



Licence Number	L4503/1975/14
Licence Holder	BHP Billiton Iron Ore Pty Ltd
ACN	088 700 981
File Number:	DER2013/000901
Premises	Mt Whaleback/Orebody 29/30/35 Tenements E52/2009-1, ML244SA, G52/19-G52/27, G52/276, G52/277, G52/279; and Special Leases K858923 and N088235
Date of Amendment	24 March 2020

Amendment

The Chief Executive Officer (CEO) of the Department of Water and Environmental Regulation (DWER) has amended the above licence in accordance with section 59 of the *Environmental Protection Act 1986* (EP Act) as set out in this Amendment Notice. This Amendment Notice constitutes written notice of the amendment in accordance with section 59B(9) of the EP Act.

Alana Kidd

Manager Licensing – Resource Industries

an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

Definitions and interpretation

Definitions

In this Amendment Notice, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
AER	Annual Environment Report
AMD	Acid Mine Drainage
Amendment Notice	refers to this document
Category/ Categories/ Cat.	categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CEO	means Chief Executive Officer. CEO for the purposes of notification means: Director General Department administering the <i>Environmental Protection Act 1986</i> Locked Bag 10 Joondalup DC WA 6919 info@dwer.wa.gov.au
Delegated Officer	an officer under section 20 of the EP Act
Department	means the department established under section 35 of the <i>Public Sector Management Act 1994</i> and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation
EC	Electrical Conductivity
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
EP Regulations	<i>Environmental Protection Regulations 1987 (WA)</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
Existing licence	The licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of and during this Review
Licence holder	BHP Billiton Iron Ore Pty Ltd

m ³	cubic metres
mg/L	Milligrams per litre
mtpa	million tonnes per annum
Noise Regulations	<i>Environmental Protection (Noise) Regulations 1997 (WA)</i>
Occupier	has the same meaning given to that term under the EP Act.
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report.
Risk Event	as described in <i>Guidance Statement: Risk Assessment</i>
TARP	Trigger Action Response Plan
TDS	Total Dissolved Solids
UDR	<i>Environmental Protection (Unauthorised Discharges) Regulations 2004 (WA)</i>
µS/cm	Micro Siemens per centimetre

Amendment Notice

This amendment is made pursuant to section 59 of the *Environmental Protection Act 1986* (EP Act) to amend the licence issued under the EP Act for a prescribed premises as set out below. This notice of amendment is given under section 59B(9) of the EP Act.

The following DWER Guidance Statements have informed the decision made on this amendment.

- *Guidance Statement: Regulatory Principles* (July 2015);
- *Guidance Statement: Setting Conditions* (October 2015);
- *Guidance Statement: Decision Making* (June 2019);
- *Guidance Statement: Risk Assessment* (February 2017); and
- *Guidance Statement: Environmental Siting* (November 2016).

Amendment description

On 30 October 2018, BHP Billiton Iron Ore Pty Ltd (BHP) submitted an application to DWER under section 59B of the EP Act for an amendment to the Mt Whaleback/Orebody 29/30/35 licence (L4503/1975/14). An email was received on 26 March 2019 to also include a new inert landfill for the in-situ disposal of the Ponderosa demolished buildings inert waste.

The licence holder has applied to make the following changes.

Category 64 – new inert landfill, putrescible landfill and asbestos disposal locations

The licence holder currently operates:

- Three inert landfills;
- One putrescible landfill; and
- Three asbestos disposal areas.

The licence holder has requested approval for the construction and operation of a new inert landfill for the Ponderosa demolished buildings inert waste, a new putrescible landfill east of Orebody 29, and construction and operation of two asbestos disposal locations north and south of Orebody 29. These new facilities will be operated under the existing Category 64 throughput limit of 6,000 tonnes per annual period. No change is required to the licensed annual disposal limit.

The two asbestos disposal areas will accept Type 1 Special Wastes (asbestos) contained within demolition debris waste from onsite and from other BHP premises in the vicinity of Newman. Fibrous material from drill holes during exploration and production drilling will also be disposed of at these asbestos disposal sites.

Prescribed premises boundary expansion

The licence holder has applied to amend the prescribed premises boundary map to include the overburden storage areas (OSAs) associated with Orebody 35, used as inert waste disposal locations (used tyres). This area was excluded by an administration error in 2016.

Other – DWER initiated amendment

Monitoring data presented in the 2017/2018 Mt Whaleback AER, and previous AERs, indicates that sulfate concentrations in groundwater downstream of the AMD facility is increasing. At the time of this amendment, DWER has undertaken an assessment of the risk associated with sulfate and other contaminants in groundwater seepage and determined to amend licence L4503/1975/14 to include regulatory controls as recommended by DWER's Contaminated Sites Branch (CSB).

Exclusions

As part of the amendment application, the licence holder originally applied to increase the Category 5 throughput from 80 million tonnes per annum (mtpa) to 82 mtpa. On 27 November 2018, the licence holder requested that this component of the amendment be withdrawn as the project to increase production has been placed on hold until FY22/23. Separate approvals are required for future proposed production increases at Mt Whaleback.

It should also be noted that this licence has been highlighted for licence review. The review will apply a risk-based assessment approach in accordance with DWER's *Guidance Statement: Regulatory Principles* (July 2015) to the regulation of the premises.

Other approvals

The licence holder has provided the following information relating to other approvals as outlined in Table 2.

Table 2: Relevant approvals

Legislation	Number	Approval
<i>Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007.</i>	Dangerous Goods licence (DGS0153988)	This approval is administered by the Department of Mines, Industry Regulation and Safety (DMIRS) for the purpose of licensing the containment facilities.

Amendment history

Table 3 provides the amendment history for L4503/1975/14.

