								
26-Apr-18														Dry
21-May-18														Dry
26-Jun-18														Dry
25-Jul-18														Dry
29-Aug-18														Dry
28-Sep-18														Dry
24-Oct-18														Dry
29-Nov-18														Dry
18-Dec-18	6.1	560				18								

Site
WM2[illegible]

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	5.6	180	42	234	1.4	126								
23-Feb-15	7.3	210				16.5								
30-Mar-15														Dry
28-Apr-15	5	1,040	47	790	0.04	74	5	485	37	45	66	76	13	
28-May-15														Dry
24-Jun-15														Dry
29-Jul-15														Dry
27-Aug-15														Dry
28-Sep-15														Dry
22-Oct-15														Dry
30-Nov-15	7	280				43.8								
29-Jan-15	5.6	180	42	234	1.4	126								
29-Jan-16	6.2	276	47	238	1.1	69								
26-Feb-16	6.7	260				23								
31-Mar-16	7.3	640				161								
28-Apr-16														Dry
26-May-16														Dry
29-Jun-16	6	440				24								
19-Jul-16	5.5	450	4	341	0.17	7								
22-Aug-16	6.7	350				31								
28-Sep-16	7.5	390				11								
20-Oct-16	5	480	10	347	0.09	15	5	180	17	19	21	35	9	
24-Nov-16														Dry
21-Dec-16														Dry
30-Jan-17														Dry
27-Feb-17														Dry
30-Mar-17	5	370				86								Not flowing
26-Apr-17	6.2	270	21	256	3.2	94	16	94	18	12	13	17	9	Not flowing
30-May-17	5.6	460				44								Not flowing
28-Jun-17	5.6	395				27								Not flowing
27-Jul-17														Dry
30-Aug-17														Dry
28-Sep-17														Dry
24-Oct-17	6.4	5,560	10	5,620	0.05	22	150	3100	410	330	330	920	36	
28-Nov-17														Dry
13-Dec-17														Dry
29-Jan-18														Dry
22-Feb-18														Dry
29-Mar-18	5.1	470				26								
26-Apr-18	5	2,630	54	2,290	0.14	30	30	1100	140	110	130	380	24	
21-May-18														Dry
25-Jun-18	4.5	750				7								
25-Jul-18														Dry
29-Aug-18														Dry
29-Sep-18														Dry
24-Oct-18	4.5	830	15	604	0.48	17	30	330	26	38	35	64	14	
29-Nov-18														Dry
18-Dec-18	4.1	700				14								

Site
WM3 **Elwells Creek / Four Mile Creek Junction**

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.80	360	14	220	0.74	34								
13-Oct-09	8.10	310	370	210	0.61	46	52		38	15	10	39	3	
03-Nov-09	8.30	640	10	500	0.70	27								
13-Dec-09	7.60	410	8	140	0.23	18								
13-Jan-10	6.80	280	10	200	0.61	17	92		39	14	10	34	3	
09-Feb-10	7.30	220	14	130	0.28	14								
04-Mar-10	8.90	280	9	200	0.35	86								
08-Apr-10	8.70	323	7	220	0.20	23	54		42	18	9	33	3	
14-May-10	7.50	193	7	131	0.10	10								
10-Jun-10	6.80	462	41	370	0.14	65								
07-Jul-10	7.30	581	14	354	0.21	33	75		57	19	16	67	4	
25-Aug-10	6.10	419	10	266	0.29	28								
20-Sep-10	7.42	1,950	10	1,390	0.11		89	710	143	95	81	256	9	
19-Oct-10	7.38	336	7	166	0.15									
19-Nov-10	7.94	2,840	31	1,740	0.05									
21-Dec-10	7.44	1,150	9	674	0.30									
14-Jan-11	7.74	2,140	9	1,430	0.09		181	642	217	59	70	353	8	
22-Feb-11	7.93	4,590	10	3,730	0.05									
24-Mar-11	7.96	4,940	12	3,630	0.06									
27-Apr-11	7.01	326	16	234	0.46		60	52	39	14	9	41	3	
26-May-11	8.24	5,460	24	3,800	0.05									
27-Jun-11	7.44	2,950	21	2,230	0.05									
25-Jul-11	7.78	2,420	67	1,440	0.20		148	504	311	56	57	358	7	
26-Aug-11	7.24	780	20	514	0.32									
21-Sep-11	8.02	1497	15	934	0.12									
26-Oct-11	7.71	627	190	436	0.39		43	140	74	19	18	80	5	
22-Nov-11	7.43	1871	29	1330	0.13									
15-Dec-11	7.76	3180	32	2190	0.05									
25-Jan-12	8.17	4810	14	3770	0.07		327	1760	513	109	201	813	18	
17-Feb-12	6.9	442	45	372	0.72									
30-Mar-12	8	3150	17	2190	0.05									
27-Apr-12	7.17	426	24	314	0.95		45	84	48	14	13	49	6	
24-May-12	7.58	351	23	224	1.25									
27-Jun-12	8.21	4810	24	3740	0.63									
27-Jul-12	7.45	1912	35	1370	0.39		82	689	192	85	81	269	8	
30-Aug-12	7.68	711	30	508	0.42									
25-Sep-12	7.94	2140	15	1330	0.1									
25-Oct-12	7.78	786	17	458	0.36		86	147	91	22	23	104	5	
29-Nov-12	8.06	4790	14	3180	0.05									
20-Dec-12	8.14	3620	12	2420	0.05									
24-Jan-13	8.03	2290	6	1510	0.06		204	690	253	62	79	400	9	
25-Feb-13	7.96	2450	54	1560	0.09									
22-Mar-13	7.58	1640	8	1110	0.27									
22-Apr-13	8.29	4150	54	2940	0.09		286	1370	427	109	149	734	15	
17-May-13	7.64	935	54	498	0.59									
21-Jun-13	7.64	860	10	580	0.35									
24-Jul-13	7.48	650	49	416	0.44		52	150	57	19	19	78	4	
28-Aug-13	7.58	596	15	345	0.34									
17-Sep-13	7.52	1180	38	758	0.17									
22-Oct-13	7.79	1250	8	703	0.17		137	246	135	23	31	192	5	
14-Nov-13	7.94	4210	14	2820	0.05									
11-Dec-13	7.29	718	15	447	0.24									
24-Jan-14	8.47	3840	26		0.07									
20-Feb-14	8.1	2810	58		0.05									
25-Mar-14	7.98	1270	17		0.07									
30-Apr-14	7.78	2600	20	1860	0.05		189	965	240	100	109	452	12	
28-May-14	6.94	357	15		0.46									
26-Jun-14	7.85	667	6		0.31									
28-Jul-14	8.36	4960	19	3890	0.05									
31-Aug-14	7.84	1090	23		0.23									
22-Sep-14	7.4	750				62								
27-Oct-14	7.2	1100	17	702	0.26	20.6	108	323	116	25	32	163	5	
21-Nov-14	8	1000				19.3								
22-Dec-14	8	2700				15.9								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	8.4	3000	26	2120	0.05	29.2								
20-Feb-15	8.2	4000				8.7								
30-Mar-15	7.7	960				18.1								
28-Apr-15	7.1	984	33	636	0.25	48	41	330	82	34	38	115	6	
28-May-15	7	890				62								
24-Jun-15	7.4	690				57								
29-Jul-15	7.5	554	8	382	0.41	29.9								
27-Aug-15	8.3	4840				31								
28-Sep-15	7.7	1980				16								
22-Oct-15	6.5	960	25	633	0.09	38.4	78	280	78	39	36	110	5	
30-Nov-15	7.7	2040				20.6								
21-Dec-15	7.7	5400				14								
29-Jan-16	7.4	1290	28	942	0.37	73								
26-Feb-16	7.1	1300				45								
31-Mar-16	8.1	5000				14								
28-Apr-16	7.5	1400	8	992	0.01	14	195	440	97	39	46	210	6	
26-May-16	7.5	670				51								
29-Jun-16	6.7	2400				18								
19-Jul-16	7.1	1100	7	812	0.27	20								
22-Aug-16	7.2	960				27								
28-Sep-16	8.1	4320				11								
20-Oct-16	8.3	3100	7	2460	0.02	14	240	1100	200	92	140	640	11	
28-Nov-16	8.1	3900				22								
21-Dec-16	8	5300				6								
30-Jan-17	8.2	4490	4	3860	0.01	5								
27-Feb-17	7.5	5320				7								
30-Mar-17	7.2	2100				12								
26-Apr-17	7.5	738	10	567	0.45	19	79	210	85	28	29	110	5	
30-May-17	7.4	1420				17								
28-Jun-17	7.1	923				30								
27-Jul-17	7.1	481	8	312	0.61	23								
30-Aug-17	7	1400				8								Not flowing
28-Sep-17	8.2	3790				6								Not flowing
24-Oct-17	8.2	5510	7	5210	0.01	9	410	2300	390	200	290	1200	22	
28-Nov-17	7.4	3100				3								Not flowing
13-Dec-17	7.9	3100				4								Not flowing
29-Jan-18														Dry
22-Feb-18	7.5	1030				108								Stagnant pool
29-Mar-18	7.5	1300				32								
26-Apr-18	7.4	3300	14	2770	0.01	14	220	1200	210	150	150	550	12	
21-May-18	7.4	2600				12								
25-Jun-18	7.6	2250				11								
25-Jul-18	7.1	713	6	512	0.14	17								
29-Aug-18	7.9	4500				7								
28-Sep-18	7.5	2700				7								
24-Oct-18	7.5	2280	3	1660	0.02	10	160	760	180	76	82	400	7.8	
29-Nov-18	8	4150				10								Discharging
29-Jan-19														Dry

