Broken Hill Operations Pty Ltd ABN 95 103 555 862

Rasp Mine

Annual Environmental Management Report/Annual Review

REPORTING PERIOD

1 January 2017 31 December 2017

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Title Block

Name of Operation:	Rasp Mine
Name of Operator:	Broken Hill Operations Pty Ltd
Development consent / project approval:	PA 07_0018 (MOD1, MOD2, MOD3 and MOD4)
Name of holder of development consent / project approval:	Broken Hill Operations Pty Ltd
Mining Titles / Leases:	Consolidated Mining Lease 7 Mining Purpose Leases 183, 184, 185, 186
Name of holder of mining lease:	Broken Hill Operations Pty Ltd
Water licence:	85WA752823
Name of holder of water licence:	Broken Hill Operations Pty Ltd
MOP Commencement Date: 1 October 2017	**MOP Completion Date:** 30 September 2019
AEMR Commencement Date: 01/01/2017	**AEMR End Date:** 30/12/2017
I, Gwen Wilson, certify that this audit report is a true and accurate record of the compliance status of the Rasp Mine for the period 1 January 2017 to 30 December 2017 (Reporting Period) and that I am authorised to make this statement on behalf of Broken Hill Operations Pty Ltd.	
Name of authorised reporting officer:	Gwen Wilson
Title of authorised reporting officer:	Group Manager – Health, Safety and Environment
Signature of authorised reporting officer:	
Date: 6 April 2017	

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1. STATEMENT OF COMPLIANCE

Table 1-1 lists the development consent and mining leases and confirms compliance as at the end of the reporting period. **Table 1.2** lists the non-compliances with relevant approval conditions for the reporting period.

Table 1-1 Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	(Yes/No)
Project Approval 07_0018 (Consolidated MOD 4)	No
Consolidated Mining Lease 7	Yes
Mining Purpose Lease 183	Yes
Mining Purpose Lease 184	Yes
Mining Purpose Lease 185	Yes
Mining Purpose Lease 186	Yes

Table 1-2 lists conditions that were identified as non-compliant and provides a comment outlining actions undertaken and where appropriate, addressed in this Annual Report.

Table 1-2 Non-Compliances

Relevant Approval	Relevant Condition	Condition description (summary)	Compliance Status	Comment	Annual Review Section
PA07_0018	Schedule 3 Condition 11	Update Air Quality Management Plan for MOD4.	Non-compliant	AQMP to be updated following meeting with EPA (20 Feb 2018) currently still in consultation.	4.6.1.2 11.2.1
PA07_0018	Schedule 3 Condition 30	Preparation of a Conservation Management Plan.	Non-compliant	Waiting for results of inter-governmental discussions.	6.17.1 11.2.1
PA07_0018	Schedule 3 Condition 33A	Update of Waste Management Plan with long term waste (tailings) management strategy.	Non-compliant	Propose to use Kintore Pit as TSF3 - waiting for design report from consultant and identification of new location for mine portal. Tailings will be deposited in TSF2 until mid-2021.	6.10.1, 11.2.1
PA07_0018	Schedule 3	Environmental monitoring requirements – various.	Non-compliant	Samples could not be taken form various environmental monitoring points during the reporting period due to power failure, operator error, repairs and insufficient water depths.	6.3, 6.5, 6.6, 11.2.1
PA07_0018	Schedule 4 Condition 4	Update of management plans – MOD4.	Non-compliant	A Construction Environment Management Plan was formulated to provide for managing issues for the Concrete Batching Plant. Other Plans that require updating and still waiting for design decisions for the embankments at TSF2 are the Environment Management Strategy and Site Water Management Plan.	11.2.1

2. INTRODUCTION

2.1 Purpose

The Annual Environment Management Report / Annual Review (AEMR) documents the environmental performance of the Rasp Mine for the reporting period 1 January 2017 to December 31 2017. It has been prepared in accordance with the NSW Government *Post-approval requirements for State significant mining developments - Annual Review Guideline*, October 2015 to meet the requirements of the relevant mining leases and Project Approval 07_0018.

2.2 Location

The Rasp Mine is owned and operated by Broken Hill Operations Pty Ltd (BHOP), a wholly owned subsidiary of CBH Resources Ltd (CBH). The Mine is located on Consolidated Mine Lease 7 (CML7) within the City of Broken Hill and includes several Mining Purposes Leases (183,184,185 and 186) with the entire Project extending over Western Land Leases and freehold properties.

The Rasp Mine consists of underground mining operations, a processing plant producing zinc and lead concentrates, a rail siding for concentrate dispatch to shipping facilities at the Port of Newcastle NSW, or smelter operations in Port Pirie SA, as well as other mining ancillary facilities. It is approved to produce 750,000 tpa of ore and 8,450,000 tonnes of ore over the life of the Project to December 2026.

The Mine is located centrally within the City of Broken Hill (**Figure 2-1, Plan 1**) and is surrounded by transport infrastructure, areas of commercial and industrial development and some residential housing. The Mine is bounded by Eyre Street to the south east, Perilya Broken Hill Operations Pty Ltd (Perilya) North Mine to the east and Perilya's South Mine to the west, and the commercial centre of Broken Hill to the north. Two major State roads dissect CML7 - South Road (Silver City Highway SH22) to the southwest and Menindee Road (MR66) to the northeast. These roads form part of the existing road train and B-double routes through Broken Hill. The Blue Metal Quarry lies to the east of the existing processing plant. The Broken Hill railway station is located within CML7 on a surface exclusion with the main Sydney – Perth railway line also located within the Lease on various surface exclusions. Residential and commercial areas surround the mine with pastureland to the southeast.

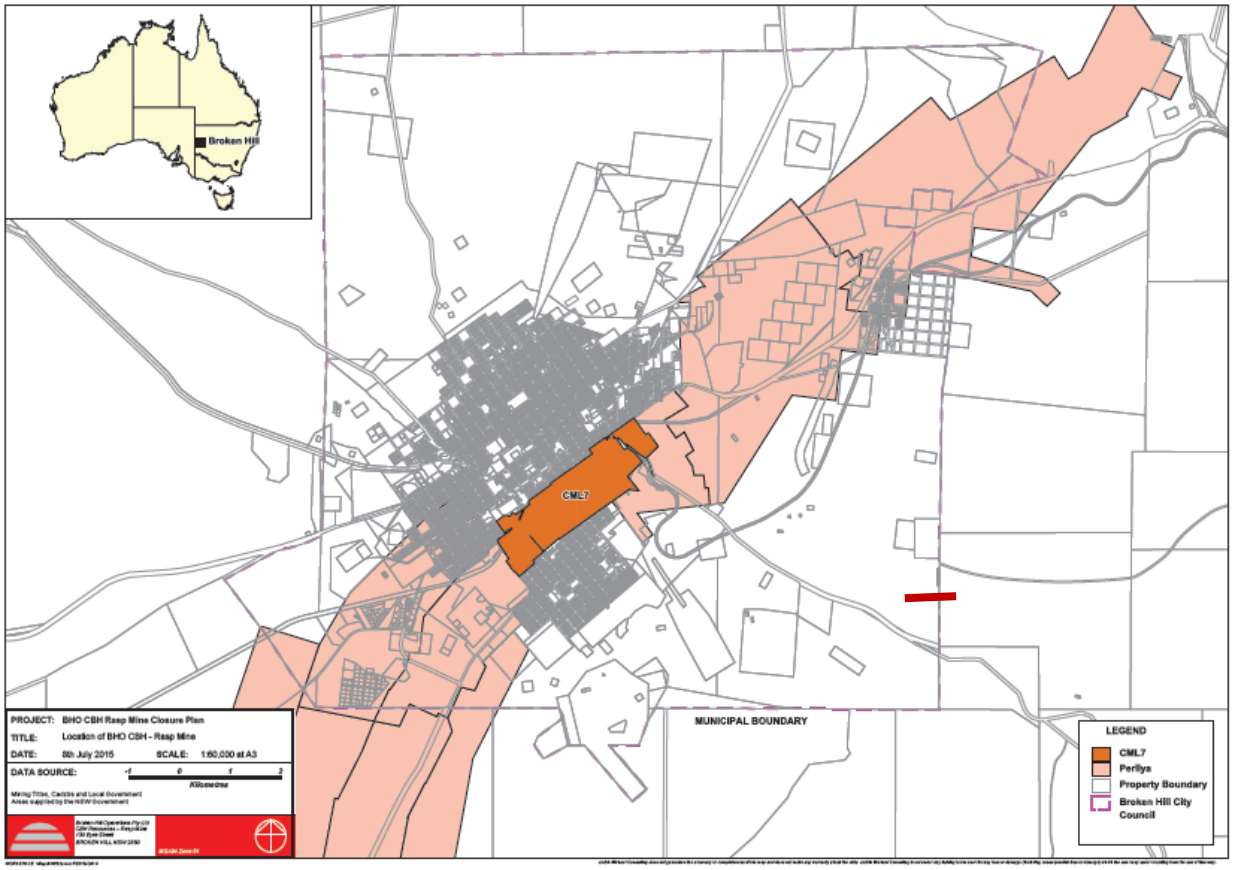
The mining leases occupy a central region of the historic Broken Hill Line of Lode ore body incorporating the original mine areas that commenced operations in the 1880s including a substantial amount of mining infrastructure from various mining phases. The Mine was the birthplace of Broken Hill Pty Ltd (BHP) in 1885. Subsequently several mining companies, including Broken Hill South and Minerals Mining and Metallurgy Ltd (MMM), have operated the mine. This past mining has left the mining lease highly modified and disturbed. The original landform has been significantly altered, the majority of native vegetation removed and soils have been degraded and covered with waste rock.

There are a number of heritage items on the site relating to historic mining activities and the site is recorded on the Register of National Estate for its heritage values. The people of Broken Hill consider the mine as an important historic site for its role in Broken Hill's history. The Broken Hill Miners Memorial and Broken Earth Café are located centrally within CML7.

The CML7 boundary is shown in **Figure 2-2 Plan 2,** which also indicates surface exclusion areas and MPLs. The Project Area includes additional areas to the south-east located on Western Land leases or freehold properties owned or leased by BHOP which form part of the Project area (highlighted in dotted orange). Located in this area are the current Rasp Mine administration offices and stores.

The AEMR is distributed to a range of stakeholders that include government authorities and is available on the CBH website at: www.cbhresources.com.au.

Figure 2-1 Plan 1 Location Map



2.2 Mine Level

The Rasp Mine is classified as a Level 1 Mine as it is treated as State Significant Development under the *EP&A Act* with development consent determined and authorised by the Minister for the Department of Planning and Environment.

2.3 Mine Contacts

Table 2-1 outlines the contacts for the Rasp Mine.

Table 2-1 Mine Contacts

Name	Title	Contact Details
Visko Sulicich	BHOP Director CBH Chief Operating Officer	T: 08 8088 9106 viskosulicich@cbhresources.com.au
Robert Williamson	BHOP General Manager	T: 08 8088 9157 robwilliamson@cbhresources.com.au
Gwen Wilson	CBH Group Manager – Safety Health Environment Community	M: 0431 483 825 gwenwilson@cbhresources.com.au
Joel Sulicich	BHOP HSET Manager	T 08 8088 9125 joelsulicich@cbhresources.com.au
Complaints Line	Health, Safety and Environment Office	T: 08 8088 1211

Figure 2-2 Plan 2 Aerial of CML7

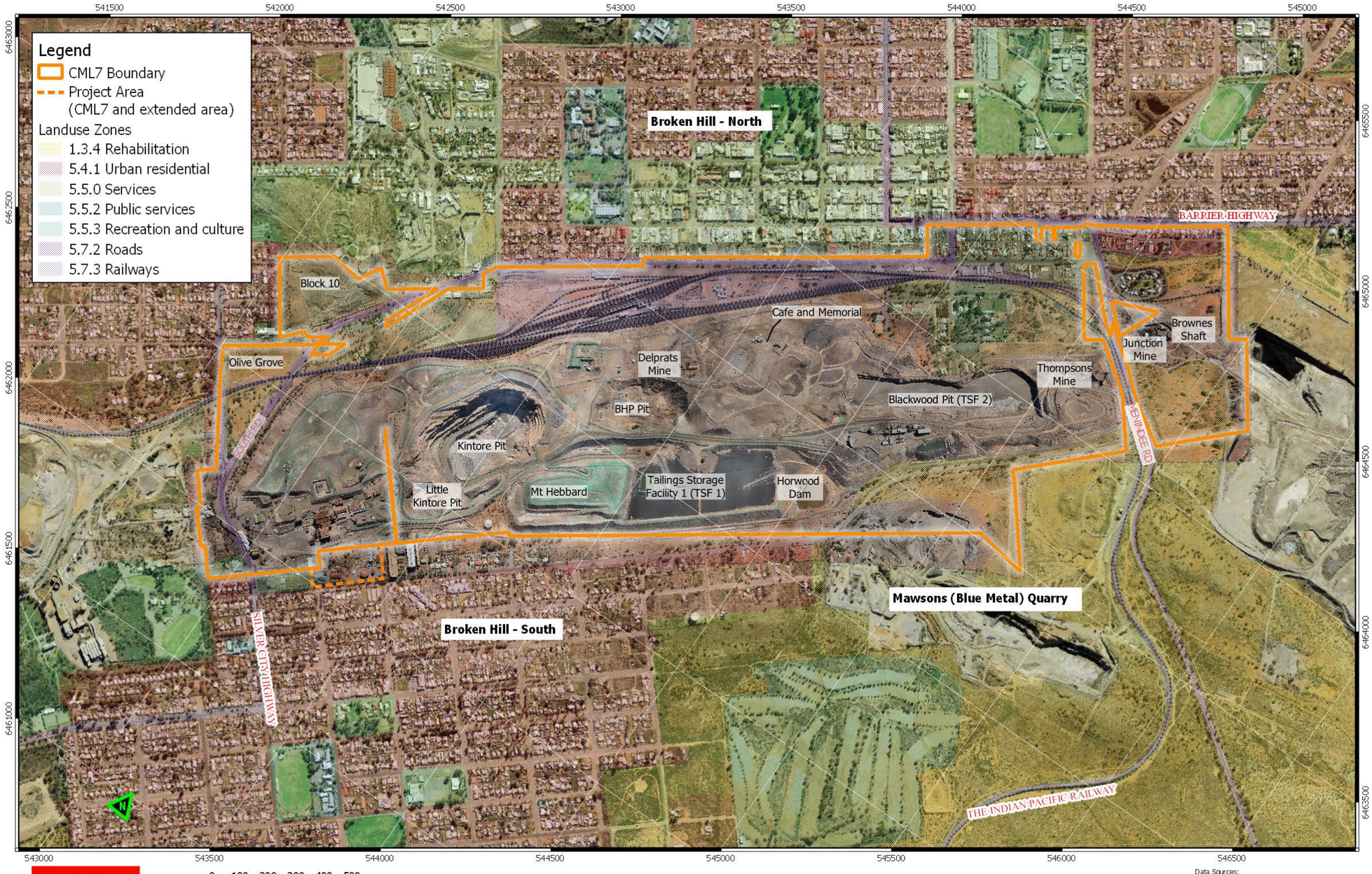
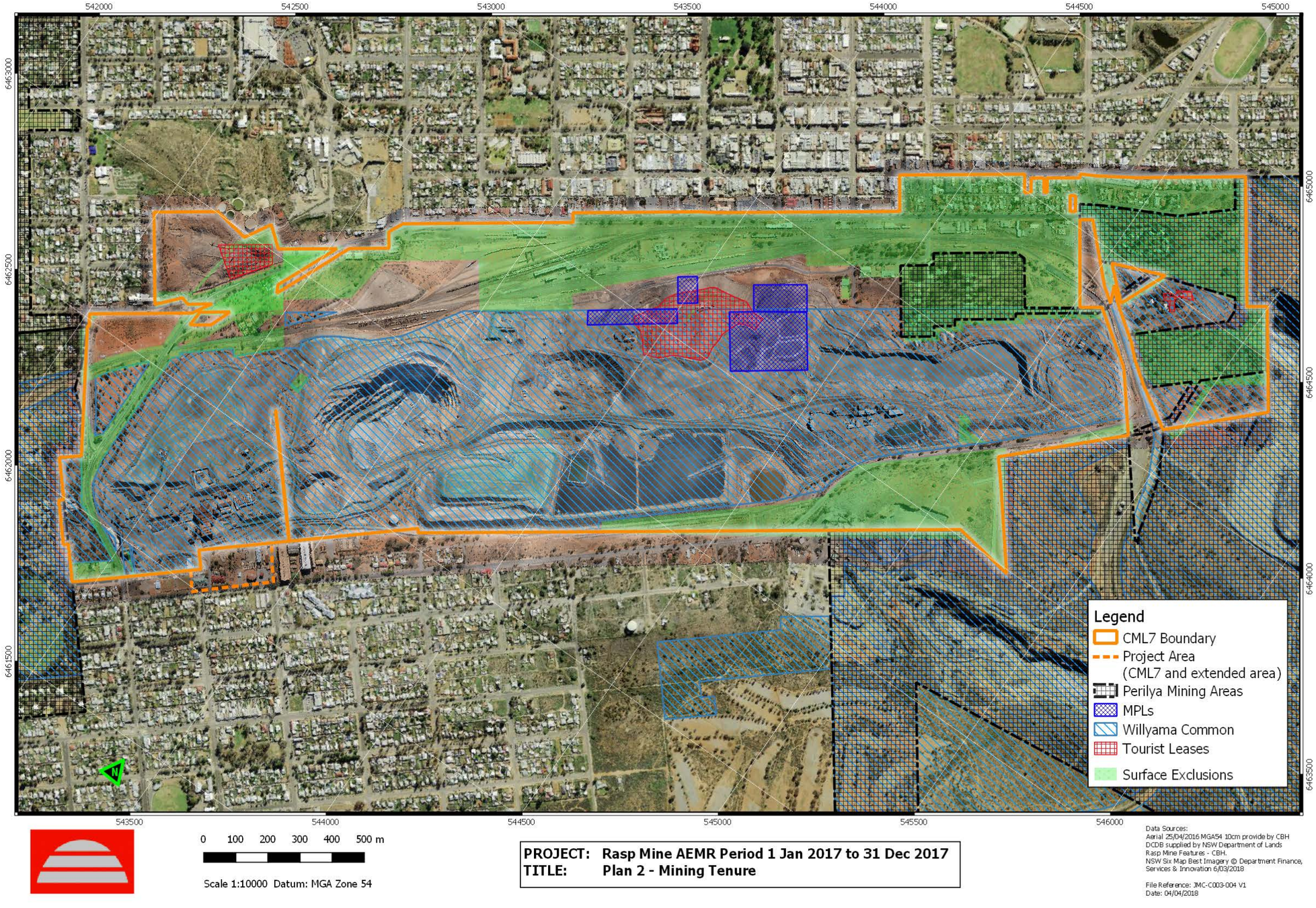


Figure 2-3 Plan 2 Mining Leases



3. APPROVALS, LICENCES AND PERMITS

3.1 Approvals

Table 3-1 provides a list of all current development consents, mining leases and licences held by the Rasp Mine. Mining lease boundaries are shown in **Figure 2-3**.

Table 3-1 Rasp Mine - Current Approvals

Approval Number	Date Issued	Expiry	Purpose
Project Approval 07_0018 (Part 3A)	31 Jan 2011	31 Dec 2026	Mining production of 750,000 tpa from Western Mineralisation, Centenary Mineralisation and Main Lode Pillars. Construction and operation of minerals processing plant and rail load out facility. Supported by an EAR and PPR. MOD1 – relocation of primary ventilation shaft MOD2 – 24 hour operation of crusher MOD3 – Mining of Block 14 (Zinc & Main Lodes) MOD 4 – Installation of Concrete Batching Plant and Extension to TSF2
CML7	17 Jan 2007	31 Dec 2026	Granted 8 Oct 1987. As per Schedule 2 of the Lease - Open cutting, shaft sinking, stoping, tunnelling, building of dams, extraction and obtaining minerals, generation of electricity, erecting dwellings, storage of fuels, dumping of ore, treatment and dumping of tailing, development of roads
MPL 183	24 Apr 2007	31 Dec 2026	Granted 4 Feb 1981. Dumping of ore and mine residues, treatment of tailing
MPL 184	24 Apr 2007	31 Dec 2026	Granted 4 Feb 1981. Dumping of ore and mine residues, treatment of tailing
MPL 185	24 Apr 2007	31 Dec 2026	Granted 4 Feb 1981. Dumping of ore and mine residues, treatment of tailing
MPL 186	24 Apr 2007	31 Dec 2026	Granted 4 Feb 1981. Dumping of ore and mine residues, treatment of tailing

3.2 Mining Operations Plan

The Rasp Mine has an approved Mining Operations Plan (MOP) currently in place for the period 1 October 2017 to 30 September 2019. The AEMR, as required by the mining leases, incorporates reporting against this MOP.

3.3 Licences / Permits

Table 3-2 presents the licences and/or permits held by BHOP in relation to the Rasp Mine.

Table 3-2 Licences/Permits

Licence / Permit	Issued By	Date of Expiry/ Renewal	Purpose
EPL 12559	EPA	Upon surrender, suspension or revocation.	Authorises the carrying out of scheduled activities: Crushing , grinding or separating >500,000 – 2,000,000T processed. Mining for minerals >500,000 – 2,000,000T produced.
Dangerous Goods Explosives	Work Cover	24 Oct 2022	Store Manufacture
Refrigerant	Refrigerant Trading Council	7 Jan 2019	Use of refrigerant

Water extraction 85WA752823	NOW	29 Mar 2027	To extract 370 ML for use on site or to send to Perilya Broken Hill Operations Pty Ltd.
Radiation	EPA	26 Jul 2018	Sell and/or possess radiation apparatus. Sell and/or possess radioactive or items containing radioactive substances.

3.4 Management Plans

The Rasp Mine has developed a number of environmental management plans as required by PA07_0018. **Table 3-3** provides a list of these Plans together with the date last updated.

Table 3-3 Status of Environmental Management Plans

Environmental Management Plan	Condition	Updated
Environment Management Strategy	Sched 4 Cond 1	Nov-16
Air Quality Management Plan	Sched 3 Cond 11	Sep-17
Air Quality Monitoring Program	Sched 3 Cond 11	Jul - 16
(Community) Lead Management Plan	Sched 3 Cond 13	Mar-16
Noise and Blast Management Plan:	Sched 3 Cond 20	
- Noise Management Plan		Jan-18
- Vibration, Overpressure and Subsidence Management Plan		Nov-16
- Ground Control Management Plan		Sep-14
- Technical Blasting and Vibration Management Plan		Nov-16
Noise Monitoring Program		Nov-16
(Site) Water Management Plan	Sched 3 Cond 23	Nov-16
Construction Environment Management Plan (CBP)		Dec-17

4. OPERATIONS SUMMARY

During the 2017 reporting period, the Project Approval was modified to permit the construction of a Concrete Batching Plant and the installation of three embankments and a retaining wall around the perimeter of Blackwood Pit TSF2. there were no material changes to the operations at the Rasp Mine. It is planned for works to commence on the Concrete Batching Plant in January 2018 and the embankments in Quarter 3 2018, all construction will be undertaken in accordance with stipulated construction hours – 7 am to 6 pm Monday to Friday, 8 am to 1 pm Saturday and no Sundays or public holidays.

Table 4-1 outlines the production summary for the reporting period. The information in this table is a result of a review of data inputs for the years 2012 to 2017 and has been amended to improve accuracy. Predictions for the next reporting period are taken from the planned 2018 budget.

Table 4-1 Production Summary – Cumulative

Material	Approved Limit	Start of reporting period	At end of reporting period	End of next reporting period
Waste rock	NA	1,730,498	2,022,973	2,503,839
Ore	750,000	2,836,251	3,557,083	4,278,656
Processing waste (Tailings)	NA	2,439,128	3,067,234	3,695,340
Product (Concentrates)	NA	317,433	410,901	504,369

4.1 Exploration

4.1.1 Surface exploration

Consistent with the drilling programs proposed in the MOP, the Rasp Mine completed a surface drilling program totalling 827.8 m at the Browne's Shaft. The program tested for remnant ore areas and extensions of 2 Lens and 3 Lens.

The program was located on land already disturbed by historic mining and no vegetation was removed. Top soils had already been removed from the area by historic mining activities. The drill pads were installed off existing tracks with minimal earthworks required. No heritage structures at Browne's Shaft were affected.

Rehabilitation of drill pads has been delayed in lieu of further drilling planned in this area in 2018.

4.1.2 Underground exploration

During the reporting period, 55,771 m on 376 holes were drilled from the following areas:

- Underground Diamond Drilling Western Mineralisation – 41717.6m
- Underground Diamond Drilling Main Lodes – 14,053.4m

The metres planned for the next reporting period is 50,500 m across 3 drilling rigs – Main Lodes 20,000 m and Western Mineralisation: 30,500 m.

4.2 Construction

4.2.1 New buildings / structures

No new buildings were constructed during the reporting period.

4.2.2 Roads and fencing

No new roadways or fencing were constructed during the reporting period. Routine maintenance of roads was undertaken as required. Boundary fencing was also inspected and repaired.

4.3 Mining

4.3.1 Mine access

All mining is undertaken underground accessed via the existing portal located at the northern end of Kintore Pit. Mining activities included mining of the Western Mineralisation, Main Lode Pillars and Zinc Lode.

Mining activities were undertaken as follows and met the requirements of the Project Approval:

- Underground operations, 24 hours per day, 7 days per week;
- Truck haulage of ore from underground to ROM Pad 24 hours per day, 7 days per week;
- Production rock blasting between 6.45 am to 7.15 pm, 7 days per week;
- Development blasting concurrently with production blasting where practicable;
- Ventilation fans, 24 hours per day, 7 days per week;

4.3.2 Mining method and sequence

A variety of production methods are utilised, including long-hole open stoping (LHOS), uphole benching, room and pillar and uphole pillar retreat mining. LHOS is the most prevalent method used in the Western Mineralisation, uphole stoping (with room and pillar) and uphole pillar retreat in the Main Lode Pillars.

The ore was blasted using a bulk emulsion explosive and extracted using load haul dump vehicles (LHD's) either conventionally or under remote control and transported to loading points where mine trucks transported ore to the ROM pad.

A total 672,830 t of ore from 40 stopes was mined during the reporting period. This resulted in approximately 15,000 truck movements to the ROM pad. **Table 4-2** lists the stopes mined during the reporting period and **Figure 4-1** (**Plan 3)** provides a long section indicating location of the stopes mined. A vertical distance of 64 m was maintained (in the Zinc Lodes) from South Rd/Bonanza Street.

Table 4-2 Mined Stopes 2017

Western Mineralisation			Zinc Lodes	Main Lodes
WM_11_177 UH	WM_13_183_UH	WM_12_170_UH	ZL_Lift2_330_DH	ML_1630_134_DH
WM_13_188	WM_7_1_UH	WM_8_10_UH		ML_1715_127_DH
WM_13_188 UH	WM_15_143_UH	WM_14_158_UH		ML_B11_FLOORSTRIP
WM_13_190 UH	WM_12_DP3	WM_15_160_UH		ML_B11_10_Sub_143
WM_15_158 UH	WM_14_160_UH	WM_14_154_UH		ML_1630_134_DH
WM_15_163 UH	WM_12_229_Sth_UH	WM_15_156_UH		ML_1715_127_DH
WM_7_186 UH	WM_12_229_UH	WM_8_10_UH		ML_B11_FLOORSTRIP
WM_6_249 UH	WM_11_186_UH	WM_14_158_UH		ML_B11_10_Sub_143
WM_7_183 UH	WM_12_186_UH			ML_1630_134_DH

4.3.3 Void backfilling

Waste rock was used to backfill mined out stopes with a total of 215,897 t placed during the reporting period.. The backfill plant did not operate during the reporting period and no tailings were placed underground.

4.3.4 Waste rock and void backfilling

Waste rock is generated from underground mining operations and is predominantly used underground for backfilling stopes and maintenance of underground roads. During the reporting period 292,475 t was extracted as waste, 215,897 t of waste rock was returned underground as void fill and 76,578 t stockpiled in Kintore Pit. At the end of the reporting period the waste stockpile in Kintore Pit held approximately 865,712 t.

Waste rock is also used for road making/repair, noise bunds or rehabilitation. When used for these purposes the waste rock is tested to ensure that only material with less than 0.5% lead is used. No roads were installed during the reporting period.

4.3.5 Underground decline development

The Rasp Decline provides access to stopes for mining, during the reporting period the Decline was extended by 147 m providing access to the Western Mineralisation below the 17 Level.

4.3.6 Ore and waste stockpiles

Ore (720,832 t) was transported by truck and stored on the ROM Pad before being processed. The ROM Pad is 32 m by 80 m and is surrounded by 5 m wind breaks. Water sprays were used to control dust. No more than a week's processing was stored on the ROM stockpile at any one time. Mined ore was below the approved maximum rate of 750,000 tpa. Closing ore stockpiles on the ROM pad at the end of the reporting period totalled 5,643 t.

A total of 76,578 t of waste was hauled to the surface from underground during the reporting period and stored in Kintore Pit totalling 865,712 stored.

Ore and waste production for the reporting period is summarised in **Table 4-3**.

Figure 4-1 Plan 3 Stopes Mined During the Reporting Period (2017)

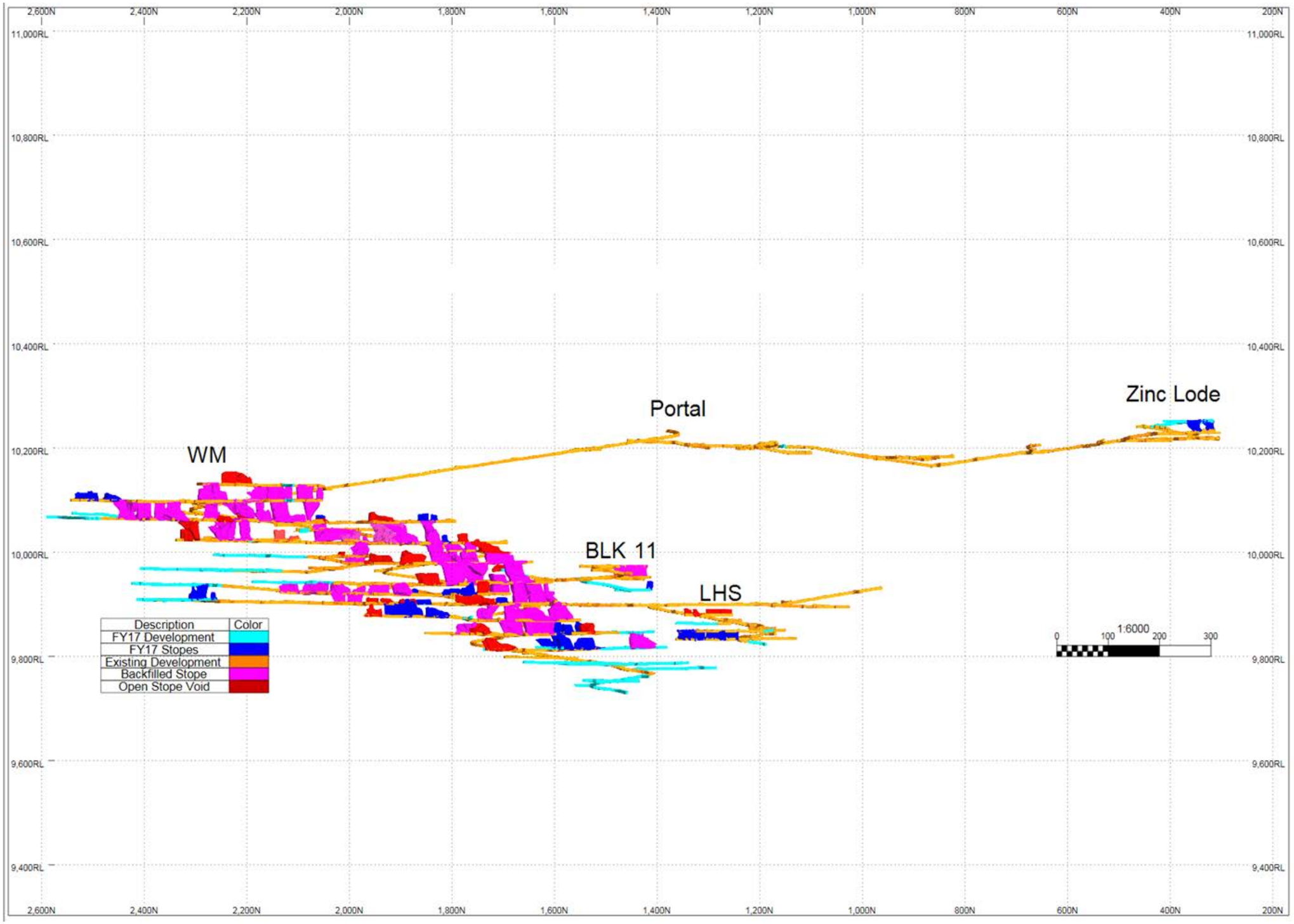


Table 4-3 Ore and Waste Summary for the Reporting Period (2017)

Item	Total Production Tonnes
Topsoil Stripped	N/A
Topsoil Spread	N/A
Ore Tonnes Mined: Dry Tonnes	720,832
Waste Backfill (UG voids): Tonnes	215,897
Waste Trucked to Kintore Pit: Tonnes	76,578

4.4 Mineral Processing

4.4.1 Processing methods and rates

All mined ore is processed on site in the processing plant. This consists of a single stage crushing circuit with a two stage Semi-Autogenous Grind (SAG) – Ball milling circuit capable of processing ore at the required rate and to the required grind size. Material then passes through differential flotation, which incorporates conventional roughing, scavenging and multi-stage cleaning and includes concentrate regrind, to separate lead and zinc concentrates. Concentrates are dewatered using thickeners and pressure filtration. The filtered concentrates are conveyed directly into containers and sealed. The concentrate is stored in these sealed containers in readiness for loading onto rail wagons for transport to the CBH ship loader in Newcastle, NSW or to the Nyrstar Pty Ltd smelter at Port Pirie, SA. Truck movements from filtration to the rail load out during the reporting period totalled approximately 3220. In 2017 all zinc concentrate was sent via rail to the ship loader, and all lead concentrate was sent via rail to the smelter.