Table 3: Licence amendments

Instrument	Issued	Amendment
L4503/1975/13	22/12/2011	Licence amendment to increase capacity of Category 5 to 58 million tonnes per annum, change premises boundary and include Category 61 to the licence
L4503/1975/13	16/02/2012	Licence amendment to include Category 85B constructed under W4972/2011/1
L4503/1975/13	7/11/2012	Licence amendment to incorporate three additional water treatment cells to the existing Newman temporary water treatment plant
L4503/1975/14	9/10/2014	Licence amendment to include additional discharge points and convert to new format
L4503/1975/14	11/06/2015	Licence amendment to include two inert landfills, oily water separator, treated wastewater evaporation pond and contingency discharge point, extension of the hydrodynamic trial timeframe and disposal of used conveyor belts
L4503/1975/14	28/04/2016	Licence amendment to extend the duration of the hydrodynamic trial
L4503/1975/14	30/06/2016	Licence amendment to include Category 6, increase Category 73 approved design capacity, contingency discharge of Reverse Osmosis (RO) reject water to Ophthalmia Dam, increase in RO reject water discharge to Acid Mine Drainage (AMD) facility, remove wastewater treatment plants less than 20 cubic metres per day capacity and updates to monitoring requirements
L4503/1975/14	1/09/2016	Licence amendment to update the premises address and include a new asbestos disposal location

L4503/1975/14	21/04/2017	Amendment Notice 1 Licence amendment to remove Category 85B, increase capacity for Category 61 and change premises boundary
L4503/1975/14	06/11/2017	Amendment Notice 2 Licence amendment to increase capacity for Category 73
L4503/1975/14	24/03/2020	Amendment Notice 3 (this amendment) Licence amendment to approve a new inert landfill for the Ponderosa demolished buildings inert waste, putrescible landfill, two asbestos disposal locations, expand the premises boundary to include the Orebody 35 OSA and include conditions relating to the management of groundwater contamination at the AMD facility

Location and receptors

Table 4 below lists the relevant sensitive land uses in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

Table 4: Receptors and distance from activity boundary

Residential and sensitive premises	Distance from Prescribed Premises
Residences in the town of Newman	Approximately 2.5 km from proposed asbestos disposal locations

Table 5 below lists the relevant environmental receptors in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

Table 5: Environmental receptors and distance from activity boundary

Environmental receptors	Distance from Prescribed Premises
Power Station Creek	50 m east of the AMD facilities

Risk assessment

Table 6 and Table 7 below describe the Risk Events associated with the amendment consistent with the *Guidance Statement: Risk Assessments*. Both tables identify whether the emissions present a material risk to public health or the environment, requiring regulatory controls.

Table 6: Risk assessment for proposed amendments during construction

Risk Event					Consequence rating	Likelihood rating	Risk	Reasoning	
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts					
Landfills and asbestos disposal locations	Construction of the Ponderosa inert landfill, putrescible landfill and asbestos disposal locations	Dust: Associated with earthworks and vehicle movements	Residences in the town of Newman, approximately 2.5 km from landfill sites	Air/wind dispersion	Impact on amenity and health	Slight	Unlikely	Low	<p>Dust emissions will be restricted by the short duration of construction activities and the relatively small disturbance footprint. It is unlikely that dust emissions during construction will contribute significantly to emissions from the premises.</p> <p>Construction of the landfill will not occur during a 90° wind arc (southerly to westerly wind directions). Excavated material will be used for construction of the diversion windrows and stockpiled for use as cover for the landfilled material.</p> <p>Licence holder controls during construction will include water tankers used to apply water to construction areas, areas of land disturbance will be minimized and disturbed areas will be rehabilitated as they become available.</p> <p><u>Consequence:</u> Given that onsite impacts would be low level, there will be minimal impacts to sensitive receptors. The consequence has been determined as slight.</p> <p><u>Likelihood:</u> The risk event is unlikely to occur due to management measures in place and the distance to nearest sensitive receptors. The likelihood of the risk event has been determined as unlikely.</p> <p><u>Overall risk rating:</u> Comparison of the consequence and likelihood ratings described above with the Risk Rating Matrix (<i>Guidance Statement, Risk Assessments 2017</i>) determines the overall rating of impacts from dust during construction of the landfill and asbestos disposal areas to be low.</p>

Risk Event					Consequence rating	Likelihood rating	Risk	Reasoning
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts				
		<p>Noise: Associated with earthworks and vehicle movements</p>			Slight	Unlikely	Low	<p>The Delegated Officer considers that the separation distance between the source and potential receptor is sufficient, the risk of noise impacts from the construction activities is deemed low.</p> <p><u>Consequence:</u> Given that onsite impacts would be low level, there will be minimal impacts to sensitive receptors. The consequence has been determined as slight.</p> <p><u>Likelihood:</u> The risk event is unlikely to occur due to the noise controlled equipment used and the distance to nearest sensitive receptors. The likelihood of the risk event has been determined as unlikely.</p> <p><u>Overall risk rating:</u> Comparison of the consequence and likelihood ratings described above with the Risk Rating Matrix (<i>Guidance Statement, Risk Assessments 2017</i>) determines the overall rating of impacts from noise during construction of the landfill and asbestos disposal areas to be low.</p>

Table 7: Risk assessment for proposed amendments during operation

Risk Event					Consequence rating	Likelihood rating	Risk	Reasoning	
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts					
Landfills and asbestos disposal locations	Putrescible landfill	<p>Leaching: Associated with rainfall percolation through additional landfill and contaminated surface runoff</p>	<p>Soil</p> <p>Groundwater</p> <p>Surface water</p>	<p>Infiltration through soil and into groundwater</p> <p>Runoff of contaminated surface water</p>	<p>Localised soil contamination</p> <p>Groundwater contamination</p> <p>Surface water contamination</p>	Minor	Unlikely	Low	<p>Leaching may occur from the new putrescible landfill.</p> <p>Management measures implemented by the licence holder will include:</p> <ul style="list-style-type: none"> • Facility designed to prevent runoff leaving the facility; • Hydrocarbon contaminated wastes will not be disposed of at the facility; and • Windrows will be implemented to direct clean stormwater around the landfill. <p><u>Consequence:</u> Given that onsite impacts would be low level, there will be minimal impacts to sensitive receptors. The consequence has been determined as minor.</p> <p><u>Likelihood:</u> The risk event is unlikely to occur due to management measures in place and the depth to groundwater is at 60 mbgl. The likelihood of the risk event has been determined as unlikely.</p> <p><u>Overall risk rating:</u> Comparison of the consequence and likelihood ratings described above with the Risk Rating Matrix (<i>Guidance Statement, Risk Assessments 2017</i>) determines the overall rating of impacts from leaching to groundwater during operations of the landfill to be low.</p>
		<p>Dust: Associated with vehicle movements</p>	Residences in the town of Newman, located	Air/wind dispersion	Impacts on health and amenity	Slight	Unlikely	Low	The Delegated Officer considers that the separation distance between the source and potential receptor is sufficient to prevent dust impacts occurring as a result