Site
WM4

Four Mile Creek @ Possums Puddle Discharge

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.70	160	6	120	0.72	5								
13-Oct-09	7.10	170	4	140	0.61	10	33		28	11	4	20	3	
03-Nov-09	8.80	150	6	130	0.44	22								
13-Dec-09	7.10	160	2	90	0.13	22								
13-Jan-10	7.10	150	6	120	0.17	8	46		24	12	4	14	2	
09-Feb-10	6.30	70	2	110	0.22	5								
04-Mar-10	9.30	190	4	120	0.18	12								
08-Apr-10	8.90	171	1	130	0.59	4	43		25	13	4	14	2	
14-May-10	7.40	157	2	117	0.05	2								
10-Jun-10	6.80	1,250	58	858	0.12	83								
07-Jul-10	7.30	190	13	148	0.24	31	34		27	11	4	13	2	
25-Aug-10	6.49	192	5	136	0.36	28								
20-Sep-10	7.74	180	2	128	0.46		31	15	22	13	4	13	2	
19-Oct-10	7.62	180	4	103	0.12									
19-Nov-10	7.69	332	12	226	0.63									
21-Dec-10	7.50	194	<5	164	0.70									
14-Jan-11	8.12	192	<5	123	0.37		39	14	30	10	4	18	3	
22-Feb-11	8.36	812	<5	656	0.12									
24-Mar-11	8.13	601	7	432	0.18									
27-Apr-11	7.43	185	12	116	0.50		41	12	21	13	4	16	2	
26-May-11	8.37	5,460	24	3,640	0.05									
27-Jun-11	8.04	3,250	20	2,480	0.05									
25-Jul-11	8.18	2,790	57	1,760	0.12		179	610	366	66	70	462	8	
26-Aug-11	7.36	319	14	257	0.41									
21-Sep-11	8.48	243	10	186	0.6									
26-Oct-11	8.71	4670	232	3480	0.5		328	1640	478	132	173	824	17	
22-Nov-11	7.94	760	126	534	0.37									
15-Dec-11	7.57	3340	22	2300	0.05									
25-Jan-12	8.65	2430	110	1770	0.36		126	733	250	52	87	373	10	
17-Feb-12	7.44	241	23	240	1.15									
30-Mar-12	7.8	521	5	374	0.69									
27-Apr-12	7.82	216	11	322	0.91		29	24	32	7	6	26	4	
24-May-12	7.73	206	6	163	1.02									
27-Jun-12	8.35	4710	29	3540	0.05									
27-Jul-12	7.09	342	15	289	47.7		42	52	50	14	10	41	4	
30-Aug-12	8.07	404	15	302	0.55									
25-Sep-12	7.68	255	10	160	0.58									
25-Oct-12	7.68	308	8	155	0.47		34	19	39	11	5	24	3	
29-Nov-12	8.23	550	5	364	0.33									
20-Dec-12	8.07	495	7	290	0.28									
24-Jan-13	8.25	290	6	229	0.14		51	38	32	16	7	30	3	
25-Feb-13	7.79	843	37	554	0.42									
22-Mar-13	7.54	764	8	474	0.63									
22-Apr-13	8.34	4430	16	3110	0.05		310	1510	463	119	159	810	16	
17-May-13	7.55	194	5	150	0.9									
21-Jun-13	7.6	261	5	174	0.62									
24-Jul-13	7.54	232	5	165	0.6		28	25	25	9	5	26	3	
28-Aug-13	7.69	179	5	136	0.37									
17-Sep-13	8.35	5750	25	4400	0.05									
22-Oct-13	8.05	180	5	136	0.41		37	12	22	10	3	16	2	
14-Nov-13	8.17	890	7	511	0.23									
11-Dec-13	7.67	202	5	160	0.56									
24-Jan-14	8.36	253	5		0.44									
20-Feb-14	7.56	413	18		0.23									
25-Mar-14	7.73	189	5		0.14									
30-Apr-14	7.74	493	9	321	0.39		53	120	45	17	16	74	4	
28-May-14	8.13	133	7		0.55									
26-Jun-14	7.91	187	5		0.47									
28-Jul-14	8.4	5220	8	3540	0.05									
31-Aug-14	8.17	297	6		0.32									
22-Sep-14	6.5	140				12.9								
27-Oct-14	7.9	230	3	112	0.24	5	30	10	30	10	3	15	2	
21-Nov-14	7	180				5								
22-Dec-14	8.3	140				3.7								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	8.5	3220	28	2270	0.03	32								
20-Feb-15	8.2	480				5.7								
30-Mar-15	7.9	130				4.5								
28-Apr-15	7.1	1030	46	702	0.23	57	26	400	65	42	48	105	6.4	
28-May-15														No access
24-Jun-15	7.8	390				44								
29-Jul-15	7.6	308	5	222	0.61	29.1								
27-Aug-15	7.9	590				19								
28-Sep-15	7.6	300				19.7								
22-Oct-15	6.8	260	2	168	0.29	9.3	42	43	30	17	7.6	26	2.2	
30-Nov-15	8.4	210				2.5								
21-Dec-15	7	220				4								
29-Jan-16	7.2	680	10	491	0.48	35.2								
26-Feb-16	7	210				10								
31-Mar-16	8.2	4950				12								
28-Apr-16	7.3	320	5	232	0.53		49	64	33	11	10	40	4	
26-May-16	7.9	240				15								
29-Jun-16	7.4	390				13								
19-Jul-16	7.3	230	4	178	0.41	10								
22-Aug-16	7.6	200				11								
28-Sep-16	7.8	760				6								
20-Nov-16	8	200	1	147	0.21	3	40	28	22	12	6	24	3	
24-Nov-16	8.1	190				4								
21-Dec-16	7	220				4								
30-Jan-17	8.4	322	2	146	0.08	5								
27-Feb-17	8.3	5380				3								Discharging
30-Mar-17	7.3	350				6								
26-Apr-17	7.8	330	5	221	0.73	11	46	71	50	12	10	45	5	
30-May-17														No access
28-Jun-17	7.4	500				21								
27-Jul-17	7.3	228	4	159	0.7	17								
30-Aug-17	7.3	250				22								
28-Sep-17	8.3	240				15								
24-Oct-17	8.3	5100	4	4770	0.01	7	340	2200	360	190	260	1000	20	Discharging
28-Nov-17	6.9	270				9								
13-Dec-17	7.8	310				11								Not flowing
29-Jan-18														Dry
22-Feb-18	7.5	1400				99								Stagnant pool
29-Mar-18	7.3	360				28								
26-Apr-18	7.9	560	12	439	0.31	18	52	140	53	16	16	95	4	
21-May-18	7.8	220				15								
25-Jun-18	7.8	540				14								
25-Jul-18	7.7	214	3	157	0.29	15								
29-Aug-18	7.8	4500				7								
28-Sep-18	7.6	220				8								
24-Oct-18	8.3	350	5	221	0.28	7	31	71	37	11	8.8	48	3.4	
29-Nov-18	8	4500				12								Discharging
18-Dec-18	7	300				25								

Site
WM5

Elwells Creek @ Haul Road

[illegible]

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	6.90	1,300	19	1,020	0.05	35.7								
20-Feb-15	6.80	1,700				5								
30-Mar-15														Dry
28-Apr-15	5.20	2,240	13	1,890	0.03	8	5	1190	77	160	135	185	10	
28-May-15	6.60	1,730				6								
24-Jun-15	7.20	1,400				4								
29-Jul-15	7.10	768	5	550	0.05	8.2								
27-Aug-15	6.60	1,500				5								
28-Sep-15	7.70	1,920				4.5								
22-Oct-15	6.30	2,600	10	2,380	0.04	10.7	10	1400	110	205	160	220	12	
30-Nov-15														Dry
21-Dec-15														Dry
29-Jan-16	6.40	1,760	9	1,280	0.04	12.7								
26-Feb-16														Dry
31-Mar-16	7.00	2,300				12.5								
28-Apr-16														Dry
26-May-16														Dry
29-Jun-16	6.60	1,730				4								
19-Jul-16	6.30	1,900	8	1,540	0.09	12								
22-Aug-16	6.20	2,010				31								Not flowing
28-Sep-16	7.20	1,560				6								Not flowing
20-Nov-16														Dry
24-Nov-16														Dry
21-Dec-16	6.60	2,300				15								Not flowing
30-Jan-17														Dry
27-Feb-17	4.20	3,050				3								Not flowing
30-Mar-17	5.20	2,000				17								Not flowing
26-Apr-17	4.40	1,820	20	1,900	0.22	33	5	1100	89	120	130	200	9	Not flowing
30-May-17														Dry
28-Jun-17	4.50	1,110				2								
27-Jul-17	5.50	1,190	36	978	0.13	11								Not flowing
30-Aug-17														Dry
28-Sep-17														Dry
24-Oct-17	3.70	2,130	4	1,880	5.4	6	5	1200	71	130	130	180	7	Not flowing
28-Nov-17														Not flowing
13-Dec-17														Dry
29-Jan-18														Dry
22-Feb-18														Dry
29-Mar-18	5.00	2,300				4								
26-Apr-18	3.20	2,630	2	2,320	8.7	7	30	1500	62	140	170	160	6	
21-May-18														No flow
25-Jun-18	5.00	1,350				5								
25-Jul-18														Dry
29-Aug-18	7.40	450				11								
28-Sep-18														No flow
24-Oct-18	4.00	1,980	19	1,680	2.6	40	30	970	84	100	110	200	8	
29-Nov-18	4.00	1,350				62								
18-Dec-18	4.60	1,400				5								

Site
WM6

Four Mile Creek U/S Possums Puddle

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	9.10	120	10	80	0.86	42								
13-Oct-09	8.30	110	10	85	0.54	23	38		13	12	2	8	1	
03-Nov-09	8.80	120	12	120	0.40	31								
13-Dec-09	7.90	120	5	50	0.19	13								
13-Jan-10	6.70	110	5	88	0.62	110	47		12	13	2	8	1	
09-Feb-10	7.60	150	38	130	0.77	52								
04-Mar-10	8.90	140	90	350	0.24	24								
08-Apr-10	9.00	122	29	200	0.50	10	35		13	14	2	6	1	
14-May-10	8.20	124	6	87	0.17	18								
10-Jun-10	6.70	250	73	268	0.67	122								
07-Jul-10	7.40	130	10	75	0.19	6	35		11	13	2	6	1	
25-Aug-10	6.87	156	13	103	0.22	20								
20-Sep-10	7.35	141	9	101	0.23		32	9	12	15	2	8	1	
19-Oct-10	7.14	127	5	69	0.19									
19-Nov-10	6.80	274	65	417	1.59									
21-Dec-10	7.13	164	24	156	0.94									
14-Jan-11	6.91	135	7	85	0.71		40	2	19	13	2	8	2	
22-Feb-11	7.16	129	<5	83	0.57									
24-Mar-11	7.34	119	5	94	0.18									
27-Apr-11	7.07	125	78	175	0.42		30	8	15	12	2	10	2	
26-May-11	7.17	125	40	144	0.05									
27-Jun-11	7.38	272	22	214	0.31									
25-Jul-11	6.84	305	30	238	0.79		21	20	60	6	6	40	5	
26-Aug-11	7.11	245	70	256	0.46									
21-Sep-11	7.15	158	18	115	0.18									
26-Oct-11	8.04	185	30	139	0.38		33	12	25	12	4	19	2	
22-Nov-11	7.53	167	51	157	0.38									
15-Dec-11	6.78	225	95	246	1.13									
25-Jan-12	8.21	171	9	105	1.06		45	3	24	13	4	13	2	
17-Feb-12	6.68	189	38	242	1.31									
30-Mar-12	7.3	284	21	230	0.94									
27-Apr-12	7.03	248	37	268	1.16		39	15	41	8	6	30	4	
24-May-12	7.32	176	28	107	0.52									
27-Jun-12	8.18	324	22	190	0.72									
27-Jul-12	7.15	292	44	270	1.14		38	17	57	9	7	34	4	
30-Aug-12	6.5	147	9	121	0.15									
25-Sep-12	7.27	166	14	97	0.23									
25-Oct-12	7.53	144	164	89	0.24		39	7	14	14	3	11	2	
29-Nov-12	7.44	141	12	121	0.69									
20-Dec-12	8.19	499	8	278	0.14									
24-Jan-13	7.4	160	54	109	0.59		50	3	14	18	3	10	2	
25-Feb-13	8.24	2780	31	1760	0.05									
22-Mar-13	7.23	297	8	200	1.25									
22-Apr-13	7.41	166	136	198	0.25		28	17	22	9	4	17	2	
17-May-13	7.29	173	69	115	0.24									
21-Jun-13	7.28	161	9	114	0.18									
24-Jul-13	7.24	159	16	114	0.33		27	7	13	10	3	14	2	
28-Aug-13	7.29	130	5	89	0.1									
17-Sep-13	7.36	138	7	82	0.21									
22-Oct-13	7.3	138	5	111	0.15		43	5	10	11	2	8	1	
14-Nov-13	7.12	271	5	165	0.16									
11-Dec-13	6.97	206	11	145	0.59									
24-Jan-14	7.81	237	5		1.11									
20-Feb-14	8.13	196	38		0.55									
25-Mar-14	7.39	145	5		0.25									
30-Apr-14	7.75	141	14	154	0.77		18	13	28	6	3	24	3	
28-May-14	8.22	112	6		0.15									
26-Jun-14	7.57	136	16		0.1									
28-Jul-14	7.47	109	7	79	0.13									
31-Aug-14	7.87	233	30		0.64									
22-Sep-14	6.9	150				34.7								
27-Oct-14	7.9	150	6	84	0.32	11.5	32	10	23	10	2	9	1	
21-Nov-14	6.3	120				10.8								
22-Dec-14	7.5	130				14.9								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	6.6	150	56	20	0.88	121								
20-Feb-15	7.2	120				12.8								
30-Mar-15	7.6	100				15.4								
28-Apr-15	6.7	337	30	254	0.97	80	22	29	64	10	8.5	37	4.8	
28-May-15	7.9	200				58								
24-Jun-15	8.2	190				63								
27-Jul-15	7.3	171	14	114	0.2	33.2								
27-Aug-15	8	110				36								
28-Sep-15	7.7	140				27								
22-Oct-15	7.1	140	5	108	0.49	7.4	48	10	16	19	3.1	9	1.1	
30-Nov-15	7.3	150				9								
21-Dec-15	6.5	120				8								
29-Jan-16	6.8	220	12	176	1	37.3								
26-Feb-16	7	190				11.8								
31-Mar-16	7.1	140				9								
28-Apr-16	7.1	120	6	98	0.41	13	39	8	14	12	4	9	2	
26-May-16	7.6	120				18								
29-Jun-16	7.5	130				44								
19-Jul-16	7.4	120	13	107	0.14	37								
22-Aug-16	7.9	140				21								
28-Sep-16	8	120				18								
20-Nov-16	7.7	130	6	104	0.26	6	43	8	16	15	3	10	1	
24-Nov-16	7.5	120				11								
21-Dec-16	6.7	150				5								
30-Jan-17	7.2	174	2	104	0.02	3								
27-Feb-17	7.4	130				4								
31-Mar-17	7.6	300				62								
26-Apr-17	7.1	195	5	168	0.77	9	39	15	38	12	5	20	3	
30-May-17	7.3	250				8								
28-Jun-17	6.8	285				15								
27-Jul-17	6.8	124	4	35	0.13	9								
30-Aug-17	7.1	150				11								
28-Sep-17	7.7	225				7								
24-Oct-17	6.7	241	2	133	0.04	3	32	49	18	21	5	14	1	
28-Nov-17	7.1	180				5								
13-Dec-17	7.6	210				5								
29-Jan-18	7	214	4	126	0.49	7								
22-Feb-18	7.5	200				4								No flow
29-Mar-18	7.2	320				19								
26-Apr-18	7.6	260	5	178	0.72	6	41	32	39	14	5.5	27	3.1	
21-May-18	8.2	230				7								
25-Jun-18	7.7	200				60								
25-Jul-18	6.8	124	3	74	0.04	6								
29-Aug-18	7.9	150				5								
28-Sep-18	7.4	190				6								
24-Oct-18	7.3	190	12	122	0.37	17	30	23	22	7.9	3.8	17	1.5	
29-Nov-18	7.3	140				89								
18-Dec-18	7	150				64								