Reagents used in the process included pulp pH modifier, flotation frothers, collectors, activators and depressants, used in various combinations in the lead and zinc flotation circuits. Flocculants are used in concentrate and tailing dewatering.

A summary of mineral processing production rates for the reporting period is presented in **Table 4-4.**

Table 4-4 Mineral Processing Summary for the Reporting Period (2017)

Activity	Total 2017 (t)
Milled	721,754
Lead concentrate	30,857
Zinc concentrate	62,611
Tailings deposited	628,106
Tailings Storage Facility (TSF2) storage capacity as at end of period	Mid 2021 (with embankments)

4.4.2 Mill operating hours

The processing plant operates 24 hours per day in accordance with the Project Approval. Schedule 3 Condition 16 places a restriction on milling activities - (b) *shunting of concentrate wagons shall only occur between 7:00am and 6:00pm on any day*. No shunting of concentrate wagons occurs during the loading or unloading of concentrate containers. Concentrate trains are moved into and out of the loading area by Pacific National operators as one unit and no reordering of wagons occurs. Pacific National conducts this activity twice per week taking 10 to 15 minutes, following inspection of the connection and state of the wagons. Once loaded, the train departs in the same direction as arrival. During the reporting period there were no community complaints related to this activity.

4.5 Mining Fleet

There were minor changes to the mining fleet during the reporting period with some trucks and light vehicles replaced and/or scrapped. There were 10 additional light vehicles added in 2017 and five new trucks purchased for 2018. No further changes are planned for the next reporting period. **Table 4-5** lists the mining fleet as at the end of the reporting period.

Table 4-5 Mining Fleet 2017

Vehicle Category	Number	Vehicle Category	Number
Jumbo drill	3	Grader	1
Production Drill	2	Excavator	1
Haul Truck	7	Service Vehicle	9
Load Haul Dump	7	Wheel Loader	2
ANFO Charger	1	Prime Mover	2
Forklift IT	10	Light Vehicle	35

4.6 Next Reporting Period

4.6.1 Construction

Construction works of the Concrete Batch Plant is proposed for 2018. On completion of the Concrete Batch Plant, construction of the TSF2 embankment will be undertaken.

4.6.1.1 Construction of concrete batch plant

Development consent (PA07_0018) was granted for the CBP in September 2017. The EA and associated studies are available on the CBH website.

The area proposed for the location for the CBP was designated for plant infrastructure in the original EA. There is no vegetation or topsoil located in this area, which lies on consolidated waste rock. The installation and erection of the CBP will undertaken in early 2018. A Construction Environment Management Plan for the CBP was completed in December 2017 outlining environmental protection measures for this project (Appendix 1) and the Noise Management and Monitoring Plan was updated and approved by the DPE in January 2018 (Appendix 2).

Land preparation for the construction of the CBP commenced mid-January 2018 and consisted of levelling the area (minor works) and extending the existing noise abatement bund. The surface area for the CBP, material storage, truck delivery and turnaround was levelled using an excavator and grader. Waste rock from Kintore Pit was used to form a base over the proposed area and to form the extension on the noise bund. The waste rock was tested prior to use to identify material suitable for use in the construction of the embankments that would minimise any increased risk to community health. The material will be selected to average no more than 0.5% lead, the procedure for this testing is attached at Appendix 3.

The bund is approximately 6 m in height and extends along the north, east and western sides of the area. The bund will act to reduce noise levels and any visual amenity impacts to the township of Broken Hill. To minimise dust entrainment by wind the waste rock was not crushed and a chemical dust suppressant was applied.

The CBP is currently being constructed off-site and it is anticipated that this Project will be completed by the end of April with the installation of concrete storage bunkers, loading hopper and conveyor.

4.6.1.2 Construction of the embankments and retaining wall at TSF2

Development consent (PA07_0018) was granted to construct three embankments and a retaining wall at low points around the perimeter of the Blackwood Pit TSF (TSF2) in September 2017. The

preliminary design was endorsed by the NSW Dam Safety Committee in December 2016. The EA and associated studies are available on the CBH website.

BHOP are currently in discussion with the EPA in regards to an air quality monitoring program for the construction period and operations. When these negotiations are finalised BHOP will update the Air Quality Management Plan and Monitoring Program. No works will commence for the construction of the embankments until these have been approved by the DPE.

Construction of the embankments will be staged in line with required filling rate of the facility, with Embankment 2 required for tailings deposition by October 2019 and Embankments 1 and 3 by December 2020. As a result, the storage capacity of the facility after construction of the proposed embankments and retaining wall is estimated to be 1.9 Mm^3 or 2.95 Mt (from April 2016), thereby extending the life of the facility to mid-2021. Note, the capacity has been estimated 1.5 m below the top of the embankment and retaining wall elevations (as potential for a freeboard and to accommodate any settlement).

Construction will be progressed in two stages with the construction of Embankment 2 and the spillway forming Stage1 commencing in the third quarter of 2018, and construction of Embankments 1 and 3 forming Stage 2 commencing approximately 12 months later when the tailings reach the required level and have settled sufficiently for installation.

The embankments will be formed from compacted waste rock excavated during mining operations and currently stored in Kintore Pit. The rockfill would also be used to form a pioneering layer for raise construction on potentially soft tailing. The testing procedure for lead content of the waste rock will be the same as used for the noise bund constructed at the CBP.

The embankments will be lined and seepage collection systems installed. A stormwater collection systems will be designed for each embankment with Embankment 2 stormwater runoff directed to a new stormwater pond to be located to the north of the embankment and rainwater from embankments 1 and 2 directed to the current stormwater management system.

Golder Associates have been engaged to design the extensions to TSF2 and associated infrastructure are currently completing the detailed design. Following completion of the detailed design the Site Water Management Plan and Air Quality Management Plan will be updated.

4.6.1.3 Warehouse extension

Subject to approval, an extension to the current Warehouse will be undertaken during the reporting period. The Warehouse is located on freehold land owned by BHOP.

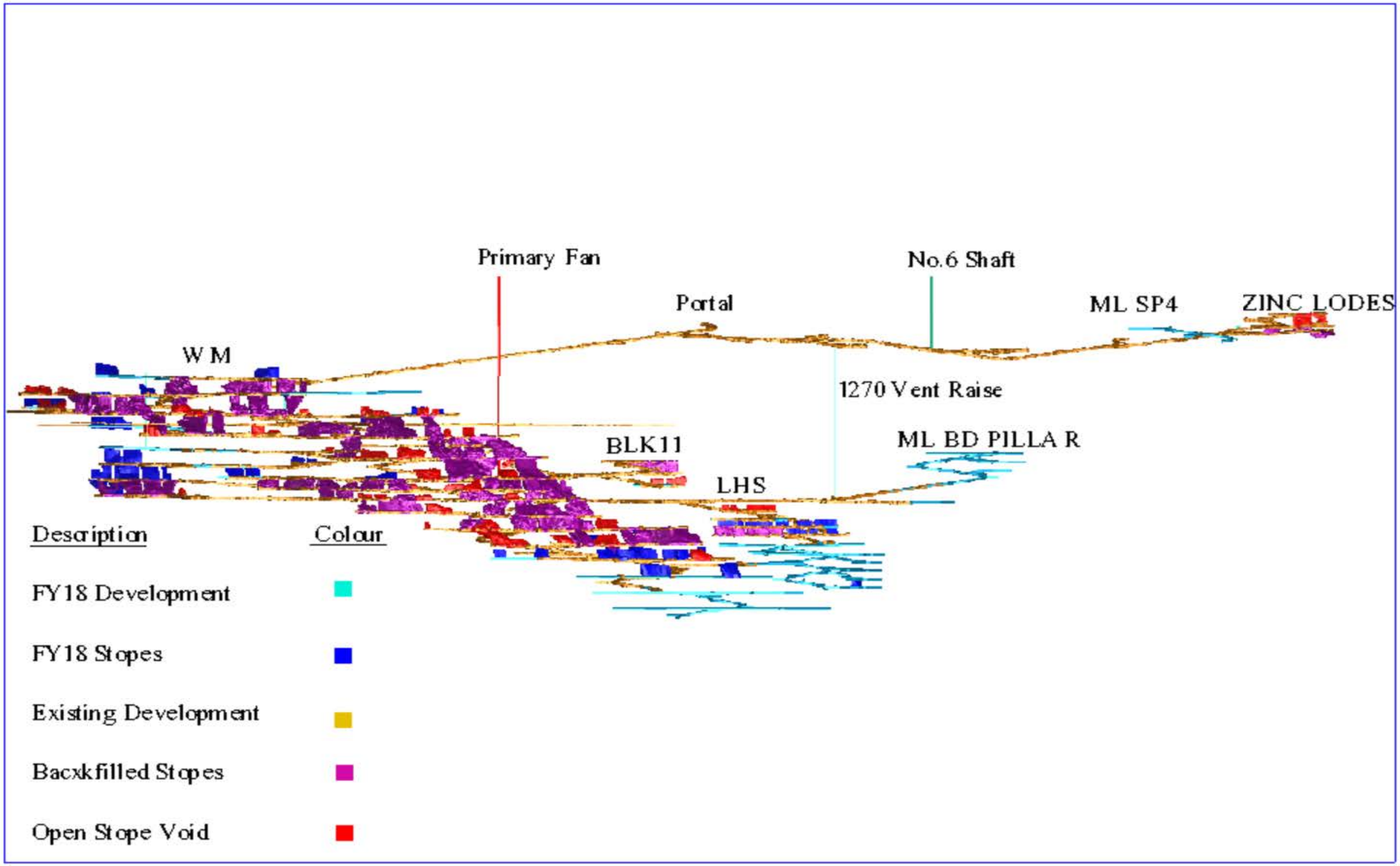
4.6.2 Exploration

- Exploration will continue on surface and underground consistent with that outlined in the MOP.
- Surface drilling programs will take place within CML7 and EL5818. Proposed drilling targets include, Brownes Shaft drilling, Western Mineralisation, Blackwood Pillar, Wilsons Pillar (B14 East Vein, Footwall Target, South Dump Target, Main Lodes, Eyre Street Goossan and Ironstone. A total of 4,000 m of near mine exploration drilling is proposed for surface drilling of CML7 in 2018.
- Underground drilling will continue in line with mine plans.
- Rehabilitation of drill pads has been delayed in lieu of further drilling planned in this area in 2018.

4.6.3 Operations

Mining will continue as underground operations only, **Table 4-7** outlines the planned production rates for 2018**. Plan 3** (**Figure 4-2**) shows the mining areas and stopes. Planned mine production is 721,573 t, tailings deposition is estimated at 620,665 t. It is also planned to commission the Backfill Plant in late 2018 which will result in future tailings placement in underground voids.

Figure 4-2 Plan 3 Long Section Planned Stopes for the Next Reporting Period 2018



There are no plans to upgrade the mining fleet in the next reporting period.

Table 4-6 Summary of Planned Production for 2018

Activity	January to December 2018 (t)
Ore Mined	721,573
Waste Backfill (UG Rock Places)	292,608
Waste Trucked to Surface	188,258
Milled	721,573
Lead concentrate	30,857
Zinc concentrate	62,611
Tailings deposited	628,106
TSF2 storage capacity as at end of period	3.5 years (with approved embankments)

4.6.4 Water structures - maintenance

Detailed surveying of the water storage structures is planned for the next reporting period. Surveys will be used to develop staged storage curves that will enable more accurate capacities and volumes to be determined.

4.6.5 Modification applications

BHOP will also make three applications to modify its Project Approval during 2018:

- To extend the warehouse (not located on CML7).
- To deposit tailings in Kintore Pit and to relocate the Mine portal.
- To extend underground mining operations across CML7.

5. ACTIONS REQURIED FROM PREVIOUS ANNUAL REVIEW

BHOP received a notification of a satisfactory AEMR (2016) on 6 July 2017 and no further actions were requested.

6. ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

6.1 Meteorological

Figure 6-1 and **Table 6-1** provide summary weather data. This data is a combination of information from the Rasp Mine weather station and the Bureau of Meteorology station at the Broken Hill airport as the site weather station was off-line between March to June for repairs.

While temperatures in 2017 remained consistent with historical records, rainfall (108.8 mm) for the period was significantly lower than the BoM's long-term annual average of 259 mm. There were only 35 rain days for the period with most rain falling in spring (36.6 mm) and summer (30.0 mm) during periods of highest evaporation resulting in very dry conditions. Winds were predominantly from the south with high winds experienced during July to October and December.

Figure 6-1 Weather Data for the Reporting Period (2017)

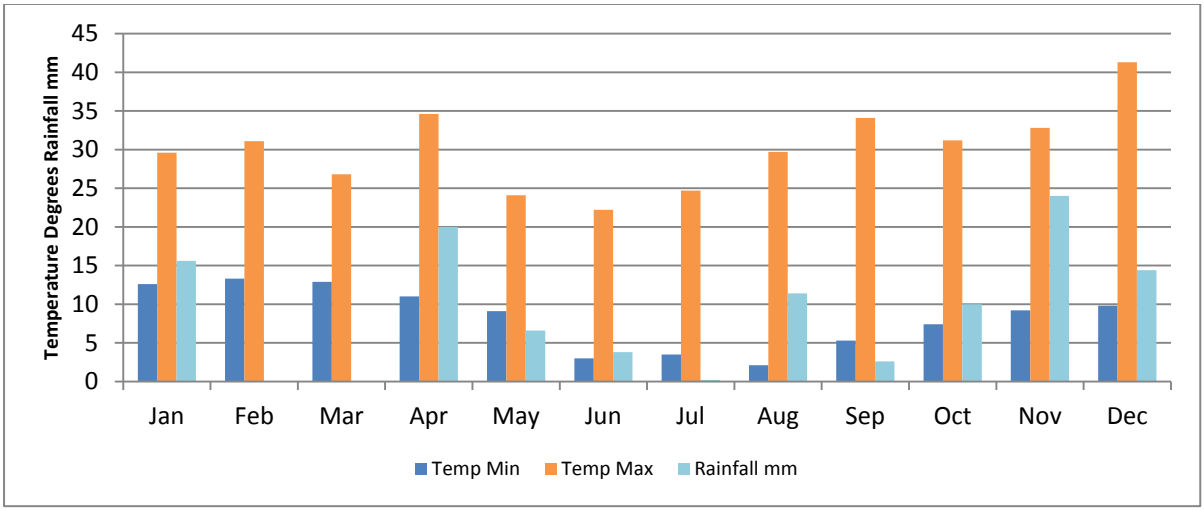


Table 6-1 Summary of Wind and Rain Days in Reporting Period (2017)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Predominant Wind Direction		S	S	S	S	S	W	SSW	N	S	S	S
Max wind speed (gusts)		63	65	69	50	46	76	74	80	72	65	85
Days rained in month	4	0	0	6	4	2	1	2	2	4	8	2

6.2 Environmental Monitoring Locations

The BHOP site environmental monitoring program is summarised in **Table 6.2** and locations for sampling/monitoring points are shown in **Figure 6.2**.

Table 6-2 Summary of BHOP Environmental Monitoring Program

EPA ID	BHOP ID	Parameter	Frequency
AIR QUALITY			
1 & 56	Primary Vent Shaft and Shaft 6	- Oxides of Nitrogen (as NO_2) -Total solid particles (TSP) - Volatile organic compounds - Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V	Quarterly (at blasting event)
2	Crusher Baghouse Stack	- Total solid particles (TSP) - Total - Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V	Quarterly
3 - 9	D1 – D7	Insoluble solids, Lead	Monthly
10	TSP-HVAS	Total Suspended Particulate, Lead on filter paper	Every 6 days
11 & 12[1]	HVAS1 & 2	PM10, Lead on filter paper	Every 6 days
13 & 14	TEOM 1 & 2	PM10, Wind Speed/Direction	Continuous
SURFACE WATER			
29 - 36	S31-1, 44, 49, 1A, 9B-2, Horwood Dam, Upstream and Downstream	pH, EC, TDS, SO4, Cl, Na, Cd, Pb, Mn, Zn	When contain water (at least 2 per 12 mths) April & October
GROUNDWATER			
37 - 52	GW01 – GW16	pH, EC, TDS, SO4, Cl, Ca, Mg, Na, Fe, Cd, Pb, Mn, Zn	Quarterly

EPA ID	BHOP ID	Parameter	Frequency
53 & 54	Shaft 7 & Kintore Pit extraction	pH, EC, TDS, SO4, Cl, Ca, Mg, Na, Fe, Cd, Pb, Mn, Zn	Quarterly
NOISE & BLASTING VIBRATION			
15 - 28	A1 – A14	Leq, 15min/Day Leq, 15min/Evening Leq, 15min/Night	Annually
V1 – V5	V1 – V5	dB mm/ second	Continuous (when blasting)
-	V6	dB mm/ second	Continuous (when blasting)
-			
WEATHER			
55	Meteorological Station	Temperature, wind speed & direction, rainfall	Continuous (15 minute intervals)

Note 1 = EPL 12559 lists TSP and TSP Lead to be sampling from these units, however, these units can only monitor one type of parameter. BHOP are in discussion with the EPA to resolve this.

The following sections provide a summary of these monitoring requirements together with the results for the reporting period. A discussion of any identified trends and a comparison with predictions in the original EA/PPR are also provided where available.

6.3 Air Quality

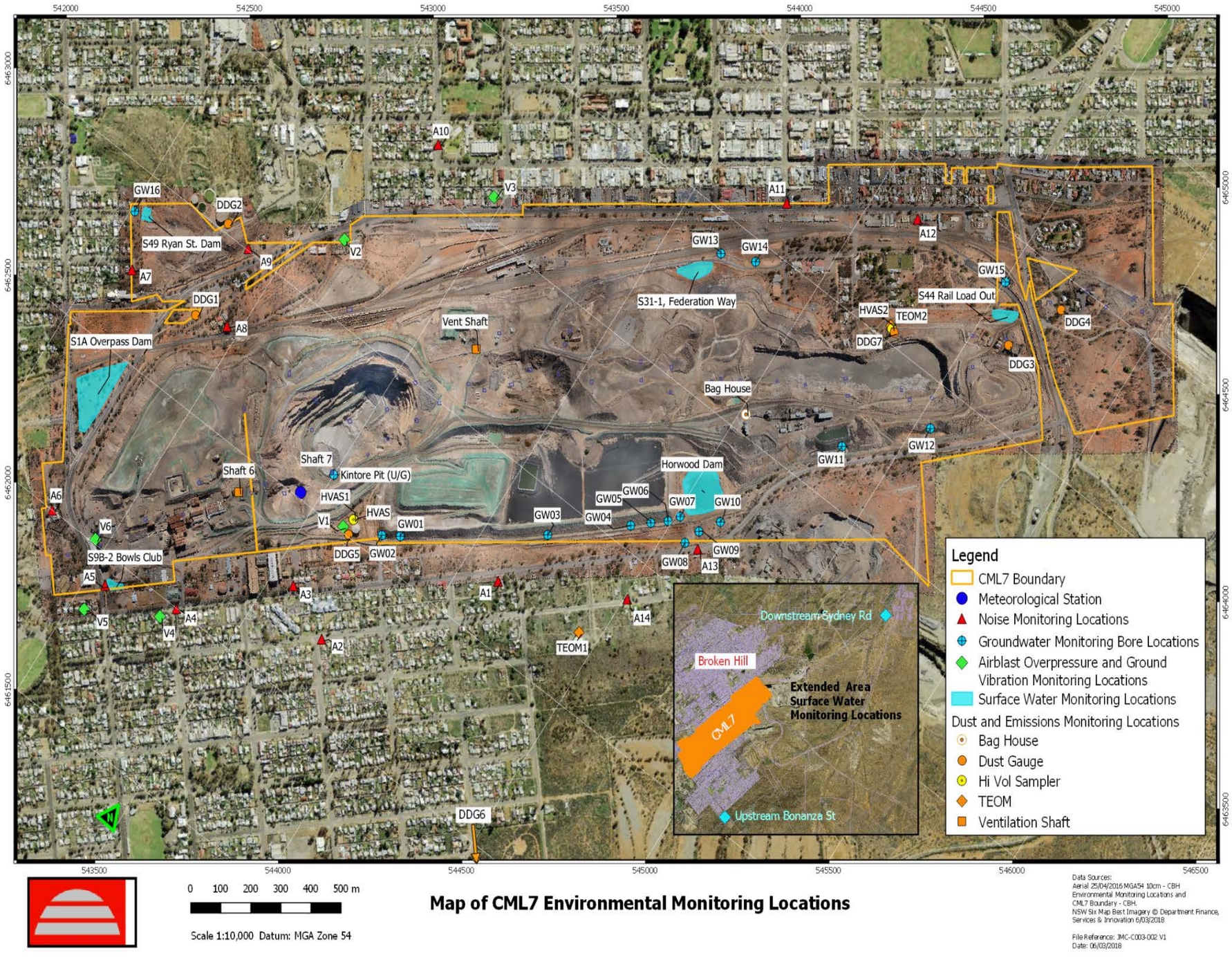
In accordance with the conditions of PA07_0018 and EPL12259 air quality is monitored:

- Air emissions from in-stack mine exhaust ventilation and the crusher baghouse are tested quarterly by an external contractor with specialised equipment;
- Ambient air quality is monitored by BHOP personnel via a combination of dust deposition gauges, high volumes air samplers (HVAS) and tapered element oscillating microbalance (TEOM) sampling units; and

Real-time information is downloaded and alerts automatically forwarded to assist in the day-to-day operational management of issues as well as long-term analysis of environmental data.

Figure 6-2 shows the sampling locations for all air quality monitoring units.

Figure 6-2 Location of Monitoring / Sampling Points



6.3.1 In-stack air quality

During the reporting period BHOP engaged Assured Monitoring Group (AMG) to conduct testing of the mine ventilation exhaust points and the Crusher Baghouse, testing was performed each quarter in accordance with the EPL. AMG are NATA accredited to perform this testing. The EPL Condition L2.1 specifies the in-stack performance criteria for the two ventilation exhaust units - Primary Ventilation Shaft and Shaft 6 and the Crusher Baghouse. **Table 6-3** provides the results of the testing against the limits as set out in the EPL. All limits were met.

Table 6-3 Vent and Baghouse Testing Results During the Reporting Period

	Limit	Primary Vent (EPL1)				Vent Shaft 6 (EPL 56)				Crusher Baghouse (EPL2)			
Testing Date (2017)		30/1	5/4	4/7	4/9	30/1	5/4	4/7	4/9	30/1	5/4	4/7	4/9
Nitrogen Oxides (mg/m^3)	350	3.27	4.5	3.9	2.9	4.5	<2.1	<2.05	<2.1	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Volatile Organic Compounds (mg/m^3)	40	<0.49	<0.4	<0.44	<0.44	<0.49	<0.5	<0.46	<0.43	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Total Suspended Particles (mg/m^3)	20	6.67	3.1	9.6	4.8	2.8	1.9	5.29	<1.4	14.5	8.4	13.6	<1.6
Type 1 and Type 2 (mg/m^3)	1	0.261	0.053	0.139	0.067	0.035	0.062	0.060	0.061	0.561	0.28	0.248	0.202

Note 1 = Not required to be tested.
Note 2 = Type 1 substance Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements. Type 2 substance Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements.

Air Quality Management Plan BHO-PLN-ENV-001 lists the controls that were in place during the reporting period. In summary, the major controls include:

- Automatic watering sprays on the ventilation shafts; and
- Fully enclosed primary crusher operating under negative pressure to a baghouse.

6.3.2 Dust deposition gauges

Dust deposition levels refer to the quantity of dust particles that settle out from the air as measured in grams per square metre per month (g/m^2/month) at a particular location. Total fallout dust (depositional dust) is continuously monitored from seven deposition gauges located on and around the Rasp Mine, as shown in **Figure 6-2**. D1 and D6 are located off-site, D1 near the St Johns training facility north of the Rasp Mine and D6 in Casuarina Avenue south of the Rasp Mine. D2 to D5 and D7 are located on the Mine lease in various locations.

Samples are collected monthly and are sent to ALS Laboratory (NATA accredited) in Newcastle and analysed for total deposited dust and deposited lead-dust. Deposited dust is assessed as insoluble solids as defined by Standards Australia, 2003, AS 3580.10.1-2003: *Methods for Sampling and Analysis of Ambient Air - Determination of Particulates - Deposited Matter - Gravimetric Method*.

Dust deposition criteria are provided in terms of both an acceptable increase in dust deposition over the existing background levels and an absolute maximum value. These impact assessment criteria are summarised in **Table 6-4.** Note some of the background results exceeded 4 g/m^2/month prior to the commencement of Rasp Mine operations.

Table 6-4 Dust Deposition Criteria

Pollutant	Averaging Period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m^2/month	4 g/m^2/month

Provided below is a discussion of results for dust deposition during the reporting period (2017) and trends over the operational life of the Rasp Mine. Dust deposition results are reported and reviewed internally on a monthly basis.

Table 6-5, Figure 6-3 and **Figure 6-4** show the monthly dust deposition and total deposited lead-dust results for the reporting period. In **Table 6-5** Blue represents the lowest result at that monitoring location for the reporting period and maroon represents the highest. Dust deposition results are higher for all gauges in 2017 when compared to the previous year. This may be the result of significantly lower rainfall (108 mm) than the BoM's long-term average of 259 mm.

There were six occasions where the monitoring location exceeded the depositional dust level of 4 g/m^2/month (highlighted in bold in **Table 6-5**), two occurred at on-site locations (D3 and D5) and three occurred at Casuarina Avenue (D6). Note background levels at D3 and D5 are above 4 g/m^2/month, there is no background for D4. The spike in total deposited dust at the Thompson's Shaft location (D3 onsite) in July is unknown and following an investigation has been identified as probable contamination of the sample. This higher result did not continue into the following months. Elevated total dust recorded at the offsite monitor at Casuarina Avenue (D6) appears to have been caused by motor bikes accessing the vacant lot at the rear of the property. A more suitable location is being investigated. It should be noted that known background levels were equal to, or exceeded, 4 g/m^2/month.

No monitoring locations exceeded the site contribution of 2 g/m$^{2/}$month for depositional dust above background.

There is no criteria for deposited lead dust. The total monthly deposited lead dust is comparable with 2016 data, with the exception of D5 Silver Tank (on-site). Following an investigation the result for the high reading in September for D5 is unknown and has been identified as probable contamination of the sample. Five of the seven locations recorded its highest result in September which is historically know as a windy month, in 2017 twenty-one days recorded above 30 km/h winds.

Table 6-5 Dust Deposition Results for the Reporting Period (g/m$^{2/}$month)

	D1 EPL3 (off site)		D2 EPL4		D3 EPL5		D4 EPL6		D5 EPL7		D6 EPL8 (off site)		D7 EPL9	
2017	DD	LD	DD	LD	DD	LD	DD	LD	DD	LD	DD	LD	DD	LD
Jan	0.79	0.003	0.11	0.001	0.45	0.003	1.24	0.007	1.41	0.006	1.92	0.002	1.24	0.010
Feb	0.91	0.002	0.68	0.001	0.96	0.002	2.15	0.008	1.53	0.006	**4.41**	0.002	1.58	0.011
Mar	0.57	0.003	0.85	0.002	1.08	0.005	2.43	0.013	1.70	0.007	**7.41**	0.005	2.15	0.019
Apr	0.57	0.005	1.80	0.008	0.11	0.017	1.41	0.007	1.13	0.010	3.70	0.003	1.36	0.009
May	0.45	0.003	0.23	0.001	0.68	0.005	0.91	0.002	0.85	0.006	1.19	0.001	0.85	0.003
Jun	0.62	0.003	0.17	0.001	0.91	0.005	0.68	0.002	1.19	0.006	0.85	0.001	0.62	0.003
Jul	1.36	0.006	0.62	0.001	**16.75**	0.023	1.24	0.007	1.87	0.017	2.32	0.006	1.13	0.005
Aug	0.28	0.002	0.23	0.001	1.75	0.010	0.85	0.005	0.91	0.007	**4.81**	0.006	0.17	0.004
Sep	1.58	0.027	1.19	0.015	1.47	0.009	2.83	0.018	**8.09**	0.401	**4.41**	0.038	1.81	0.049
Oct	0.85	0.003	1.13	0.003	1.30	0.005	2.43	0.012	2.38	0.013	3.45	0.004	2.21	0.010
Nov	1.41	0.008	0.79	0.007	1.30	0.022	2.66	0.024	1.87	0.006	3.85	0.007	2.15	0.034
Dec	2.66	0.001	0.34	0.001	1.87	0.005	3.28	0.008	1.41	0.001	1.92	0.001	1.87	0.005
2010	**4.0**	**0.003**	**3.1**	**0.005**	**4.3**	**0.005**	**5.7**	**0.006**	**N/A[1]**	**N/A[1]**	**5.8**	**0.004**	**N/A[1]**	**N/A[1]**

Note 1 = Background is not available for these locations.