Risk Event					Consequence rating	Likelihood rating	Risk	Reasoning
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts				
	and waste deposition	approximately 2.5 km from the proposed landfill						<p>of these activities. Intermittent use of the landfill will reduce the likelihood of dust emissions impacting sensitive receptors. The licence holder has existing dust monitoring requirements on the licence for the site as a whole.</p> <p><u>Consequence:</u> Given that onsite impacts would be minimal, there will be minimal impacts to sensitive receptors. The consequence has been determined as slight.</p> <p><u>Likelihood:</u> The risk event is unlikely to occur. The likelihood of the risk event has been determined as unlikely.</p> <p><u>Overall risk rating:</u> Comparison of the consequence and likelihood ratings described above with the Risk Rating Matrix (<i>Guidance Statement, Risk Assessments 2017</i>) determines the overall rating of impacts to sensitive receptors from dust during operations of the landfill to be low.</p>
	Noise: Associated with vehicles and machinery used within the landfilling area				Slight	Rare	Low	<p>The Delegated Officer considers that the separation distance between the source and potential receptor is sufficient to prevent noise impacts occurring. Intermittent use of the landfill will also reduce the likelihood of noise emissions impacting sensitive receptors.</p> <p><u>Consequence:</u> Given that onsite impacts would be minimal, there will be minimal impacts to sensitive receptors. The consequence has</p>

Risk Event					Consequence rating	Likelihood rating	Risk	Reasoning
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts				
								<p>been determined as slight.</p> <p><u>Likelihood:</u> The risk event would rarely occur. The likelihood of the risk event has been determined as rare.</p> <p><u>Overall risk rating:</u> Comparison of the consequence and likelihood ratings described above with the Risk Rating Matrix (<i>Guidance Statement, Risk Assessments 2017</i>) determines the overall rating of impacts to sensitive receptors from noise during operations of the landfill to be low.</p>
	<p>Windblown waste: Additional waste from the new landfill potentially leaving the landfill site via wind transportation</p>	<p>Terrestrial environment, including fauna habitat</p>	<p>Direct discharges to land</p>	<p>Visual amenity, impacts to flora and fauna</p>	<p>Slight</p>	<p>Rare</p>	<p>Low</p>	<p>The landfill will operate within the Category 64 capacity of 6,000 tonnes/annum and there is an existing licence condition requiring wind-blown waste to be contained within the boundary of the premises, and for wind-blown waste to be returned to the tipping area on at least a monthly basis. This is deemed adequate to mitigate wind-blown waste becoming an issue.</p> <p><u>Consequence:</u> Given that onsite impacts would be minimal, there would be minimal impacts to sensitive receptors. The consequence has been determined as slight.</p> <p><u>Likelihood:</u> The risk event would rarely occur due to the existing condition in place on the licence for waste to be contained within the boundary of the premises, and for wind-blown waste to be returned to the tipping area on at least a monthly basis. The likelihood of the risk</p>

Risk Event					Consequence rating	Likelihood rating	Risk	Reasoning
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts				
								<p>event has been determined as rare.</p> <p><u>Overall risk rating:</u> Comparison of the consequence and likelihood ratings described above with the Risk Rating Matrix (<i>Guidance Statement, Risk Assessments 2017</i>) determines the overall rating of impacts to sensitive receptors from windblown waste during operations of the landfill to be low.</p>
Asbestos disposal	Release of fibrous materials during storage, transport and disposal of waste into landfill.	Residences in the town of Newman, located approximately 2.5 km from the asbestos disposal locations.	Air/wind dispersal	Exposure to airborne asbestos fibres poses a risk to health if inhaled. Fibres that enter the lungs may lead to asbestos-related diseases such as pleural disease, asbestosis, lung cancer and mesothelioma.	Severe	Rare	High	<p>Two new asbestos disposal areas are proposed to be implemented by the licence holder as the existing facilities are nearing capacity.</p> <p>Management measures implemented by the licence holder include:</p> <ul style="list-style-type: none"> Asbestos waste is managed in accordance with the <i>Environmental Protection (Controlled Waste) Regulations 2004</i>, the <i>Code of Practice for the Management and Control of Asbestos in Workplaces</i>, <i>Code of Practice for the Safe Removal of Asbestos</i>, <i>Australian Standard 2601 – The Demolition of Structure</i>. <p>The Delegated Officer notes that the Existing conditions of licence L4503/1975/14 include the following provisions in relation to the disposal of asbestos:</p> <ul style="list-style-type: none"> Asbestos is only disposed of into the designated asbestos disposal areas; Asbestos is not to be deposited within 2 m of the final tipping surface of the landfill; No works are to be carried out on the

Risk Event					Consequence rating	Likelihood rating	Risk	Reasoning
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts				
								<p>landfills that could lead to a release of asbestos fibres; and</p> <ul style="list-style-type: none"> Asbestos material is covered by 1,000 mm of Type 1 inert waste, clean fill or soil by within the close of the business day in which the asbestos waste was deposited. <p><u>Consequence:</u> Exposure to fibrous materials can lead to the requirement for high level or ongoing medical treatment and potential loss of life from asbestos-related diseases. The Delegated Officer has therefore determined the consequence to be severe.</p> <p><u>Likelihood:</u> The Delegated Officer has considered the applicant controls and the distance to the nearest sensitive receptor (noting that onsite employee exposure is not regulated by DWER and is a workplace health and safety issue regulated by DMIRS) and determined that the risk of human exposure to asbestos disposed of at the new location may only occur in exceptional circumstances. Therefore, the likelihood has been determined as rare.</p> <p><u>Overall risk rating:</u> Comparison of the consequence and likelihood ratings described above with the Risk Rating Matrix (Guidance Statement, Risk Assessments 2017) determines the overall rating of risk of health impacts to residents of the town of Newman as high.</p> <p>The existing specified conditions in the licence are considered appropriate to</p>

Risk Event					Consequence rating	Likelihood rating	Risk	Reasoning	
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts					
								manage the risk associated with the additional asbestos disposal locations.	
AMD Facilities	AMD Dam and Evaporation Cells	Seepage from AMD and Evaporation Cells containing dilute sulfuric acid, elevated magnesium and other contaminants (metals and metalloids)	Stygofauna that inhabit the hyporheic zones beneath nearby creeks	Seepage into groundwater, migration of groundwater into the hyporheic zones in gravels beneath nearby creeks beds	Impacts to the diversity and abundance of stygofauna assemblages	Moderate	Likely	High	See detailed Risk Assessment in section 1.1.
			Riparian vegetation (<i>Eucalyptus camaldulensis</i> (red river gums))	Seepage into groundwater, migration of groundwater into areas that groundwater dependent vegetation use.	Degradation of the vegetation	Moderate	Possible	Medium	

1.1 Risk Assessment – AMD Dam and Evaporation Cells Seepage

1.1.1 Description of AMD Dam and Evaporation Cells Seepage

Approximately 15% of mining overburden at Mt Whaleback is potentially acid forming (PAF) pyritic shales. When exposed to the atmosphere, the PAF material oxidises and produces significant heat and sulfur dioxide and carbon dioxide gases. When combined with water these materials can produce dilute sulfuric acid, commonly known as Acid Mine Drainage (AMD).