Site
WM7

Possums Puddle

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.50	170	7	110	0.81	82								
13-Oct-09	7.10	170	6	130	0.57	41	36		27	10	4	19	3	
03-Nov-09	8.70	160	4	140	0.38	108								
13-Dec-09	7.00	160	3	40	0.45	67								
13-Jan-10	6.80	150	2	110	0.16	11	44		24	12	4	14	2	
09-Feb-10	6.50	160	10	120	0.11	7								
04-Mar-10	8.80	170	9	97	0.81	12								
08-Apr-10	8.60	187	1	130	0.25	6	43		25	14	4	13	1	
14-May-10	7.30	158	2	119	<0.05	4								
10-Jun-10	6.80	167	46	161	0.16	75								
07-Jul-10	7.30	186	8	128	0.33	30	34		25	11	4	13	2	
25-Aug-10	6.93	188	6	145	0.37	32								
20-Sep-10	7.41	174	2	132	0.42		34	14	21	13	4	12	2	
19-Oct-10	7.40	174	6	107	0.12									
19-Nov-10	6.95	211	14	197	0.68									
21-Dec-10	7.08	194	12	159	0.77									
14-Jan-11	7.53	193	6	131	0.29		39	14	30	11	4	18	3	
22-Feb-11	7.69	175	<5	119	0.18									
24-Mar-11	7.29	164	<5	128	0.24									
27-Apr-11	7.03	178	5	133	0.49		41	8	22	13	4	15	2	
26-May-11	7.08	173	15	176	0.27									
27-Jun-11	6.94	235	50	270	0.48									
25-Jul-11	6.70	231	35	228	0.74		13	16	42	4	4	28	4	
26-Aug-11	7.01	247	16	230	0.38									
21-Sep-11	6.54	229	10	147	0.56									
26-Oct-11	8.45	202	5	142	0.35		34	10	24	11	4	18	2	
22-Nov-11	7.61	187	14	151	0.59									
15-Dec-11														No access
25-Jan-12	8.71	217	8	172	0.54		27	12	28	6	5	26	3	
17-Feb-12	6.9	194	38	218	0.94									
30-Mar-12	7.29	215	6	187	0.84									
27-Apr-12	7.41	219	26	152	0.89		28	11	29	6	4	23	4	
24-May-12	7.44	211	6	154	1.12									
27-Jun-12														No access
27-Jul-12	7.51	215	14	202	0.8		27	17	40	8	5	23	4	
30-Aug-12	7.02	202	9	191	0.66									
25-Sep-12	7.43	230	5	133	0.57									
25-Oct-12	7.8	204	5	143	0.44		32	14	35	11	4	21	3	
29-Nov-12	8.04	213	5	130	0.35									
20-Dec-12	7.84	213	5	133	0.21									
24-Jan-13	7.81	213	5	137	0.19		41	13	24	14	5	20	3	
25-Feb-13														No access
22-Mar-13	7.08	209	5	161	0.74									
22-Apr-13														No access
17-May-13	7.25	196	5	155	0.9									
21-Jun-13	8.06	4960	5	3580	0.05									
24-Jul-13	7.27	197	6	147	0.61		28	13	24	8	4	21	3	
28-Aug-13	7.44	179	5	137	0.44									
17-Sep-13	7.38	162	6	83	0.23									
22-Oct-13	7.64	182	5	127	0.43		38	12	22	9	3	16	3	
14-Nov-13	7.6	184	5	118	0.28									
11-Dec-13	7.37	204	5	156	0.5									
24-Jan-14	8.17	279	5		0.39									
20-Feb-14	7.6	202	8		0.25									
25-Mar-14	7.59	188	5		0.13									
30-Apr-14	7.65	163	5	106	0.48		34	13	25	7	4	24	4	
28-May-14	7.79	127	5		0.66									
26-Jun-14	7.6	176	5		0.42									
28-Jul-14	7.49	128	5	92	0.36									
31-Aug-14	7.91	210	2		0.33									
22-Sep-14	6.8	150				11.3								
27-Oct-14	7.7	190	3	107	0.23	12.4	30	10	30	10	3	15	2	
21-Nov-14	7.2	170				7.8								
22-Dec-14	8	150				3.4								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	7.4	140	16	122	0.29	35								
20-Feb-15	7.5	140				3.8								
30-Mar-15	7.6	130				5.1								
28-Apr-15	6.5	410	48	302	0.75	93	16	105	45	12	13	48	4.9	
28-May-15	7.7	350				58								
24-Jun-15	7.8	320				45								
27-Jul-15	7.4	290	7	202	0.5	31								
27-Aug-15	8.2	230				19								
28-Sep-15	7.6	230				9								
22-Oct-15	7.8	210	2	157	0.36	4.5	44	32	27	17	5.9	22	2	
30-Nov-15	8.6	220				2.5								
21-Dec-15	6.6	200				4								
29-Jan-16	6.8	210	23	173	0.86	45.2								
26-Feb-16	7.5	220				9.4								
31-Mar-16	7	210				7								
28-Apr-16	7	250	5	206	0.46	9	41	47	28	11	7	32	3	
26-May-16	8	260				10								
29-Jun-16	7.4	220				14								
19-Jul-16	7.2	220	4	153	0.41	12								
22-Aug-16	7.7	190				9								
28-Sep-16	7.5	200				5								
20-Oct-16	7.8	200	3	153	0.19	10	39	28	23	12	5	19	3	
24-Nov-16	7.7	190				8								
21-Dec-16	6.7	200				4								
30-Jan-17	7.8	227	2	139	0.08	2								
27-Feb-17	7.6	200				5								
31-Mar-17	7.3	210				9								
26-Apr-17	7.2	230	5	181	0.66	10	28	30	41	9	6	29	4	
30-May-17	7	300				11								
28-Jun-17	7.2	235				22								
27-Jul-17	6.9	228	6	152	0.62	17								
30-Aug-17	6.9	200				17								
28-Sep-17	7.9	235				8								
24-Oct-17	7.2	246	3	182	0.22	7	29	33	33	11	5	28	3	
28-Nov-17	6.5	220				6								
13-Dec-17	7.9	240				4								
29-Jan-18	7.8	289	5	168	0.09	4								
22-Feb-18	7.6	270				6								
29-Mar-18	7.2	170				25								
26-Apr-18	7.9	210	4	174	0.46	11	30	25	29	6.8	4.4	26	2.8	
21-May-18	7.5	210				12								
25-Jun-18	7.6	212				14								
25-Jul-18	7	210	4	140	0.33	13								
29-Aug-18	7.8	200				11								
28-Sep-18	7.3	210				5								
24-Oct-18	7.7	200	6	120	0.3	6	30	29	27	8.8	4.4	20	3	
29-Nov-18	7.6	210				14								
18-Dec-18	7	200				23								