Figure 6-3 Monthly Total Deposited Dust for 2017

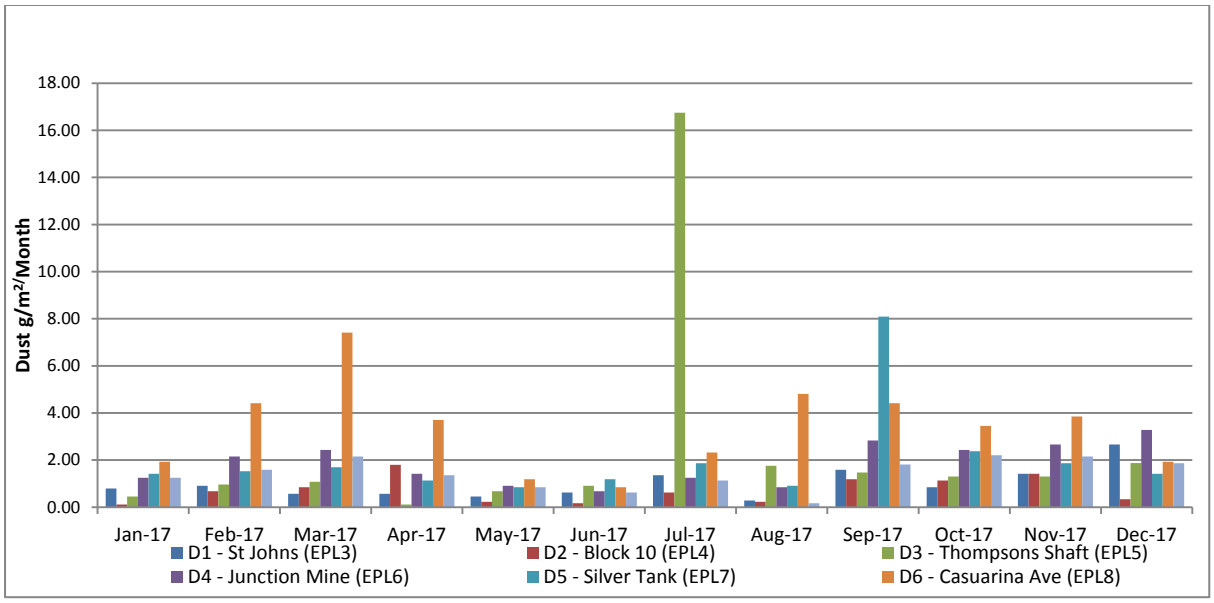
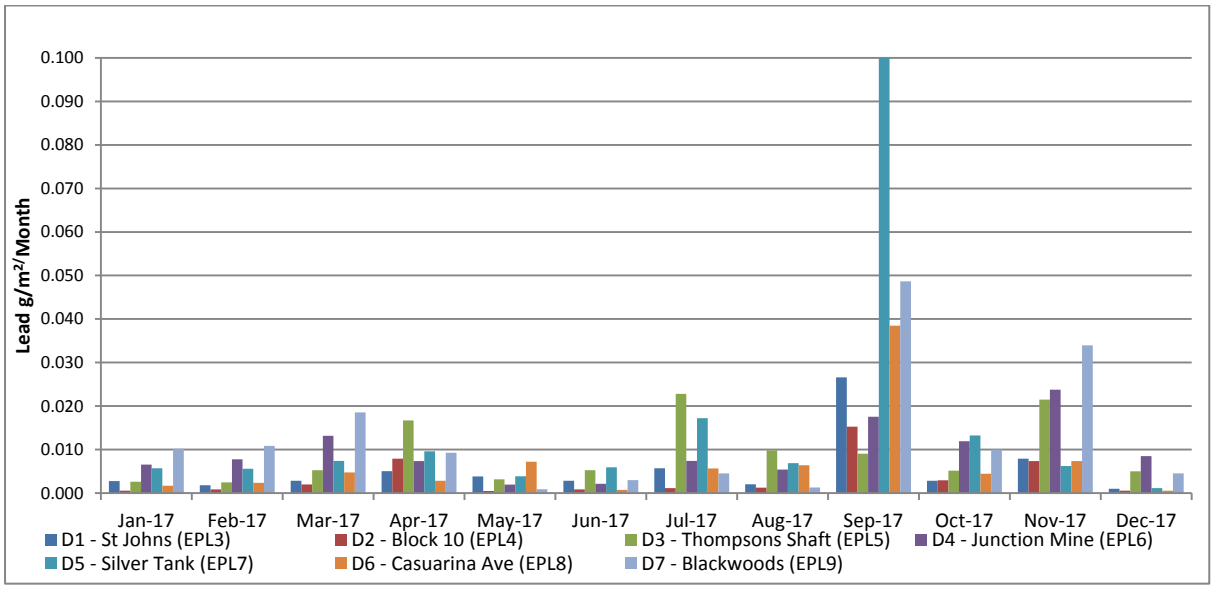


Figure 6-4 Monthly Lead Deposition for 2017



Results for 2017 are consistent with previous years.

In the original EA predictions were made for receptor locations and not at the monitoring units. The closest receptor to a gauge is R28 located at Proprietary Square a distance of 30 m. Predicted results for dust deposition at R28 was 2.83 g/m^2/month, this is double the annual average dust deposited at the closest gauge D7 of 1.428 g/m^2/month. The lead dust results for the reporting period are also below predicted results. The predicted result for lead dust at R28 was 0.040 g/m^2/month, again this is considerably higher than the annual average lead dust deposited at the closest gauge D7 of 0.0135 g/m^2/month.

Figure 6-5 provides a summary of results for deposition dust and **Figure 6-6** provides a summary of results for deposited lead-dust for the period 2007 to 2017. Significant operational activities include:

- March to May 2007 when works commenced on installation of the portal at the floor of Kintore Pit;

Figure 6-5 Results for Deposition Dust 2007 – 2017

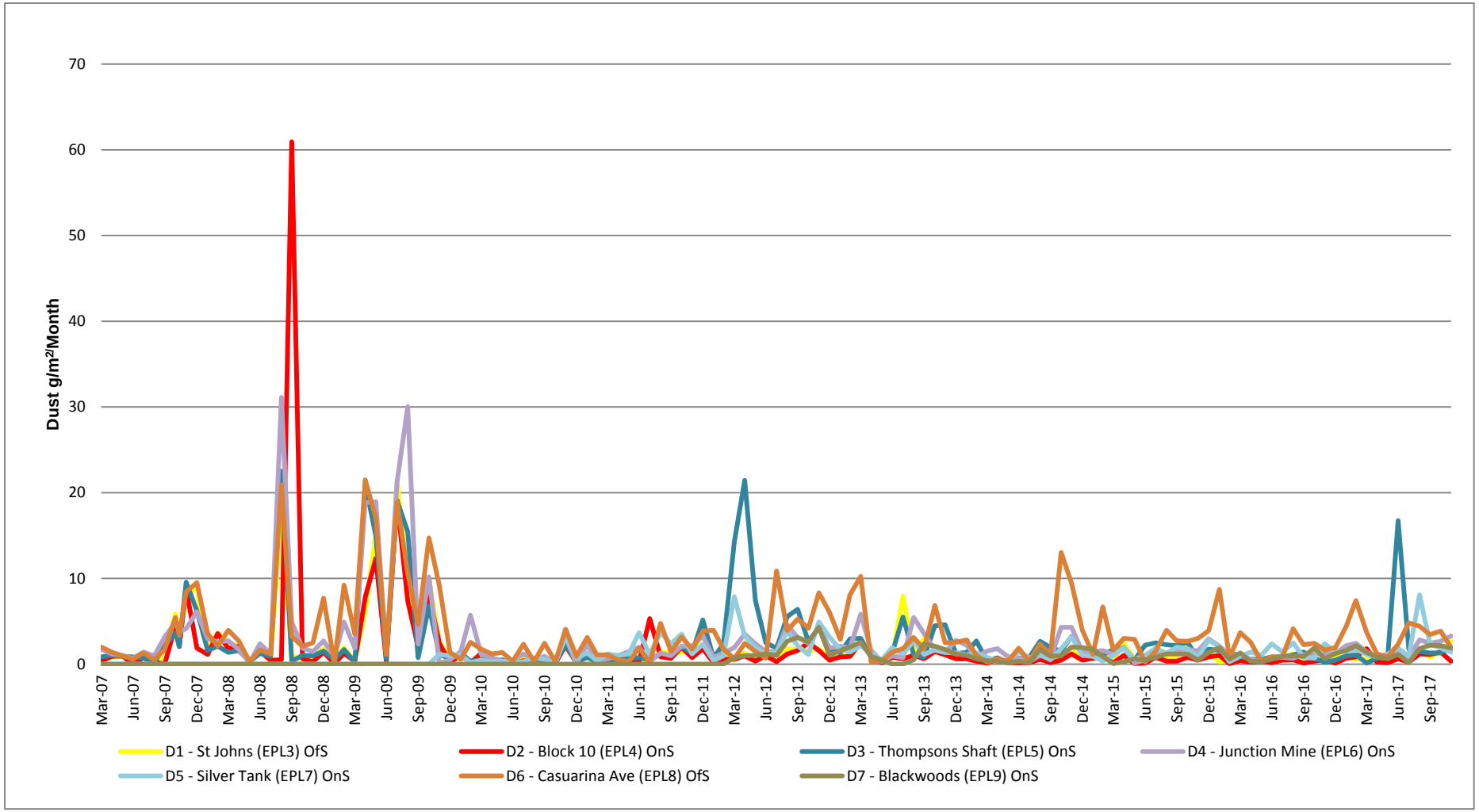
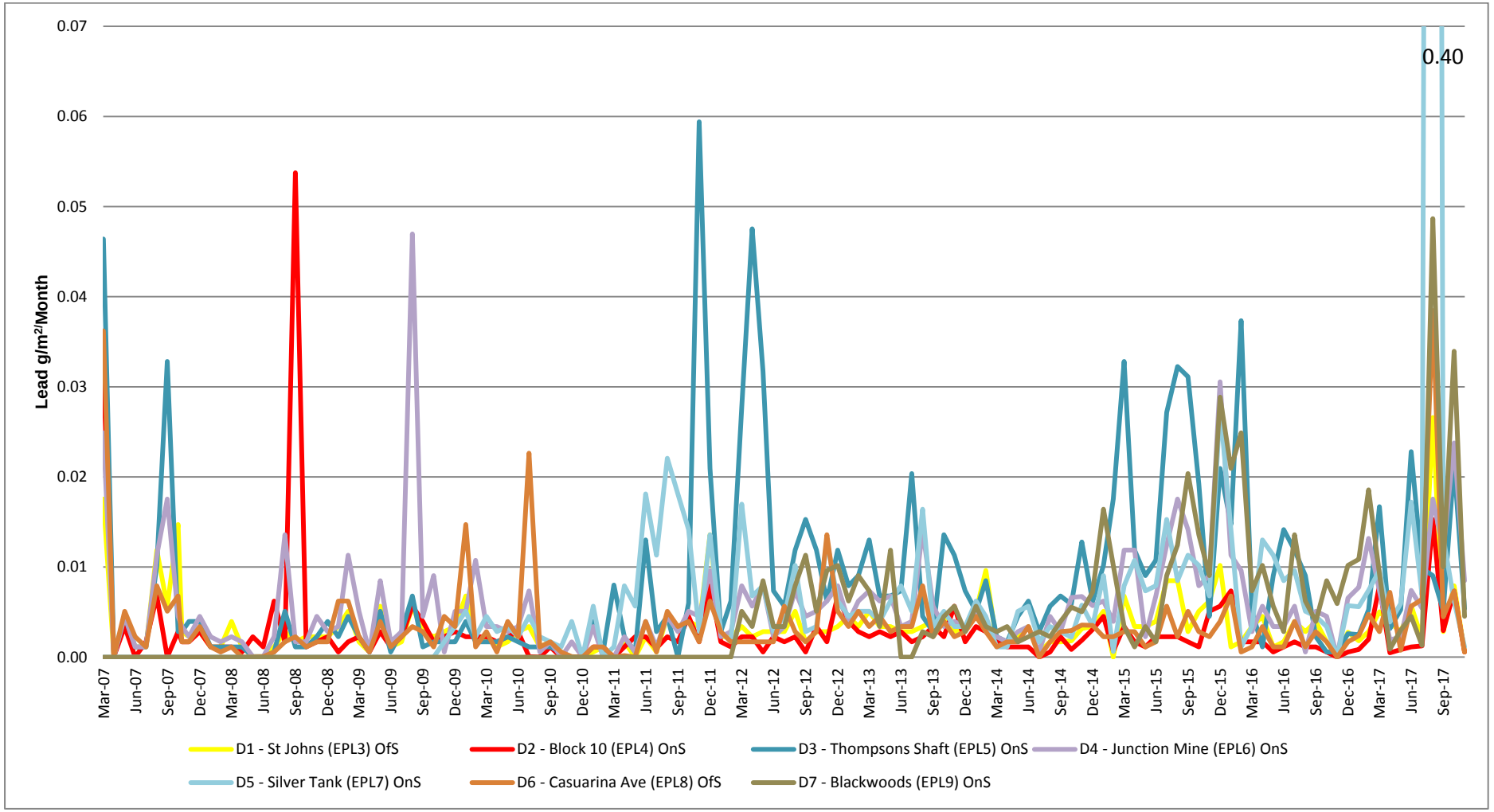


Figure 6-6 Results for Deposition Lead-dust 2007 to 2017



- During 2008 and 2009, the period of the GFC, no active mining activities occurred at the site;
- March 2011 to March 2012 major earthworks and construction of the processing plant;
- April 2012 when Rasp mining operations and processing commenced; and
- The application of chemical dust suppressant over free areas (non-active mine areas) of the site commenced in late 2012, the program was extended in 2013/14.

6.3.3 High volume air samplers

There are three high volume air samplers used to measure ambient air quality at the Rasp Mine – HVAS (EPL10) and HVAS1 (EPL11) are located at the Silver Tank, central and to the south of the mine lease, and HVAS2 (EPL12) is located adjacent to and north of Blackwood Pit. Locations are shown in **Figure 6-2**. HVAS samples for total suspended particulates (TSP) and lead dust, and HVAS1 and HVAS2 sample for particulate matter less than 10 microns (PM_{10}) and lead dust.

Samples are collected every six days and are sent to ALS Laboratory (NATA accredited) in Newcastle. **Table 6-6** and **Table 6-7** outline the impact assessment criteria as listed in PA07_0018.

In accordance with the PA07_0018 from September 2017 the criteria for the annual rolling average for PM_{10} criterion was reduced from 30 μg/m^3 to 25 μg/m^3. All other air quality criterion remain unchanged.

Table 6-6 Impact Assessment Criteria

Pollutant	Averaging Period	Criterion
Total suspended particulate (TSP) matter	Annual	90 μg/m^3
Particulate matter < 10 μm (PM_{10})	Annual	25 μg/m^3
Particulate matter < 10 μm (PM_{10})	24 hour	50 μg/m^3

Note: Criteria changed from 30 μg/m^3 to 25 μg/m^3 in September 2017

Provided below is a discussion of results for each HVAS unit during the reporting period (2017) and trends over the operational life of the Rasp Mine. HVAS unit results are reported and reviewed internally on a monthly basis.

On the following occasions during the reporting period the HVAS units were offline due to interruption of electricity supply, operator error or repairs and samples could not be taken: HVAS – 23 Jan, HVAS1 – Nil and HVAS2 – 16 Feb and 26 Oct.

HVAS (EPL10)

TSP and TSP-lead results for 2017 recorded by HVAS are show in **Figure 6-7** and **Figure 6-8**, these show the results have remained consistent over the reporting period.

The annual average TSP at the HVAS unit recorded 36.81μg/m^3 for the reporting period was, a slight increase from the previous period from 35.88 μg/m^3, however the result remains below the background annual average of 56.4μg/m^3 and the criteria of 90μg/m^3. Higher general dust levels may be the result of lower rainfall in the area.

The annual average TSP-lead at the HVAS unit has decreased from 0.23 μg/m^3 in the 2016 reporting period to 0.18 μg/m^3 in the 2017 reporting period. The Rasp Mine PA07_0018 does not stipulate any criteria for lead, however the recorded annual average of TSP-lead remains below the NSW EPA guideline of 0.50 μg/m^3.

On 13 December Broken Hill experienced high winds (49 km/h) with dry conditions (39.5^{o}C), winds were predominantly from the north east, result in a high reading for TSP (229 μg/m^3) and TSP-lead (1.30 μg/m^3). This was a storm event and the criteria does not apply.

Figure 6-9 provides a summary of TSP and TSP-lead results from 2008 to 2017. Results for are well below the EPA threshold of 90 μg/m^3 for TSP and 0.5 μg/m^3 for TSP-lead.

Figure 6-7 HVAS TSP Results for the Reporting Period (2017)

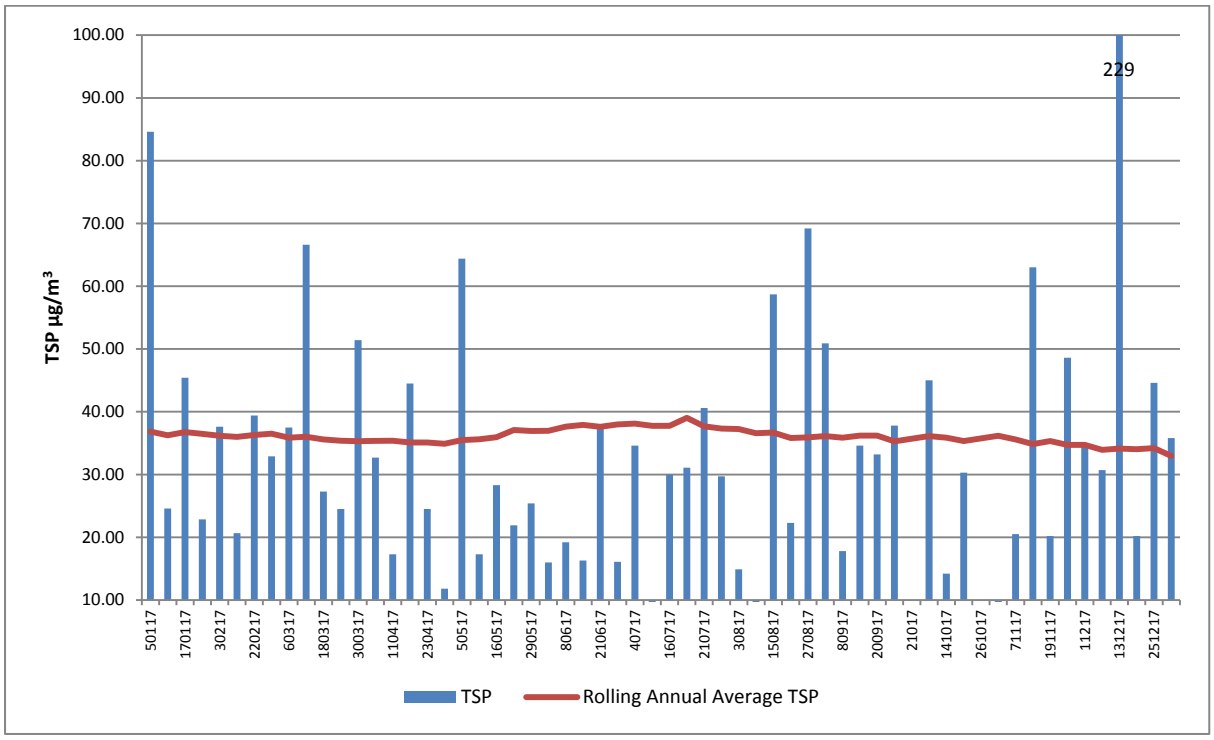
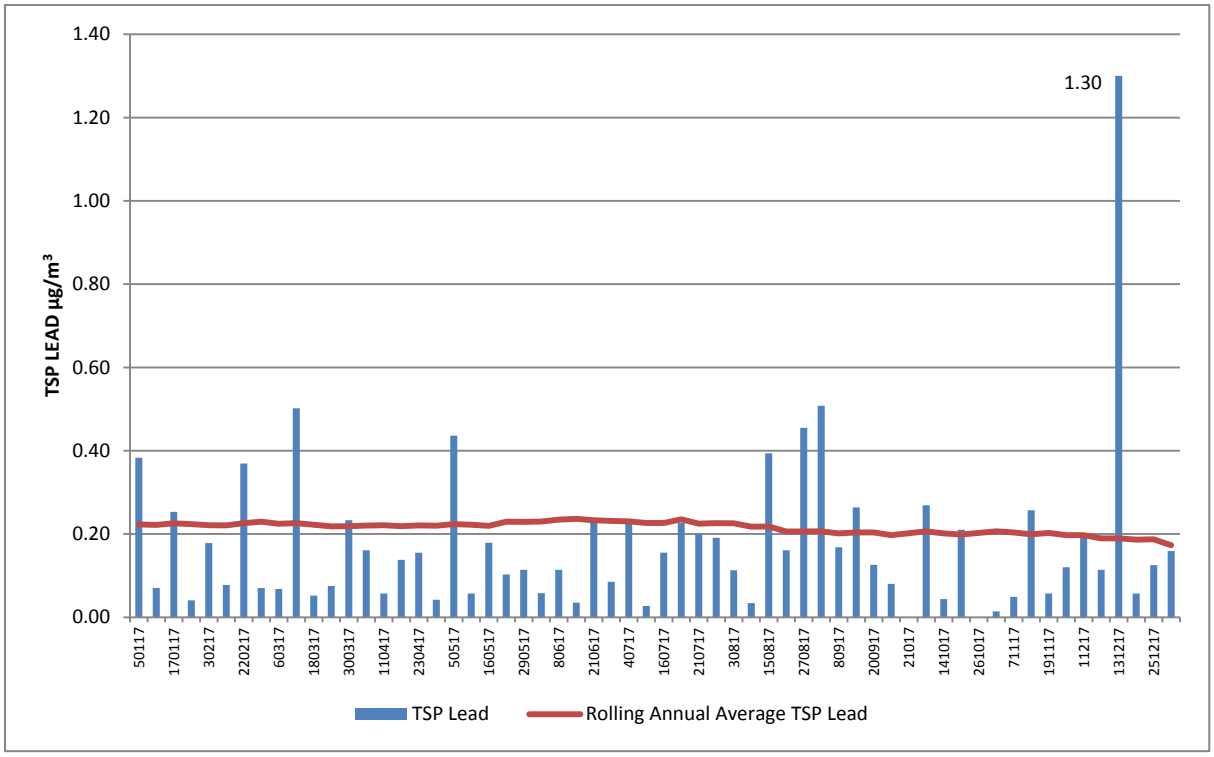
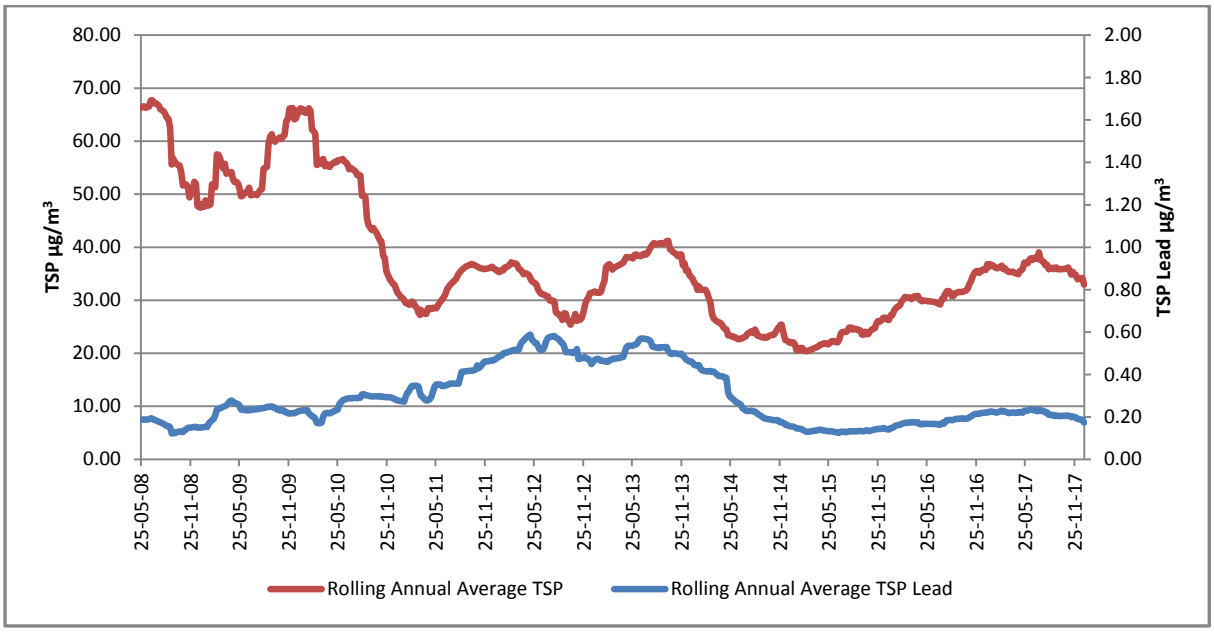


Figure 6-8 HVAS TSP-Lead Results for the Reporting Period (2017)



The original EA did not include a receptor close to HVAS in predictions for total suspended particles.

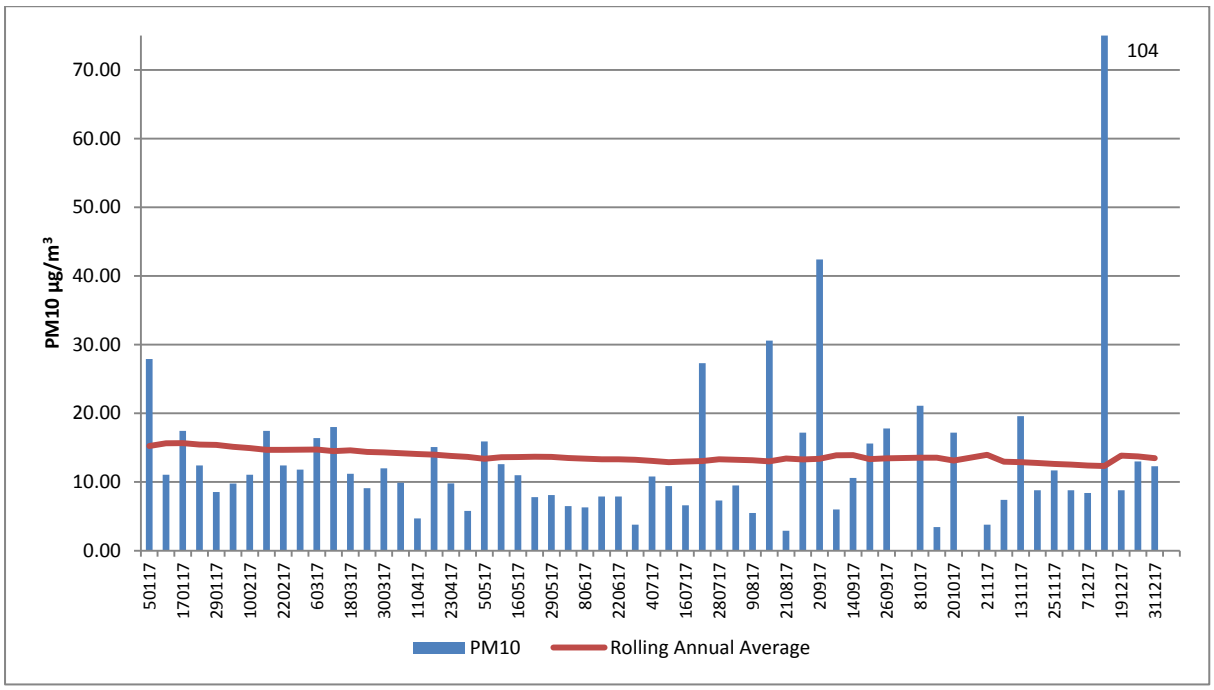
Figure 6-9 HVAS TSP and TSP-Lead Results for the Period 2008 to 2017



HVAS1 (EPL11)

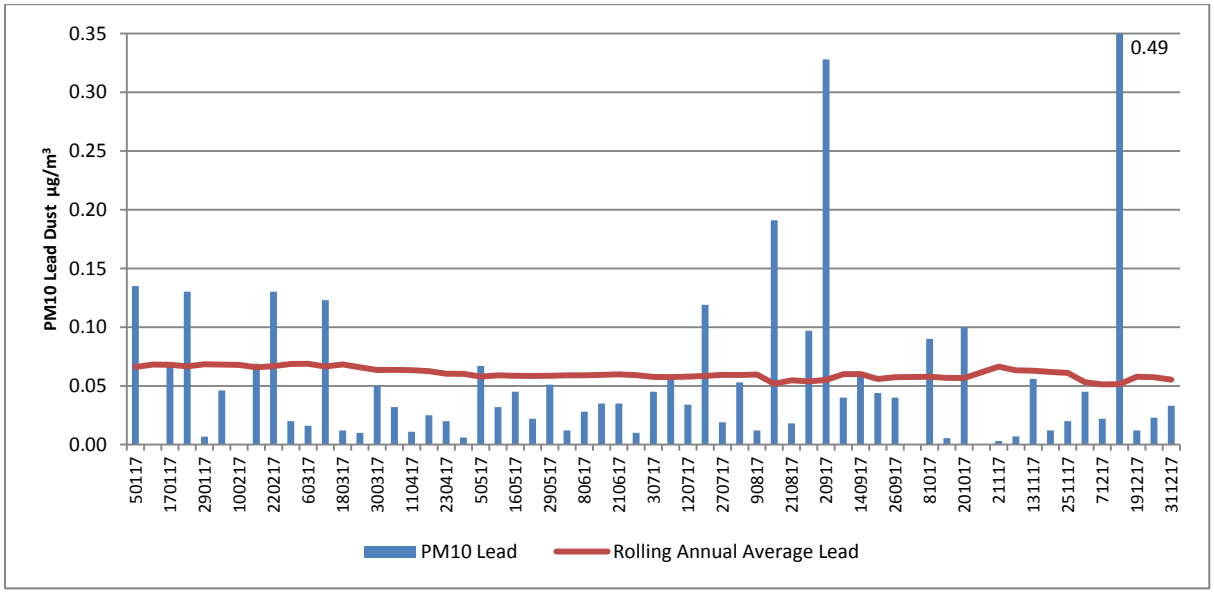
HVAS1 is used for sampling PM_{10} and PM_{10}-lead. The average annual PM_{10} level recorded at this monitoring point at the end of the reporting period was 13.62 µg/m^3, which has decreased from the previous reporting period of 14.78 µg/m^3 and remains below the background level reported in the EA of 29.1 µg/m^3. Results for the reporting period are show in **Figure 6.10** which indicates that a the rolling annual average for PM_{10} remains below the criteria of 25 µg/m^3. Wind speeds up to 49 km/h from the north to north-east created dust storms across monitors on 13 December for all HVAS monitors and was the result of a dust storm throughout the Broken Hill area. Trends are discussed below and results for the period 2011 to 2017 are shown in **Figure 6-14**.

Figure 6-10 HVAS1 PM_{10} Results for the Reporting Period (2017)



The annual average PM_{10}-lead concentration has decreased slightly from 0.07 μg/m^3 in the previous reporting period to 0.06 μg/m^3, **Figure 6-11.** There is no criterion for PM_{10}-lead. Trends are discussed below and results for the period 2011 to 2017 are shown in **Figure 6-15**.

Figure 6-11 HVAS1 PM_{10}-Lead Results for the Reporting period (2017)



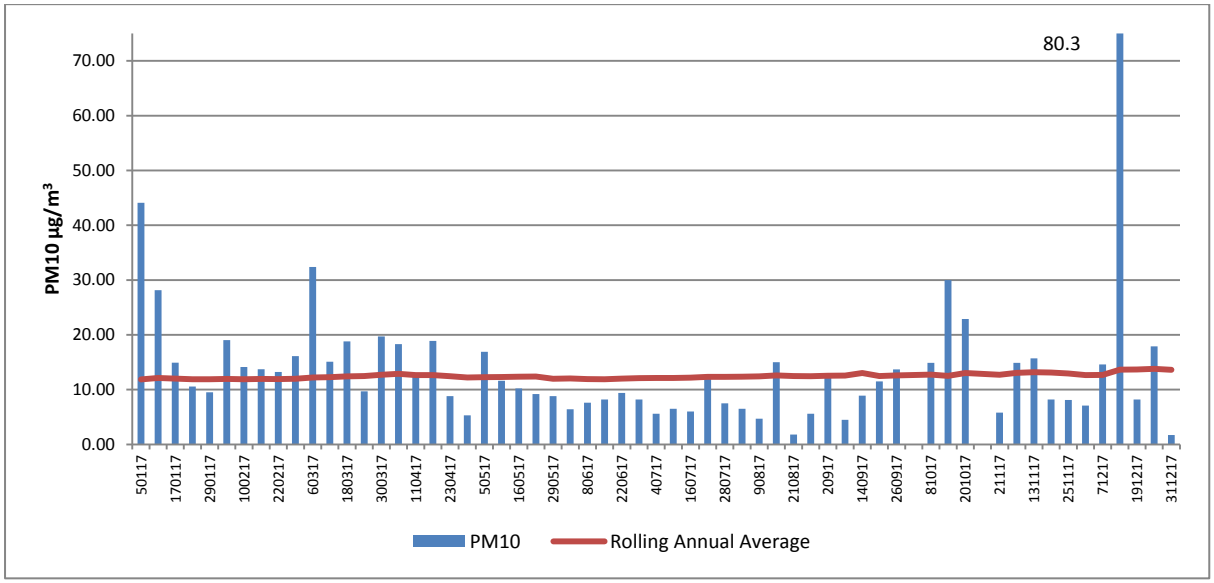
HVAS2 (EPL12)

The average annual PM_{10} level recorded at this monitoring point at the end of the reporting period was 12.97μg/m^3, which has increased slightly from the previous reporting period (11.34μg/m^3), however it remains below the background level reported in the EA of 29.1μg/m^3 and remains well below the criteria of 25μg/m^3 (for off-site receptors), **Figure 6-12.**

The recorded PM_{10} result at HVAS2 (12.97 μg/m^3) is well below the prediction for R28, the closest receptor to this monitoring point (30 m) reported in the EA for MOD4 at 17.54 μg/m^3.