The licence holder operates an AMD Dam and Evaporation Cells onsite as shown in the AMD Facility Process Points Map in Appendix 1. The original AMD Dam was built in 1996 to capture surface runoff from waste overburden stockpiles that contain potentially acid forming pyritic shales. The AMD Dam capacity is 820ML and consists of three above ground areas (Dam A, Dam B and Dam C) contained within the main dam embankment. Each dam cascades to the next via a shallow spillway into Dam C. Dam A is not lined, while Dam B and Dam C have 0.5m clay lining beneath them.

The Evaporation Ponds (Ponds 1 – 5) were constructed in 2000 to provide additional dam capacity and a larger surface area for water to evaporate. Ponds 1 - 2 have a compacted soil base of 300 mm, while Ponds 3 – 5 have a compacted soil base of 500mm. Water seeps through the embankments and is then recirculated back into the ponds via a sump pump.

Aside from runoff from acidic runoff from the waste overburden stockpiles, reverse osmosis water from the Yarnima Power Station RO Water Treatment Plant and Newman Water Treatment Plant are also disposed of to the AMD Dam.

Depth to groundwater at the AMD facility and beneath Power Station Creek, 50 m east of the AMD facility, is less than 5 mbgl.

As part of licensing requirements via licence L4503/1975/14, BHP is required to conduct ambient groundwater monitoring at monitoring bores WBGW050S, WBGW050D, WBGW010, WBGW011, WBGW022 and WBGW023 for sulfate in the vicinity of the AMD facility, and report the results in the Annual Environmental Report (AER).

Contaminated Sites Review

An Improvement Condition was applied to the licence and a report (referenced throughout this Amendment Notice as RPS, 2016) in response, provided by the licence holder in December 2016. This was referred to Contaminated Sites Branch for technical advice and the following recommendations provided:

- The RPS, 2016 report should have risk assessed hyporheic fauna, however, it only risk assessed groundwater dependent vegetation as a sensitive receptor. The hyporheic fauna (stygofauna that live in riverine sediments) are likely to be much more sensitive than riparian vegetation to elevated concentrations of elevated concentrations of chemical constituents that are discharged by groundwater from the AMD facility;
- Sampling of hyporheic fauna is recommended upstream of the AMD facility; within the groundwater discharge zone from the facility; and downstream of the facility so comparison can be made of the diversity and abundance of macroinvertebrates to determine the extent to which groundwater discharge from the AMD Facility is affecting hyporheic fauna;
- Additional monitoring bores should be drilled and constructed near Power Station Creek to the north-east of the AMD facility to assess whether chemical constituents from the facility are discharging to the hyporheic zone in this area; and
- Additional metals (cadmium, chromium, cobalt, copper, mercury, molybdenum, thallium, nickel, uranium, zinc, arsenic, antimony and selenium) should be included in the analytical suite monitoring bores, and sulfide levels measured in groundwater near the creek discharge zone. Although sulfate has a relatively low toxicity to aquatic organisms and to plants, this chemical constituent can be converted by

microorganisms to highly toxic sulfide ions in the presence of organic matter that is present in hyperheic zones and around the roots of riparian vegetation

1.1.2 Identification and general characterisation of emission

AMD, which is acidic (pH ranging 2-8) and contains elevated concentrations of magnesium, sulfate ions and other contaminants (metals and metalloids).

Sulphate has been monitored at up to 60,000 mg/L, however, is generally less than 10,000 mg/L in bores around the AMD Dam. Maximum concentration shown in RPS, 2016 were 6,100 mg/L.

TDS was monitored in RPS, 2016 from approximately 4,000 mg/L up to 13,000 mg/L.

Other elevated parameters include aluminium, cadmium, chromium, copper, manganese, nickel, zinc, nitrate, calcium and magnesium.

1.1.3 Description of potential adverse impact from the emission

The pathway of exposure is via seepage from the AMD facility, however, a water balance including seepage has not been conducted.

Leakage estimation is highly complex due to factors such as: variable liner permeability and thickness; lack of liner on evaporation cell walls; minimal dam and cell water level monitoring data; seepage pump back from drains to evaporation cells and dam; accumulation and removal of precipitate; and variation in water density with season and reject water input (RPS, 2016).

Hyperheic Fauna

The seepage can impact on the diversity of macroinvertebrates within river gravels and their abundance.

Elevated concentrations of magnesium in mine discharges has been found to be highly toxic to aquatic organisms (van Dam et al., 2010; Hogan et al., 2012).

Conversion of sulfate by microorganisms to highly toxic sulfide ions in the presence of organic matter that is present in hyperheic zones and around the roots of riparian vegetation, resulting in the decline and death of aquatic and terrestrial vegetation and or aquatic organisms. The process of converting sulfate to sulfide (through sulfate reduction) can also lead to the disruption of nutrient cycling within an ecosystem and can cause eutrophication (Smolders et al., 2006).

Groundwater Dependent Vegetation

The seepage can also impact on groundwater dependent vegetation in the vicinity due to acidity, TDS, sulfate and other contaminants elevations. Depth to groundwater is less than 5 mbgl at the AMD facility and beneath Power Station Creek. Studies indicate that groundwater does not directly discharge into Power Station Creek, however, the groundwater will be accessible by phyreatophytic vegetation such as *Eucalpytus Camaldulensis* (river red gum) within the creekline. *Eucalptus camaldulensis* has very deep sinker roots and typically utilises groundwater even when the trees are over highly saline groundwater (Thorburn et al. 1994). It demonstrates a moderate salt tolerance up to 16,000 $\mu\text{S}/\text{cm}$ (~10,000 mg/L) (Jackson 2007), although reduced growth rates have been observed in conditions as low as 2,000 $\mu\text{S}/\text{cm}$ (1,300 mg/L) (Benyon et al. 1999). The species prefers acidic to neutral soil pH (McMahon 2010) (RPS, 2016).

A number of studies have been undertaken to determine the toxicity of heavy metals to *E. camaldulensis*, as this species is often used in mine site rehabilitation. Studies found the toxicity of copper, manganese and zinc to *Eucalyptus camaldulensis* seedlings was 0.7 μM (micromoles per kg water; 0.044 mg/L), 296 μM (16 mg/L) and 20 μM (1.3 mg/L) respectively (Reichman et. al. 2005; 2001a; 2001b) (RPS, 2016).