Site WM8		Lake Foster												
Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.30	5,900	10	4,400	0.06	51								
13-Oct-09	8.10	5,900	11	4,700	0.05	6	340		456	213	251	846	28	
03-Nov-09	8.50	5,000	3	3,600	0.06	29								
13-Dec-09	8.10	6,300	3	6,200	0.08	45								
13-Jan-10	7.80	6,600	14	5,600	0.05	9	271		497	265	290	1050	30	
09-Feb-10	7.60	9,300	13	5,200	0.05	11								
04-Mar-10	8.70	9,700	1	110	0.16	8								
08-Apr-10	8.70	7,720	4	6,100	0.05	6	315		556	302	318	1210	32	
14-May-10	8.20	7,670	9	5,730	0.05	7								
10-Jun-10	7.50	4,800	8	4,320	0.05	7								
07-Jul-10	8.10	5,610	6	4,390	0.05	3	325		459	237	270	988	23	
25-Aug-10	8.08	6,000	5	4,730	0.05	3								
20-Sep-10	8.15	5,110	5	4,610	0.05		375	2100	478	192	245	887	20	
19-Oct-10	8.31	5,710	2	4,600	0.05									
19-Nov-10	7.94	5,670	6	4,420	0.05									
21-Dec-10	7.89	6,110	<5	4,960	0.05									
14-Jan-11	8.26	6,410	8	4,890	0.05		275	2840	489	286	397	960	29	
22-Feb-11	8.28	5,700	<5	5,500	0.05									
24-Mar-11	8.33	6,560	8	5,530	0.09									
27-Apr-11	8.05	4,960	9	3,650	0.05		200	1640	508	136	179	811	18	
26-May-11	8.10	6,330	23	5,120	0.05									
27-Jun-11	8.03	4,160	6	3,210	0.05									
25-Jul-11	6.83	2,410	22	1,630	0.11		55	848	163	94	87	291	9	
26-Aug-11	8.10	4,750	7	3,710	0.05									
21-Sep-11	8.29	5720	12	4510	0.05									
26-Oct-11	8.5	5360	12	4330	0.05		245	2210	414	224	234	843	25	
22-Nov-11	8.1	5500	12	4670	0.06									
15-Dec-11														No access
25-Jan-12	8.47	5710	10	4950	0.05		307	2330	486	186	259	903	25	
17-Feb-12	7.02	5150	8	4170	0.05									
30-Mar-12	8.27	4070	11	3130	0.05									
27-Apr-12	7.77	3980	8	3490	0.05		122	2010	277	206	205	646	21	
24-May-12	8.12	5310	26	4480	0.05									
27-Jun-12	7.7	4160	12	3460	0.05									
27-Jul-12	7.43	4960	35	4220	0.05		235	2250	440	237	246	857	24	
30-Aug-12	7.95	5770	18	4840	0.05									
25-Sep-12	8.1	6060	50	4340	0.05									
25-Oct-12	8.36	5910	21	4330	0.05		329	2340	561	157	232	953	25	
29-Nov-12	8.31	6750	6	5100	0.05									
20-Dec-12	8.36	6750	18	5290	0.05									
24-Jan-13	8.28	7070	12	5350	0.05		428	2990	648	144	260	1460	22	
25-Feb-13	7.79	2110	68	1420	0.12									
22-Mar-13	8.25	5360	15	3850	0.05									
22-Apr-13	7.75	5200	12	4160	0.05		213	2310	404	182	221	945	25	
17-May-13	8.17	6580	12	5020	0.05									
21-Jun-13	7.99	6230	5	4930	0.05									
24-Jul-13	7.96	5810	6	4320	0.05		131	2580	374	232	201	1030	22	
28-Aug-13	8.24	5940	5	2910	0.05									
17-Sep-13	8.21	7090	10	5690	0.05									
22-Oct-03	8.25	7140	5	5920	0.05		354	3090	569	246	324	1160	31	
14-Nov-13	8.45	6230	5	4730	0.05									
11-Dec-13	8.23	4910	5	3910	0.05									
24-Jan-14	8.32	8200	5		0.05									
20-Feb-14	8.42	5610	23		0.05									
25-Mar-14	8.41	6860	5		0.05									
30-Apr-14	8.45	4130	21	2570	0.05		94	1620	282	155	149	619	18	
28-May-14	7.86	4510	5		0.05									
26-Jun-14	8.1	5940	5		0.05									
28-Jul-14	8.28	5260	9	3730	0.05									
31-Aug-14	7.33	4050	10		0.05									
22-Sep-14	7.5	5400				4.6								
27-Oct-14	7.7	5500	7	4980	0.12	4.7	176	2420	422	266	262	829	26	
21-Nov-14	8	6900				34								
22-Dec-14	8.5	6100				5.7								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	7.6	3080	24	2380	0.01	35.2								
20-Feb-15	8.1	5520				5.9								
30-Mar-15	8.1	7060				6.9								
28-Apr-15	7.3	1400	61	986	0.05	114	63	530	83	58	60	155	7.8	
28-May-15	7.4	2900				11								
24-Jun-15	7.7	4040				8								
27-Jul-15	8.3	4940	4	4620	0.01	4								
27-Aug-15	8.3	5830				3								
28-Sep-15	8	5800				3.7								
22-Oct-15	8.4	5990	5	5150	0.02	7.8	300	2630	425	275	300	790	31	
30-Nov-15	8.5	6100				3								
21-Dec-15	7.3	4720				7								
29-Jan-16	5.9	1650	5	1230	0.06	10.5								
26-Feb-16	7.5	5030				7.2								
31-Mar-16	8.1	5210				11								
28-Apr-16	8	5210	3	5510	0.01	4	160	3000	385	300	300	865	30	
26-May-16	8.3	4600				3.5								
29-Jun-16	7.6	4840				2								
19-Jul-16	7.8	5000	1	4460	0.01	4								
22-Aug-16	8.1	3850				4								
28-Sep-16	8.4	4900				2								
20-Oct-16	7.8	5900	2	5490	0.01	1	240	2800	370	260	300	1000	28	
24-Nov-16	8	3950				48								
21-Dec-16	8.2	5800				4								
30-Jan-17	8.4	5230	4	5890	0.01	4								
27-Feb-17	8.4	5360				3								
31-Mar-17	7.8	2750				7								
26-Apr-17	7.3	3120	10	3030	0.01	4	44	1600	210	170	190	510	14	
30-May-17														Too low to sample
28-Jun-17	5.5	2720				5								
27-Jul-17	7.9	4870	2	4890	0.01	5								
30-Aug-17	8.3	6200				5								
28-Sep-17														Too low to sample
24-Oct-17	7.5	6280	6	6290	0.01	7	170	3200	420	320	350	1200	34	
28-Nov-17	8.2	5800				8								
13-Dec-17	8.3	6100				3								
29-Jan-18	8.3	5470	6	5830	0.01	5								
22-Feb-18	7.9	6300				4								
29-Mar-18	7.3	1720				8								
26-Apr-18	8.1	3380	2	2740	0.01	3	170	1200	210	120	140	610	14	
21-May-18	8.5	5500				4								
25-Jun-18	8.1	4400				3								
25-Jul-18	8.2	5840	2	5730	0.01	4								
29-Aug-18	7.9	6300				4								
28-Sep-18	7.8	6520				3								
24-Oct-18	8.1	4850	3	5010	0.01	4	120	2800	360	230	260	670	25	
29-Nov-18	7.8	5400				26								
18-Dec-18	6.4	3600				13								

Site WM9		Lake Kennerson												
Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	10.00	3,000	23	1,900	0.05	11								
13-Oct-09	9.90	3,600	8	2,400	0.21	19	38		355	45	131	528	12	
03-Nov-09	9.60	4,500	29	3,200	0.05	31								
13-Dec-09	8.10	6,000	5	5,500	0.05	27								
13-Jan-10	7.70	5,600	18	4,300	0.05	6	355		602	122	257	1100	24	
09-Feb-10	8.30	8,500	14	4,400	0.05	18								
04-Mar-10	8.90	8,800	15	530	0.05	6								
08-Apr-10	9.00	8,830	6	4,700	0.06	20	331		652	110	251	1130	23	
14-May-10	8.10	9,000	6	4,800	0.05	14								
10-Jun-10	7.80	2,190	30	1,800	0.06	48								
07-Jul-10	8.30	2,790	8	1,840	0.05	2	177		237	74	98	488	12	
25-Aug-10														
20-Sep-10	8.36	4,100	2	3,080	0.05		242	1440	373	105	167	648	15	
19-Oct-10	8.64	4,090	2	2,760	0.05									
19-Nov-10	9.15	2,990	3	1,680	0.05									
21-Dec-10	8.44	3,850	5	2,200	0.05									
14-Jan-11	8.59	4,440	7	2,970	0.05		310	983	638	88	132	816	15	
22-Feb-11	8.53	4,820	16	3,770	0.05									
24-Mar-11	8.68	5,070	6	3,690	0.08									
27-Apr-11	8.48	3,600	7	2,350	0.05		244	864	484	56	113	636	13	
26-May-11	8.65	4,730	78	2,790	0.07									
27-Jun-11	8.70	3,060	5	1,890	0.05									
25-Jul-11	8.20	2,770	58	1,640	0.05		186	435	482	50	55	497	7	
26-Aug-11	8.59	3,310	26	1,920	0.05									
21-Sep-11	8.68	4320	5	2900	0.05									
26-Oct-11	8.92	3960	6	2760	0.05		280	1350	419	118	134	673	13	
22-Nov-11	8.73	3250	36	2250	0.10									
15-Dec-11	7.90	2350	48	1370	0.05									
25-Jan-12	8.76	4900	12	4070	0.05		305	1780	575	97	204	852	18	
17-Feb-12	7.34	2389	20	1460	0.05									
30-Mar-12	8.35	2320	18	1410	0.05									
27-Apr-12	8.92	2,140	8	1,430	0.05		169	499	307	59	59	368	9	
24-May-12	8.55	2,910	18	1,810	0.05									
27-Jun-12	8.67	2,510	20	1,580	0.05									
27-Jul-12	8.25	2,620	12	1,630	0.05		224	418	549	50	46	532	8	
30-Aug-12	8.61	3,860	102	2,650	0.05									
25-Sep-12	8.52	4,270	5	2,800	0.05									
25-Oct-12	8.87	3,860	6	2,590	0.05		204	853	623	32	106	722	12	
29-Nov-12	9.2	4,450	6	2,920	0.05									
20-Dec-12	8.63	5,270	103	3,520	0.05									
24-Jan-13	8.39	6,650	8	4,770	0.05		505	2500	672	59	214	1440	16	
25-Feb-13	8.44	5,000	30	3,230	0.05									
22-Mar-13	8.36	4,240	5	3,040	0.05									
22-Apr-13	8.44	4,010	294	2,670	0.05		272	1070	501	80	115	738	13	
17-May-13	8.35	5,090	8	3,560	0.05									
21-Jun-13	8.38	4,460	5	2,770	0.05									
24-Jul-13	8.29	4,800	5	3,320	0.05		384	1430	525	126	159	873	14	
28-Aug-13	8.52	4,270	5	1,820	0.05									
17-Sep-13	8.66	4,640	5	2,910	0.05									
22-Oct-13	8.83	5,470	8	3,740	0.05		256	1880	571	74	225	938	17	
14-Nov-13	9.07	5,710	5	4,030	0.05									
11-Dec-13	8.23	5,370	5	3,760	0.05									
24-Jan-14	8.63	7,520	5		0.05									
20-Feb-14	8.23	4,910	38		0.05									
25-Mar-14	8.27	6,190	6		0.05									
30-Apr-14	8.44	4,070	19	3,000	0.05		365	1610	395	139	178	809	20	
28-May-14	8.51	3,790	5		0.05									
26-Jun-14	8.45	4,290	6		0.05									
28-Jul-14	8.39	5,190	5	3,530	0.05									
31-Aug-14	8.39	5,430	6		0.05									
22-Sep-14	8.4	6,000				3.8								
27-Oct-14	8.3	6,700	4	4,360	0.05	8.6	534	2020	605	85	210	1060	19	
21-Nov-14	8.5	6,000				3.8								
22-Dec-14	8.3	6,300				17								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	8.5	4,100	23	2,980	0.01	36.8								
20-Feb-15	8.4	5,480				4.9								
30-Mar-15	8.6	5,760				30.3								
28-Apr-15	7.7	1,490	167	954	0.05	314	205	350	130	37	39	215	8.1	
28-May-15	8.3	1,390				62								
24-Jun-15	8.2	3,230				7								
27-Jul-15	8.4	4,530	5	3,640	0.01	2.3								
27-Aug-15	8.5	1,940				17								
28-Sep-15	8.3	3,300				3.7								
22-Oct-15	8.5	5,580	3	4,370	0.03	6	475	1940	480	150	220	875	24	
30-Nov-15	8.5	5,810				4.3								
21-Dec-15	8.3	5,610				6								
29-Jan-16	8.2	1,530	20	1,020	0.02	38.9								
26-Feb-16	7.5	5,800				12								
31-Mar-16	8.3	5,010				15.1								
28-Apr-16	8.1	4,640	4	4,570	0.01	5	415	2360	320	190	230	910	17	
26-May-16	8.2	5,600				4								
29-Jun-16	7.8	3,450				4								
19-Jul-16	7.8	5,170	1	4,230	0.01	2								
22-Aug-16	8.2	5,490				4								
28-Sep-16	8.7	4,710				5								
20-Oct-16	8.5	5,900	1	5,100	0.02	2	360	2500	360	170	280	1100	20	
28-Nov-16	8	5,800				11								
21-Dec-16	8	5,700				11								
30-Jan-17	7.9	4,810	13	4,440	0.01	15								
27-Feb-17	8	5,400				3								
31-Mar-17	7.7	4,600				3								
26-Apr-17	8.4	3,590	4	3,250	0.01	3	370	1500	290	150	160	780	15	
30-May-17	8.4	5,160				4								
28-Jun-17	8.6	3,540				9								
27-Jul-17	8.4	4,300	4	4,030	0.01	6								
30-Aug-17	8.6	5,400				2								
28-Sep-17	8.5	5,900				3								
24-Oct-17	8	5,450	4	5,210	0.02	6	430	2300	370	220	290	1100	23	
28-Nov-17	7.8	6,400				5								
13-Dec-17	8.2	6,200				4								
29-Jan-18	8.8	4,440	17	3,770	0.01	19								
22-Feb-18	8.3	5,100				4								
29-Mar-18	8	1,520				19								
26-Apr-18	8.6	3,390	7	2,190	0.01	11	760	390	360	28	31	880	6.7	
21-May-18	8.5	4,450				6								
25-Jun-18	8.3	4,000				5								
25-Jul-18	8.4	4,340	2	3,400	0.01	4								
29-Aug-18	8.2	4,200				5								
28-Sep-18	8.3	4,510				5								
24-Oct-18	8.5	3,660	3	2,300	0.01	5	500	820	380	42	75	860	9.2	
29-Nov-18	8.2	4,300				8								
18-Dec-18	7.7	1,350				46								