Trends are discussed below and results for the period 2011 to 2017 are shown in **Figure 6-14**.

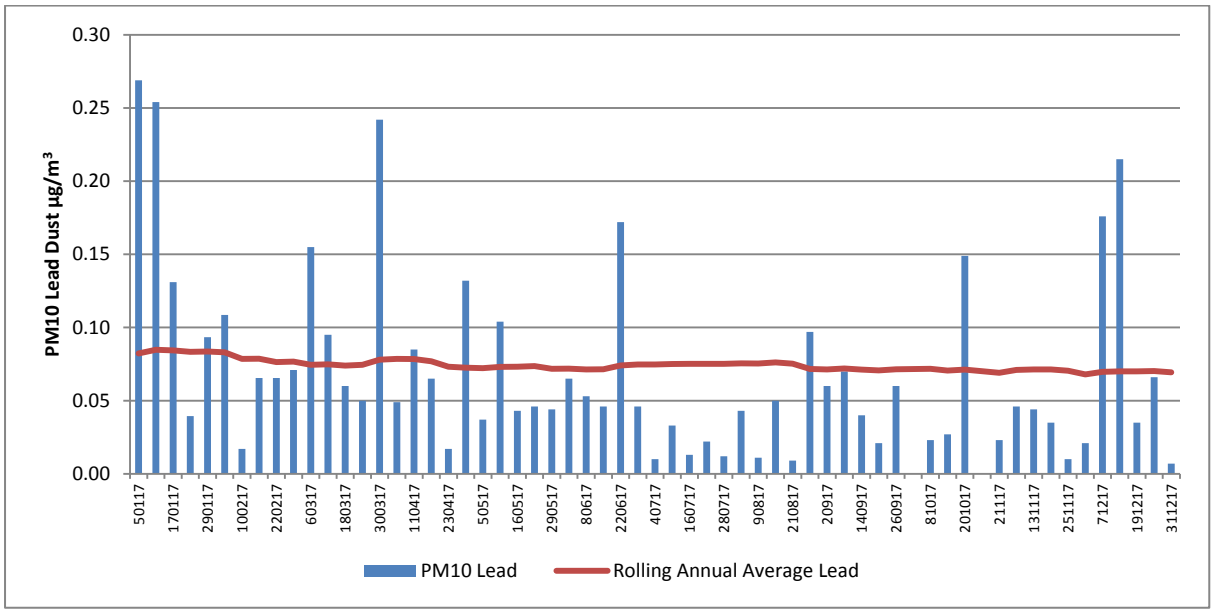
Figure 6-12 HVAS2 PM_{10} Annual Average Results for the Reporting Period (2017)



At the end of the reporting period the annual average PM_{10}-lead concentration recorded a decrease from 0.08 µg/m^3 to 0.06 µg/m^3, **Figure 6-13**. There is no criteria for PM_{10}-lead.

Trends are discussed below and results for the period 2011 to 2017 are shown in **Figure 6-15**.

Figure 6-13 HVAS2 PM_{10}-Lead Results for the Reporting Period (2017)



6.3.4 TEOM monitors

The Rasp Mine has two Tapered Element Oscillating Microbalance (TEOM) air quality monitors, which record real time PM_{10} data. **Figure 6-2** shows the location of these monitors. **Table 6-7** lists the PM10 criteria as required by PA07_0018.

Table 6-7 PM_{10} Assessment Criteria

Pollutant	Averaging Period	Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	50 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	25 µg/m^3

Note: Criteria changed from 30 µg/m^3 to 25 µg/m^3 in September 2017

The monitors operate continuously over a 24 hour period and provide a real time data read out on a kiosk computer in the HSE office. The monitors also provide auto-generated notifications when triggers are exceeded (when the level exceeds 100 ug/m^3 expressed as a 1 hour rolling average) the cause is investigated and controlled by the use of the water truck or by modifying work methods.

On the following occasions during the reporting period the TEOM units were offline due to an interruption to electricity supply and analysis was not be undertaken: TEOM1 – Nil, TEOM2 – 29 to 31 December.

The results for TEOM1 PM_{10} 24-hour average for the reporting period are provided in **Figure 6-16**. There were three occasions at TEOM1 (located south of the Mine) during the reporting period when the monitor recorded above the criteria for a 24-hour average, these were 183.71 (Jul), 87.08 (Sep) and 114.76 (Dec). This was the result of dust storms across Broken Hill with wind gusts of 47, 64 and 76 km/h respectively with winds predominantly from the north. Storm events are excluded from the application for criteria.

Figure 6-14 HVAS1 & HVAS2 PM_{10} Annual Average Results for the Period 2011 to 2017

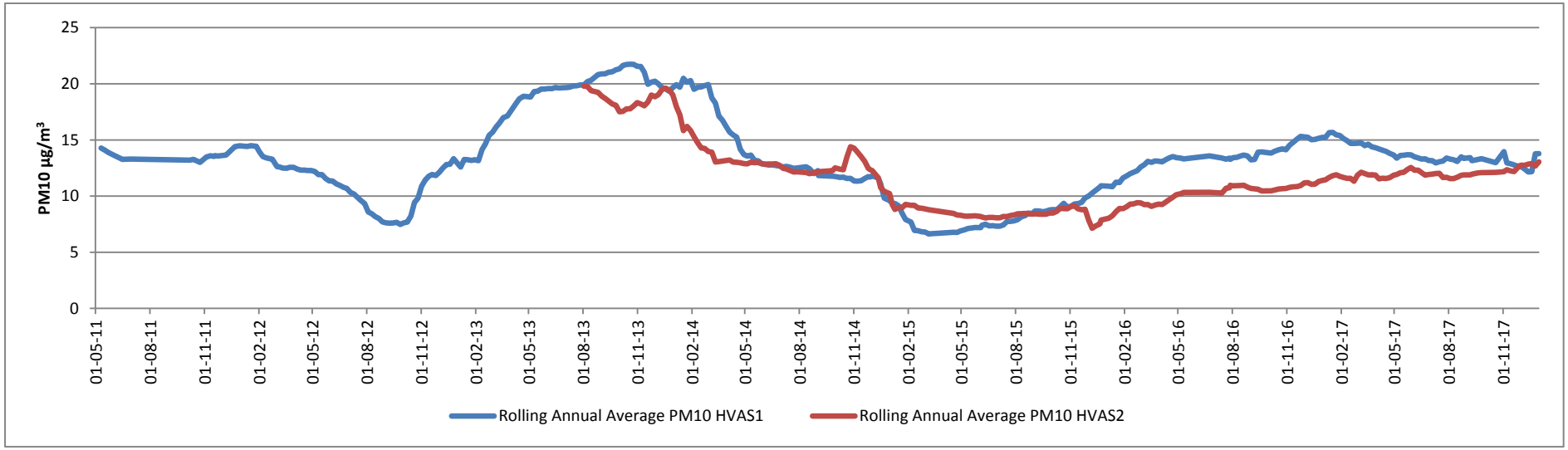
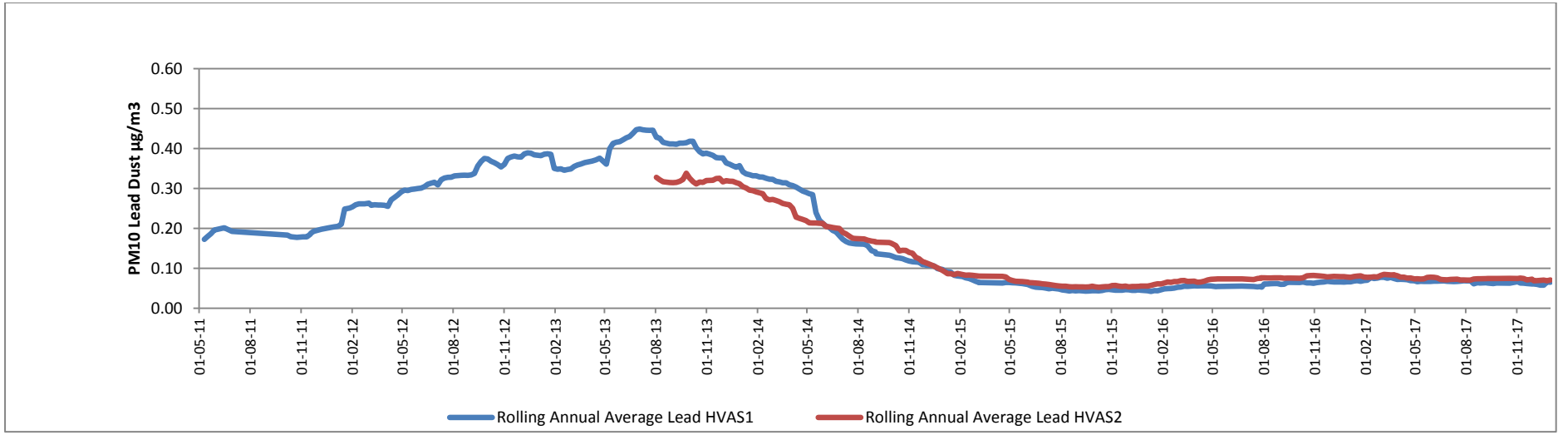


Figure 6-15 HVAS1 & HVAS2 PM_{10}-Lead Annual Average Results for the Period 2011 to 2017



The results for TEOM2 PM_{10} 24-hour average for the reporting period are provided in **Figure 6-17**. There were five occasions at TEOM2 (located adjacent Blackwood Pit) during the reporting period when the monitor recorded above the criteria for a 24-hour average, these were 58.81 (Jan), 55.17 (Mar), 152.72 (Jul), 77.71 (Sep) and 117.43 (Dec). Again this was the result of dust storms across Broken Hill. Storm events are excluded from the application for criteria.

The PM_{10} annual average at the TEOM1 monitor at the end of the reporting period was 16.7 $\mu g/m^3$ and is below the listed criteria of 25 $\mu g/m^3$. The annual average PM_{10} for December of 19.5 $\mu g/m^3$ is below the PM_{10} annual average criterion of 25 $\mu g/m^3$ required at the nearest residential location. The results for TEOM1 and TEOM2 are provided in **Figure 6-18**.

The recorded annual average PM_{10} result at TEOM2 (19.5 $\mu g/m^3$) is below the prediction for R28, the closest receptor to this monitoring point (30 m) reported in the EA for MOD4 at 17.54 $\mu g/m^3$.

Criteria were met at these locations during the reporting period.

Annual average PM_{10} results for 2017 results for TEOM1 and TEOM2 are consistent with long term monitoring data, **Figure 6.19**.

Air Quality Management Plan BHO-PLN-ENV-001 lists the controls that were in place during the reporting period. In summary, the major controls include:

- The use of chemical dust suppressant on non-active mining areas and roads;
- Sealing of all major roads and the use of a street sweeper and water truck;
- Wing walls and roof over the ROM Bin and water sprays on the apron feeder to the crusher;
- Fully enclosed conveyors and transfer points prior to the Sag Mill with installed dust collectors;
- Restricted access to non-active mining areas;
- Use of water sprays on the ROM Pad;
- Concentrate loading into containers occurs in an enclosed building and containers are covered prior to exiting the building; and
- All vehicles leaving site are washed, including trucks taking containers to the rail loadout area.
- Traffic light system informing all staff and contractors of wind speeds.
- Wind speed alerts from the onsite weather station notifying of wind speeds greater than 35 km/hr

Monitoring results indicate that controls have been adequate to manage dust levels during the reporting period.

Figure 6-16 TEOM1 PM_{10} 24-hour Average Results for the Reporting Period (2017)

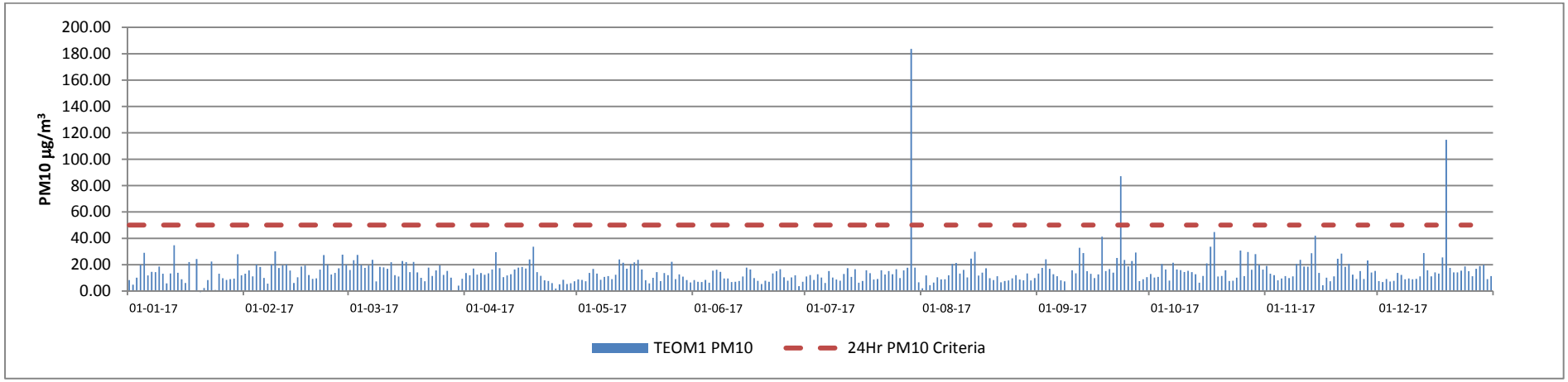


Figure 6-17 TEOM2 PM_{10} 24-Hour Average Results for the Reporting Period (2017)

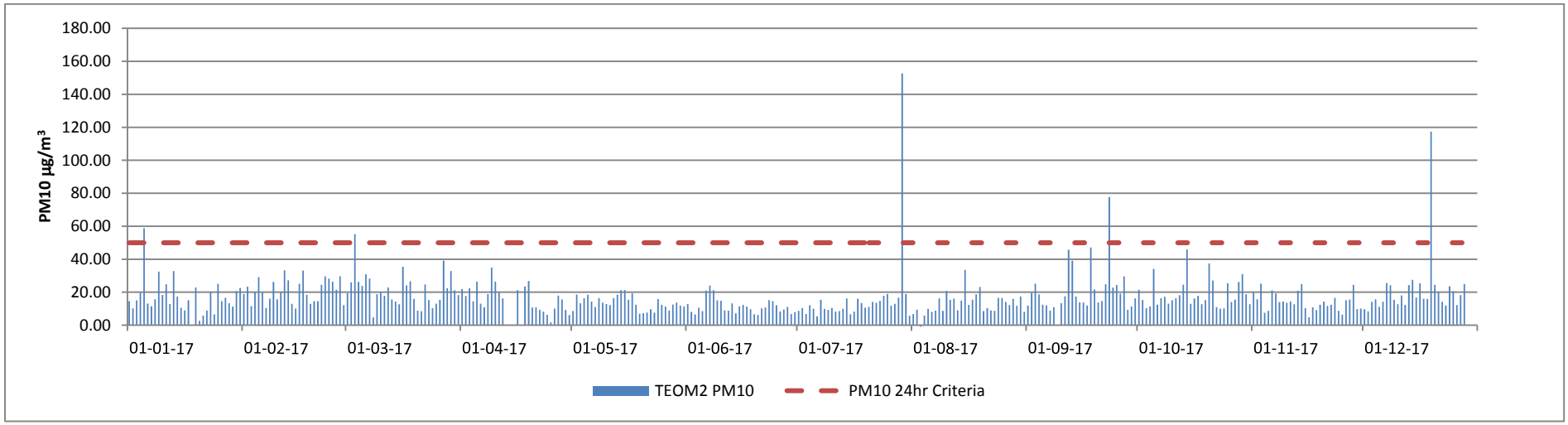


Figure 6-18 TEOM1 & TEOM2 PM_{10} Annual Average for the Reporting Period (2017)

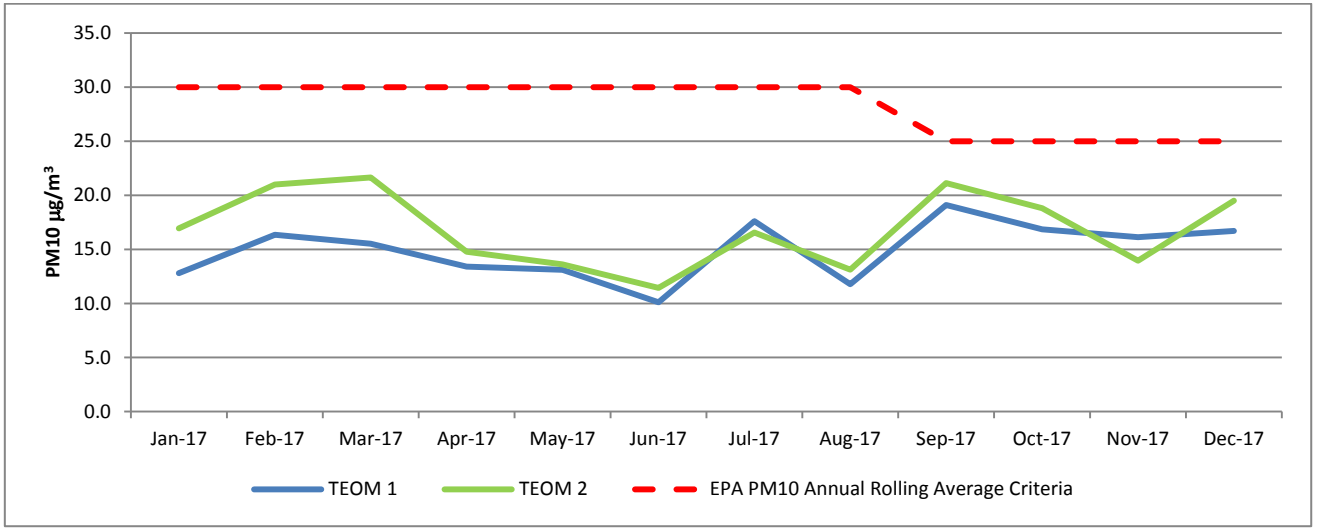
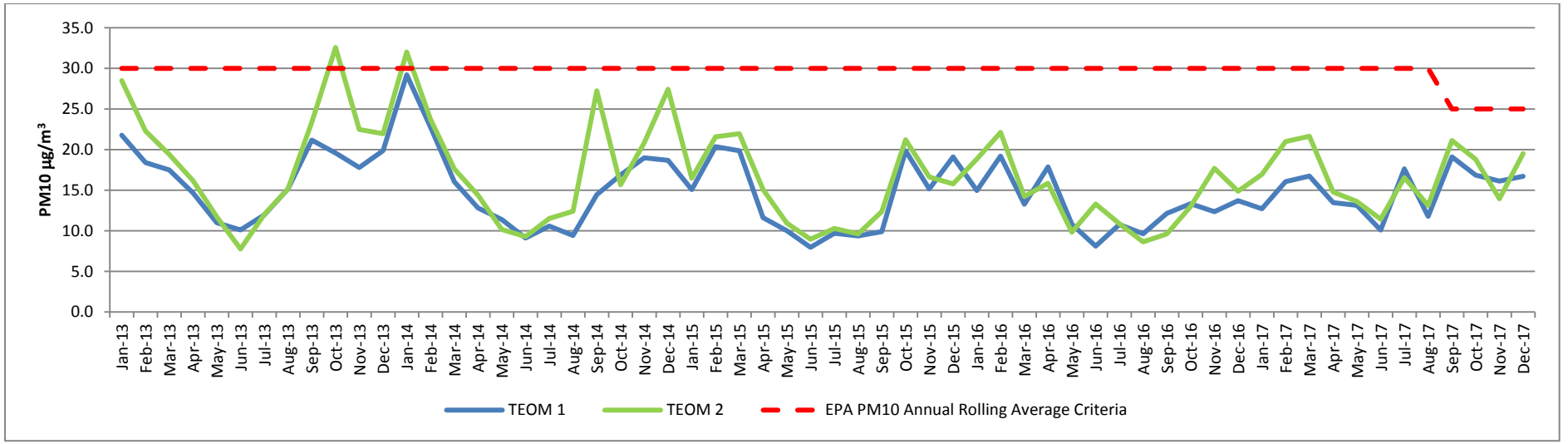


Figure 6-19 TEOM1 & TEOM2 PM_{10} Annual Average Results for the Period 2013 to 2017



6.4 Erosion and Sediment

The majority of the existing batters were constructed during former mining operations and consequently the surfaces of the batters consist predominantly of weathered rock. It is not practical to reshape the slopes, as most of the slopes are steep, on the mine lease boundary and predominantly comprise of large rock aggregate. The process of erosion over the years since the slopes were formed has removed most of the finer materials and the existing surface now comprises relatively large and coarse rock resulting in a self- armoured surface with limited erosion potential.

Storage ponds effectively serve as sediment control ponds and limit the movement of sediment throughout and off site. Ponds are inspected routinely quarterly and after significant rain events (30 mm or more of rain falling in up to 2 hours or 75 mm or more over any three consecutive days). Inspections consist of a visual assessment for erosion, flooding, rubbish, algal growth or significant sediment build up. No major works were required as a result of these inspections.

6.5 Surface Water

There are no natural water courses or creeks flowing through the site. The drainage network layout restricts runoff leaving active mine areas of the site for a 1 in 100year 72 hour ARI rainfall event.

Surface water monitoring includes a weekly visual inspection of water storage facilities, freeboard and structural integrity. The tailings storage facility and the processing events dam are inspected and levels checked monthly. Quarterly water quality samples are taken from dams when the water levels are above 20% capacity. Samples are couriered to ALS, a NATA accredited laboratory for analysis.

There are seven sampling locations for surface water, these include surface water basins located on the mine lease to capture and retain rainfall and two locations up and down stream of an ephemeral creek located south of the mine lease boundary. Sampling requirements are provided in **Table 6-8** and locations of sampling points are shown in **Figure 6-2**.

Table 6-8 Surface Water Monitoring Requirements

Description	Frequency	Parameters to be Analysed
Federation Way Culvert EPL29/S31-1	2 x per year , six months apart	cadmium (Cd), chloride (Cl), electrical conductivity (EC), lead Pb), manganese (Mn), pH, sodium (Na), sulphate (SO4), total dissolved solids (TDS) and zinc (Zn)
Ryan Street Dam EPL31/S49	2 x per year , six months apart	
Adjacent Olive Grove EPL32/S1A	2 x per year , six months apart	
Adjacent Bowls Club EPL33 /S9-B2	2 x per year , six months apart	
Horwood Dam EPL34/Horwood Dam	2 x per year , six months apart	
Upstream Bonanza St EPL35	2 x per year , six months apart	
Downstream Sydney Rd EPL36	2 x per year , six months apart	

Ponds are sampled at least twice a year when the pond contains water for at least one week and the volume of stored water is at least 20% of the pond capacity. Sampling is undertaken in October (highest rainfall month as recorded by Bureau of Meteorology) and April. Results of the surface water analysis for the reporting period are provided in **Table 6-9**. Monitoring could not be undertaken at some locations as the ponds were dry, these are indicated in **Table 6-9**.

No storage water overflowed from these ponds during the reporting period.

Table 6-9 Stormwater Pond Water Quality Results for the Reporting Period (2017)

Site	Month Sampled	Cd	Cl	EC	Pb	Mn	pH	Na	SO4	TDS	Zn
		mg/L	mg/L	µs/cm^3	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L
EP29 S31-1	Apr 2017	0.193	2	389	0.272	4.94	6.58	19	134	304	22.4
	Oct 2017	2.49	17	1650	6.52	65.8	6.48	34	899	1630	65.8
EPl31 S49	Apr 2017	Dry									
	Oct 2017	Dry									
EP32 S1-A	Apr 2017	Dry									
	Oct 2017	Dry									
EP33 S9B-2	Apr 2017	0.12	50	715	0.73	6.83	6.56	48	221	519	22.4
	Oct 2017	Dry									
EP34 Horwood Dam	Apr 2017	4.19	1810	17200	0.853	734	6.37	1950	7670	18900	1570
	Oct 2017	3.32	4180	20600	2.91	624	6.71	3400	7910	20800	624
EPL35 Upstream Bonanza St	Apr 2017	Dry									
	Oct 2017	Dry									
EPL36 Downstream Sydney Rd	Apr 2017	Dry									
	Oct 2017	Dry									

S49 Pump

S49 captures runoff from a catchment contaminated by historic mining activities. In 2011 with the end of a long term drought in Broken Hill, water escaped from this facility. A number of measures have been undertaken to address the issues. In response to a seepage issue in 2016 a solar pump was installed within the Dam in June, to remove water immediately from the dam to ensure a) water does not seep through the walls (which are lined), and b) to ensure capacity for catchment runoff is maintained. This is connected to a pipeline and sends water back onto the Rasp Mine site.

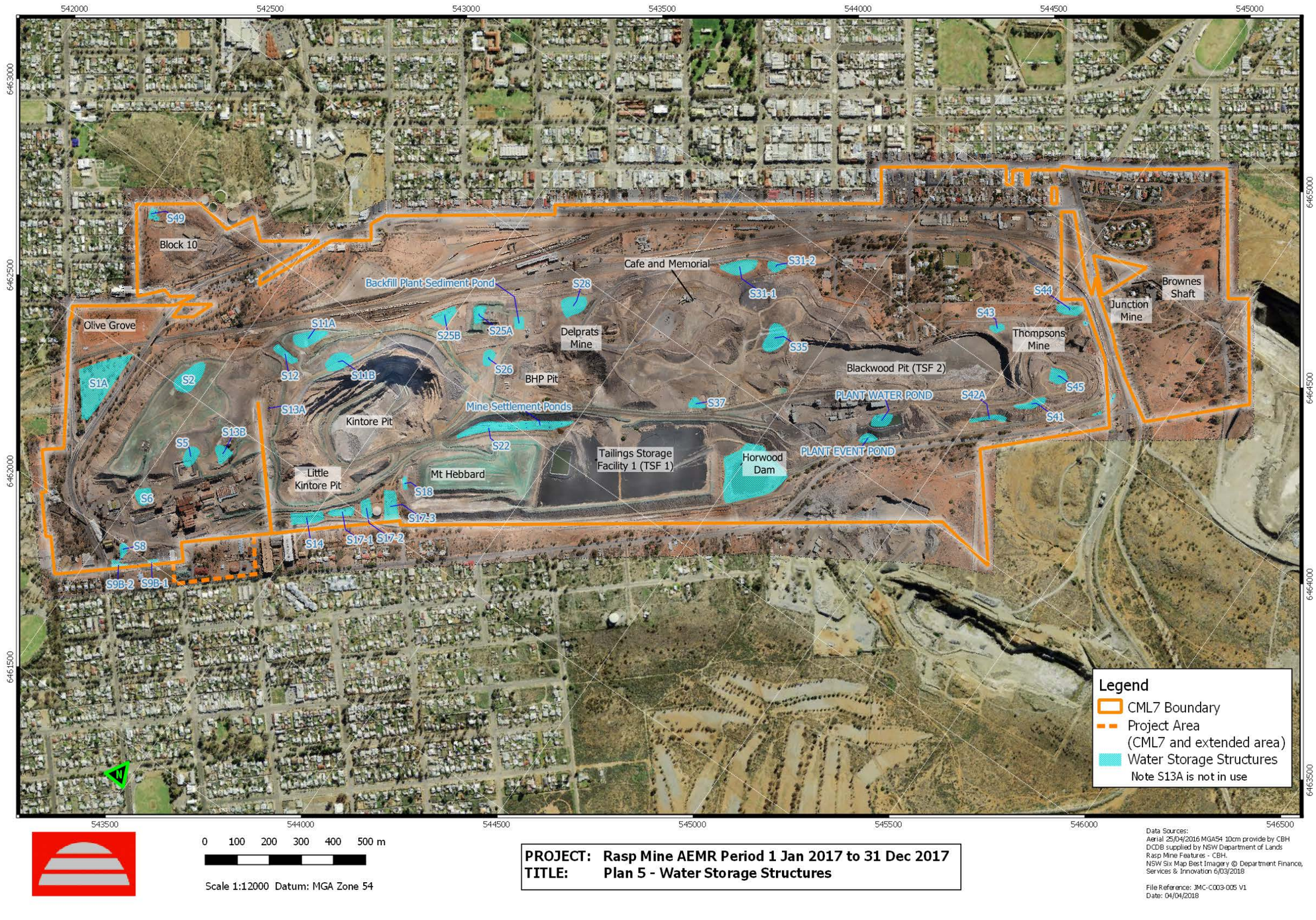
It is difficult to undertake sampling of surface waters due to the low rainfall and high evaporation rates in Broken Hill. In particular 2017 was a dry year (108 mm) with less than half the normal average rainfall (259 mm).

The quantity of water in the ponds at the time of sampling is unknown, this would have a major impact on the water quality results. All waters were contained within the containment structures with no off site discharges during the reporting period.

6.5.1 Water containment structures

All surface runoff on site is captured by diversion trenches or berms and channelled to site water storage structures. No changes were made to this system during the reporting period. **Figure 6-20 Plan 5** shows the water catchments and containment structures. **Table 6-10** provides the capacities and estimated stored water volumes at the end of the reporting period**.** Detailed surveying of the water storage structures is planned for the next reporting period. Surveys will be used to develop staged storage curves that will enable more accurate capacities and volumes to be determined.

Figure 6-20 Plan 4 Storm Water Storage Ponds



Markers are placed in water ponds to indicate the maximum level to which water may be stored in the facilities to maintain sufficient free board to accommodate a 1:100 year 72 hour storm event.

Table 6-10 Water Containment Structures

	Pond Identification	Start of reporting period m^3 (1-Jan-17)	At end of reporting period m^3 (31-Dec-17)	Storage Capacity m^3
Potable and Raw Water	Workshop	9	9	14
	Boom Gate	22.5	22.5	22.5
	Mill	22.5	22.5	1400
	Delprat's Shaft	22.5	22.5	22.5
	Kintore Pit	14	14	18
	Silver Tank	6500	6500	6500
Dirty Water (rain runoff)	S2	0	0	5003
	S14	0	0	7813
	S17	0	0	4265
	S31-2	0	0	225
	S49	0	0	1951
	S35	0	0	6092
Process, underground and used water	Horwood Dam	3000	2000	7663
	Plant Water Pond	2000	1000	2000
	S22 Mine Settlement Ponds	1000	3000	20,489
	S22-A	2000	3500	2000
	Vehicle Wash	22.5	22.5	22.5

6.5.2 Independent dam audit results

A multi-agency dams audit was completed in October 2016. The audit reports was provided in 2017 and results are presented in **Table 6-11**.

Table 6-11 Dam Audit Results

Item	Cond'n/ Clause	Action Details	Code	Rasp Response	Update
Environment Protection Licence No. 12559					
1	L7.1	The licensee must ensure that all storm water and other surface water management pond identified in the Site Water Management Plan are designed, constructed and maintained to accommodate the stormwater runoff generated in a 100 year (24 hour) Average Recurrence Interval rain event.	Yellow	Maintenance and audit program on dams to be completed by end of 2017. This will include review against SWMP and desilting where necessary.	A survey of dam capacities has been completed for high-risk dams, and desilting has been scheduled.
2	O1.1b	Seepages from dam walls must be managed to prevent surface water pollution.	Yellow	Pump and line to be installed at Dam S49 by end of June 2017.	Pump and pipeline have been installed.
3		The licensee must manage the waters levels in the wastewater holding dams in a manner that will prevent uncontrolled discharges to surface waters.	Yellow	Inspection procedures to be reviewed and implemented within 3 months of final report.	Action completed. Mill operators record dam levels on shift handover, HSE complete a monthly dam integrity inspection, and the Eyre St trench monitoring procedure is being followed.
4		The licensee must manage the waters levels in the sedimentation dams in a manner that will prevent uncontrolled discharges to surface waters.	Yellow	Pump and line to be installed at Dam S49 by end of June 2017.	Pump and pipeline have been installed.
5	M1.3 b and c	Sampling records must show the time of sampling and the point at which the sample was taken.	Blue	Procedure to be updated noting that time of sample is to be	Sampling times are now recorded.