1.1.4 Criteria for assessment

Golder Associates (2015) undertook an assessment of groundwater quality for the Mount Whaleback area for baseline comparison. The baseline sites were those up gradient of mining activities and assessed to be undisturbed by mining activity. The ANZECC/ARMCANZ, 2018 95% level of protection trigger values for freshwater were not exceeded for pH, aluminium, arsenic, cadmium, mercury, manganese, nickel, lead and selenium in the baseline sites, hence this guideline was proposed as a trigger for these analytes. The ANZECC/ARMCANZ, 2018 95% level of protection for freshwater trigger values for freshwater was exceeded for Electrical Conductivity, chromium, copper and zinc, and the ANZECC/ARMCANZ, 2018 water quality guidelines for the protection of wetlands and lakes in Tropical Australia for nitrate, and due to the elevated levels Golder proposed site specific trigger values (SSTVs) for these analytes (RPS, 2016). Table 8 shows the relevant trigger values.

Table 8: Criteria selected for analytes comparison

Parameter	Source	ANZECC/ARMCANZ 95%	SSTV	<i>Eucalyptus camaldulensis</i>	Units
pH		6-8	-		pH units
TDS	4,500	585	715–910	10,400	mg/L
Sulfate	2,500	-	-	-	mg/L
Nitrate	40	0.01	4.6	-	mg/L
Aluminium	-	0.055	-	-	mg/L
Arsenic	-	0.013	-	-	mg/L
Cadmium	-	0.0002	-	-	mg/L
Mercury	-	0.00006	-	-	mg/L
Manganese	-	1.9	-	-	mg/L
Nickel	-	0.011	-	-	mg/L
Lead	-	0.0034	-	-	mg/L
Selenium	-	0.011	-	-	mg/L
Electrical conductivity	-	90-900	1,100 – 1,400	-	µS/cm
Chromium	0.002	0.001	0.001	2.0	mg/L
Copper	0.01	0.0014	0.006	0.044	mg/L
Zinc	0.09	0.008	0.017	1.3	mg/L

1.1.5 Licence holder controls

This assessment has reviewed the controls set out in Table 9.

Table 9: Licence holder’s proposed controls for AMD Dam and Evaporation Cells Seepage

Site infrastructure	Design Details	Operation details
AMD Cells A, B, C	Dam A is not lined Dam B and Dam C have 0.5m clay lining beneath them	Waste acceptance controls on salinity from the Yarnima Power Station RO Water Treatment Plant and Newman Water Treatment Plant.
Evaporation Ponds 1, 2, 3, 4, 5	Ponds 1 - 2 have a compacted soil base of 300 mm Ponds 3 – 5 have a compacted soil base of 500mm	Process monitoring (volume flow rate, pH and TDS) of brine from the Yarnima Power Station RO Water Treatment Plant and Newman Water Treatment Plant disposed of to the AMD Facility. Ambient groundwater quality in the vicinity of the AMD Facility is monitored.
The licence holder is in the process of implementing a project to remediate the AMD facility, which includes upgrading the pipework, changing the clay liners to poly liners and remediating the soil.		

1.1.6 Key findings

The Delegated Officer has reviewed the information regarding AMD Dam and Evaporation Cells Seepage and has found:

1. Depth to groundwater at the AMD facility and beneath Power Station Creek, 50 m east of the AMD facility, is less than 5 mbgl.
2. Receptors are hyporheic fauna and groundwater dependent vegetation in the vicinity of Power Station Creek.
3. Although groundwater monitoring is conducted in the vicinity of the AMD Facility, no direct monitoring is conducted of the water in the ponds.
4. The licence holder has established ANZECC, ARMCANZ 2018 95%, SSTVs and Eucalyptus camaldulensis criteria.
5. The licence holder is implementing a remediation project for the AMD Facility.
6. Recommendations have been made by CSB and require implementation.

1.1.7 Consequence

Hyperheic Fauna

If AMD Dam and Evaporation Cells Seepage on hyporheic fauna occurs, then the Delegated Officer has determined that the impact of the reduction in diversity and abundance of macroinvertebrates will be of mid-level onsite impacts. Therefore, the Delegated Officer considers the consequence to hyporheic fauna to be **moderate**.

Groundwater Dependent Vegetation

If AMD Dam and Evaporation Cells Seepage on groundwater dependent vegetation occur, then the Delegated Officer has determined that the impact of degradation to the vegetation will be of mid-level onsite impacts. Therefore, the Delegated Officer considers the consequence to groundwater dependent vegetation to be **moderate**.

1.1.8 Likelihood of Risk Event

Hyperheic Fauna

The Delegated Officer has determined that the likelihood of AMD Dam and Evaporation Cells Seepage on hyporheic fauna occurring will probably be occurring. Therefore, the Delegated Officer considers the likelihood to be **likely**.

Groundwater Dependent Vegetation

The Delegated Officer has determined that the likelihood of AMD Dam and Evaporation Cells Seepage on groundwater dependent vegetation could occur at some time due to the depth to groundwater at less than 5mbgl. Therefore, the Delegated Office considers the likelihood to be **possible**.

1.1.9 Overall rating of AMD Dam and Evaporation Cells Seepage

Hyperheic Fauna

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 10) and determined that the overall rating for the risk of AMD Dam and Evaporation Cells Seepage on hyporheic fauna is **high**.

The Contaminated Sites Branch has stated that sampling of hyporheic fauna would be required at various locations along the creek to determine the extent to which groundwater discharge of sulfate is affecting the hyporheic zone beneath this creek. In particular, sampling of hyporheic fauna would be required in gravels beneath the creek bed upstream of where groundwater discharge from the AMD facility is taking place; within the groundwater discharge zone (which could be identified by measuring pore water sulfate levels with a field test kit and EC values with a conductivity meter); and downstream of this groundwater discharge zone. The diversity of macroinvertebrates within river gravels and their abundance would help determine the extent to which groundwater discharge from the AMD facility is affecting the hyporheic zone beneath this creek.

Groundwater Dependent Vegetation

The Delegated Officer has compared the consequence and likelihood rating described above with the risk rating matrix (Table 10) and determined that the overall rating for the risk of AMD Dam and Evaporation Cells Seepage to groundwater dependent vegetation is **medium**.

Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 10 below.

Table 10: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 11 below.