Site
WM10

Four Mile Creek @ John Renshaw Drive

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.50	460			2.33									
13-Oct-09	8.30	440			1.26	66	84		109	10	13	73	7	
03-Nov-09	8.50	380	18	430	2.10	120								
13-Dec-09														Dry
13-Jan-10														Dry
09-Feb-10														Dry
04-Mar-10														Dry
08-Apr-10	8.70	241	17	230	1.28	21	74		29	9	7	31	4	
14-May-10	8.00	255	50	210	0.61	21								
10-Jun-10	7.70	408	14	324	0.69	47								
07-Jul-10	7.80	470	28	262	0.77	16	52		88	12	11	63	5	
25-Aug-10	7.74	512	4	308	0.90	17								
20-Sep-10	7.42	516	5	306	1.07		63	17	109	14	10	72	6	
19-Oct-10	7.47	512	12	268	0.42									
19-Nov-10	7.07	448	13	312	1.21									
21-Dec-10	7.20	505	8	352	2.91									
14-Jan-11	7.13	478	32	294	1.96		73	1	92	9	10	60	8	
22-Feb-11														Dry
24-Mar-11														Dry
27-Apr-11	6.96	258	21	174	0.73		60	21	25	11	7	29	4	
26-May-11	7.03	261	17	251	0.63									
27-Jun-11	7.23	559	16	308	0.62									
25-Jul-11	6.53	401	14	282	0.67		24	23	87	5	8	52	6	
26-Aug-11	7.25	411	8	290	0.86									
21-Sep-11	7.65	527	8	250	1.3									
26-Oct-11	7.32	595	42	362	0.98		56	22	138	14	14	83	7	
22-Nov-11	7.72	446	26	306	2.36									
15-Dec-11	8.29	369	12	268	1.34									
25-Jan-12	7.03	514	10	322	3.55		79	1	100	11	12	64	7	
17-Feb-12	5.68	316	8	272	1.16									
30-Mar-12	7.24	456	6	278	1.28									
27-Apr-12	7.78	375	10	280	1.6		46	14	85	8	10	54	6	
24-May-12	7.6	525	12	202	1.64									
27-Jun-12	7.51	501	18	324	1.22									
27-Jul-12	7.42	352	21	298	1.5		46	15	77	6	9	51	6	
30-Aug-12	6.08	527	11	348	1.86									
25-Sep-12	7.18	432	20	254	0.86									
25-Oct-12	7.92	470	84	302	1.32		72	10	95	10	11	60	8	
29-Nov-12	7.51	4,900	24	3,390	0.05									
20-Dec-12														Dry
24-Jan-13	7.63	428	5	260	1.08		106	10	75	12	12	55	12	
25-Feb-13	6.86	388	41	360										
22-Mar-13	6.94	353	7	268	1.1									
22-Apr-13	7.31	238	92	262	1.13		31	10	41	4	5	39	5	
17-May-13	7.32	274	36	276	1.2									
21-Jun-13	7.22	328	5	244	1.09									
24-Jul-13	6.97	382	10	249	1.24		45	12	70	6	8	49	6	
28-Aug-13	7.24	373	15	258	0.98									
17-Sep-13	7.4	362	14	234	1.1									
22-Oct-13	7.39	475	21	334	2.31		88	10	86	9	10	60	10	
14-Nov-13	6.75	199	6	197	1									
11-Dec-13	6.69	328	5	262	0.95									
24-Jan-14	7.94	465	18		1.52									
20-Feb-14														Dry
25-Mar-14	7.33	187	5		0.46									
30-Apr-14	7.35	168	17	217	1.17		29	11	34	4	4	31	5	
28-May-14	6.39	175	8		0.65									
26-Jun-14	7.14	194	7		0.57									
28-Jul-14	7.01	144	6	188	0.38									
31-Aug-14	7.16	348	7		0.88									
22-Sep-14	7.5	400				38.7								
27-Oct-14	7.2	250	19	207	1.63	32.1	51	10	50	7	6	34	6	
21-Nov-14	7.3	260				37.6								
22-Dec-14	7.2	230				36								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	6.5	180	20	217	1	38.9								
23-Feb-15	7	190				31.5								
30-Mar-15	7	130				31.1								
28-Apr-15	6.8	255	25	230	0.88	75	20	20	48	5.8	7	28	6.5	
28-May-15	7.2	160				47								
24-Jun-15	7.3	160				67								
27-Jul-15	7.2	247	11	215	2.1	43								
27-Aug-15	7.4	250				27								
28-Sep-15	7.8	240				29.6								
22-Oct-15	7.2	230	10	230	1.4	18.8	78	9	23	17	9.9	17	4.6	
30-Nov-15	7.3	220				26.1								
21-Dec-15	7.1	320				41								
29-Jan-16	6.9	210	14	190	1.4	34.3								
26-Feb-16	6.8	260				22								
31-Mar-16	7.2	220				36								
28-Apr-16	7.3	230	5	220	3.6	36	62	7	26	9	8	20	7	
26-May-16	6.8	190				58								
29-Jun-16	6.8	120				65								
19-Jul-16	7.3	150	8	176	1.1	43								
23-Aug-16	7	120				66								
28-Sep-16	7.3	160				40								
20-Oct-16	7.5	170	8	179	4.3	30	72	3	19	9	7	18	5	
28-Nov-16	7.2	190				14								
21-Dec-16	7.1	180				14								
30-Jan-17	6.9	177	19	147	0.77	23								
27-Feb-17	7.2	110				45								
30-Mar-17	7.3	180				22								
26-Apr-17	7.2	280	10	236	3.5	18	48	11	64	9	9	43	7	
30-May-17	6.7	295				25								
28-Jun-17	6.9	310				27								
27-Jul-17	7.1	383	4	232	2.3	28								
30-Aug-17	6.8	330				23								
28-Sep-17	7.5	380				15								
24-Oct-17	7.1	265	12	233	1.1	28	65	20	26	12	7	32	3	
28-Nov-17	6.9	190				37								
13-Dec-17	7.7	220				34								
29-Jan-18														Dry
22-Feb-18	7	165												Stagnant
29-Mar-18	6.9	230				28								
26-Apr-18	6.8	280	5	263	6.1	23	55	11	46	8.7	7.3	39	6.3	
21-May-18	7.7	330				32								
26-Jun-18	7.3	215				45								
25-Jul-18	7.2	253	4	316	0.49	35								
29-Aug-18	7.5	120				124								
28-Sep-18	7.5	210				30								
24-Oct-18	7	400	4	300	1.2	25	40	23	77	10	8.5	61	5.8	
29-Nov-18	7.5	180				77								
18-Dec-18	7	240				32								

Site
WM11 **Four Mile Creek U/S New England Highway**

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.10	3,100	8	2,100	0.23	14								
13-Oct-09	7.40	3,500	24	2,700	0.10	16	166		240	139	136	452	17	
03-Nov-09	8.10	4,400	33	3,200	0.10	17								
13-Dec-09	7.30	3,100	55	3,500	0.05	27								
13-Jan-10	6.50	530	18	370	0.38	11	146		63	22	18	81	6	
09-Feb-10	6.10	320	45	310	0.33	10								
04-Mar-10	8.40	550	16	4,500	0.05	15								
08-Apr-10	8.60	356	10	260	0.32	18	76		49	16	10	48	4	
14-May-10	8.20	818	27	202	0.08	117								
10-Jun-10	6.60	721	21	476	0.18	30								
07-Jul-10	7.80	2,840	10	2,050	0.05	8	114		203	110	113	438	13	
25-Aug-10	6.59	3,240	6	2,430	0.05	8								
20-Sep-10	7.59	3,860	5	3,020	0.05		145	1590	264	168	163	509	16	
19-Oct-10	7.43	712	8	402	0.11									
19-Nov-10	7.70	3,630	12	2,410	0.13									
21-Dec-10	7.60	3,080	5	2,200	0.20									
14-Jan-11	7.70	5,420	11	4,030	0.05		284	2330	472	217	231	843	23	
22-Feb-11	7.68	4,530	<5	3,840	0.07									
24-Mar-11	7.86	5,040	6	3,750	0.06									
27-Apr-11	7.18	671	14	432	0.26		89	109	72	17	18	89	4	
26-May-11	8.02	5,710	16	4,470	0.05									
27-Jun-11	7.47	2,690	16	1,920	0.08									
25-Jul-11	7.69	2,510	41	1,580	0.14		138	586	299	61	65	388	9	
26-Aug-11	7.26	2,580	30	1,880	0.10									
21-Sep-11	8.17	3560	10	2630	0.05									
26-Oct-11	7.90	890	22	524	0.15		51	184	125	23	23	126	5	
22-Nov-11	7.92	1243	32	832	0.32									
15-Dec-11	8.14	3160	40	2180	0.05									
25-Jan-12	8.29	4950	24	4050	0.08		318	1910	546	115	209	841	19	
17-Feb-12	6.98	1428	24	1140	0.72									
30-Mar-12	8.04	3430	16	2390	0.05									
27-Apr-12	7.74	3000	15	1490	0.21		133	1190	244	133	138	438	16	
24-May-12	7.72	2650	24	1880	0.18									
27-Jun-12	8.12	4680	42	3570	0.05									
27-Jul-12	7.23	3040	25	2250	0.07		228	938	400	105	120	525	12	
30-Aug-12	6.48	1,043	25	724	0.27									
25-Sep-12	7.94	4,240	14	2,900	0.06									
25-Oct-12	7.52	1,706	32	1,000	0.18		163	332	222	40	52	257	9	
29-Nov-12	7.90	4,580	19	3,000	0.05									
20-Dec-12	8.18	5,020	12	3,510	0.07									
24-Jan-13	7.78	2,940	34	1,970	0.18		242	825	301	82	103	475	13	
25-Feb-13	7.80	2,530	47	1,580	0.14									
22-Mar-13	7.72	4,150	8	3,070	0.05									
22-Apr-13	8.24	4,120	30	2,880	0.05		275	1310	415	104	149	716	15	
17-May-13	7.92	3,370	14	2,510	0.06									
21-Jun-13	8.06	2,480	5	1,610	0.05									
24-Jul-13	7.78	2,710	5	1,920	0.08		107	1020	205	109	116	386	12	
28-Aug-13	7.86	1,960	5	1,270	0.09									
17-Sep-13	7.75	1,710	7	1,040	0.12									
22-Oct-13	7.86	2,420	6	1,500	0.06		247	537	297	46	67	141	10	
14-Nov-13	7.84	5,270	15	3,570	0.06									
11-Dec-13	7.48	3,790	17	2,730	0.06									
24-Jan-14	7.65	8,070	5		0.27									
20-Feb-14	6.74	1,582	22		0.09									
25-Mar-14	7.82	2,830	43		0.37									
30-Apr-14	8.01	3,970	14	2,960	0.05		328	1610	379	154	176	757	19	
28-May-14	7.61	880	8		0.09									
26-Jun-14	7.98	2,840	6		0.05									
28-Jul-14	8.41	4,890	5	3,990	0.05									
31-Aug-14	7.75	2,551	13		0.07									
22-Sep-14	6.90	4,050				15.7								
27-Oct-14	7.90	2,650	9	1,700	0.06	14.2	237	756	259	49	76	398	9	
21-Nov-14	7.20	1,300				73								
22-Dec-14	8.00	3,950				14.5								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	8.20	2,390	18	1,590		30.9								
20-Feb-15	8.00	4,700				6.6								
30-Mar-15	7.60	1,960				11.8								
28-Apr-15	7.40	2,280	21	1,640	0.10	42	86	870	180	89	95	275	11	
28-May-15	7.50	2,430				23								
24-Jun-15	7.50	1,960				29								
27-Jul-15	7.60	931	7	632	0.16	20								
27-Aug-15	8.20	5,100				10								
28-Sep-15	8.20	4,570				14.9								
22-Oct-15	7.40	1,030	37	658	0.07	60	105	230	120	31	31	135	7.1	
30-Nov-15	8.20	3,300				22.8								
21-Dec-15	7.80	3,600				64								
29-Jan-16	7.50	3,510	12	2,810	0.11	19.7								
26-Feb-16	7.50	4,200				36.7								
31-Mar-16	8.30	4,900				10								
28-Apr-16	7.80	3,620	39	3,000	0.01	40	28	1380	265	110	130	510	12	
26-May-16	7.50	1,600				27								
29-Jun-16	7.30	4,000				19								
19-Jul-16	7.70	4,100	14	3,460	0.01	23								
22-Aug-16	7.60	1,800				33								
28-Sep-16	8.10	4,580				11								
20-Oct-16	8.40	4,300	24	3,520	0.01	33	330	1700	310	130	190	880	15	
28-Nov-16	8.20	4,300				72								
21-Dec-16	7.60	4,300				41								
30-Jan-17	8.00	4,240	46	3,680	<0.01	16								
27-Feb-17	8.10	5,100				4								
30-Mar-17	7.40	3,900				12								
26-Apr-17	7.70	1,300	12	1,050	0.23	16	150	390	150	48	53	240	8	
30-May-17	8.00	3,550				13								
28-Jun-17	7.50	2,516				13								
27-Jul-17	7.40	720	22	879	0.32	32								
30-Aug-17	6.60	1,730				37								Not flowing
28-Sep-17	7.80	5,150				68								
24-Oct-17	8.10	5,080	22	4,520	0.01	21	360	1700	290	160	250	1000	19	
28-Nov-17	7.50	3,150				42								Not flowing
13-Dec-17	7.80	3,540				48								Not flowing
29-Jan-18	7.80	1,670	50	1,320	0.06	67								Not flowing
22-Feb-18	5.60	1,280				19								Ashtonfield runoff
29-Mar-18	6.50	2,000				29								
26-Apr-18	7.60	3,560	8	2,810	0.01	15	240	1200	250	110	140	670	13	
21-May-18	7.60	2,600				16								
25-Jun-18	7.70	3,400				13								
25-Jul-18	7.40	866	7	541	0.07	17								
29-Aug-18	7.80	4,800				9								
28-Sep-18	7.50	3,400				17								
24-Oct-18	7.60	2,400	26	1,310	0.01	36	210	720	210	67	77	460	9.6	
29-Nov-18	7.80	3,900				23								Discharging
18-Dec-18	6.70	550				27								