Item	Cond'n/ Clause	Action Details	Code	Rasp Response	Update
				recorded.	
6	M2.3	EPA Points 29, 31, 32, 33, 34 The licensee must use the sampling method specified. The licensee must sample at the required frequency OR renegotiate the condition with the EPA Regional Office.	Blue	The dams listed are ephemeral and are highly unlikely to contain water at six month intervals. Therefore BHOP will renegotiate sampling frequencies with the EPA.	Following discussion, there are few options to change this requirement that would appropriately capture the required sampling frequencies given the ephemeral nature of these dams and infrequent sampling. Therefore BHOP will retain the existing condition.
Protection of the Environment Operations (General) Regulation 2009- Chapter 7, Part 3A					
7	98C(1) (d) and (e)	The licensee must include the potentially contaminated water in their inventory of potential pollutants and the maximum quantity stored.	Blue	PIRMP to be updated.within 2 months of final audit report.	PIRMP update complete, capturing Items 7-12.
8	(g)	The names of key personnel must be included in the PIRMP.	Blue	PIRMP to be updated.within 2 months of final audit report.	PIRMP update complete, capturing Items 7-12.
9	(k)	A detailed map (or set of maps) as required must be included in the Plan.	Blue	PIRMP to be updated.within 2 months of final audit report.	PIRMP update complete, capturing Items 7-12.
10	(n)	The dates that the Plan has been tested and the name of the person who carried out the test must be included in the plan.	Blue	PIRMP to be updated.within 2 months of final audit report.	PIRMP update complete, capturing Items 7-12.
11	(o)	The dates on which the Plan is updated must be included in the plan.	Blue	PIRMP to be updated.within 2 months of final audit report.	PIRMP update complete, capturing Items 7-12.
12	98E(1) and (2)	The licensee must test the Plan at least once every 12 months.	Blue	PIRMP tests will be completed every 12 months, with dates recorded in the PIRMP.	PIRMP update complete, capturing Items 7-12.
Protection of the Environment Operations Act 1997 – Chapter 3, Part 3.5					
13	3.5	The data must be published in tabular format that is easy for the general public to understand. It must be exportable to common programs like Microsoft Excel or Word.	Blue	Monthly Monitoring Reports to be revised within 2 months of final audit report.	Monitoring report revised to reflect "Requirements for publishing pollution monitoring data", EPA NSW.
14	3.7.1	The environment protection licence number, licensee's name and address and a link to the EPA's Public Register must accompany each data set.	Blue	Monthly Monitoring Reports to be revised within 2 months of final audit report.	Monitoring report revised to reflect "Requirements for publishing pollution monitoring data", EPA NSW.
15	3.7.4	The units of measure must be provided and noted in full.	Blue	Monthly Monitoring Reports to be revised within 2 months of final audit report.	Monitoring report revised to reflect "Requirements for publishing pollution monitoring data", EPA NSW.
16	3.7.5	The date that data was obtained must be published with the data.	Blue	Monthly Monitoring Reports to be revised within 2 months of final audit report.	Monitoring report revised to reflect "Requirements for publishing pollution monitoring data", EPA NSW.

6.6 Groundwater

The regional groundwater near the site is depressed due to long term pumping from the underground mines in the area. This results in the depressed groundwater level below the site being more than 100m below the surface level, with a hydraulic gradient into the site at depth. The groundwater monitoring program is undertaken with the purpose of recording perched groundwater movement. Perched groundwater refers to surface water that has infiltrated into the near surface moderate to high permeability material generally comprising of granular soils and rock dill. The perched ground

water exists for short periods of time after rainfall events and generally seeps laterally over the low permeability bedrock surface below the near surface permeable material. The rainfall events at Rasp mine site indicate that the perched groundwater has the potential to surface seep rather than seep into the regional groundwater. Considering the depth of the regional groundwater it is concluded that there is little interaction between the shallow perched groundwater and the regional groundwater.

Rasp's groundwater monitoring plan is outlined in the Site Water Management Plan.

The monitoring program includes eighteen sampling locations for groundwater, GW01 (EPL37) to GW16 (EPL52) are installed piezometers at various locations around the mine site and are sampled quarterly. There are also two sampling locations for water pumped from underground mining, Shaft 7 (EPL53) and Kintore Pit (EPL54), sampled monthly. The locations for these monitoring points are shown in **Figure 6-2**. Groundwater monitoring is scheduled for completion in March, June, September and December. A number of parameters are required to be analysed including: alkalinity (calcium carbonate ($CaCO_3$)), cadmium (Cd), calcium (Ca), chloride (Cl), electrical conductivity (EC), iron (Fe), lead Pb), magnesium (Mg), manganese (Mn), pH, sodium (Na), sulphate (SO4), total dissolved solids (TDS) and zinc (Zn). **Table 6-12** lists the location and function of each borehole.

Table 6-12 Location and Function for Groundwater Monitoring Points

Bore ID	Location	Function
GW01, GW02	Southeast of Mt Hebbard	Monitor potential seepage from Mt Hebbard
GW03 – GW09	East of TSF1	Monitor potential seepage from TSF1 towards CML7 boundary
GW10	Downstream of Horwood Dam	Monitor potential seepage north of Eyre St Dam
GW11, GW12	East of Blackwood Pit	Monitor perched groundwater mounding from TSF
GW13-GW15	Adjacent to storage areas S44, S31-1 and S31-2	Monitor movement of perched groundwater occurring from the storages
GW16	West of S49	Monitor potential seepage from S49
Shaft 7	Shaft 7	To maintain safety for underground mining at both the Rasp and Perilya South Mines
Kintore Pit - Mine dewatering	Kintore Pit decline	To maintain safety for underground mining at the Rasp Mine

Groundwater quality monitoring was undertaken in May 2007 and August 2011 at Shaft 7 to establish an initial baseline for parameters and trigger levels for the monitoring program (30% above 2011 results).

The site's groundwater is deep and is extracted as part of mining. The underground extraction system results in inward flow of the groundwater into the mine. Hence, groundwater at the mine is likely to be impacted by off-site sources due to the inward hydraulic gradient into the mine.

The majority of piezometers showed a steadying or very slight decrease in water levels during the reporting period which can be attributed to the low rainfall, **Table 6-13**. **Table 6-14** provides a summary of groundwater monitoring results for 2017, indicating highest in maroon and lowest in blue.

Table 6-15 provides a summary of water monitoring results for Shaft 7 and mine dewatering (Kintore Pit), indicating highest in maroon, lowest in blue and samples above baseline trigger in orange.

The series of figures shown in **Figure 6-21** and **Figure 6-22** provide a summary of water monitoring results for the period 2012, commencement of operations, to 2017.

During the reporting period some samples were unable to be taken as water depths were insufficient or the piezometer was dry, these are indicated in **Table 6-14** and Table **6-15**.

Table 6-13 Bore Piezometer Depths

Sample	Depth TOC				
	Ave 2017	Ave 2016	Ave 2015	Ave 2014	Trend
GW01	6.85	7.39	7.25	7.25	Stable
GW02	3.33			Dry	
GW03	3.58	3.64	3.62	3.61	Stable
GW04	2.87	2.94	2.9	2.83	Stable
GW05	3.49	3.53	3.5	3.4	Stable
GW06	2.96	2.85	2.76	2.66	Stable
GW07	2.58	2.74	2.8	2.54	Stable
GW08	1.88	1.81	1.87	2.11	Stable
GW09	3.50	2.94	3.07	1.79	Variable
GW10	1.90	1.49	1.725	0.83	Variable
GW11	10.00	10.10	10.4	10.69	Stable
GW12	19.19	34.49	37.1	21.6	Potentially falling
GW13	Dry	Dry	Dry	Dry	
GW14	1.3	Dry	Dry	Dry	
GW15	2.8	Dry	Dry	Dry	
GW16	Dry	1.55	Dry	Dry	Increased

Quarterly samples were obtained from 5 of the16 bores (GW1, GW3, GW4, GW9 and GW11), three samples were obtained from three bores (GW6, GW8, and GW10), bores GW2, GW12, GW14 and GW15 could only be sampled once and no samples could be obtained from bores GW7, GW13 or GW16. This was probably due to dry conditions as a results of the low rainfall in Broken Hill for 2017.

Results remained within historic ranges and were consistent with the expectation of Golder as outlined in the Site Water Management Plan, that perched groundwater quality would contain significant concentrations of lead, manganese and zinc due to the seepage contact with the near surface materials on site and the surrounding areas.

The following provides a discussion of results.

GW01 and GW2 Located Downstream of Mt Hebbard

These water bores are intended to monitor the sub-surface water fluctuations south of Mt Hebbard. GW1 had sufficient water to monitor each quarter, GW2 was dry and could only be monitored once in April. The ground water level decreased at GW1, probably due to low rainfall; water levels for GW2 were not recorded for previous years as the bore was dry. **Figure 6-21** indicates that results remain within historic ranges.

GW03, GW04, GW05, GW06, GW07, GW08, GW09 and GW10 Located Adjacent to TSF1 and Horwood Dam

Groundwater bores are located near the eastern side of the unused historic TSF1 and extend to Horwood Dam. The intent of the monitoring bores is to monitor perched water in the area that may impact on Eyre Street Dam. The monitoring is in response to surface seepage noted in the area during intense 2011 rainfall events Bores GW3,GW4, GW9 and GW10 were able to be monitored as they each quarter, the other bores had some dry periods with GW7 unable to be monitored due to dry

conditions. Water levels remained stable with GW9 and GW10 showing some variability. **Figure 6-21** indicates that results remain within historic ranges.

GW11 and GW12 located south east of Blackwood Pit

Blackwood Pit is used for the storage of tailings. It forms part of the mining area and is surrounded by historic mine workings. Due to these historic workings any seepage from the Pit will be intercepted and collected by the underground mine water management system. Due to the north east and south west length of the pit there is a possibility for the formation of a perched aquifer as a result of groundwater mounding around the south east site of the pit once it receives tailings. If a perched water table is measured in the two bores consideration will be given to the installation of additional bores to assess the local hydrogeological conditions and risk of migration of seepage. On the advice of Golder bores were installed to the south east of the facility in order to detect any seepage.

The ground water level in GW11 was steady over the reporting period and the level of GW12 decreased. the bores decreased over the reporting period with GW12 being dry in October and January. Quarterly samples were obtained from GW11 but only one sample could be obtained from GW12 due to dry conditions. **Figure 6-21** indicates that results remain within historic ranges.

GW13) (adjacent 31-1, GW14 (adjacent BHP chimney) and GW15 (adjacent rail load out) and GW16 (adjacent S49)

As perched water seepage may occur from ponds located near the CML7 boundary when these ponds store water, bores have been installed adjacent these locations. Two of the bores (GW13 and GW16) were dry throughout the reporting period. Samples were able to be taken from GW14 and GW15 in July only. . **Figure 6-21** indicates that results remain within historic ranges.

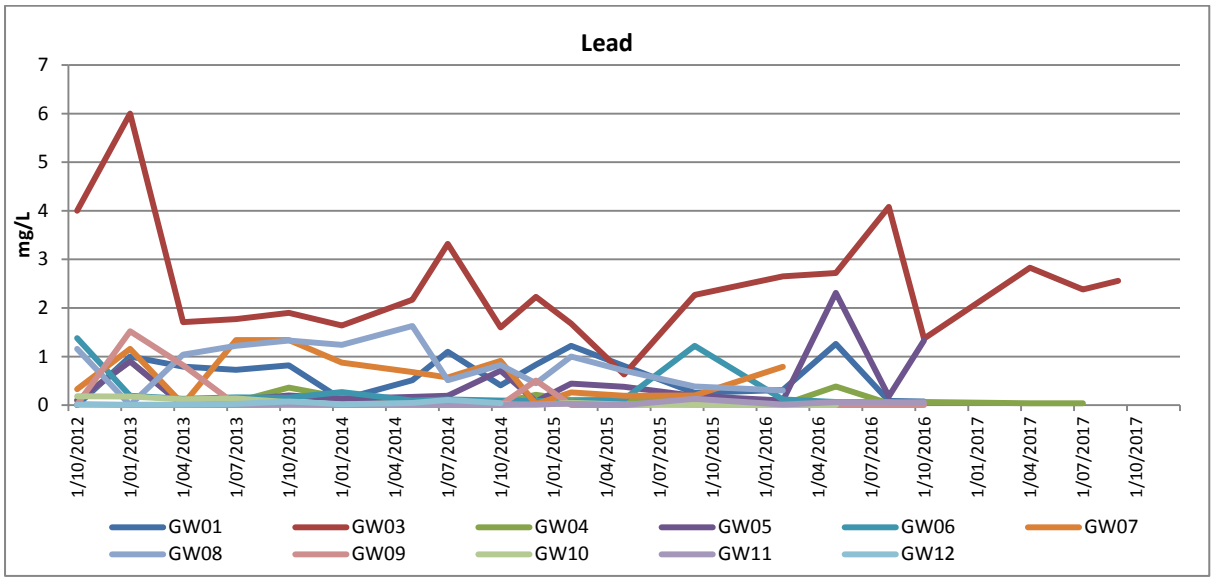
Table 6-14 Piezometer Monitoring Results for the Reporting Period (2017)

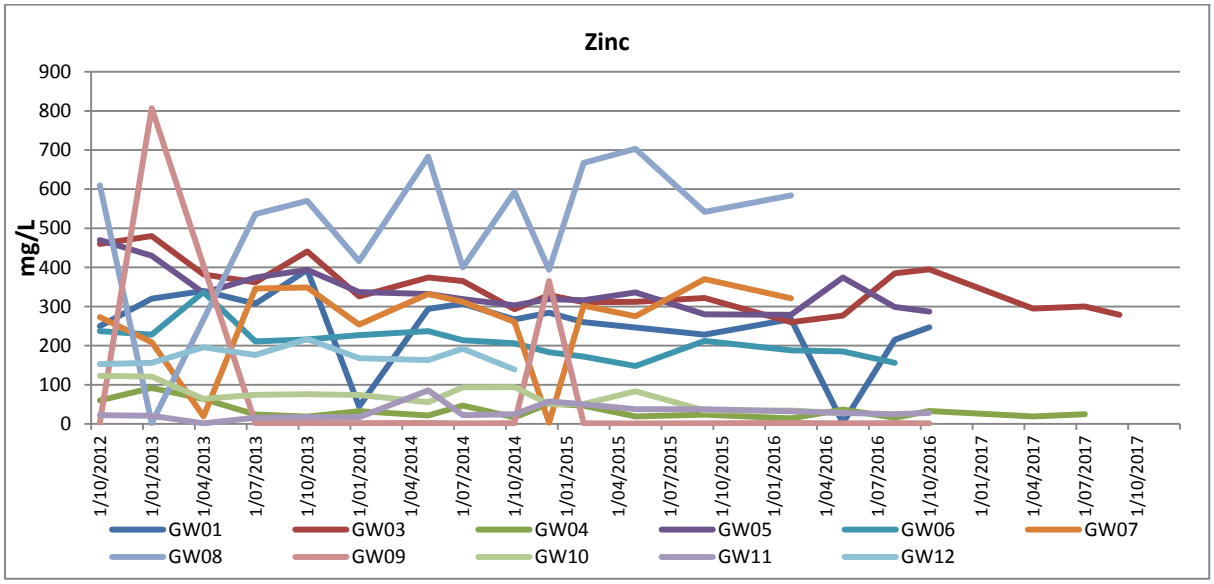
Site	Month Sampled	Alkalinity CaCO3 (mg/L)	Cd (mg/L)	Ca (mg/L)	Cl (mg/L)	EC (µS/cm)	Fe (mg/L)	Pb (mg/L)	Mg (mg/L)	Mn (mg/L)	pH	Na (mg/L)	SO as SO4 (mg/L)	TDS (mg/L)	Zn (mg/L)
GW01	Apr	47	0.0994	537	2590	14100	<0.05	1.26	13.3	306	7.35	2180	4000	9560	2.41
	Jul	1	0.167	246	1010	10300	0.05	0.089	412	291	4.88	1440	4110	9970	215
	Sep	1	0.167	254	471	10300	<0.05	0.0075	405	314	4.73	1420	4000	9470	247
	Dec	<1	0.165	264	1020	10200	<0.05	0.068	432	230	4.58	1520	5250	10100	175
GW02	Apr	47	1.65	467	1320	11900	<0.05	1.7	270	294	6.96	1750	4780	11400	425
	Jul, Sep, Dec	Insufficient depth for sample													
GW03	Apr	10	1.89	555	3010	15700	<0.05	2.83	380	317	6.23	2100	4540	13900	295
	Jul	4	1.05	550	3100	14900	18.5	2.38	365	380	5.76	2140	4120	12800	300
	Sep	9	1.06	532	2760	14600	9.22	2.56	385	349	5.8	2320	4010	11600	279
	Dec	9	1.33	577	3040	14700	<0.05	2.92	375	326	5.9	2300	5110	13200	287
GW04	Apr	156	0.337	538	2680	14700	<0.05	0.065	436	79.9	7.14	2050	4390	14200	32.9
	Jul	241	0.055	553	2870	14700	0.05	0.04	505	35.3	7.15	2270	4690	11800	19.1
	Sep	229	0.102	553	2570	14500	<0.05	0.039	491	50.9	6.99	2290	4050	11900	24.7
	Dec	233	0.168	610	2760	14500	<0.05	0.339	546	43.9	7.1	2420	5130	12800	22.5
GW05	Apr	134	1.51	473	2820	18000	<0.05	1.33	616	339	6.58	2570	6760	16900	287
	Jul & Sep	Insufficient depth for sample													
	Dec	133	1.6	542	2800	16600	<0.05	1.14	704	292	6.53	2820	6700	16400	236
GW06	Apr	41	0.759	508	1930	13700	<0.05	0.064	397	294	6.65	1910	4540	12700	185
	Jul	47	0.697	519	2570	13600	0.05	0.061	406	249	6.53	1970	4240	11900	156
	Sep	Insufficient depth for sample													
	Dec	42	0.866	545	2480	13400	<0.05	0.056	440	198	6.37	2140	5260	13300	129
GW07	Apr, Jul, Sep, Dec	Insufficient depth for sample													
GW08	Apr	Insufficient depth for sample													
	Jul	14	1.81	545	1420	9410	0.05	0.386	220	451	6.32	923	3240	9320	542
	Sep	20	1.84	548	1310	9210	<0.05	0.302	208	453	6.09	910	3060	8530	584
	Dec	17	1.58	592	1910	11500	<0.05	0.43	284	439	6.17	1440	4700	12000	524
GW09	Apr	272	0.0247	721	2600	12200	<0.05	0.001	528	0.39	7.6	1280	3350	10100	1.39
	Jul	300	0.0218	720	2500	11800	0.05	0.001	533	0.049	7.55	1330	3190	9100	1.78

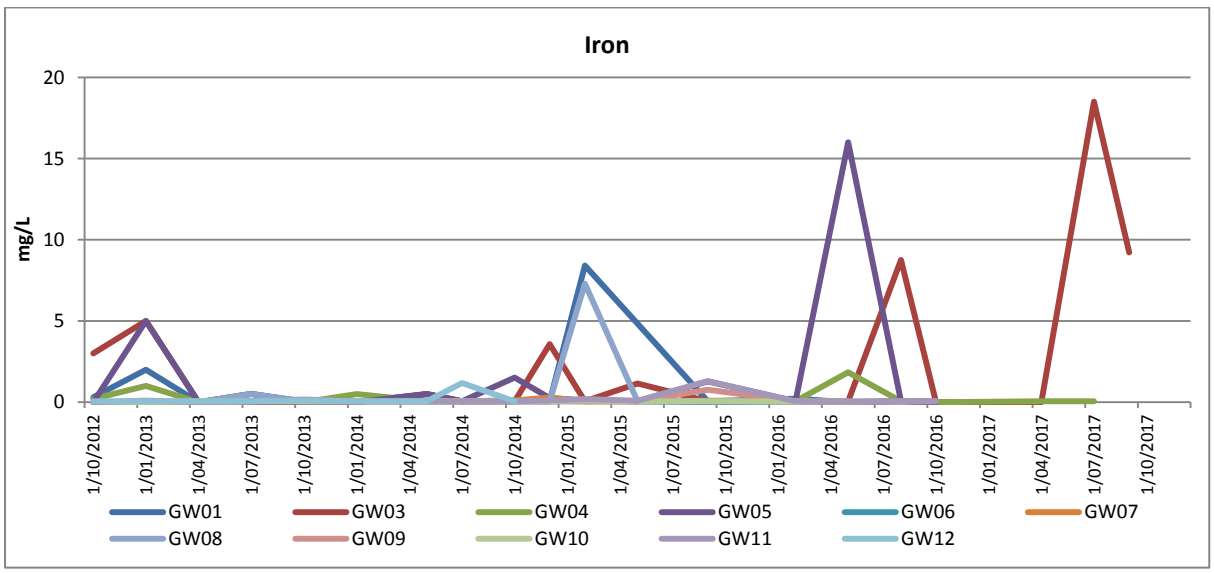
Site	Month Sampled	Alkalinity CaCO3 (mg/L)	Cd (mg/L)	Ca (mg/L)	Cl (mg/L)	EC (µS/cm)	Fe (mg/L)	Pb (mg/L)	Mg (mg/L)	Mn (mg/L)	pH	Na (mg/L)	SO as SO4 (mg/L)	TDS (mg/L)	Zn (mg/L)
	Sep	334	0.018	676	1850	11400	<0.05	<0.001	473	0.018	7.49	1240	2910	8620	1.6
	Dec	287	0.038	735	1930	11400	<0.05	<0.001	580	0.033	7.5	1420	3920	9740	3.64
GW10	Apr	118	0.695	572	2560	14200	0.05	0.001	499	22.7	6.97	2150	4300	11500	34.4
	Jul	215	0.44	559	2650	13900	0.05	0.001	488	18	7.14	2100	4480	11200	34.1
	Sep	268	0.3	558	2420	13800	<0.05	<0.001	487	12.6	7.1	2070	4070	6920	27.2
	Dec	Insufficient depth for sample													
GW11	Apr	50	0.0675	292	399	4380	0.05	0.062	139	16.7	7.23	552	1800	3610	28.1
	Jul	56	0.0563	287	418	4480	0.05	0.063	128	15.2	7.0	530	1560	2650	25
	Sep	60	0.0582	282	387	43.70	<0.05	0.054	121	16.3	6.67	515	1770	3460	28
	Dec	60	0.0807	302	425	4390	<0.05	0.124	131	570	7.01	570	2140	3740	32
GW12	Apr	Insufficient depth for sample													
	Jul	1	0.167	246	1010	10300	0.05	0.089	412	291	4.88	1440	4110	9970	215
	Sep & Dec	Insufficient depth for sample													
GW13	Apr, Jul Sep, Dec	Insufficient depth for sample													
GW14	Apr	Insufficient depth for sample													
	Jul	4	1.05	550	3100	14900	18.5	2.38	365	380	5.76	2140	4120	12800	300
	Sep & Dec	Insufficient depth for sample													
GW15	Apr	Insufficient depth for sample													
	Jul	241	0.055	553	2870	14700	0.05	0.04	505	35.3	7.15	2270	4690	11800	19.1
	Sep & Dec	Insufficient depth for sample													
GW16	Apr, Jul, Sep, Dec	Insufficient depth for sample													

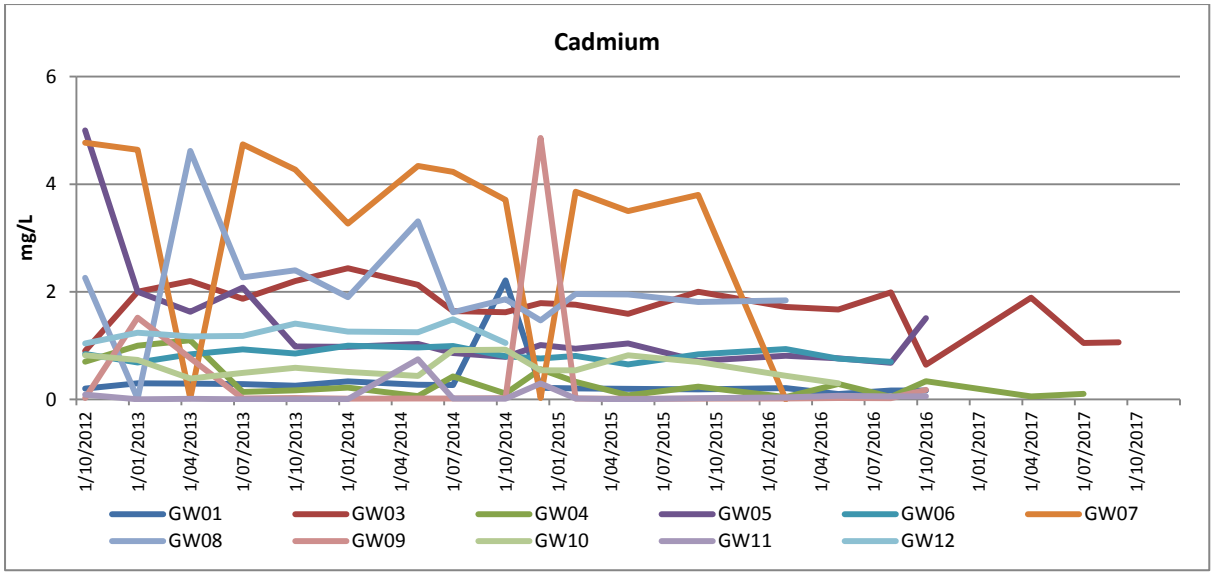
HIGHEST LOWEST

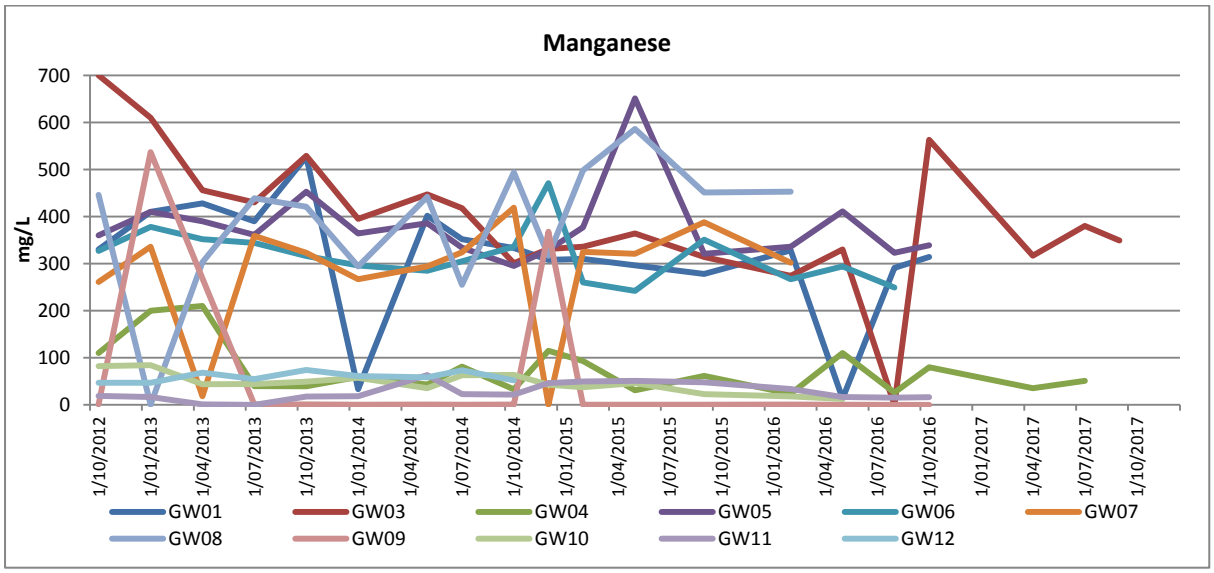
Figure 6-21 Groundwater Quality Results for Sampled Parameters for the Period 2012 to 2017