Table 11: Risk criteria table

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
			Environment	Public health* and amenity (such as air and water quality, noise, and odour)
Almost Certain	The risk event is expected to occur in most circumstances	Severe	<ul style="list-style-type: none"> onsite impacts: catastrophic offsite impacts local scale: high level or above offsite impacts wider scale: mid-level or above Mid to long-term or permanent impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are significantly exceeded 	<ul style="list-style-type: none"> Loss of life Adverse health effects: high level or ongoing medical treatment Specific Consequence Criteria (for public health) are significantly exceeded Local scale impacts: permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	<ul style="list-style-type: none"> onsite impacts: high level offsite impacts local scale: mid-level offsite impacts wider scale: low level Short-term impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are exceeded 	<ul style="list-style-type: none"> Adverse health effects: mid-level or frequent medical treatment Specific Consequence Criteria (for public health) are exceeded Local scale impacts: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	<ul style="list-style-type: none"> onsite impacts: mid-level offsite impacts local scale: low level offsite impacts wider scale: minimal Specific Consequence Criteria (for environment) are at risk of not being met 	<ul style="list-style-type: none"> Adverse health effects: low level or occasional medical treatment Specific Consequence Criteria (for public health) are at risk of not being met Local scale impacts: mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	<ul style="list-style-type: none"> onsite impacts: low level offsite impacts local scale: minimal offsite impacts wider scale: not detectable Specific Consequence Criteria (for environment) likely to be met 	<ul style="list-style-type: none"> Specific Consequence Criteria (for public health) are likely to be met Local scale impacts: low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	<ul style="list-style-type: none"> onsite impact: minimal Specific Consequence Criteria (for environment) met 	<ul style="list-style-type: none"> Local scale: minimal to amenity Specific Consequence Criteria (for public health) met

[^] Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting*.

* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines*.

"onsite" means within the Prescribed Premises boundary.

Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment Table 12 below:

Table 12: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

Decision

New Inert Landfill, Putrescible Landfill and two new Asbestos Disposal Locations

Condition 1.2.1, Table 1.2.1 has been amended from landfill to landfills.

Condition 1.2.3, Table 1.2.2 has been amended from landfill to landfills and from asbestos disposal area to asbestos disposal areas.

Condition 1.2.6 has been amended from landfill to landfills.

Condition 1.2.11, Table 1.2.5 has been included for construction requirements.

Condition 1.2.12 has been included for the facilities to be operated as per the requirements of the licence following construction and compliance.

Condition 5.3.1, Table 5.3.1 has been included for compliance requirements.

AMD Facility

Condition 3.5.1, Table 3.5.1 has been updated to include process sampling directly from the AMD Cells A, B and C and Evaporation Ponds 1 – 5.

Condition 3.6.1, Table 3.6.3 has been updated to add in additional ambient groundwater monitoring bores in the vicinity of the AMD Facility. These bores are sampled by the licence holder, however, had not been included in the licence conditions previously.

Condition 4.1.1, Table 4.1.1 has been included for a report to be provided that addresses:

- additional monitoring bores that are to be drilled and constructed near Power Station Creek to the north-east of the AMD Facility to assess whether chemical constituents from the AMD Facility are discharging to the hyporheic zone in this area;
- a sampling program to be implemented for hyporheic fauna upstream of the AMD facility; within the groundwater discharge zone from the facility; and downstream of the facility. The diversity of macroinvertebrates within river gravels and their abundance would help

determine the extent to which groundwater discharge from the AMD facility is affecting the hyporheic zone in this creek;

- details of a vegetation monitoring program to be implemented to assess impacts to groundwater dependent vegetation in the vicinity of Power Station Creek; and
- Provides details of the AMD Facility Remediation Project, including timeframes for implementation.

Prescribed Premises Map

Prescribed Premises Map has been updated to include the new putrescible landfill and two new asbestos disposal areas and the overburden storage areas (OSAs) associated with Orebody 35.

Licence holder comments

The licence holder was provided with the draft Amendment Notice on 05 March 2020. The Applicant responded on 23 March 2020 requesting for an extension of the Improvement Condition due date from 30 June 2020 to 30 September 2020. DWER has updated this as requested.

Amendment

1. Definition of “CEO” updated to:

“CEO” means means Chief Executive Officer of the Department.

“submit to / notify the CEO” (or similar), means either:

Director General
Department administering the *Environmental Protection Act 1986*
Locked Bag 10
Joondalup DC WA 6919

or:

info@dwer.wa.gov.au

2. Prescribed Premises Map has been replaced with the map in Attachment 1 of this Amendment Notice.

3. Condition 1.2.1, Table 1.2.1 is amendment by the insertion of the bold text shown in underline below:

1.2.1 The licence holder shall only accept waste on to the **landfills**, asbestos disposal areas, sewage treatment plants and liquid waste facility if:

- (a) it is of a type listed in Table 1.2.1;
- (b) the quantity accepted is below any quantity limit listed in Table 1.2.1; and
- (c) it meets any specification listed in Table 1.2.1 .

Table 1.2.1: Waste acceptance		
Waste type	Quantity limit	Specification ¹
Inert Waste Type 1	6 000 tonnes/year	None specified
Inert Waste Type 2		Tyres and plastic only
Putrescible Waste		None specified
Clean Fill		None specified
Special Waste Type 1		Cement bonded and fibrous asbestos
Controlled waste Category J: Oils	5 100 tonnes/year	None specified
RO reject water discharge Yarnima Power Station (RO Water Treatment Plant, blowdown water from heat recovery system generation and cooling tower)	1,058,000 tonnes/year	Discharged to AMD evaporation ponds with a Total Dissolved Solids less than 5 900 mg/L
RO reject water discharge (Newman Water Treatment Plant)	6,205,000 tonnes/year	Discharged to XD57 with Total Dissolved Solids less than 2 000 mg/L
	2,080,500 tonnes/year	Discharged to AMD evaporation ponds with a Total Dissolved Solids less than 6 257 mg/L
Sewage	183.2 m ³ /day	Accepted through sewer inflow(s) only

Note 1: Additional requirements for the acceptance of controlled waste (including asbestos and tyres) are set out in the *Environmental Protection (Controlled Waste) Regulations 2004*.

4. Condition 1.2.3, Table 1.2.2 is amendment by the insertion of the bold text shown in underline below:

1.2.3 The licence holder shall ensure that wastes accepted onto the landfills, sewage treatment facility and liquid waste facility are only subjected to the process(es) set out in Table 1.2.2 and in accordance with any process limits described in that Table.