Site
WM12 Shamrock Creek / Four Mile Creek Junction

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.00	2,800	16	1,800	0.74	52								
13-Oct-09	7.10	3,500	16	2,500	0.22	20	193		217	139	139	448	17	
03-Nov-09	8.30	6,200	2	5,200	<0.05	5								
13-Dec-09	7.30	550	64	300	<0.05	10								
13-Jan-10	6.10	310	6	190	0.30	16	90		39	13	8	32	4	
09-Feb-10	5.50	230	22	150	0.29	58								
04-Mar-10														
08-Apr-10	8.70	276	10	190	0.19	21	55		37	16	8	27	3	
14-May-10	7.50	200	6	171	0.07	9								
10-Jun-10	7.10	1,560	36	1,380	0.09	44								
07-Jul-10	7.70	2,750	16	1,960	0.09	17	110		194	111	110	414	13	
25-Aug-10	7.54	3,150	10	2,360	<0.05	20								
20-Sep-10	7.58	2,650	8	1,970	0.14		106	1050	183	116	111	364	12	
19-Oct-10	7.40	1,520	8	936	0.07									
19-Nov-10	7.86	4,370	30	3,080	0.06									
21-Dec-10	7.67	3,920	10	3,010	0.55									
14-Jan-11	7.78	5,840	12	4,420	<0.05		252	2230	462	245	244	813	26	
22-Feb-11	7.91	4,680	12	3,720	<0.05									
24-Mar-11	8.07	5,060	16	3,670	0.07									
27-Apr-11	7.41	420	26	304	0.43		66	66	44	14	11	51	3	
26-May-11	8.24	5,690	24	3,980	<0.05									
27-Jun-11	7.49	3,390	16	2,640	<0.05									
25-Jul-11	7.81	2,800	44	1,860	0.13		160	702	327	75	77	434	10	
26-Aug-11	7.62	2,130	22	1,510	0.17									
21-Sep-11	7.14	1,943	16	1,230	0.05									
26-Oct-11	8.17	774	134	502	0.33		43	189	86	25	25	93	5	
22-Nov-11	8.13	2,341	58	1,630	0.18									
15-Dec-11	8.12	3,440	30	2,420	0.05									
25-Jan-12	8.17	4,940	12	4,050	0.05		333	1910	527	116	216	843	19	
17-Feb-12	6.62	1,582	18	1,200	0.7									
30-Mar-12	8.03	4,510	18	3,470	0.05									
27-Apr-12	7.76	3,300	18	2,700	0.3		147	1580	254	166	171	532	18	
24-May-12	7.66	1,066	63	684	0.62									
27-Jun-12	8	4,860	32	3,800	0.14									
27-Jul-12	6.48	2,180	43	2,270	0.25		104	824	232	91	95	331	10	
30-Aug-12	6.83	1,029	62	712	0.26									
25-Sep-12	7.92	2,930	22	1,910	0.05									
25-Oct-12	7.57	728	145	446	0.15		92	138	89	21	22	98	5	
29-Nov-12	7.95	4,950	24	3,270	0.05									
20-Dec-12	6.4	4,480	12	3,040	0.05									
24-Jan-13														Dry
25-Feb-13														No Access
22-Mar-13	7.69	3,430	6	2,530	0.17									
22-Apr-13														No access
17-May-13														No access
21-Jun-13														No access
24-Jul-13	7.87	3,280	19	2,530	0.12		124	1350	228	144	151	477	15	
28-Aug-13	7.74	1,040	5	669	0.29									
17-Sep-13														Dry
22-Oct-13	7.75	1,370	5	742	0.06		160	270	152	25	34	217	6	
14-Nov-13	7.98	5,140	7	3,700	0.05									
11-Dec-13	7.44	1,830	6	1,250	0.13									
24-Jan-14	8.2	8,260	8		0.05									
20-Feb-14	8.42	4,170	29		0.05									
25-Mar-14	7.95	3,910	5		0.06									
30-Apr-14	7.85	4,390	10	3,250	0.05		306	2000	397	199	210	817	22	
28-May-14	7.34	1,752	6		0.11									
26-Jun-14	8	2,790	5		0.05									
28-Jul-14	8.44	5,000	18	3,660	0.05									
31-Aug-14	7.6	2,570	15		0.12									
22-Sep-14	7.3	5,030				8.1								
27-Oct-14	7.6	1,200	9	778	0.76	13.8	124	340	122	26	35	175	5	
21-Nov-14	7.4	1,000				8.8								
22-Dec-14	8	2,640				6.8								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	8.5	2,940	22	2,060	0.04	28								
23-Feb-15	8	2,000				9								
30-Mar-15	7.6	1,100				9.3								
28-Apr-15	7.5	2,350	34	1,740	0.12	59	90	880	170	92	97	280	11	
28-May-15	7.5	1,460				58								
24-Jun-15	7.6	2,490				36								
27-Jul-15	7.5	675	6	458	0.3	26								
27-Aug-15	8.3	4,990				12								
28-Sep-15	8	4,980				6.2								
22-Oct-15	7.5	980	25	661	0.06	41.4	96	260	89	35	34	125	6	
30-Nov-15	8.1	2,100				7.5								
21-Dec-15	7.8	4,800				23.8								
29-Jan-16	7.5	3,070	16	2,470	0.15	39.8								
26-Feb-16	7.3	3,500				43								
31-Mar-16	8.2	4,850				11								
28-Apr-16	7.5	1,730	12	1,210	0.17	16	155	560	115	51	60	260	7	
26-May-16	7.6	750				56								
29-Jun-16	7.2	3,120				7								
19-Jul-16	7.2	1,300	7	927	0.24	20								
22-Aug-16	7.3	1,100				25								
28-Sep-16	8.2	4,520				8								
20-Oct-16	8.5	4,700	3	4,100	0.02	7	350	2000	320	140	220	990	16	
28-Nov-16	8.2	4,500				16								
21-Dec-16	7.9	5,300				10								
30-Jan-17	8.2	4,500	9	3,930	0.01	11								
27-Feb-17	8	5,330				8								
30-Mar-17	7.3	4,000				8								
26-Apr-17	7.6	1,038	8	854	0.33	19	110	320	110	41	42	170	7	
30-May-17	7.6	1,630				13								
28-Jun-17	7.4	1,921				23								
27-Jul-17	7.2	566	7	405	0.51	31								
30-Aug-17	6.8	1,300				6								Not flowing
28-Sep-17	7.9	4,520				4								
24-Oct-17	8.3	5,490	8	5,100	0.01	9	410	1900	310	190	280	1100	22	
28-Nov-17	7.5	4,500				5								Not flowing
13-Dec-17														Dry
29-Jan-18														Dry
22-Feb-18														Dry
29-Mar-18	7.1	1,900				38								
26-Apr-18	7.6	3,860	8	3,040	0.01	13	350	1200	280	120	130	770	13	
21-May-18	7.7	3,000				8								
25-Jun-18	7.5	3,500				4								
25-Jul-18	7.3	626	13	425	0.14	20								
29-Aug-18	8.1	4,520				7								
28-Sep-18	7.2	2,800				5								Not flowing
24-Oct-18	7.7	2,340	2	1,840	0.01	5	180	790	180	77	85	420	8.9	
29-Nov-18	7.6	4,100				6								Discharging
18-Dec-18	6.7	500				19								