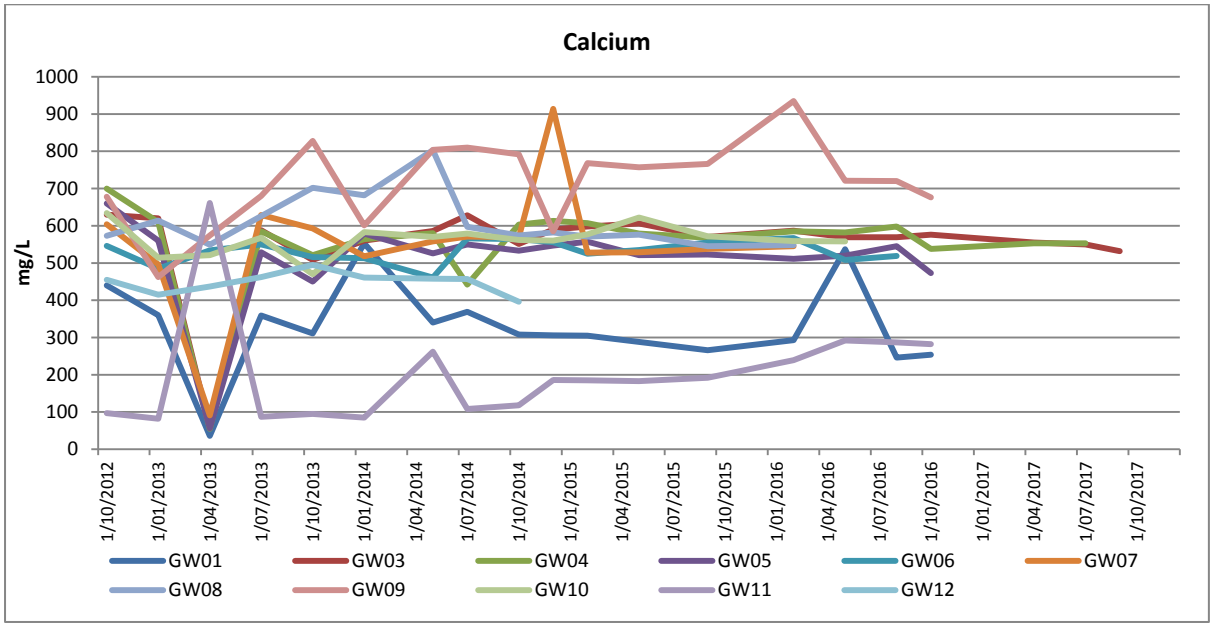


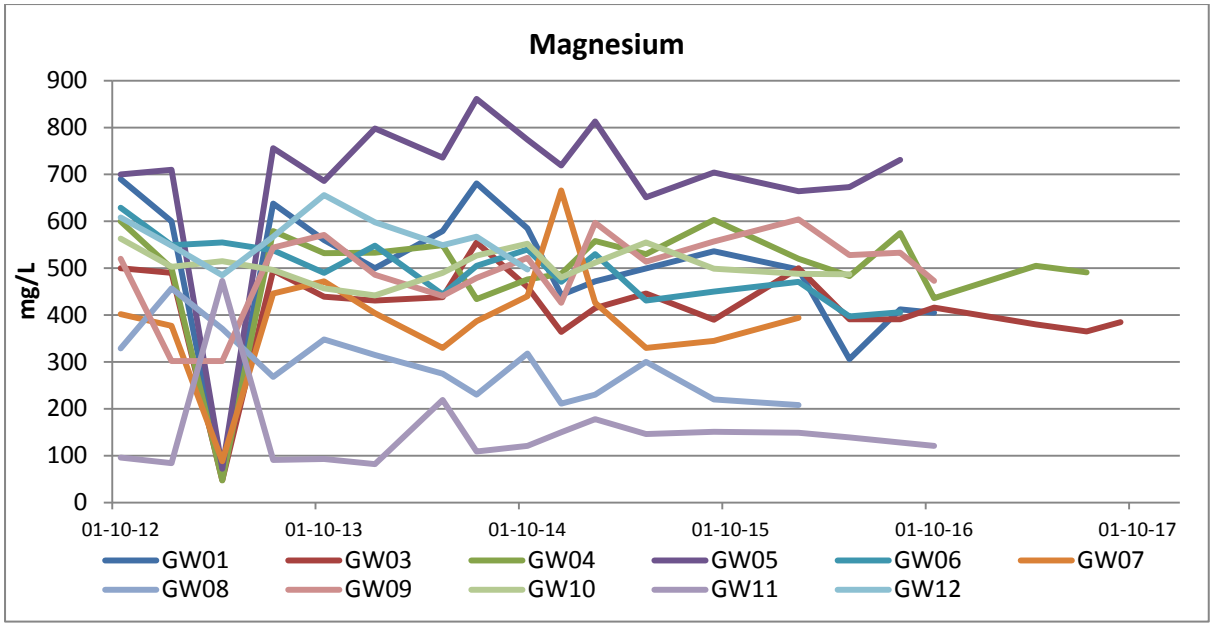


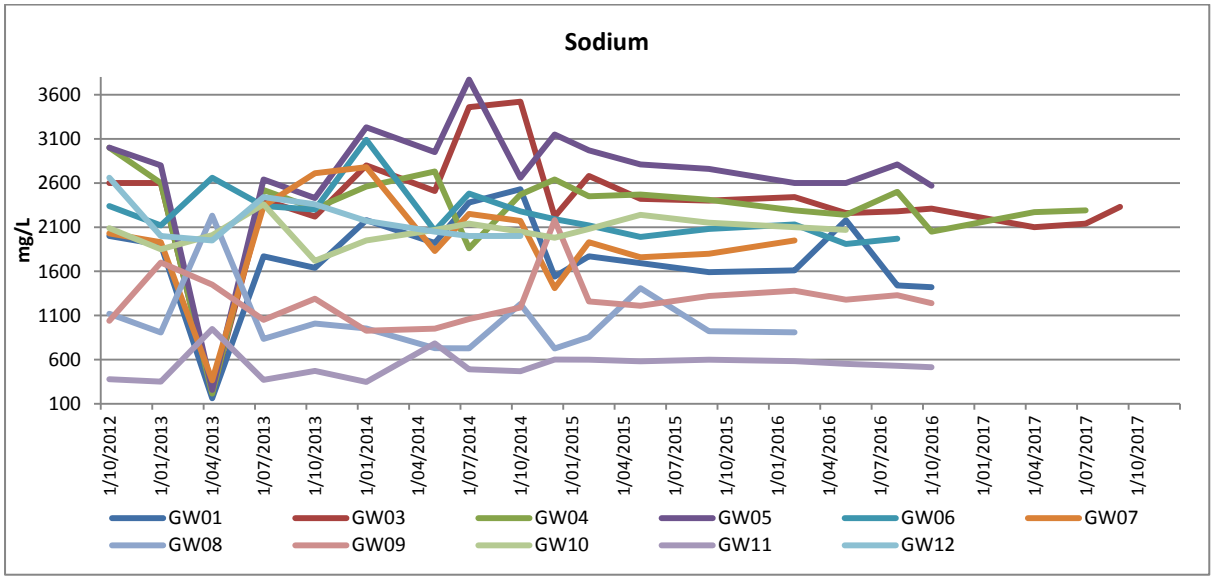


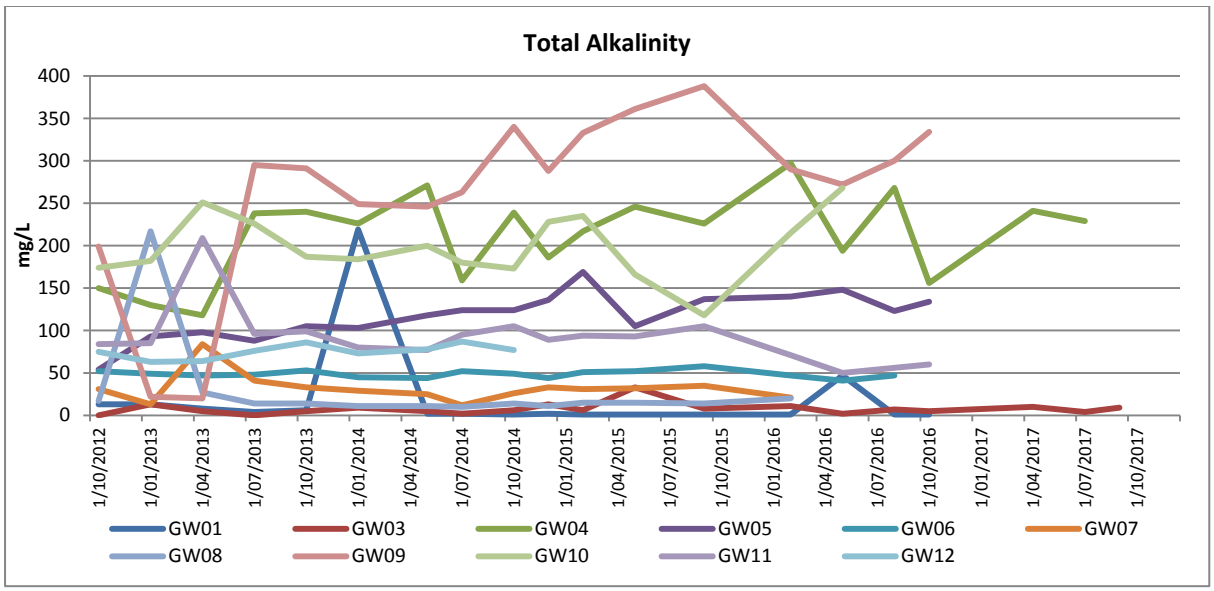

Cadmium
mg/L
6
4
2
0
1/10/2012
1/01/2013
1/04/2013
1/07/2013
1/10/2013
1/01/2014
1/04/2014
1/07/2014
1/10/2014
1/01/2015
1/04/2015
1/07/2015
1/10/2015
1/01/2016
1/04/2016
1/07/2016
1/10/2016
1/01/2017
1/04/2017
1/07/2017
1/10/2017
GW01
GW03
GW04
GW05
GW06
GW07
GW08
GW09
GW10
GW11
GW12

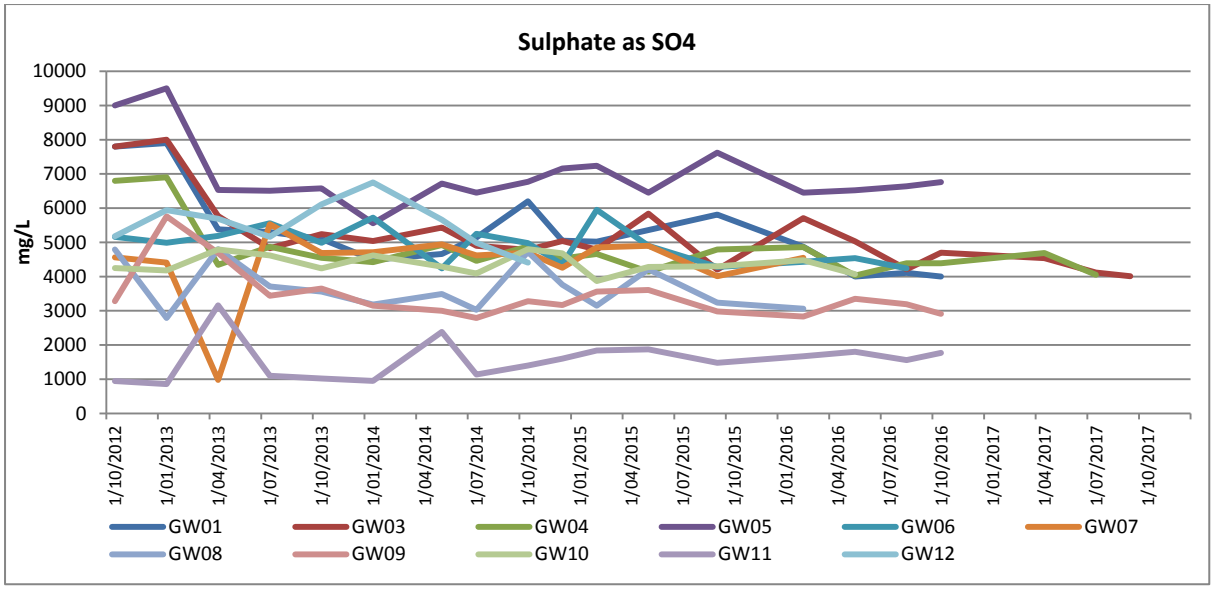

Manganese
mg/L
700
600
500
400
300
200
100
0
1/10/2012
1/01/2013
1/04/2013
1/07/2013
1/10/2013
1/01/2014
1/04/2014
1/07/2014
1/10/2014
1/01/2015
1/04/2015
1/07/2015
1/10/2015
1/01/2016
1/04/2016
1/07/2016
1/10/2016
1/01/2017
1/04/2017
1/07/2017
1/10/2017
GW01
GW03
GW04
GW05
GW06
GW07
GW08
GW09
GW10
GW11
GW12

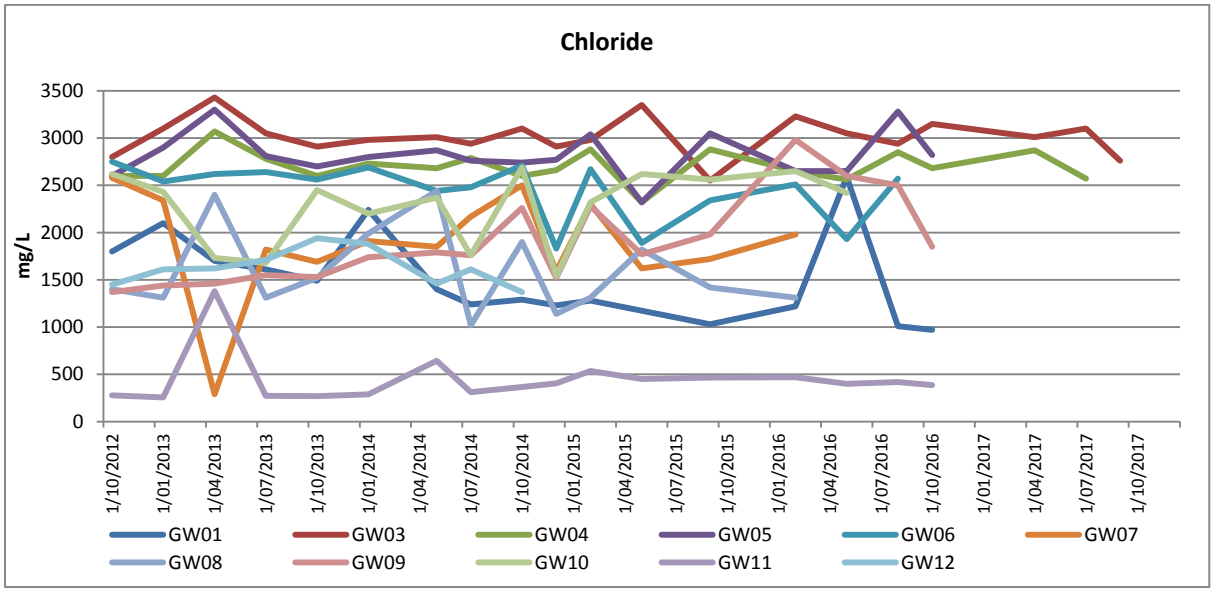

Calcium
mg/L
1000
900
800
700
600
500
400
300
200
100
0
1/10/2012
1/01/2013
1/04/2013
1/07/2013
1/10/2013
1/01/2014
1/04/2014
1/07/2014
1/10/2014
1/01/2015
1/04/2015
1/07/2015
1/10/2015
1/01/2016
1/04/2016
1/07/2016
1/10/2016
1/01/2017
1/04/2017
1/07/2017
1/10/2017
GW01
GW03
GW04
GW05
GW06
GW07
GW08
GW09
GW10
GW11
GW12

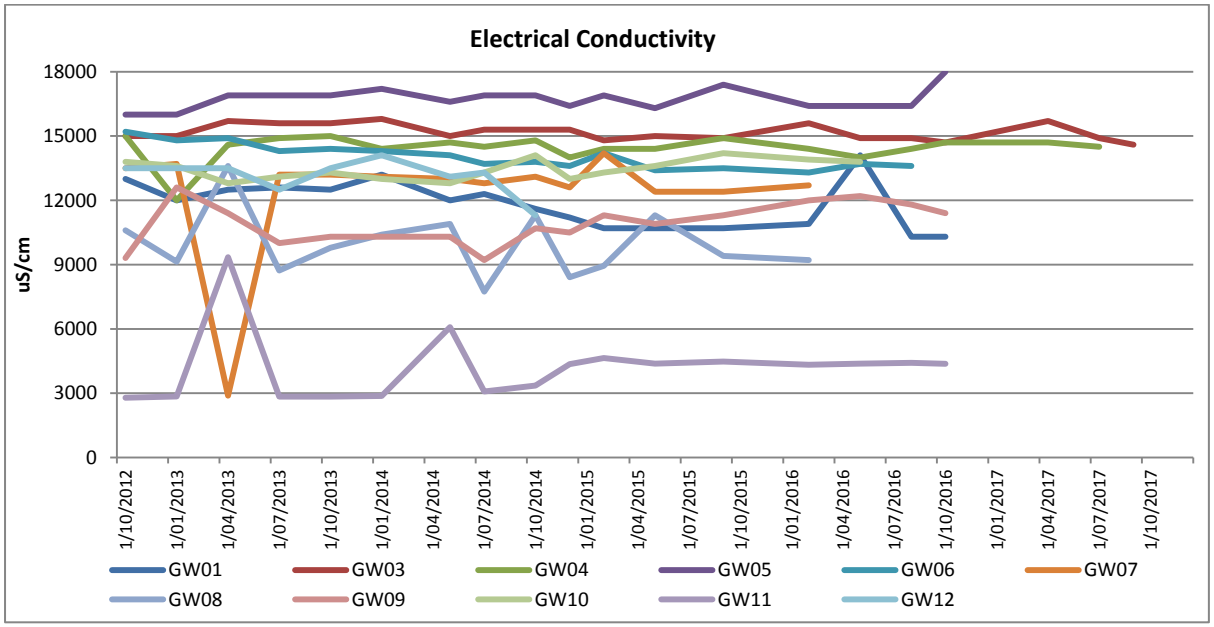

Magnesium
mg/L
900
800
700
600
500
400
300
200
100
0
01-10-12
01-10-13
01-10-14
01-10-15
01-10-16
01-10-17
GW01
GW03
GW04
GW05
GW06
GW07
GW08
GW09
GW10
GW11
GW12

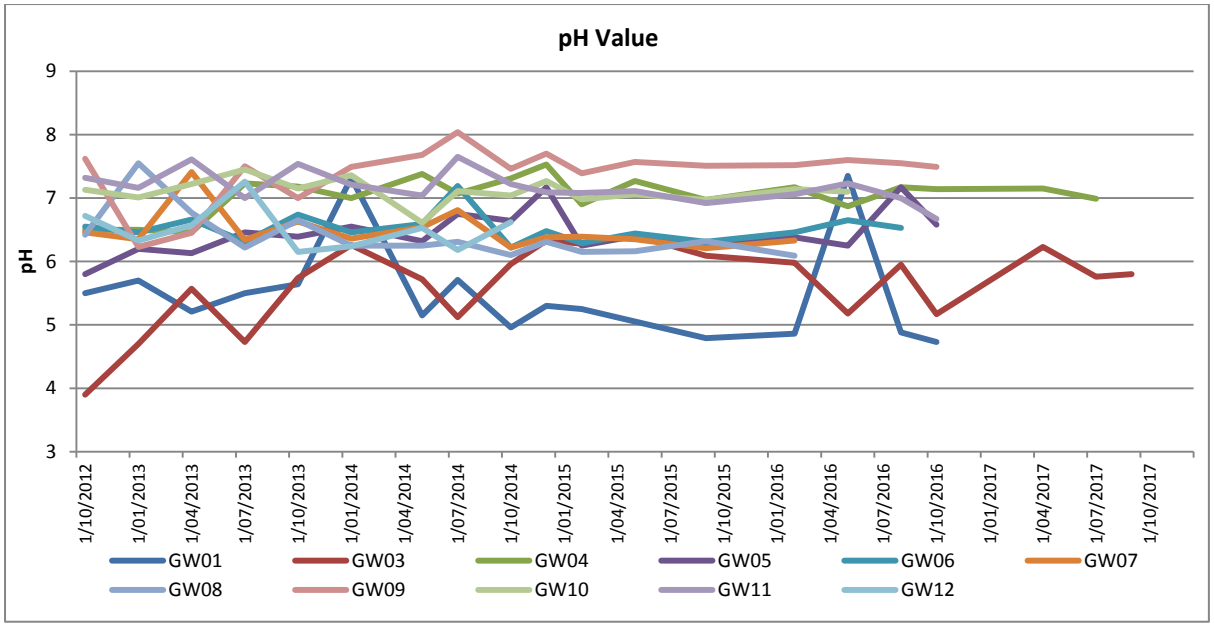

Sodium
mg/L
3600
3100
2600
2100
1600
1100
600
100
1/10/2012
1/01/2013
1/04/2013
1/07/2013
1/10/2013
1/01/2014
1/04/2014
1/07/2014
1/10/2014
1/01/2015
1/04/2015
1/07/2015
1/10/2015
1/01/2016
1/04/2016
1/07/2016
1/10/2016
1/01/2017
1/04/2017
1/07/2017
1/10/2017
GW01
GW03
GW04
GW05
GW06
GW07
GW08
GW09
GW10
GW11
GW12


Total Alkalinity
mg/L
400
350
300
250
200
150
100
50
0
1/10/2012
1/01/2013
1/04/2013
1/07/2013
1/10/2013
1/01/2014
1/04/2014
1/07/2014
1/10/2014
1/01/2015
1/04/2015
1/07/2015
1/10/2015
1/01/2016
1/04/2016
1/07/2016
1/10/2016
1/01/2017
1/04/2017
1/07/2017
1/10/2017
GW01
GW03
GW04
GW05
GW06
GW07
GW08
GW09
GW10
GW11
GW12


Sulphate as SO4
mg/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/10/2012
1/01/2013
1/04/2013
1/07/2013
1/10/2013
1/01/2014
1/04/2014
1/07/2014
1/10/2014
1/01/2015
1/04/2015
1/07/2015
1/10/2015
1/01/2016
1/04/2016
1/07/2016
1/10/2016
1/01/2017
1/04/2017
1/07/2017
1/10/2017
GW01
GW03
GW04
GW05
GW06
GW07
GW08
GW09
GW10
GW11
GW12


Chloride
mg/L
3500
3000
2500
2000
1500
1000
500
0
1/10/2012
1/01/2013
1/04/2013
1/07/2013
1/10/2013
1/01/2014
1/04/2014
1/07/2014
1/10/2014
1/01/2015
1/04/2015
1/07/2015
1/10/2015
1/01/2016
1/04/2016
1/07/2016
1/10/2016
1/01/2017
1/04/2017
1/07/2017
1/10/2017
GW01
GW03
GW04
GW05
GW06
GW07
GW08
GW09
GW10
GW11
GW12


Electrical Conductivity
uS/cm
18000
15000
12000
9000
6000
3000
0
1/10/2012
1/01/2013
1/04/2013
1/07/2013
1/10/2013
1/01/2014
1/04/2014
1/07/2014
1/10/2014
1/01/2015
1/04/2015
1/07/2015
1/10/2015
1/01/2016
1/04/2016
1/07/2016
1/10/2016
1/01/2017
1/04/2017
1/07/2017
1/10/2017
GW01
GW03
GW04
GW05
GW06
GW07
GW08
GW09
GW10
GW11
GW12


pH Value
pH
9
8
7
6
5
4
3
1/10/2012
1/01/2013
1/04/2013
1/07/2013
1/10/2013
1/01/2014
1/04/2014
1/07/2014
1/10/2014
1/01/2015
1/04/2015
1/07/2015
1/10/2015
1/01/2016
1/04/2016
1/07/2016
1/10/2016
1/01/2017
1/04/2017
1/07/2017
1/10/2017
GW01
GW03
GW04
GW05
GW06
GW07
GW08
GW09
GW10
GW11
GW12

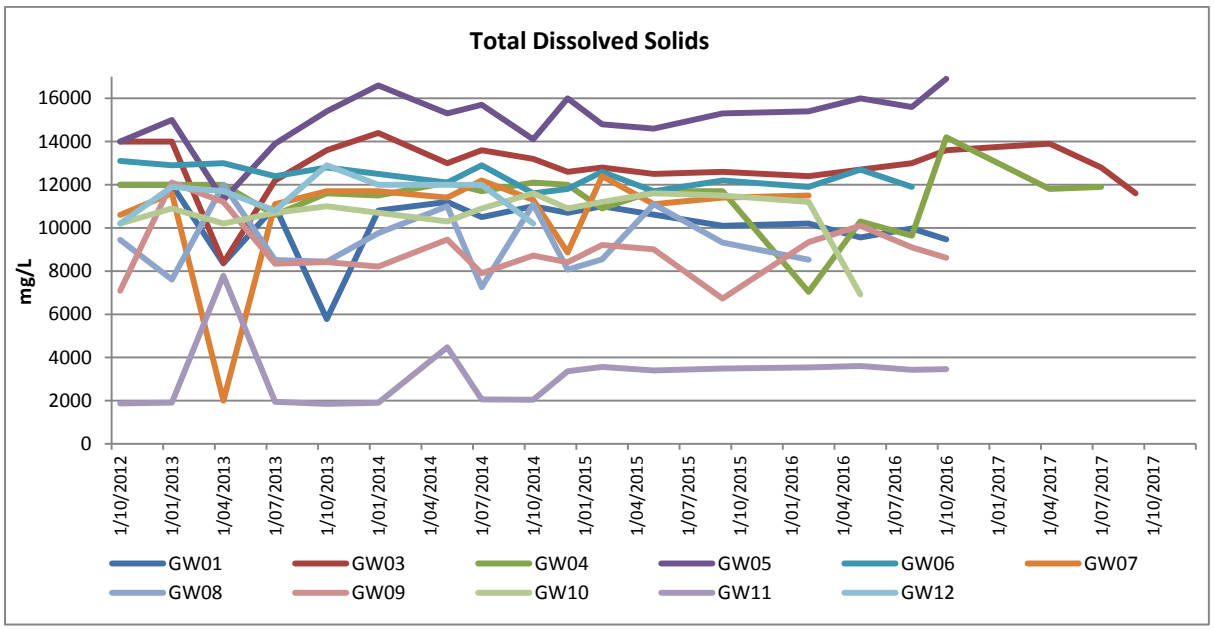

Total Dissolved Solids
mg/L
16000
14000
12000
10000
8000
6000
4000
2000
0
1/10/2012
1/01/2013
1/04/2013
1/07/2013
1/10/2013
1/01/2014
1/04/2014
1/07/2014
1/10/2014
1/01/2015
1/04/2015
1/07/2015
1/10/2015
1/01/2016
1/04/2016
1/07/2016
1/10/2016
1/01/2017
1/04/2017
1/07/2017
1/10/2017
GW01
GW03
GW04
GW05
GW06
GW07
GW08
GW09
GW10
GW11
GW12

Table 6-15 Groundwater Monitoring Results for Shaft 7 and Mine Dewatering for the Reporting Period (2017)

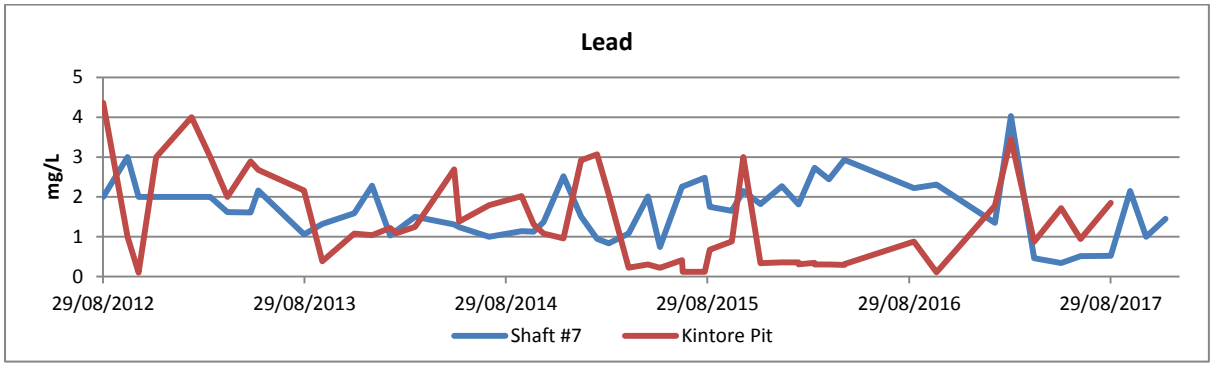
Site	Month Sampled	Alkalinity CaCO3 (mg/L)	Cd (mg/L)	Ca (mg/L)	Cl (mg/L)	EC (µS/cm)	Fe (mg/L)	Pb (mg/L)	Mg (mg/L)	Mn (mg/L)	pH	Na (mg/L)	SO as SO4 (mg/L)	TDS (mg/L)	Zn (mg/L)
Shaft 7	Jan	13	2.02	483	1260	11200	1.73	1.35	243	348	6.52	1400	4910	10900	898
	Feb	Dry													
	Mar	14	1.85	464	1430	-	1.14	4.03	290	327	-	1430	4670	12300	802
	Apr	5	0.0097	855	1210	9100	<0.05	0.35	258	366	6.24	1320	4100	7610	12.4
	May	2	1.76	497	1280	11500	0.66	0.341	273	246	5.65	1410	5300	8840	1010
	Jun	Not Undertaken													
	Jul	10	2.03	493	1300	12000	0.2	0.515	296	384	6.65	1570	6020	11900	984
	Aug	11	1.79	463	1400	10800	<0.05	0.759	265	298	6.41	1390	4050	11500	839
	Sep	10	2.24	501	1670	12590	1.51	1.6	327	387	6.58	1610	5610	13000	1000
	Oct	11	1.72	502	1320	11900	1.99	1.18	308	274	6.57	1610	4190	14800	794
	Nov	8	2.22	492	1480	12400	3.3	2.15	296	352	6.53	1610	5120	11200	1030
	Dec	3	2.43	510	1520	12000	<0.05	1.45	287	332	5.94	1590	6030	7430	1080
U/G water	Jan	8	2.21	494	1320	11700	1.34	1.78	271	386	6.58	1490	5750	11300	978
	Feb	Dry													
	Mar	7	2.21	508	1570	-	0.42	3.45	316	393	-	1520	6940	13600	916
	Apr	13	0.832	527	1240	9660	<0.05	0.002	282	354	7.01	1470	4320	8310	41.9
	May	2	2.33	593	1810	14300	0.05	1.72	420	374	5.71	1930	6480	14900	1110
	Jun														
	Jul	4	2.60	508	1340	12400	0.19	0.945	313	426	6.52	1500	6190	12400	1090
	Aug	Not Undertaken													
	Sep	Not Undertaken													
	Oct	Not Undertaken													
	Nov	Not Undertaken													
	Dec	3	2.62	492	1360	11500	<0.05	2.64	252	296	5.78	1510	5940	8950	1180
Baseline		40	6.32	472	1360	13900	1.57	2.25	395	907	5.8	3550	9660	8000	3330
Trigger		52	7.58	614	1768	18070	2.04	2.93	514	1179	7.54	4615	12558	10400	4329

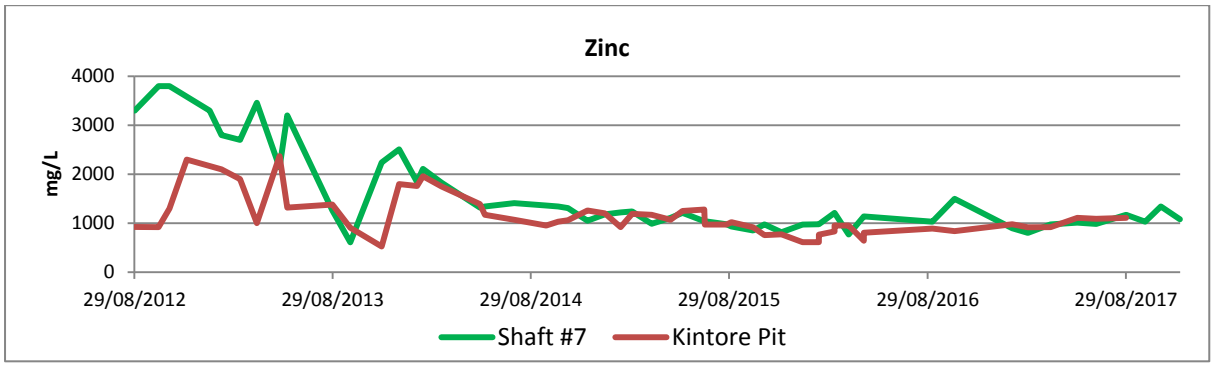
HIGHEST LOWEST >Above baseline trigger value (baseline + 30%)

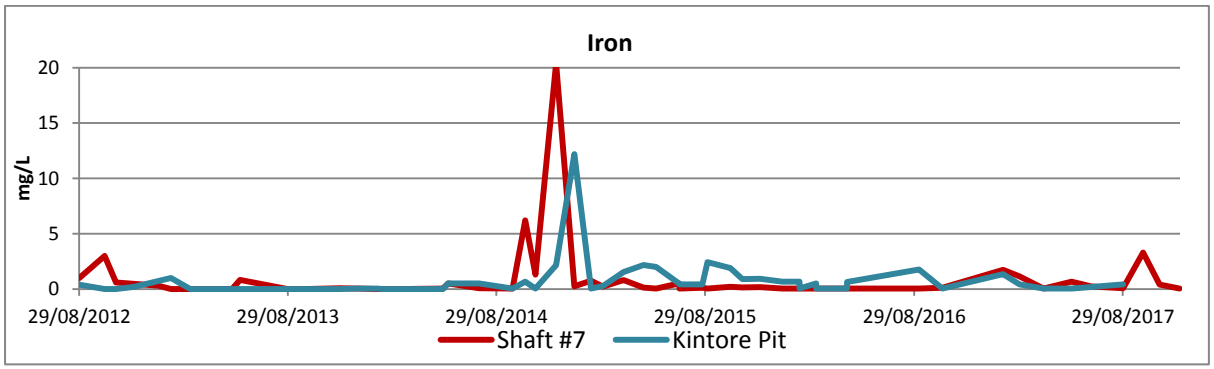
Results were below the trigger threshold with the exception of total dissolved solids (TDS) which was above the trigger most of the year, however results were within the historic range for TDS. This is probably consistent with mining works in the area where the water is extracted. There was only one other parameter which exceeded the trigger value, lead at Shaft 7 in November. There was no particular event that resulted in this exceedence.