Table 1.2.2: Waste processing		
Waste type(s)	Process	Process limits ^{1,2}
All	Disposal of waste by landfilling	Shall only take place within the areas shown in Schedule 1. No waste shall be temporarily stored or landfilled within 35 m from the boundary of the premises. The separation distance between the base of the <u>landfills</u> and the highest groundwater level shall not be less than 2 m.
Clean Fill	Receipt, handling and disposal by landfilling	None specified
Inert Waste Type 1		
Inert Waste Type 2 – Tyres ¹ and used conveyor belts	Receipt, handling, storage prior to disposal by landfilling	To be stored in piles of up to 100 units with a 6 m separation distance between piles. Shall only be buried in overburden storage areas located within the prescribed premises boundary shown in Schedule 1.
Putrescible Waste	Receipt, handling, storage prior to disposal by landfilling	Shall only be placed in the putrescible <u>landfills</u> shown in Schedule 1.
Special Waste Type 1 (Asbestos Waste ²)	Receipt, handling and disposal by landfilling	Shall only be disposed of into the designated asbestos disposal <u>areas</u> shown in Schedule 1. Not to be deposited within 2m of the final tipping surface of the <u>landfills</u> . No works shall be carried out on the <u>landfills</u> that could lead to a release of asbestos fibres.
Controlled waste: oils and emulsions	Receipt, handling and storage prior to removal from site	Only stored in designated storage tanks as depicted in Schedule 1.
RO brine (Yarnima Power Station)	Receipt and disposal by evaporation	Only disposed of at the AMD evaporation ponds as depicted in Schedule 1.
RO brine (Newman Water Treatment Plant)	Receipt and disposal by evaporation and discharge point	Disposed of at the AMD evaporation ponds or Tank XD57 (L2) as depicted in Schedule 1. Total Dissolved Solids limit of <2 000 mg/L must be met prior to disposal at Tank XD57.
Tailings	Treatment and storage	Only stored in Tailings Storage Facility (TSF) as depicted in Schedule 1. A minimum freeboard of 300 mm maintained at the TSF.
Sewage	Biological, physical and chemical treatment	None specified
Sewage sludge	Drying and storage	None specified

Note 1: Requirements for landfilling tyres are set out in Part 6 of the *Environmental Protection Regulations 1987*.

Note 2: Additional requirements for the acceptance and landfilling of controlled waste (including asbestos and tyres) are set out in the *Environmental Protection (Controlled Waste) Regulations 2004*.

5. Condition 1.2.6 amended by the insertion of the bold text shown in underline below:

1.2.6 The licence holder shall prevent unauthorised access to the landfills.

6. Condition 1.2.11, Table 1.2.5 is added to the licence as shown by the insertion of the bold text shown in underline below:

1.2.11 The licence holder must install and undertake the works for the infrastructure and equipment specified in Table 1.2.5, to the requirements specified in that table.

Table 1.2.5: Infrastructure to be constructed

Infrastructure Specifications (design and construction)

New inert landfill

- **Inert waste disposal;**
- **Hydrocarbon contaminated wastes will not be disposed of at the facility;**
- **Waste disposal in designated areas specified in Schedule 1 of the licence.**

New putrescible landfill

- **Facility designed to prevent runoff leaving the facility;**
- **Hydrocarbon contaminated wastes will not be disposed of at the facility;**
- **Windrows implemented to direct clean stormwater around the landfill;**
- **Waste disposal in designated areas specified in Schedule 1 of the licence.**

Two new asbestos disposal areas

- **Asbestos waste is managed in accordance with the *Environmental Protection (Controlled Waste) Regulations 2004, the Code of Practice for the Management and Control of Asbestos in Workplaces, Code of Practice for the Safe Removal of Asbestos, Australian Standard 2601 – The Demolition of Structure;***
- **Asbestos disposal in designated areas specified in Schedule 1 of the licence;**
- **No asbestos deposited within 2 m of the final tipping surface of the landfill;**
- **No works to be carried out on the landfills that could lead to a release of asbestos fibres;**
- **Asbestos material is covered by 1,000 mm of Type 1 inert waste, clean fill or soil by the end of the working day in which the asbestos waste was disposed; and**
- **Waste disposal in designated areas specified in Schedule 1 of the licence.**

6. Condition 1.2.12 is added to the licence as shown by the insertion of the bold text shown in underline below:

1.2.12 The licence holder shall operate the new inert landfill, new putrescible landfill and two asbestos disposal areas in accordance with the conditions of this licence, following submission of the compliance document required under condition 5.3.1.

7. Condition 3.5.1, Table 3.5.1 is amendment by the insertion of the bold text shown in underline below:

3.5.1 The licence holder shall undertake the monitoring in Table 3.5.1 according to the specifications in that table.

Table 3.5.1: Process monitoring						
Monitoring point reference and location on map	Process description	Parameter	Units	Limit	Averaging period	Frequency
P1 (Acid Mine Drainage (AMD) Evaporation Cells)	Brine from the Newman Water Treatment Plant to the clay lined AMD evaporation ponds	Volumetric flow rate (cumulative)	m ³ /day	N/A	Monthly	Continuous
		pH ¹	pH units	N/A		
		TDS	mg/L	N/A	Spot sample	Quarterly
P2 (OWWTP evaporation pond)	Treated wastewater from the Mobile Equipment Workshop oily water separator	TRH	mg/L	N/A	Spot sample	Quarterly
		Volumetric flow rate	m ³ /day	N/A		
	Contingency discharge during high rainfall events	TRH	mg/L	15 mg/L	Spot sample	Each discharge event
P3 (Discharge to Ophthalmia Dam)	Contingency discharge of RO reject water to Ophthalmia Dam	Volumetric flow rate (cumulative)	m ³ /day	N/A	Spot sample	Weekly when discharging
		pH ¹	pH units	N/A		
		TDS ¹	mg/L	6,000 mg/L		
<u>P4</u>	<u>Wastewater within AMD Cell A</u>	<u>pH¹</u>	<u>=</u>	<u>N/A</u>	<u>Spot sample</u>	<u>Quarterly</u>
<u>P5</u>		<u>Oxidation-reduction potential¹</u>	<u>Volts (v)</u>			
<u>P6</u>		<u>Total dissolved solids (TDS)</u>	<u>mg/L</u>			
<u>P7</u>		<u>Aluminium (Al)</u>	<u>mg/L</u>			
<u>P8</u>		<u>Antimony (Sb)</u>	<u>mg/L</u>			
		<u>Arsenic (As)</u>	<u>mg/L</u>			
		<u>Bicarbonate (HCO₃⁻)</u>	<u>mg/L</u>			
		<u>Cadmium (Cd)</u>	<u>mg/L</u>			
		<u>Calcium (Ca)</u>	<u>mg/L</u>			
		<u>Chloride (Cl⁻)</u>	<u>mg/L</u>			
	<u>Chromium (Cr)</u>	<u>mg/L</u>				
	<u>Cobalt (Co)</u>	<u>mg/L</u>				
	<u>Copper (Cu)</u>	<u>mg/L</u>				
	<u>Evaporation Pond 1</u>					