Site
WM13

Buttai Creek @ Buchanan Road

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
20-Sep-10	7.33	556	5	378	1.54		56	28	120	10	12	81	7	
19-Oct-10	7.36	603	4	320	0.81									
19-Nov-10	6.75	359	13	260	2.17									
21-Dec-10	7.36	525	5	338	2.00									
14-Jan-11	7.17	542	5	320	1.05		86	14	101	11	12	74	5	
22-Feb-11	7.38	495	5	480	0.62									
24-Mar-11	7.63	594	10	416	0.39									
27-Apr-11	6.07	1100	24	766	0.05		5	378	76	39	44	118	8	
26-May-11	6.59	1110	22	880	0.05									
27-Jun-11	7.02	826	10	518	0.28									
25-Jul-11	6.39	413	22	302	0.57		17	35	83	6	8	54	5	
26-Aug-11	7.01	593	35	372	0.76									
21-Sep-11	7.19	868	24	490	0.34									
26-Oct-11	7.84	949	21	554	0.48		55	44	237	15	22	145	6	
22-Nov-11	7.47	1,323	27	860	0.37									
15-Dec-11	8.46	386	74	380	1.03									
25-Jan-12	7.82	906	36	612	0.52		83	113	170	18	24	137	6	
17-Feb-12	6.37	291	50	339	1.06									
30-Mar-12	7.42	966	40	548	0.13									
27-Apr-12	7.3	459	26	384	1.2		51	41	96	11	13	69	5	
24-May-12	7.39	1,044	37	550	0.3									
27-Jun-12	7.44	882	32	526	0.78									
27-Jul-12	6.36	575	50	591	0.78		43	42	150	13	16	85	5	
30-Aug-12	6.89	135	37	788	0.19									
25-Sep-12														Dry
25-Oct-12	7.58	1,573	18	844	0.05		105	91	408	27	37	242	9	
29-Nov-12														Dry
20-Dec-12														Dry
24-Jan-13														Dry
25-Feb-13	6.94	475	35	358	0.62									
22-Mar-13	7.21	1,010	5	574	0.48									
22-Apr-13	6.78	1,600	14	1,020	0.25		22	407	253	51	48	248	11	
17-May-13	7.38	907	38	540	0.05									
21-Jun-13	7.24	1,120	6	646	0.16									
24-Jul-13	7.28	727	11	417	0.46		54	45	151	11	15	105	6	
28-Aug-13	7.53	869	5	443	0.11									
17-Sep-13	7.59	930	6	469	0.06									
22-Oct-13	7.53	1,080	8	541	0.05		74	74	218	19	23	155	9	
14-Nov-13	7.39	1,100	15	577	0.05									
11-Dec-13	6.81	599	18	364	0.56									
24-Jan-14	8.05	941	30		0.05									
20-Feb-14	8.35	957	22		0.05									
25-Mar-14	7.59	849	12		0.05									
30-Apr-14	6.89	282	6	204	0.91		33	21	66	4	6	55	7	
28-May-14	6.63	472	5		0.93									
26-Jun-14	7.65	475	5		0.3									
28-Jul-14	7.32	580	5	384	0.11									
31-Aug-14	7.57	352	13		0.73									
22-Sep-14	7.7	570				41.8								
27-Oct-14	7.4	560	60	337	1.33	15.9	69	10	116	9	12	74	8	
21-Nov-14	7.6	660				18.6								
22-Dec-14	7.5	690				16.4								
29-Jan-15	6.8	240	16	236	1.3	38.5								
23-Feb-15	7.2	560				7.8								
30-Mar-15	7	600				9.3								
28-Apr-15	6.5	274	44	234	3.5	63	41	22	42	11	8.2	25	8.3	Floodwater
28-May-15	7.3	640				33								
24-Jun-15	6.7	620				47								
27-Jul-15	7.6	919	4	542	0.42	9								
27-Aug-15	7.2	1,100				7								
28-Sep-15	7.5	760				9.1								
22-Oct-15	7.1	900	2	533	0.28	5	88	21	210	19	21	120	7.2	
30-Nov-15	7.5	590				10.2								
21-Dec-15	7	640				9.4								
29-Jan-16	7	640	11	383	0.94	12.5								

26-Feb-16	6.9	840				7								
31-Mar-16	7.1	450				13								
28-Apr-16	8	930	3	524	0.04	4	115	14	210	19	21	130	6	
26-May-16	7.6	960				19								
29-Jun-16	6.9	1,200				5								
19-Jul-16	7.8	1,180	8	757	0.01	7								Stagnant
22-Aug-16	7.5	790				13								Stagnant
28-Sep-16	7.5	800				5								
20-Oct-16	7.6	860	2	536	0.35	3	97	81	150	25	24	130	13	
28-Nov-16	7.6	940				11								Stagnant
21-Dec-16	7.7	960				9								Stagnant
30-Jan-17	8	1,060	8	623	0.02	8								
27-Feb-17	8.1	1,100				270								Cattle
30-Mar-17	7.4	390				41								
26-Apr-17	7.3	454	8	356	2.1	10	65	26	110	13	13	72	8	
30-May-17	7.1	580				7								
28-Jun-17	6.7	510				28								
27-Jul-17	7.2	547	4	364	1	12								
30-Aug-17	7.6	590				6								Not flowing
28-Sep-17	7.9	695				6								Not flowing
24-Oct-17	7.5	711	2	428	0.19	6	77	53	120	16	16	110	8	
28-Nov-17	7.5	630				8								Not flowing
13-Dec-17	7.7	670				8								Not flowing
29-Jan-18	7.8	779	22	489	0.08	29								Not flowing
22-Feb-18	8	800				39								Stagnant - cattle
29-Mar-18	7	500				18								Cattle
26-Apr-18	6.5	560	6	367	2	12	64	31	110	13	13	84	7.3	Cattle
21-May-18	8	610				8								
26-Jun-18	7.7	500				19								
25-Jul-18	7.6	536	2	334	1.1	6								
29-Aug-18	7.7	520				6								
28-Sep-18	8.1	550				5								Not flowing
24-Oct-18	7.1	450	13	486	1.6	13	57	22	83	8.5	9.4	71	7	
29-Nov-18	8.3	480				13								
18-Dec-18	6.4	250				40								

Table C1 - Discharge Monitoring Results 2018

DATE	pH	TOTAL SUSPENDED SOLIDS (mg/l)	TOTAL DISSOLVED SOLIDS (mg/l)	SPECIFIC CONDUCTANCE (uS/cm)	IRON (mg/l)	DISCHARGE VOLUME (ML/day)
22-Feb-18	8.3	7	4,700	5,480	0.01	40
26-Feb-18	8.4	10	3,890	4,870	<0.01	30
21-Mar-18	7.8	8	4,880	5,900	<0.01	40
22-Mar-18	8.2	18	4,330	4,700	<0.01	40
20-Apr-18	7.5	2	1,730	2,340	<0.01	30
21-Apr-18	8.1	3	1,460	2,010	<0.01	20
22-Apr-18	8.3	11	2,500	3,280	<0.01	10
26-Apr-18	8.0	7	2,860	4,570	<0.01	30
27-Apr-18	8.4	10	3,210	3,960	<0.01	10
28-Apr-18	8.3	18	2,750	3,680	<0.01	10
04-Jun-18	7.8	3	5,000	5,480	<0.01	40
05-Jun-18	8.1	4	4,450	5,250	<0.01	30
06-Jun-18	8.1	7	3,900	4,370	<0.01	20
11-Jun-18	8.0	2	3,990	4,640	0.01	20
12-Jun-18	8.0	2	3,970	4,720	<0.01	10
19-Jun-18	8.1	3	5,220	5,210	<0.01	40
20-Jun-18	8.1	3	4,280	4,660	<0.01	30
21-Jun-18	8.3	4	3,320	4,250	<0.01	10
27-Aug-18	8.1	2	4,660	4,880	<0.01	40
04-Sep-18	8.2	2	5,000	4,820	<0.01	40
05-Sep-18	8.4	8	3,510	4,090	<0.01	40
06-Sep-18	8.4	5	3,430	3,920	<0.01	30
05-Oct-18	8.1	8	5,470	4,890	<0.01	40
06-Oct-18	8.1	3	5,100	5,070	<0.01	40
07-Oct-18	8.2	2	4,770	4,820	<0.01	40
08-Oct-18	8.1	3	2,910	3,430	<0.01	30
11-Oct-18	8.1	2	4,690	4,520	<0.01	20
12-Oct-18	8.5	6	2,340	3,150	<0.01	20
13-Oct-18	8.2	6	2,450	3,150	<0.01	10
08-Nov-18	8.1	4	5,460	4,900	<0.01	40
09-Nov-18	8.1	9	4,380	4,400	<0.01	40
28-Nov-18	7.8	2	4,960	4,750	<0.01	40
29-Nov-18	8.2	6	3,910	4,010	<0.01	40
30-Nov-18	7.9	3	3,590	3,770	<0.01	40
Max	8.5	18	5,470	5,900	0.01	40
Min	7.5	2	1,460	2,010	0.01	10
Average	8.1	6	3,914	4,351	0.01	30

APPENDIX D

GROUNDWATER MONITORING RESULTS

Bore
PD2.1 **Buttai Reservoir**

Date	RL	Depth (m)	pH	EC (uS/cm)	TDS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Iron (mg/L)	
20-Sep-10	22.87	56.33	6.67	5350	3780	569	730	1330	32	74	1150	24	0.29	
19-Oct-10	22.63	56.57	6.72	6000	3100	553	802	1210	34	78	1330	27	2.45	
14-Jan-11	22.84	56.36	6.6	6420	3750	598	718	1260	30	73	1310	28	1.47	
27-Apr-11	22.61	56.59	6.6	6560	3610	483	953	1120	32	90	1200	26	2.14	
25-Jul-11	23.13	56.07	6.64	6320	3810	541	621	1230	30	72	1280	28	1.28	
26-Oct-11	23.64	55.56	7.09	6170	3660	503	506	1290	27	67	1270	29	1.61	
25-Jan-12	24.02	55.18	7.06	5720	3330	430	607	1300	34	56	1180	29	1.39	
27-Apr-12	24.44	54.76	6.64	5270	3490	409	418	1270	36	47	1130	29	1	
27-Jul-12	24.71	54.49	7.32	6120	3830	355	608	1650	134	74	1320	35	0.05	
31-Oct-12	24.64	54.56	6.74	5950	3990	592	874	1240	48	79	1370	33	11.4	
24-Jan-13	24.80	54.40	7.3	6360	4130	590	816	1190	67	78	1320	31	0.85	
22-Apr-13	25.23	53.97	6.81	6080	4170	549	654	1210	54	79	1220	30	0.79	
24-Jul-13	25.00	54.20	7.21	6820	3830	212	450	1700	159	34	1290	37	1.99	
28-Oct-13	24.82	54.38	6.87	6380	3990	622	726	1200	38	80	1310	31	2.06	
02-May-14	25.34	53.86	6.84	6460	3800									
29-Nov-14	25.40	53.80	7.3	6460	3740	560	503	1600	96	53	1220	27	0.05	
24-Feb-15	25.42	53.78												
03-Jun-15	26.72	52.48	6.7	6350	3170									
26-Aug-15	25.87	53.33												
30-Nov-15	25.92	53.28	6.9	5520	3420	350	310	1300	87	33	1300	33	0.05	
21-Mar-16	25.92	53.28												
25-May-16	25.70	53.50	7	5000	2600									
19-Aug-16	25.17	54.03												
30-Nov-16	25.12	54.08	7.3	4700	3010	330	220	1200	120	16	1100	29	0.01	
27-Feb-17	24.89	54.31												
01-May-17	25.54	53.66	8	3920	2513									
31-Aug-17	24.86	54.34												
29-Nov-17	24.74	54.46	7	4650	3020	280	400	1200	72	25	1100	24	0.02	
28-Feb-18	24.61	54.59												
29-May-18	25.28	53.92	6.9	5900	3770									
30-Aug-18	25.02	54.18												
30-Nov-18	24.94	54.26	7.1	4900	3490	440	600	1200	120	170	590	24	0.01	