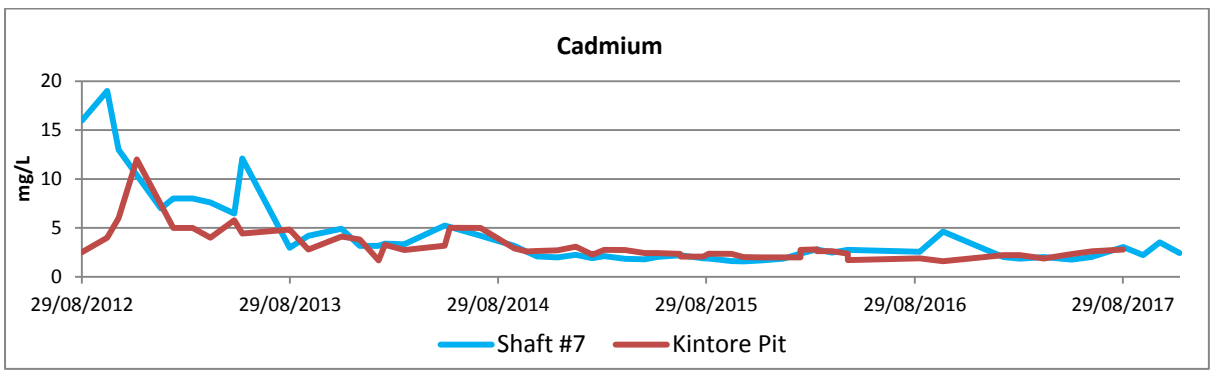
Figure 6-22 provides a series of graphs for indicating results for the period 2012, commencement of operations, to 2017. Results are within the historic range for all parameters

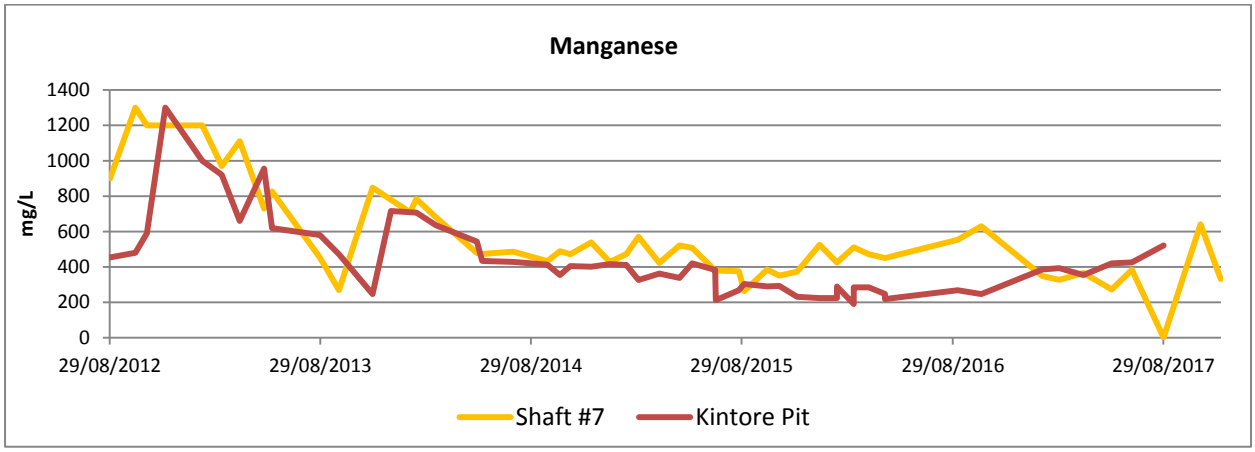
Figure 6-22 Shaft 7 & Mine Dewatering Results for Sampled Parameters - Period 2012 to 2017

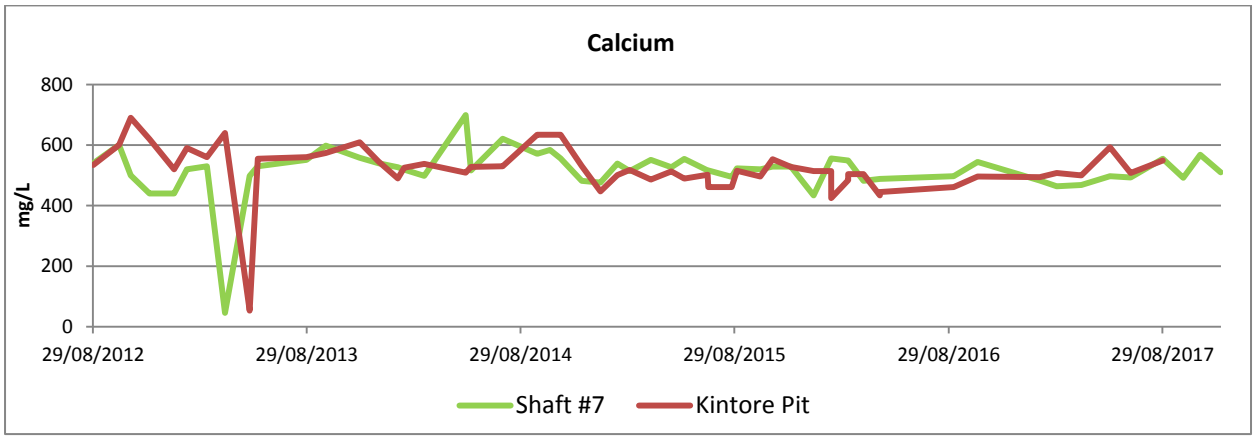


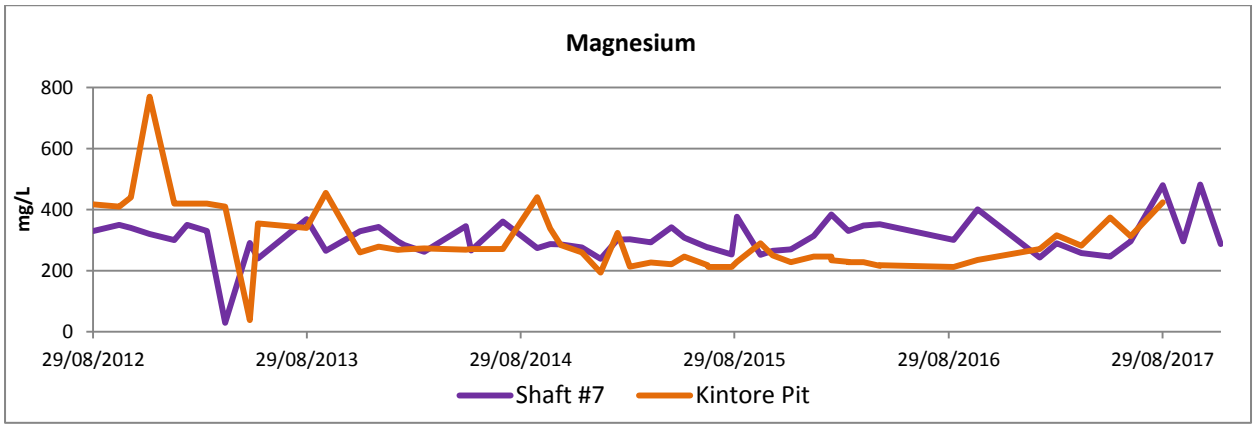


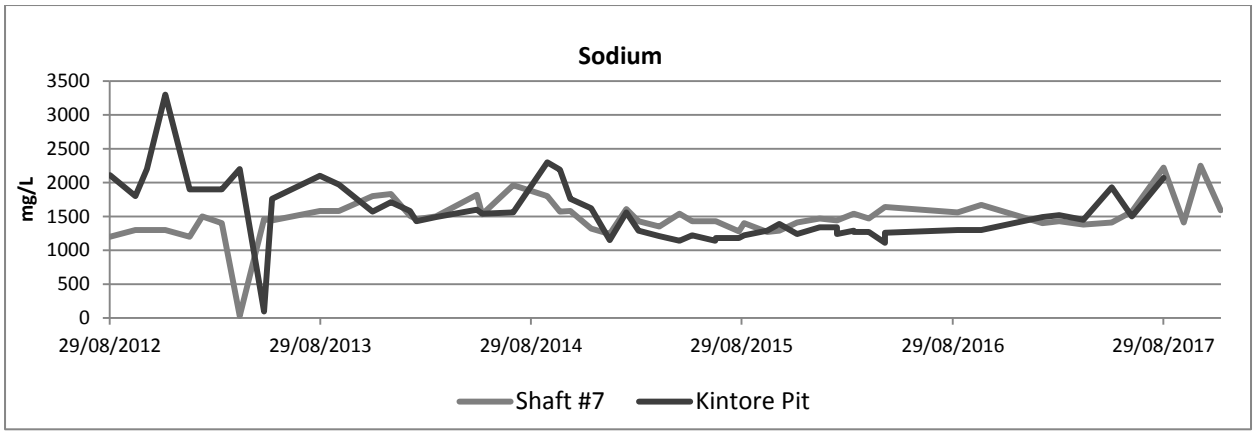


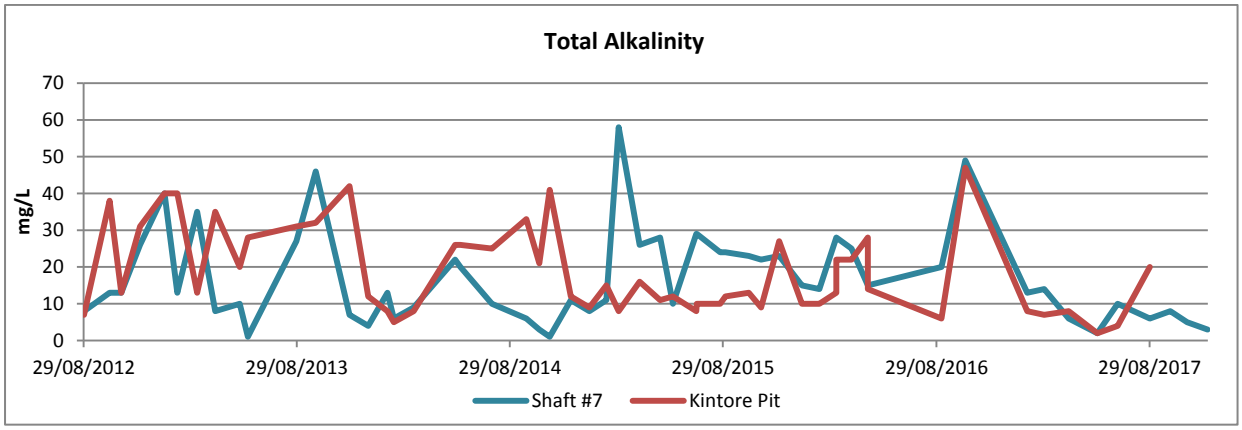


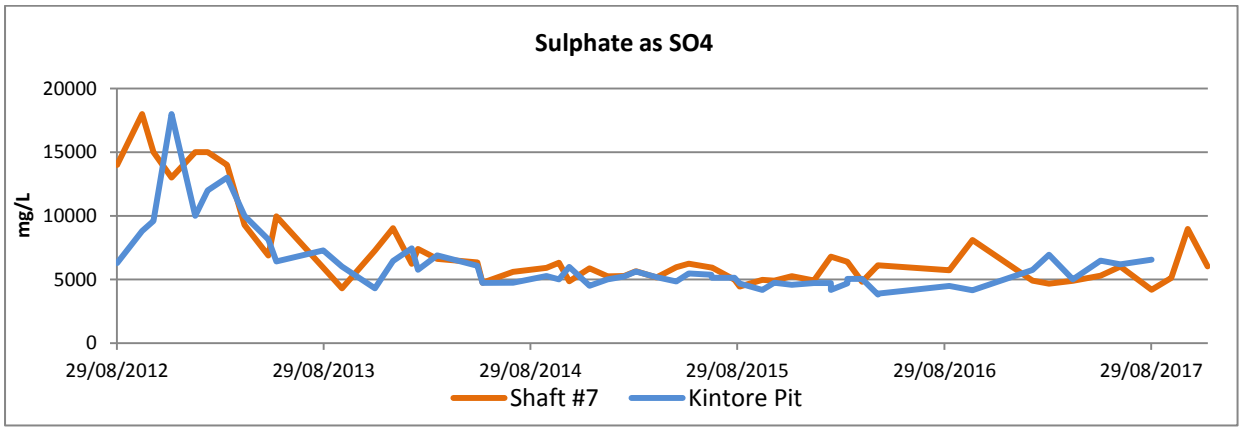

Manganese
1400
1200
1000
800
600
400
200
0
mg/L
29/08/2012
29/08/2013
29/08/2014
29/08/2015
29/08/2016
29/08/2017
Shaft #7
Kintore Pit

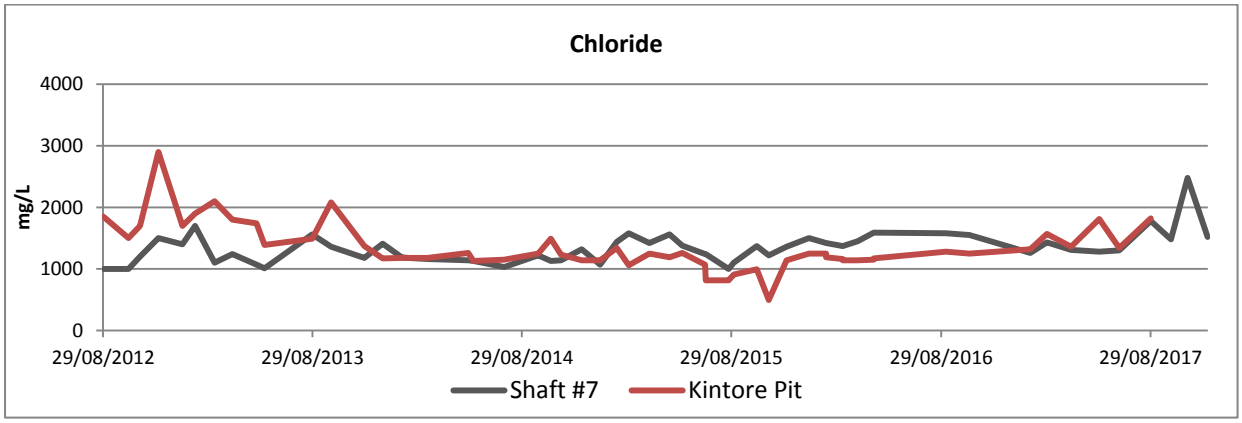

Calcium
800
600
400
200
0
mg/L
29/08/2012
29/08/2013
29/08/2014
29/08/2015
29/08/2016
29/08/2017
Shaft #7
Kintore Pit

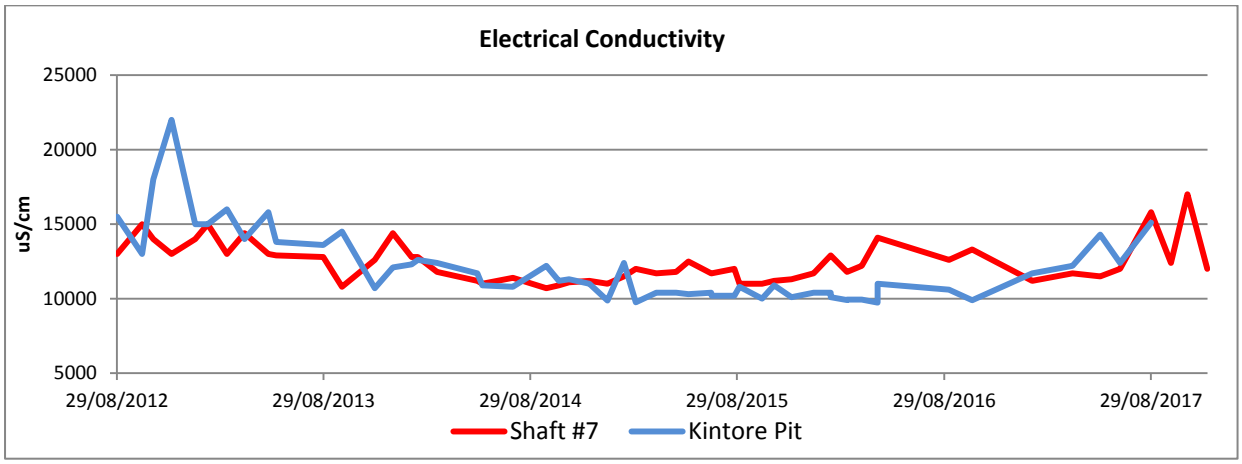

Magnesium
800
600
400
200
0
mg/L
29/08/2012
29/08/2013
29/08/2014
29/08/2015
29/08/2016
29/08/2017
Shaft #7
Kintore Pit

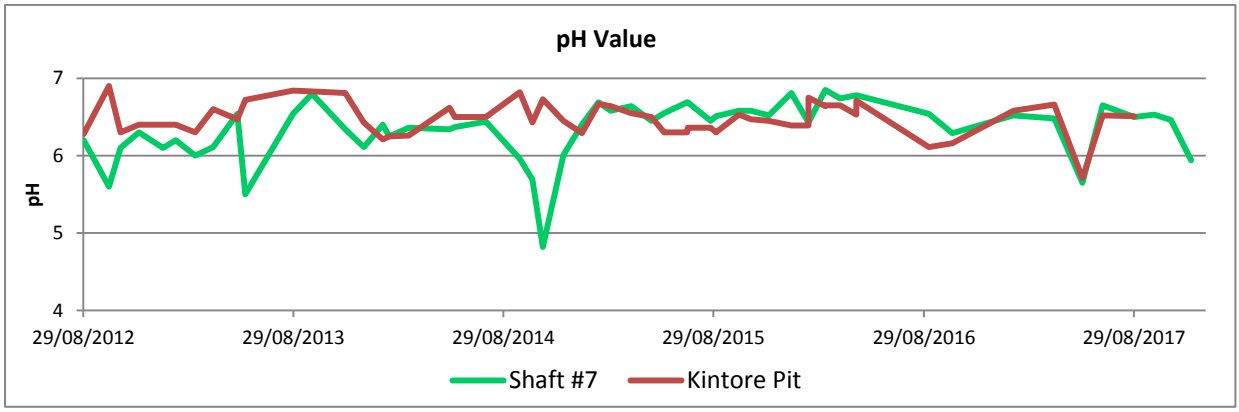

Sodium
3500
3000
2500
2000
1500
1000
500
0
mg/L
29/08/2012
29/08/2013
29/08/2014
29/08/2015
29/08/2016
29/08/2017
Shaft #7
Kintore Pit

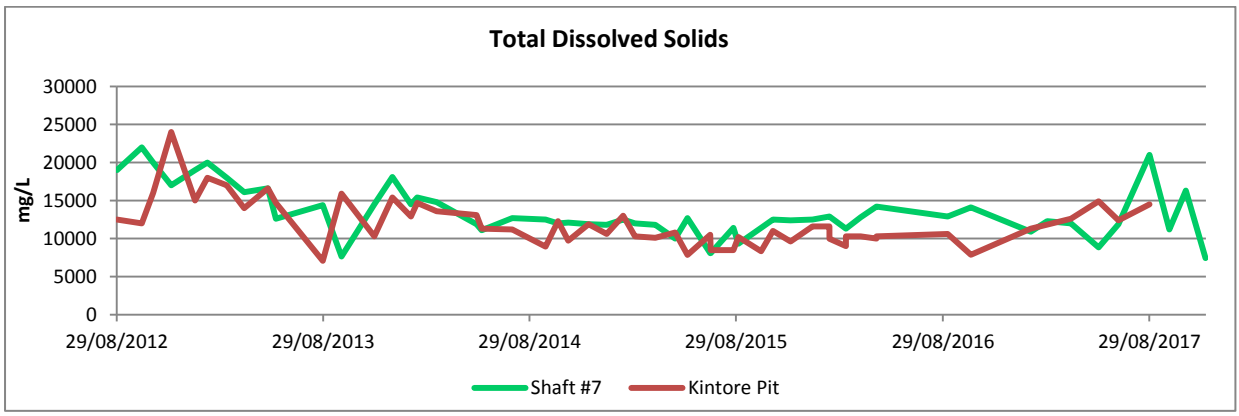

Total Alkalinity
70
60
50
40
30
20
10
0
mg/L
29/08/2012
29/08/2013
29/08/2014
29/08/2015
29/08/2016
29/08/2017
Shaft #7
Kintore Pit


Sulphate as SO4
20000
15000
10000
5000
0
mg/L
29/08/2012
29/08/2013
29/08/2014
29/08/2015
29/08/2016
29/08/2017
Shaft #7
Kintore Pit


Chloride
4000
3000
2000
1000
0
mg/L
29/08/2012
29/08/2013
29/08/2014
29/08/2015
29/08/2016
29/08/2017
Shaft #7
Kintore Pit


Electrical Conductivity
25000
20000
15000
10000
5000
uS/cm
29/08/2012
29/08/2013
29/08/2014
29/08/2015
29/08/2016
29/08/2017
Shaft #7
Kintore Pit





6.7 Contaminated Land

The majority of the surface land area that makes up the Rasp Mine is contaminated historic mining waste material including waste rock emplacements and tailings.

The storage and handling of diesel fuels, lubricants and oils, and waste rock material are the only aspects of the operation, which have the potential to contribute to contaminated land. The sections below outline how dangerous goods are handled onsite and procedures in place for managing and reporting spills.

6.8 Hydrocarbon and Chemical Management

The main streams of hydrocarbons managed on site include:

- Fuel (diesel) - storage and distribution;
- Grease oils and lubricants - storage distribution and recovery for recycling; and
- Solvents used in the parts washer.

6.8.1 Fuel

Diesel is stored in two tanks each with a capacity of 68,000L. These self-bunded trans-tanks are located adjacent to the workshop and are sitting on a constructed concrete re-fuelling station. The facility has been designed and manufactured in accordance with AS1940 and AS1692. BHOP has provision for diesel storage on its Dangerous Goods Licence, UN 00C1 Diesel 150,000 L. Surface distribution of diesel is by direct collection from the fuel browser. The tanks operate on a float and cut-off system that prevents overfilling of the tanks.

A 10,000L diesel tank was commissioned in October 2017. The tank is situated at the 13L Service Bay underground. It is double skinned and self-bunded.

Rasp's fuel management system enables monitoring of fuel usage by each vehicle and piece of plant. This assists with maintenance and security as well as providing an accurate reporting mechanism for the collecting of data for NPI and NGERS reporting.

A hydrocarbon spill procedure was developed in 2017 and outlines the potential sources of spills onsite and procedures for managing and reporting spills, **Appendix 4**.

6.8.2 Grease, oils and lubricants

Lubricants and oils are stored in individual pods located on a portable bund. A storage facility for these lubricants and oils has been constructed on the western side of the main workshop. It consists of a raised concrete pad incorporating drainage to a sump to facilitate cleaning.

6.8.3 Solvents

Oil solvent used for cleaning of mechanical parts at the workshop is removed by a contractor on a fixed maintenance schedule.

6.8.4 Processing reagent storage

All reagents are stored in a purpose built storage facility designed to prevent contamination and capture spillage.

The reagents stored here include:

- Hydrated Lime
- Copper Sulphate
- Sodium metabisulphite
- Sodium ethyl xanthate
- Flocculant
- InterFroth F228
- Cytec S9232 (zinc collector)
- Antiscalant
- Defoamer
- Zinc Sulphate

All quantities and map with storage locations are reference in the Pollution Incident Response Management Plan which is tested annually and available on the CBH website.

6.9 Hazardous Material Management

6.9.1 Licensing

Rasp holds Licence XSTR100095 for the storage and handling of dangerous goods, Radiation Management Licence 5063802, which is valid until 26-Jul-18. Additionally, Rasp holds an explosives licence (licence number XMNF200003) to manufacture, possess, store explosives and ammonium nitrate emulsion on site.

6.9.2 Dangerous goods management

Site dangerous goods management is managed according to the site Chemical Management Procedure BHO-PRO-SAF-020.

A Safety Data Sheet (SDS) database for each chemical is maintained. SDS's are kept at each location where chemicals are stored and in the mines rescue room. SDS's are also electronically available on the intranet.

General and contractor inductions outline the required actions in the event of a spill, including completing an Incident Report.

All quantities and a map with storage locations are referenced in the Pollution Incident Response Management Plan, which is tested annually and updated as required.

Storage, management and access to explosives onsite is outlined in the Store, Manage and Access Explosives Standard BHO-STD-MIN-001. A security plan compiled and submitted by the supervising licensee detailing the security measures for explosives on the Broken Hill Operations Pty Ltd, Rasp Mine site. (Document PLN- 03-06-01)

Explosives are stored both on the surface and underground. The surface explosive magazines (SEM) are located within the BHP Pit approx. 3 km north from the main office on Eyre Street. The area encompasses one detonator magazine (IE), one packaged explosives magazine (HE) and one emulsion bulk storage compound. The magazines are separated by a minimum of 7 metres and are bunded in accordance with AS 2187.1. All gates and magazines are secured with locks, and signage that meet the minimum required standards.

The underground explosive magazines (UEM) are located within the underground operations of Broken Hill Operations Pty Ltd, Rasp Mine. Separate storages are utilised for the storage of (IE) and (HE) Explosives Magazines are secured with locks, and signage that meet the minimum required standards.

SEM & UEM keys are locked in a secured key cabinet in the Broken Hill Operations Pty Ltd, Rasp Mine Site Office and are to be issued only by the Emergency Service Officers, who must check the identity and authority of the person wishing to take possession of the keys. The SEM & UEM Explosive Magazine Access Log Book BHO-TRN-REG-004 must be completed prior to issuing and returning the keys. Personnel will only be granted access if they possess a Security Clearance and their name appears on the Key Register (Section 7 of the Site Security Plan).

6.10 Waste Management

Waste management at the mine is classified into two broad categories: mineral wastes (mining and mineral processing wastes discussed above), and non-mineral wastes which include recyclables and non-recyclables.

Waste generated is summarised in **Table 6-17**.

6.10.1 Mineral wastes

Mineral wastes consist of waste rock from underground workings and tailings residue from the processing of ore.

Waste rock that cannot be returned underground to fill voids is stored in Kintore Pit or used for roads or bunding, following testing and confirmation that it is less than 0.5% lead. In the reporting period 215,879 t of waste rock was placed underground and 76,578 t placed on the stockpile in Kintore Pit.

Tailings is discharged into Blackwood Pit (TSF2) with water recycled for use in processing where possible. In the reporting period all tailings was placed in Blackwood Pit, 628,106 t.

All tailings generated from the processing plant are deposited into Blackwood Pit (TSF2). Tailings from the flotation process are pumped to and deposited at the south-western end of TSF2 via a duty/standby configuration of centrifugal pumps. Particle solids settle out of the slurry stream along the length of TSF2 in a north-easterly direction. Any excess water collects at the northeast end of the facility and is pumped back into the process water tank via a mobile diesel water pump.

During the reporting period, 628,106 t of tailings were pumped to TSF2, on average the tailings contained zinc (0.31%), lead (0.22%) and copper (0.01%), Zn (0.33%), Pb (0.23%), Ag (8g/t), Fe (2.97%) and Cu (0.01%).

In the initial Project Approval, BHOP underestimated the amount of mine development that was required to access the Main Lode and Western Mineralisation ore bodies. The need to undertake more underground mining development than anticipated has reduced the capacity of underground voids to accept both waste rock and tailings material from the Backfill Plant. In the original EA, it was predicted that approximately 250,000 t of waste rock would be produced each year for a production rate of 750,000 t of ore. This increased to 300,000 t to 360,000 t per year for an average production

rate per year of 650,000 t of ore. (In 2017 with 720,832 t mined, waste rock produced was 292,475 t.) BHOP has chosen to place the additional waste rock underground to fill voids and stopes, as it is more economical to dispose waste rock underground if possible rather than transporting waste to the surface. Hence, there is no void space underground for the backfill of tailings.

BHOP also opted to only deposit tailings in TSF2 as this facility had greater capacity and was economically more viable.

Table 6-16 shows past and proposed tailings deposition and waste rock production rates.

Table 6-16 Summary of Proposed (EA) and Actual Placement of Waste Rock and Tailings

Year (to 30 June)	EA Tailings in Underground back fill per year (t)	EA Tailings deposited in TSF1 (t)	EA Tailings deposited in TSF2 (t)	EA Waste Rock U/G (t)	Actual[1]/ Predicted[2] Tailings in TSF2 (t)	Actual waste rock placed underground (t)	Actual waste rock stored Kintore Pit (t)	Actual Total waste rock (t)
2012	97,969	273,281	0	250,000	322,111[1]	47,527	150,000[3]	197,527
2013	195,938	195,138	0	250,000	574,833[1]	230,607	150,000[3]	380,607
2014	195,938	195,138	0	250,000	486,749[1]	223,473	163,304	386,777
2015	216,563	216,563	0	250,000	499,598[1]	223,611	228,942	452,553
2016[1]	247,500	88,281	159,219	250,000	555,837[1]	265,369	96,888	362,257
2017[1]	292,475	0	278,438	250,000	622,161[1]	215,897	76,578	292,475
2018[1]	309,375	0	309,375	250,000	530,000[2]	-	-	-
2019[1]	309,375	0	309,375	250,000	530,000[2]	-	-	-
2020[1]	309,375	0	309,375	250,000	530,000[2]	-	-	-
TOTALS	**2,174,508**	**968,401**	**1,365,782**	**2,250,000**	**4,651,289**	**1,206,484**	**865,712**	**2,072,196**

Note[1]: Actual tailings deposited.
Note[2]: Predicted tailings deposition.
Note[3]: Estimated from visual inspection at the time.

To extend the life of the facility BHOP completed a modification to its Project Approval to allow for the in-filling of low points around the perimeter of TSF2. Approval was granted in September 2017 for the installation of three embankments and a retaining wall to be installed near an old mine managers house ensuring its protection. Embankment 2 is planned to commence in Quarter 3 of this year with Embankments 1 and 3 occurring up to 12 months later, as tailings rise to the required level. The embankments will be constructed consecutively and when completed in early 2020 will provide tailings storage until mid 2021.

BHOP plan to submit an application to modify its current Project Approval to allow for further tailings placement post 2021 in 2018, on completion of the preliminary design BHOP will update the Waste Management Plan as required.

6.10.2 Non-mineral waste

Rasp Mine has four main laydown areas where used parts and equipment are stored for future use. The recyclable area has dedicated sections for scrap metal, timber, batteries, rubber, electronic goods and used pods. Used 1000L pods are returned to the manufacturer for reconditioning and reuse.

Used hydrocarbons are sent offsite for handling, processing, recycling and disposal at the waste hydrocarbon depot operated by the waste management contractor. The facility handles used oil, grease, oily rags, oil filters and hydrocarbon contaminated items.

Other recyclables include office paper, cardboard, printer cartridges and scrap metal. Standard practices/procedures are in place for paper, cardboard and printer carriages. Exact figures for recycling cannot be provided as material is taken off site “co-mingled”.

Table 6-17 provides a summary of wastes removed from site during the reporting period.

Table 6-17 Waste Summary

Waste	Recycled*
Oil	24,000 L
Oily water	3,000 L
Scrap metal	176.1 t
Grease	10,560 L
Oil filters, hoses, rags	18,000
Contaminated drums	12
Printer cartridges	6 bags
E-waste	Nil

No tyres were disposed in underground workings during the reporting period. Tyres for heavy mobile equipment have been stored or reused around the mine site for barricades on roadways and within the laydown yards. All other LV and light truck tyres are removed from site under arrangement with the tyre supplier.

The Broken Hill City Council on a weekly basis empties rubbish bins containing general site rubbish into a garbage truck. The rubbish is taken to the Broken Hill rubbish dump where it is deposited.

6.11 Flora and Fauna

The site is a highly disturbed environment that provides little value as native flora and fauna habitat. There have been no threatened flora, fauna or species habitat identified at the Rasp Mine.

6.12 Weeds

Weeds are managed on an annual basis with a contractor engaged to spray any weed infestations. During the reporting period, a weed survey and spray was carried out in November 2017 and there have been no reported outbreaks.

6.13 Blasting

There are six monitors installed to record blasting vibration and over pressure. Blast monitors are installed at five locations around Broken Hill and there is one monitor located on-site near the core shed (this is used to monitor blast impacts at South Road). Locations are shown on **Figure 6-2**. A roving blast monitor is also utilised for determining more information about ground conditions and vibration movement at various locations. When a blast complaint is received, the person is given the opportunity to have the roving monitor placed at their location. The aim of this is to assess community impact and also to gather information for future blast design.

Table 6-18 and **Table 6-19** lists the criteria for blasting ground vibration and overpressure for Western Mineralisation / Main Lodes (WesternMIn/Main Lodes) and Block 7, respectively**.**

Table 6-18 Overpressure and Ground Vibration WesternMin/Main Lodes (excluding Block 7)

Location	Airblast Overpressure (dB(Lin Peak))	Ground Vibration (mm/s)	Allowable Exceedence
Residence on privately owned land (7am-7pm)	115	5	5% of the total number of blasts over a 12-month period[ab]
(7am-7pm)	120	10	0%
(7pm-10pm)	105	-	-
(10pm-7am)	95	-	-
Public Infrastructure[d]	-	100	0%

Table 6-19 Overpressure and Ground Vibration Block 7 (includes Zinc Lodes)

Location	Airblast Overpressure (dB(Lin Peak)	Ground Vibration (mm/s)	Allowable Exceedence
Residence on privately owned land (7am-7pm)	115	3 (interim)[c]	5% of the total number of blasts over a 12-month period[a]
(7am-7pm)	120	10	0%
(7pm-10pm)	105	-	-
(10pm-7am)	95	-	-
Broken Hill Bowling Club, Italio (Bocce) Club, Heritage Items within CML7	-	50	0%
Perilya Southern Operations	-	100	0%
Public Infrastructure[d]	-	100	0%

The Project Approval provides the following notes to these **Tables 6-18** and **6-19:**

a) The allowable exceedence must be calculated separately for development blasts and production blasts;
b) The 5% allowable exceedence does not apply to production blasts until the Proponent has successfully completed a Pollution Reduction Program aimed at achieving this goal, as required by the EPA under the Proponent's EPL (No. 12559), or as otherwise agreed with the EPA;
c) The interim criteria applies unless and until such time that the Proponent has written consent from the Secretary to apply site specific criteria in accordance with condition 19 of this approval; and
d) The Proponent must close South Road to pedestrians if blasts are expected to exceed a peak particle velocity ground vibration of 65 mm/s at the road reserve surface, while the blast firing occurs.