Bore
PD2.2 **Buttai Reservoir**

Date	RL	Depth (m)	pH	EC (uS/cm)	TDS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Iron (mg/L)	
20-Sep-10	16.29	63.37	6.69	5140	4500	319	1890	695	183	180	943	20	4.22	
19-Oct-10	15.88	63.78	6.79	5780	4300	333	2010	706	185	180	1040	22	8.83	
14-Jan-11	16.38	63.28	6.65	6170	4220	342	2300	728	191	189	1070	24	9.19	
27-Apr-11	15.87	63.79	6.42	6270	4500	288	1890	701	171	206	952	23	7.52	
25-Jul-11	17.12	62.54	6.29	6090	4250	239	1800	806	167	209	972	27	31.1	
26-Oct-11	18.58	61.08	7.03	5960	4320	206	1740	791	157	204	1000	29	6.23	
25-Jan-12	18.81	60.85	7.07	6460	4840	483	1480	1130	100	177	1170	33	0.05	
27-Apr-12	19.23	60.43	6.44	5720	4230	282	1360	1110	106	194	1090	33	23.6	
27-Jul-12	19.21	60.45	6.52	5720	4390	272	1710	1070	97	182	1110	32	30.5	
31-Oct-12	19.23	60.43	6.35	5650	4040	205	1840	892	100	178	1190	33	32.9	
24-Jan-13	19.36	60.30	6.73	5810	4110	241	1820	838	115	203	1140	31	29.1	
22-Apr-13	19.95	59.71	6.4	5480	3990	217	1480	852	76	160	1070	30	32.4	
24-Jul-13	19.53	60.13	6.81	6120	4100	246	1520	899	84	168	1140	32	12.2	
28-Oct-13	19.65	60.01	6.54	6450	4140	271	1490	901	79	154	1160	30	26.4	
02-May-14	19.94	59.72	6.46	6260										
29-Nov-14	19.36	60.30	6.7	5880	3610	302	1440	1010	70	127	1040	24	0.05	
24-Feb-15	20.35	59.31												
03-Jun-15	20.44	59.22	6.7	6110	3050									
26-Aug-15	20.22	59.44												
30-Nov-15	20.16	59.50	6.6	5670	4180	310	1300	890	66	150	1200	34	10	
21-Mar-16	19.90	59.76												
25-May-16	19.79	59.87	6.8	5800										
19-Aug-16	19.36	60.30												
30-Nov-16	19.24	60.42	6.7	5730	5510	400	2100	690	280	230	1200	25	1.9	
27-Feb-17	19.18	60.48												
01-May-17	19.32	60.34	7.3	5370	3447									
31-Aug-17	19.60	60.06												
29-Nov-17	19.63	60.03	6.8	5670	4030	360	1300	1100	55	120	1400	28	0.01	
28-Feb-18	19.62	60.04												
29-May-18	19.82	59.84	7.1	6400	4050									
30-Aug-18	19.99	59.67												
30-Nov-18	19.99	59.67	7	5380	4170	420	1300	1100	50	110	1000	27	0.01	

Bore PD3 Shamrock Lane

Date	RL	Depth (m)	pH	EC (uS/cm)	TDS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Iron (mg/L)	
20-Sep-10	23.88	7.12	4.1	2660	2090	1	958	220	34	112	374	21	0.09	
19-Oct-10	23.62	7.38	6.37	5890	5120	217	2710	510	262	311	884	27	22.6	
14-Jan-11	23.78	7.22	6.59	6040	4940	168	2890	507	247	300	878	29	0.05	
27-Apr-11	23.27	7.73	6.7	6680	5390	134	2790	545	256	333	863	28	0.05	
25-Jul-11	24.75	6.25	6.24	6520	5280	134	2440	614	247	309	874	30	7.05	
26-Oct-11	23.97	7.03	6.52	6420	5170	120	2780	615	267	328	1010	34	0.05	
25-Jan-12	23.62	7.38	7.03	6580	6640	130	3160	595	273	347	980	33	0.06	
27-Apr-12	24.97	6.03	6.26	6190	5280	185	2670	604	286	331	957	33	0.38	
27-Jul-12	24.29	6.71	6.35	6350	5860	158	3530	622	308	345	985	33	0.61	
25-Oct-12	24.38	6.62	6.54	6820	5880	98	3280	599	362	380	1020	35	0.05	
24-Jan-13	23.70	7.30	6.07	6520	5430	2	3880	484	354	365	977	33	0.11	
22-Apr-13	24.01	6.99	5.74	5800	5340	46	3070	433	210	354	896	34	113	
24-Jul-13	24.61	6.39	5.76	6520	5720	85	3240	448	281	377	915	35	34.2	
22-Oct-13	23.92	7.08	4.63	6660	5480	1	3030	444	241	351	874	35	62.1	
02-May-14	24.48	6.52	6.2	6970										
29-Nov-14	24.17	6.83	3.5	6840	6390	5	3690	547	317	332	870	28	2.97	
24-Feb-15	23.98	7.02												
03-Jun-15	24.36	6.64	5.9	3820	1900									
26-Aug-15	24.27	6.73												
30-Nov-15	23.98	7.02	6.2	5550	5720	110	2700	400	290	330	960	37	71	
21-Mar-16	23.93	7.07												
25-May-16	23.84	7.16	6	3500	1800									
19-Aug-16	24.02	6.98												
30-Nov-16	23.89	7.11	5.2	3480	3190	15	1500	220	130	170	640	24	0.01	
27-Feb-17	24.03	6.97												
01-May-17	24.33	6.67	6.3	3740	2399									
31-Aug-17	23.97	7.03												
29-Nov-17	24.24	6.76	5.9	4670	4660	28	2600	390	240	270	990	29	17	
28-Feb-18	23.75	7.25												
29-May-18	24.03	6.97	6.3	7400	4750									
30-Aug-18	23.89	7.11												
30-Nov-18	23.83	7.17	5.9	5580	6920	34	3600	550	320	360	890	33	34	

Product Stockpile Pad

[illegible]

Bore
PD4.2 **Product Stockpile Pad**

Date	RL	Depth (m)	pH	EC (uS/cm)	TDS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Iron (mg/L)	
20-Sep-10	24.30	2.69	5.63	8390	7870	69	3900	1150	123	424	1500	30	19.5	
19-Oct-10	24.24	2.75	5.59	9060	8630	73	4870	438	163	527	1700	34	45	
14-Jan-11	24.31	2.68	5.4	9970	8880	55	5740	462	134	492	1790	37	36.8	
27-Apr-11	24.33	2.66	5.36	10800	8770	45	5470	398	147	531	1690	37	33	
25-Jul-11	24.99	2	4.32	9440	5990	1	4670	364	179	510	1540	37	0.87	
26-Oct-11	24.96	2.03	5.72	8220	4600	24	4550	358	261	520	1330	34	57.1	
25-Jan-12	24.80	2.19	5.63	7610	8550	7	4370	277	195	482	1180	31	50.6	
27-Apr-12	24.89	2.10	5.35	5890	5710	1	3210	230	168	366	930	26	63.3	
27-Jul-12	25.19	1.80	5.44	5440	6400	12	4260	238	182	415	1030	29	44.1	
25-Oct-12	24.46	2.53	3.82	7210	6780	1	4580	245	286	489	1110	31	65.4	
24-Jan-13	24.48	2.51	5.67	6760	5960	26	4940	176	298	465	1060	27	71	
22-Apr-13	24.98	2.01	5.16	6180	6430	22	4500	156	272	465	1030	26	89.2	
24-Jul-13	24.80	2.19	5.41	7160	6940	26	4410	184	351	475	1010	26	79.4	
28-Oct-13	24.34	2.65	5.7	7650	7390	1	4370	229	326	474	1050	26	77.5	
02-May-14	24.99	2.00	5.75	7100										
29-Nov-14	24.91	2.08	4.2	7300	7260	5	4600	338	410	403	958	21	16.5	
24-Feb-15	25.24	1.75												
03-Jun-15	25.28	1.71	5.5	7780	3870									
26-Aug-15	25.26	1.73												
30-Nov-15	25.29	1.70	5.9	5930	7310	49	4400	270	360	400	1100	31	50	
21-Mar-16	25.41	1.58												
25-May-16	25.39	1.60	5.5	6200	3400									
19-Aug-16	25.38	1.61												
30-Nov-16	25.26	1.73	5.5	5730	6640	25	3900	230	360	360	1000	25	0.06	
27-Feb-17	25.40	1.59												
01-May-17	25.41	1.58	6.6	5740	3681									
31-Aug-17	24.88	2.11												
29-Nov-17	25.02	1.97	6.2	5910	7420	49	4500	220	440	390	1200	26	36	
28-Feb-18	24.78	2.21												
29-May-18	24.81	2.18	6.1	7360	4720									
30-Aug-18	25.00	1.99												
30-Nov-18	25.10	1.89	6	6040	9970	47	5900	130	490	530	990	24	140	

**Bore
PD7.1**

[illegible]

APPENDIX E

COMPLAINTS REGISTER

BLOOMFIELD COLLIERY
COMPLAINTS REGISTER
2018



No.	About *	Time/Date	Location	Details	Action Taken / Findings
18_01	B	16-Jan-18	Louth Park	Complained about blast after seeing dust cloud and smell of what he thought was blast fume on 16/1/18.	<p>No blast conducted on 16/1/18. However an area of potential spontaneous combustion was being addressed which caused heat and dust to escape which would be the dust cloud and odour described by complainant. The Mine Manager rang complainant to explain what had happened. Work had been completed before the complaint could be investigated.</p> <p>Wind SSE 20 km/h. Future work on any heating area to include review of prevailing weather conditions.</p>
18_02	N	4-Apr-18	Ashtonfield	Complaint via 'Website Feedback' email address. Complaint about noise of engines revving from the washery on the night of 3/4/18.	<p>The Mine Manager rang complainant on 5/4/18. Explained that engine revving noise was coal trucks dumping coal on ROM pad. A slight southerly breeze would have caused some noise enhancement towards Ashtonfield.</p> <p>Engine revving noise caused by trucks lifting the body to dump off coal. Tests were carried out to determine optimal engine revs to lift truck body efficiently and keep engine noise as low as possible. It was determined to be about 1700 rpm.</p> <p>The existing noise model does not include washery operations. Future scheduling of night-time coal trucking will include review of weather forecasts.</p>

No.	About *	Time/Date	Location	Details	Action Taken / Findings
18_03	O	19-Apr-18	Regulator	Complaint received from DPE Resources Regulatory by phone to Environmental Manager regarding treatment of potential spontaneous combustion at Bloomfield. Environmental Manager responded to DRG by email outlining the treatment of an area of heating within overburden dump.	On 24/4/18 an Improvement Notice was issued to Bloomfield by DPE Resources Regulatory under the Work Health and Safety Act. Under the Notice Bloomfield was required to review and update Spontaneous Combustion Risk Assessment and develop safe work procedures for management of spontaneous combustion. On 22/5/18 the Mine Manger responded to DPE Resources Regulator outlining the implementation of Improvement Notice directions.
18_04	O	14-Jun-18	Black Hill	Complaint via text message to Mine Manager. Complained about odour she believed to be spontaneous combustion coming from the mine.	The Mine Manger rang complainant on 22/6/18. The Manager explained that there was no major spontaneous combustion areas but Bloomfield has been working on some small areas which needed addressing.
18_05	O, N	3-Sept-18	Buttai	Complaint via email to Environmental Officer. Complained about odour and noise from pit during night of 30/8/18.	Environmental Officer responded by email. Regarding odour, it was explained that plans are underway to extend de-watering pipe to discharge water into open drain further away from John Renshaw Drive. The pipe had previously been extended and would be extended further. Regarding noise, the noise that could be heard was the end of the afternoon shift. Production on nightshift was cancelled due to unfavourable noise modelling results.
18_06	N	21-Nov-18	Ashtonfield	Complaint via 'Website Feedback' email address. Complaint about noise from the Coal Handling Preparation Plant (CHPP) on the night of 20/11/18.	Environmental Officer rang complainant on 22/11/18 to try to establish noise source. Environmental Officer was able to establish that the CHPP was the noise source. The existing predictive noise model was reviewed and established that the CHPP was not included in the modelling. Bloomfield has since updated the predictive noise model to include CHPP and better assist in planning operations.

* D = Dust, N = Noise, B = Blasting, V = Visual, L = Lighting, W = Weeds, O = Other