In addition the following conditions also apply:-

- Production blasts may occur between 6.45 am and 7.15 pm on any day
- 1 production blast per day, with 6 per week averaged over a calendar year
- 6 development blasts per day, with 42 per week averaged over a calendar year

In accordance with Project Approval and EP Licence conditions:

- All production-blasting times occurred between 6.45am and 7.15pm on any day.
- Production blasts averaged 4.3 per week over the previous calendar year
- Development blasts averaged 34.2 per week over the previous calendar year

A total of 2038 blasts were fired during the reporting period, 1858 for development and 226 for production. **Tables 6-20** and **6-22** lists the total number of blasts for each area per month during the reporting period and **Tables 6-21** and **6-23** summarise the blasts over 5 mm/s (WesternMin/Main Lodes) and 3 mm/s (Block 7).

Table 6-20 Western Min/Main Lodes Summary of Blasts for Reporting Period (2017)

	Production					Development				
	Blasts	< 5	>= 5	>= 10	nr	Blasts	< 5	>= 5	>= 10	nr
Jan 2017	17	17	0	0	0	148	6	0	0	142
Feb 2017	16	16	0	0	0	143	0	0	0	143
Mar 2017	18	16	1	0	1	144	2	0	0	142
Apr 2017	12	12	0	0	0	145	1	0	0	144
May 2017	12	11	0	0	1	146	14	0	0	132
Jun 2017	12	9	2	0	1	139	1	0	0	138
Jul 2017	16	16	0	0	0	148	4	0	0	144

	Production					Development				
Aug 2017	12	10	1	0	1	131	6	0	0	124
Sep 2017	12	11	1	0	0	161	1	0	0	160
Oct 2017	13	12	1	0	0	160	0	0	0	160
Nov 2017	14	14	0	0	0	156	0	0	0	156
Dec 2017	17	15	2	0	0	146	0	0	0	146
TOTAL	171	159	8	0	4	1767	35	0	0	1731

In the WesternMin/Main Lodes mining areas (external to Block 7), a total of 1938 blasts were fired. Of these, 1767 were for development and 171 were for production. Eight blasts exceeded 5 mm/s, all recorded from production blasts. The percentage of production blasts exceeding 5 mm/s was 4.7% and the percentage of development blasts was 0.4%, both within the criteria of 5% allowable exceedence.

Table 6-21 Western Min/Main Lodes Blasts > 5 mm/s for the Reporting Period (2017)

Production	Blasts >5 mm/s	Result	Development	Blasts >5 mm/s	Result	TOTAL	Blasts >5 mm/s	Result
171	8	4.7%	1767	0	0%	1938	8	0.4%

The EPA has imposed a Pollution Reduction Program (PRP) - U1 Blast Compliance Management Program, requiring BHOP to implement a production blast management program directed at achieving compliance with EPL Condition L5.1 - where the limit allows a 5% exceedence of the 5 mm/s ground vibration impact at any sensitive receptor outside the premises. The exceedence criteria in the WesternMin/Main Lodes has been relaxed during this period. Current improvements are consistent with achieving this requirement. However, the incremental improvements are now less and it is yet unknown if the criteria as listed in the EP Licence is sustainable for production blasts only over the long term.

All criteria were met for the WesternMin/Main Lodes during the reporting period.

Table 6-22 Block 7 (and Zinc Lodes) Summary of Blasts for the Reporting Period (2017)

	Production					Development				
	Blasts	**< 3**	**>= 3**	**>= 10**	**nr**	**Blasts**	**< 3**	**>= 3**	**>= 10**	**nr**
Jan 2017	12	0	0	0	12	0	0	0	0	0
Feb 2017	8	1	0	0	7	0	0	0	0	0
Mar 2017	8	0	0	0	8	0	0	0	0	0
Apr 2017	6	0	0	0	6	1	0	0	0	1
May 2017	14	1	0	0	13	2	0	0	0	2
Jun 2017	5	1	0	0	4	2	1	0	0	1
Jul 2017	0	0	0	0	0	0	0	0	0	0
Aug 2017	0	0	0	0	0	0	0	0	0	0
Sep 2017	14	1	1	0	12	2	0	0	0	2
Oct 2017	14	0	0	0	14	1	0	0	0	1
Nov 2017	3	3	0	0	0	3	0	0	0	3
Dec 2017	5	3	2	0	0	0	0	0	0	0
TOTAL	89	10	3	0	76	11	1	0	0	10

In Block 7 mining areas (including the Zinc Lodes), a total of 100 blasts were fired during the reporting period. Of these, 11 were for development and 89 were for production. Three blasts exceeded 3 mm/s, all recorded from production blasts. The percentage of production blasts exceeding 3 mm/s was 3.4% and the percentage of development blasts exceeding 3 mm/s was 0.0%, both within the criteria of the 5% allowable exceedence.

Table 6-23 Block 7 Blasts Exceeding 3 mm/s for Reporting Period (2017)

Prod	Blasts >3 mm/s	Result	Dev	Blasts >3 mm/s	Result	TOTAL	Blasts >3 mm/s	Result
89	3	3.4%	11	0	0%	100	3	3.0%

Table 6-24 lists the highest recorded results for ground vibration (mm/s) at each of the vibration monitors.

All criteria were met for Block 7 during the reporting period.

Table 6-24 Ground Vibration Results at Vibration Monitors for the Reporting Period (2017)

Vibration Monitor/Location	Highest Recorded Ground Vibration (mm/s)
V1 Silver Tank (located on CML7)	0.58
V2 Hire yard	7.88
V3 Air Express	5.3
V4 123 Eyre St	0.91
V5 80 Eyre St	3.1
V6 BHOP Core Shed (located on CML7)	11.37

All off-site blasts were under 10 mm/s.

There were no exceedences of criteria for overpressure levels.

6.14 Operational Noise

During the reporting period, noise was generated by operational activities, movement of heavy vehicles and delivery trucks leaving and entering site.

Noise monitoring is completed annually at noise monitoring locations shown together with the relevant location criteria in **Table 6-25**. During the reporting period EMM Consulting Pty Ltd conducted a noise assessment for these receptors, **Appendix 5.** A total of 29 operator-attended noise measurements were completed, including two measurements at each of the 14 monitoring locations, plus one additional measurement (for a total of three measurements) at location A1. The wind speed was above 3 m/s for 11 out of the 29 samples (38%) and therefore the noise criteria could not be applied on those occasions. Noise monitoring results are shown in **Table 6-26**.

Low frequency noise was assessed using the Industrial Noise Policy (EPA 2017), (INP) methodology for each attended measurement during post-analysis of data, and for audible contributions only. Low frequency noise, as defined in the INP was identified for one of the attended measurements at locations A6, A8 and A14, and hence a modification factor of 2 or 5 dB as relevant, was added to the site noise contributions.

During attended measurements when noise limits where applicable, Rasp Mine LAeq(15min) noise contribution (including the addition of the relevant modification factor) was identified to be above the relevant night-time noise limit during one of the measurements at locations A6, A8 and A14. Site

LAeq(15min) noise contribution during these measurements was dominated by noise from haul trucks travelling between the portal and the ROM pad. It is noted that further monitoring completed at these locations demonstrated that site noise complied with the relevant limits, and hence the exceedences were not sustained.

No noise complaints were received in the reporting period.

Table 6-25 Operational Noise Criteria

Location	Day (dB(A))	Evening (dB(A))	Night (dB(A))
A1 – Piper Street North	38	37	35
A2 – Piper Street Central	38	37	35
A3 – Eyre Street North	44	41	39
A4- Eyre Street Central	44	41	39
A5 – Eyre Street South	44	41	39
A6 – Bonanza and Gypsum Streets	48	41	39
A7 – Carbon Street	35	35	35
A8 – South Road	48	39	39
A9 – Crystal Street	46	39	39
A10 – Barnet and Blende Streets	42	41	35
A11 – Crystal Street	46	39	39
A12 – Crystal Street	46	39	39
A13 – Eyre Street North 2	38	35	35
A14 – Piper Street North	35	35	35

Table 6-26 Noise Monitoring Results

Location	Start	LA_{EQ}	LA_{MAX}	Rasp contribution $LA_{EQ(15\text{-}min)}$	Criteria	Compliant
A1	22:43	49	77	27	35	Y
A2	23:03	36	55	31	35	Y
A3	01:08	62	85	32	39	Y
A4	23:47	49	69	<30	39	Y
A5	00:14	56	76	35	39	Y
A6	02:24	43	58	47	39	N
A7	02:59	34	43	<29	35	Y
A8	03:25	42	52	45	39	N
A9	03:50	53	74	39	39	Y
A10	04:17	43	63	35	35	Y
A11	22:37	54	73	<30	46	Y
A12	22:59	47	69	37	46	Y
A13	23:22	52	78	30	35	Y
A14	22:22	44	56	41	35	N

Noise attenuation measures on site include:

- Plant and equipment operator training. This included correct gear selection to minimize noise emission, retraining in travelling haul road procedure and educating personnel of the noise criteria for site.

- The use of an “ice-creaming” technique when loading the crusher allows the crusher to be loaded to maximum capacity at all times reducing the noise generated by rock fall onto the grizzly. “Ice-creaming” is where the crusher bin volume is maintained at a high level by the ROM front end loader.
- Optimisation of haul truck speed and gear changing via the use of intermediate markers along haulage route.
- Extension of both length and height of the existing earth bund along the southern haul road (from Kintore Pit to ROM pad).
- Installation of noise abatement material in the crusher house.
- A 2.5 m high by 6 m long tyre wall was constructed to reduce noise transition from the filtration area of the processing plant.

6.15 Visual, Stray Light

Light towers around machinery, where practicable, are designed to face light away from residents.

There were no light complaints for the reporting period.

6.16 Indigenous Heritage

There are no known significant indigenous sites within CML7.

6.17 Natural and Social Heritage

6.17.1 Conservation management strategy

It is BHOP’s understanding that DRG are currently involved in discussions with a number of government agencies to identify a process for determining the final end land use across the length of the Line of Lode, including those areas that come within the mining leases of Perilya. It was proposed to that this process would be finalised towards the end of 2017. No advice has yet been received on these discussions, their extent or current status. As this will influence the status for heritage items, the end land use and landscape for the Line of Lode, BHOP is unable to complete the Conservation Management Plan (Schedule 3 Condition 30 PA07_0018) or other associated documents until these matters are resolved and agreed.

6.18 Spontaneous Combustion

Products with high sulphur content (tailings, ore and concentrate) are prone to spontaneous combustion. Combustion is caused by the oxidation of the sulphides, which is an exothermic chemical reaction that causes heat build-up, and the remaining sulphides begin to start smouldering. In extreme cases the sulphides may burn producing a flame. Requirements for combustion to occur are high sulphur material, oxygen, moisture and sufficient material to generate heat build-up.

No incidences occurred during the period.

6.19 Bushfire

No bushfires affected the site during the reporting period. Broken Hill and surrounding areas have limited potential for bushfires due to the lack of suitable fuel.

The Rasp Mine has a fully equipped fire truck available at all times to respond to fires and has a trained mines rescue team for fire fighting. There are fire hydrants and hoses installed at strategic locations across the mine site and within vehicles with deluge systems installed on loaders and in the underground fuel bay.

6.20 Mine Subsidence

No subsidence from mining activities was detected in the reporting period.

6.21 Methane Drainage/Ventilation

As the nature of the mine is not gassy (e.g. coal mine), there are no permanent methane monitoring locations. However, all personnel carry gas monitors while performing the following underground activities to monitor any hazardous gases:

- All production rigs while drilling;
- All production loaders(Boggers) while bogging;
- All Jumbos;
- Vent Officer while doing vent surveys;
- Re-Entry Crews while performing re-entry; and
- Service crew when required.

6.22 Public Safety

All active mine areas of the Rasp Mine site are signposted and fenced to restrict any unauthorised access.

Visitors to the mine are only allowed on site with management approval and are required to undertake a visitor briefing (induction), and are accompanied by a site representative at all times. Visitor briefing cards are distributed to ensure key information is readily at hand for visitors. Visitors must follow site policies and conform to personal protective equipment (PPE) requirements.

All employees and contractors complete a general induction and work area specific inductions where required (e.g. underground, mill).

6.23 Radiation

BHOP has a Radiation Management Licence, RML5063802 current until 26 July 2018. The Licence permits BHOP to "sell, possess, store or give away regulated material (including radiation apparatus, radioactive substances or items containing radioactive substances)".

Radiation is used in gauges in the processing plant to measure slurry density and identify the percentage of lead/zinc/iron. Radiation is used by technical services to identify the percentage of lead/zinc or other materials. The Rasp Mine Radiation Management Plan outlines how radiation and radiation equipment must be used, stored and disposed. An external contractor conducts biennial inspections of the individual radiation gauges on site while the site RSO conducts semi-annual inspections. During the reporting period no issues were identified during inspections and audits in relation to their use.

The Rasp Mine Radiation Store meets the requirements for storage of fixed radiation gauges, Code of Practice for the Safe Use of Fixed Radiation Gauges, ARPANSA. The Radiation Store is of solid construction (historically in the early 1900's it was used as an explosives magazine store) and is located on the side of a hill so it is not prone to flooding. It is clearly signed and is not accessed by the public.

No radiation apparatus was dismantled during the reporting period. SGS are contracted to conduct inspections of individual radiation gauges on site. They are scheduled to conduct the next inspection in June 2018.

Table 6-27 lists the regulated materials (fixed radiation gauges) that make up the schedule to the licence.

Table 6-27 Regulated Radiation Equipment

Location	Rasp Mine Asset Number	Type	Equipment	Components	Purpose
Mill - Flotation building	2321727346	Radiation apparatus	X-RF	- Control console / generator - X-ray tube insert	Analysis of materials
Primary cyclone	1566643388	Sealed source	Fixed Radiation	- Container	Density

feed		device	Gauge	- Sealed source	gauge
Backfill plant-transfer pump discharge	1570661547	Sealed source device	Fixed Radiation Gauge	- Container - Sealed source	Density gauge
Admin Bld, Geological vault	2321727385	Radiation apparatus	X-RF	- Control console / generator	Analysis of materials
Radiation Store 'REMOVED FROM SERVICE'	1570661354	Sealed source device	Fixed Radiation Gauge	- Container - Sealed source	Density gauge

7. WATER MANAGMENT

Raw water and potable water are supplied by Essential Water with take off valves at the Eyre Street entrance to the Rasp Mine. Raw water, water from the town supply, is supplied untreated to the mine site via existing connections.

Potable water is supplied direct from the town supply and is used for drinking, safety showers and in the crib rooms and change houses. Water from the town supply is treated at the Mica Street treatment plant and supplied to the Project via existing connections and is used for showers, toilets, and laundry. Average annual usage of potable water is 9 ML supplying the offices, workshop, core shed and processing facility.

BHOP are required to dewater the mine workings to ensure the safety of both the employees at the adjacent Perilya South Mine and its own employees. This water is extracted under licence and can be used on the Rasp Mine site or transferred for use at the Perilya operations.

Water is reclaimed onsite from various sources to be recycled for the Project, mainly from underground dewatering. If necessary, the reclaimed water is treated onsite to ensure that it is suitable for use as process water in both the processing plant and underground operations. Reclaimed water is returned after treatment to the process water tank which has a three hour holding capacity or to the Silver Tank which has a capacity of 8 ML.

The sources for the reclaimed water include:

- No. 7 Shaft dewatering;
- Underground mine operations dewatering;
- TSF decant pond; and
- Stormwater containment dams (only during extreme rain events)

The Rasp Mine has installed a number of water meters to monitoring water supplies and movements these are listed in **Table 7-1**.

Table 7-1 Flow Meters and Recording Frequency

Flow Meter	Recording Frequency
Underground supply	Weekly
Mill supply	Weekly
Concentrate shed	Weekly
Raw water supply	Weekly
Mine water (U/G water & Shaft 7)	Weekly
Evaporation dam pump well	Weekly
Patto's Pond	Weekly

Raw water used during the period was 298ML, increased from 277 ML used in the previous period. This was primarily due to the increase in throughput through the mills, resulting in pumps running longer, more gland water and reagent mixing, when compared to the previous reporting period.

Potable water used during the period was 9.95 ML, increased from 8.85 ML used in the previous period due to an increase in personnel and contractors.

BHOP has a water extraction licence, to extract by active pumping 370 ML pa. **Table 7-2** and **Table 7-3** provide details for this licence and water pumping. The level of pumping is required to maintain the safety of personnel working underground at both the Rasp Mine and the adjacent Perilya South Mine.

Table 7-2 Water Licence Details

Water Licence #	Water Management	Entitlement	Passive take / inflows	Active pumping	TOTAL
85BL256102	Bore License	370ML	NA	370ML	370ML

Table 7-3 Water Extraction and Return During the Period 1 July 2016 to 30 June 2017

Location	Total extracted (L)	Storage Location	Total Stored as at 30 June 2017
Shaft 7	408,101,000[1]	**S22**	0
U/G Dewatering	375,150,000[1]	**S22A**	0
Used U/G	171,157,000	**TSF Decant**	0
Used Mill	343,548,000		
Perilya	0		

Note 1: Suspect over estimate due to intermittent pumping which results in the pipe where the meter is installed not always being full, however, both flow meters install in this pipe (mechanical and ultrasonic) continue to record even under low / insufficient flows. The meter readings are used as a guide to indicate pumping flow-rate as opposed to volume being pumped from underground.

No water was transferred to Perilya South Mine Operations, during the reporting period.

8. REHABILITATION

8.1 Buildings

There were no buildings erected or demolished during the year.

8.2 Rehabilitation and Disturbed Land

During the reporting period, the following rehabilitation activities were undertaken / completed:

- Dust deposition gauges were installed on top of Mt Hebbard, these were required as part of the waste rock trial to be undertaken in this area in 2019. It was proposed in the MOP to install the gauges to monitoring current dust conditions for a 12 month period, then place the waste rock and re-install the gauges for another 12 month period and compare results.
- Minimal repair was undertaken to heritage structures following storm damage.
- In 2017 BHOP was successful in securing funding ($170,000) from the Federal Government for Stage 2 of the repair program for No 4 Headframe. This included further works to stabilise the Headframe enabling the removal of the guy wires, allowing the structure to stand as it was originally built. The works included reinforcing of degraded joints with steel brackets, replacing degraded ties with new, repairing and reinforcing footings and packing of undersized wooden beams to the base. All work has now been completed and BHOP will continue to monitor any movement from this structure.

Table 8-1 and **Table 8-2** detail disturbed areas. No new areas were disturbed during the reporting period.

Table 8-1 Rehabilitation Summary

	Area Affected / Rehabilitated (hectares)		
	To date 16/4/2014-31/12/2015	**Last Report 1/4/2014-16/12/2014**	**Next Report 1/1/2016 – 31/12/2016**
A: MINE LEASE AREA			
A1 Mine lease(s) Area	226.4	226.4	226.4
B: DISTURBED AREAS			
B1 Infrastructure area (other disturbed areas to be rehabilitated at closure including facilities, roads)	64.5	64.5	64.5
B2 Active Mining Area (excluding items B3 – B5 below)	11.5	11.5	11.5
B3 Waste emplacements, (active / unshaped / in or out-of-pit)	1.92	1.70	2.27
B4 Tailings emplacements (active / unshaped / uncapped)	3.8	3.8	3.8
B5 Shaped waste emplacement (awaits final vegetation)	0.0	0.0	0.0
ALL DISTURBED AREAS	77.2	77.2	77.2
C REHABILITATION			
C1 Total Rehabilitated area (except for maintenance)	149.1	149.1	149.1
D REHABILITATION ON SLOPES			
D1 10 to 18 degrees	4.1	4.1	4.1
D2 Greater than 18 degrees	14.7	14.7	14.7
E SURFACE OF REHABILITATED LAND			
E1 Pasture and grasses	N/A	N/A	N/A
E2 Native forest / ecosystems			
E3 Plantations and crops	2.6	2.6	2.6
E4 Other (include non-vegetative outcomes)	151.3	151.3	151.3

Table 8-2 Maintenance Activities on Rehabilitated Land

	Area Treated (ha)		
NATURE OF TREATMENT	**Report Period**	**Next Period**	**Comment / control strategies / treatment detail**
Additional erosion control works (drains re-contouring, rock protection)	0	0	N/A
Re-covering (detail further topsoil, subsoil, sealing etc)	0	0	N/A
Soil treatment (detail – fertiliser, lime, gypsum etc)	0	0	N/A
Treatment / Management (detail – grazing, cropping, slashing etc)	0	0	N/A
Re-seeding / Replanting (detail – species density, season etc)	0	0	N/A
Adversely Affected by Weeds (detail – type and treatment)	0	0	N/A
Feral animal control (detail – additional fencing, trapping, baiting etc)	0	0	N/A

9. COMMUNITY RELATIONS

9.1 Environmental Complaints

During the period of the AEMR, BHOP has maintained a register for community complaints and concerns. A total of six complaints were received over the reporting period all related to blasting vibration, **Table 9-1**. All complainants were contacted and any improvements were discussed.

Table 9-1 Complaints register

Date	Complaint Type	Information
06-Mar-17	Blast Vibration	Call received through complaints line and EPA. Caller did not leave details. Vibration not likely to be caused by Rasp operations.
28-Apr-17	Blast Vibration	Call received through EPA. Roving monitor was placed in situ at caller's residence.
01-May-17	Blast Vibration	Call received through EPA. No breaches of licence limits recorded. Roving monitor was placed in situ at caller's residence.
24-Aug-17 (2)	Blast Vibration	Call received through EPA. No breaches of licence limits recorded, although blast was close to a dolorite shear running through the mine and under Broken Hill.
31-Oct-17	Blast vibration	Call received through complaints line. Caller did not leave details for location of vibration issue. All blast monitors registered results in line with criteria.

All blasts were found to be compliant with the applicable licence limits. The finalised data was distributed to the EPA and the affected resident.

The number and type of community complaints for the period 2014 to 2017 is provided in **Table 9-2.** Vibration from blasting remains the major issue for complaints. BHOP has had a blasting management program in place and is working to reduce potential impacts under the current PRP.

Table 9-2 Community Complaints for the Period 2014 to 2017

Issue	2014	2015	2016	2017	TOTAL
Blast Vibration	13	8	13	5	39
Noise	0	0	2	0	2
Dust	1	0	0	0	1
Water Discharge	3	0	0	0	3
TOTAL	**17**	**8**	**15**	**5**	**45**

9.2 Community Liaison

During the period of the AEMR, BHOP has conducted direct and indirect consultation with neighbours, members of the public, local community organisations, state government agencies and local council.

The major stakeholders include:

- Broken Hill City Council (BHCC)
- Department of Industry Resource (DIR)
- Environment Protection Authority (EPA)
- Department of Planning and Environment (DPE)
- Department of Industry- Lands (DI-L)
- Essential Energy

- Essential Water
- Australian Rail Track Corporation Ltd (ARTC)
- Roads and Traffic Authority (RTA)
- Broken Hill Health Service, Child and Family Health Centre

The following community communication activities occurred during the period:

- BHOP were represented at all meetings of the BHCC Lead Reference Group.
- Child and Family Health Centre Lead Week – BHOP participated in the 2017 Lead week program and provided water and fruit.
- BHOP had three year 10 students visit site for vocational background to engineering studies in December.
- Clontarf Program for 2017 – organised a site tour to show students the operations at the Rasp Mine.

9.3 Community Support

During the reporting period, Rasp provided financial support to:

- 2017 Christmas Pageant both as a donator and contributor (Loader and Truck float) – winner of the best business entry
- Involved in the Clontarf Program for 2017. The program gives boys employment skills and insights into mining careers.
- South Football Club, supplied uniforms
- Donating produce and for their lead awareness week
- World's Greatest Shave - raising money for leukaemia and blood cancer research.

No proposal was received from the Department of Health for funding during the reporting period.

10. INDEPENDENT AUDIT

There was no independent audit during the reporting period.

11. INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

11.1 Environmental Incidents

Environmental incidents are reported using the Rasp Incident Reporting Procedure BHO-SAF-PRO-101. A summary of the incidents for the reporting period are presented in **Table 11-1**. BHOP maintains a Pollution Incident Response Management Plan BHO-ENV-PLN-002 on the CBH website in accordance with EPA requirements.

There were no externally reportable incidents during the reporting period.

Four internal environmental incidents (including complaints) were reported during the reporting period. Three incidents related to the spills in the mill area and one noise exceedence.

Table 11-1 Environmental Related Incidence for Reporting Period

Date	Incident	Brief Description
15-Oct-17	2185	Lead concentrate spillage outside of bund walls
26-Oct-17	2219	Noise exceedence at A6 (Bonanza & Gypsum Streets) and A14 monitoring site (Piper Street North)
06-Dec-17	2290	SAG Mill trommel blocked with scale resulting in slurry (ore) outside of bunded area.
16-Dec-17	2324	Tailings line blocked resulting in slurry running outside of bunded area.

The Pollution Incident Response Management Plan was tested in June 2017, in accordance with the requirements of EPL 12559.

11.2 Non-Compliances

11.2.1 Management Plans

Required changes to management plans PA07_0018MOD4:

Waste Management Plan – BHOP proposes to use Kintore Pit as TSF3 following completion of deposition into Blackwood Pit TSF2. Golder has been engaged to provide a preliminary design report addressing safety concerns and seepage. In addition current access (portal) to the Mine will require relocation and this is currently under review. Once the preliminary design report is received the Waste Management Plan can be updated. It is anticipated that this will be provided mid-2018.

Management Plans required to be updated post MOD4 – the Air Quality Management Plan / Monitoring Program, Environment Management Strategy and the Site Water Management Plan are required to be updated in line with the installation of the embankments at TSF2. BHOP is in consultation with the EPA in regards to the monitoring program for TSF2 and is waiting for the preliminary designs from Golder regarding stormwater management at the TSF2 with the addition of a new water storage pond. Documents will updated prior to the commencement of construction.

Conservation Management Plan - In accordance with Schedule 3 Condition 30 of the PA07_0018 a Conservation Management Plan is required to be completed. A definition for end land use has not yet been agreed with DRG. BHOP is waiting for the results from inter-government discussions regarding the Line of Lode to finalise this Plan.

11.2.2 Environmental Monitoring

As discussed in Section 6 a number of occasions monitoring failed during the reporting period:

High Volume Air Samplers - On three occasions during the reporting period two of the HVAS units were offline due to interruption of electricity supply or operator error and samples could not be taken: HVAS – 23 Jan and HVAS2 – 16 Feb and 26 Oct. Discussions have been held with Essential Energy regarding the electricity supply requiring a report each time such outages occur. The importance of timely sample collection has been reinforced with the technical officer.

TEOMs – TEOM2 failed to record data from 28 Dec to 31 Dec 2017 and although this was reported in the December monthly report as equipment malfunction, following an investigation it was identified as a result of power failure. Discussions have been held with Essential Energy regarding the electricity supply requiring a report each time outages occur.

Weather Station – The on-site weather station was offline for repairs from March to June. Parts were required to be sourced from an overseas manufacturer. A ‘breach letter’ was received from the EPA in regards to this matter and a report provided.

Surface and Groundwater – There were a number of monitoring points where samples were not able to be taken due to insufficient water, refer Section 6. Broken Hill experienced a dry year for the reporting period with less than half the average annual rainfall (108.8 mm compared to 259 mm).

12. ACTIVITIES PROPOSED IN THE NEXT AEMR PERIOD

Table 12-1 lists the proposed activities during the next AEMR period in line with the MOP some of these activities continue into the next reporting period. Timing is dependent on the appointment of a new Environment Officer and the schedule will be reviewed following their commencement.

Table 12-1 Rehabilitation Activities for Next Reporting Period

Activity	Schedule				
	QTR 1	QTR 2	QTR 3	QTR 4	2019
Engage with stakeholders regarding the draft CMP content as well as the concept for post-mining land uses following outcomes from the inter-governmental consultation and review. This will form part of the Rehabilitation Strategy to be developed and submitted to DRG by end of June 2018. This is dependent on receiving advice from DRG following the inter-government discussions.		✓			
Develop in consultation with stakeholders the Rehabilitation Management Plan to be completed within 6 months of the approval of the Rehabilitation Strategy. This is dependent on receiving advice from DRG following the inter-government discussions.			✓	✓	
Complete an options analysis into various dust management approaches. This will extend into 2019.				✓	✓
Inspect all heritage structures and install identification signage on those items where signage is deficient or lacking, continued from 2017.		✓	✓		
Explore potential revegetation of land depressions on the free areas where rain water may collect. Desk top review of revegetation undertaken in the past on the mine and in town to see if this is viable alternative for dust suppression or stability control. Commence pilot program, if appropriate. This will extend into 2019.				✓	✓
Undertake further sampling of surface materials to confirm lead levels which will assist in prioritising placement of waste rock/capping material and prioritise rehabilitation activities. This will extend into 2019.				✓	✓
Plan to remove goats from within the CML7 fenced area, annual program.			✓		
Pre-work for trial for use of waste rock as a capping material - Mt Hebbard. Dust deposition gauges have been installed to monitor dust levels for twelve months prior to the installation of waste rock capping material (in 2019) and then for 1 year post its placement. This data will be compared together with weather data for rain, wind speed and direction, to assess if the waste rock covering has provided a reduction in ambient air dust levels and will be used to confirm the Confined Air Burst Chamber testing conducted by PEL. This will extend into 2019 and 2010.	✓	✓	✓	✓	✓
As a consequence of damage to the roofs of two the heritage buildings (Core Shed and Mechanical Workshop) an external assessment for hail damaged was completed in 2017. These roofs will be replaced in consultation with BHCC 2018 under the Broken Hill Hail Storm Program.		✓	✓	✓	
Undertake on-going maintenance to heritage buildings as required.	✓	✓	✓	✓	✓
Continue chemical dust suppression to ‘free areas’ of the site to minimise dust generation.			✓	✓	
Eyre Street dam project, remove contaminated bunding and materials from the dam and cap the area with suitable waste rock or revegetate the area or a mixture of the two. Sampling of rain runoff will be taken to assess if water quality has improved. This will extend into 2019.				✓	✓
Ryan Street dam project, engage a suitably qualified consultant to				✓	✓

determine and advise on appropriate closure strategies for this area. Water sampling of rain runoff will also be undertaken for rainfall events to confirm level of rainwater contamination. This will extend into 2019.					

Table 12-2 lists management plans that will be reviewed during the next reporting period.

Table 12-2 Management Plans to be Updated in Next Reporting Period

Activity	Schedule			
	QTR 1	QTR 2	QTR 3	QTR 4
Air Quality Management Plan and Monitoring Program.		✓		
Site Water Management Plan		✓		
Waste Management Plan		✓		
Environment Management Strategy			✓	
(Community) Lead Management Plan				✓

In addition an Environment Construction Management Plan will be completed in July 2018 for the construction of the TSF2 embankments and the final Blast Vibration Report will be submitted to the EPA in December for the PRP U1 – blasting compliance management.

APPENDICES

Appendix 1

Construction Environment Management Plan, BHOP, December 2017

Appendix 2

Noise Management and Monitoring Plan, BHOP, Updated January 2018

Appendix 3

Waste Rock to Surface Testing Procedure, BHOP, December 2017

Appendix 4

Hydrocarbon Spill Procedure, BHOP ? 2017

Appendix 5

Attended Noise Monitoring Assessment, EMM Consulting Pty Ltd, November 2017