P9	<u>Pond 2</u> <u>Wastewater within AMD Evaporation Pond 3</u>	<u>Iron (Fe)</u>	<u>mg/L</u>			
		<u>Mercury (Hg)</u>	<u>mg/L</u>			
		<u>Magnesium (Mg)</u>	<u>mg/L</u>			
		<u>Molybdenum (Mo)</u>	<u>mg/L</u>			
		<u>Manganese (Mn)</u>	<u>mg/L</u>			
P10	<u>Wastewater within AMD Evaporation Pond 4</u>	<u>Nickel (Ni)</u>	<u>mg/L</u>			
		<u>Lead (Pb)</u>	<u>mg/L</u>			
		<u>Potassium (K)</u>	<u>mg/L</u>			
		<u>Selenium (Se)</u>	<u>mg/L</u>			
		<u>Sodium (Na)</u>	<u>mg/L</u>			
P11	<u>Wastewater within AMD Evaporation Pond 5</u>	<u>Sulfate (SO4)</u>	<u>mg/L</u>			
		<u>Sulfide (S²⁻)</u>	<u>mg/L</u>			
		<u>Thallium (Tl)</u>	<u>mg/L</u>			
		<u>Uranium (U)</u>	<u>mg/L</u>			
		<u>Zinc (Zn)</u>	<u>mg/L</u>			

Note 1: In-field non-NATA accredited analysis permitted.

8. Condition 3.6.1, Table 3.6.3 is amendment by the insertion of the bold text shown in underline below:

3.6.1 The licence holder shall undertake the monitoring in Tables 3.6.1, 3.6.2 and 3.6.3 according to the specifications in those tables and record and investigate results that do not meet any target specified.

Table 3.6.3: Monitoring of ambient groundwater quality				
Monitoring point reference and location	Parameter	Unit	Averaging period	Frequency
<u>Original bores:</u>	pH ¹	-	Spot sample	Quarterly
	Oxidation-reduction potential ¹	Volts (v)		
WBGW050S	Total dissolved solids (TDS)	mg/L		
WBGW050D	Aluminium (Al)	mg/L		
	Antimony (Sb)	mg/L		
WBGW010	Arsenic (As)	mg/L		
	Bicarbonate (HCO ₃ ⁻)	mg/L		
WBGW011	Cadmium (Cd)	mg/L		
	Calcium (Ca)	mg/L		
WBGW022	Chloride (Cl ⁻)	mg/L		
	Chromium (Cr)	mg/L		
WBGW023	Cobalt (Co)	mg/L		
	Copper (Cu)	mg/L		
<u>Upstream of AMD Facility:</u>	Iron (Fe)	mg/L		
	Mercury (Hg)	mg/L		
<u>WBG050S</u>	Magnesium (Mg)	mg/L		
	<u>Molybdenum (Mo)</u>	<u>mg/L</u>		
<u>WBG050D</u>	Manganese (Mn)	mg/L		
	Nickel (Ni)	mg/L		
<u>Around Evaporation Ponds:</u>	Lead (Pb)	mg/L		
	Potassium (K)	mg/L		
<u>WBG022</u>	Selenium (Se)	mg/L		
<u>WBG023</u>	Sodium (Na)	mg/L		
<u>WBG041D</u>	Sulfate (SO ₄)	mg/L		
<u>WBG041S</u>				

<u>WBG042S</u>	Sulfide (S²⁻)	mg/L		
<u>WBG043D</u>	Thallium (Tl)	mg/L		
<u>WBG043S</u>	Uranium (U)	mg/L		
<u>WBG044S</u>	Zinc (Zn)	mg/L		
<u>WBG045D</u>				
<u>WBG045S</u>				
<u>WBG046D</u>				
<u>WBG046S</u>				
<u>WBG047S</u>				
<u>WBG048D</u>				
<u>WBG048S</u>				
<u>WBG049D</u>				
<u>WBG049S</u>				
<u>WBG051D</u>				
<u>WBG051S</u>				
Downstream of AMD Facility:				
WBG009				
WBG014				
WBG015				
WBG016				
WBG017				
WBG018				
WBG019				
WBG020				
WBG021				
Near Power Station Creek:				
WBG010				
WBG011				

Note 1: In-field non-NATA accredited analysis permitted.

9. Condition 4.1.1, Table 4.1.1 is reinstated into the licence as shown by the insertion of the bold text shown in underline below:

4.1.1 The licence holder shall complete the improvements in Table 4.1.1 by the date of completion in Table 4.1.1.

Table 4.1.1: Improvement program		
<u>Improvement reference</u>	<u>Improvement</u>	<u>Date of completion</u>
<u>IR1</u>	<p><u>The licence holder shall submit to the CEO a report with timeframes clearly outlined, which:</u></p> <ul style="list-style-type: none"> <u>(a) provides details of the location of additional monitoring bores that are to be drilled and constructed near Power Station Creek to the north-east of the AMD Facility to assess whether chemical constituents from the AMD Facility are discharging to the hyporheic zone in this area;</u> <u>(b) provides a sampling program to be implemented for hyporheic fauna upstream of the AMD facility; within the groundwater discharge zone from the facility; and downstream of the facility. Sampling of hyporheic fauna is required at various locations along the creek to determine the extent to which groundwater discharge of sulfate is affecting the hyporheic zone beneath this creek. In particular, sampling of hyporheic fauna would be required in gravels beneath the creek bed upstream of where groundwater discharge from the AMD facility is taking place; within the groundwater discharge zone (which could be identified by measuring pore water sulfate levels with a field test kit and EC values with a conductivity meter); and downstream of this groundwater discharge zone. This should include the diversity of macroinvertebrates within river gravels and their abundance to help determine the extent to which groundwater discharge from the AMD facility is affecting the hyporheic zone in this creek;</u> <u>(c) provides a vegetation monitoring program to be implemented to assess impacts to groundwater dependent vegetation in the vicinity of Power Station Creek; and</u> <u>(d) provides the AMD Facility Remediation Project that is currently being implemented by the licence holder, including timeframes for implementation.</u> 	<u>30 September 2020</u>

10. Condition 5.3.1, Table 5.3.1 is amendment by the insertion of the bold text shown in underline below:

5.3.1 The Licence holder shall ensure that the parameters listed in Table 5.3.1 are notified to the CEO in accordance with the notification requirements of the table.

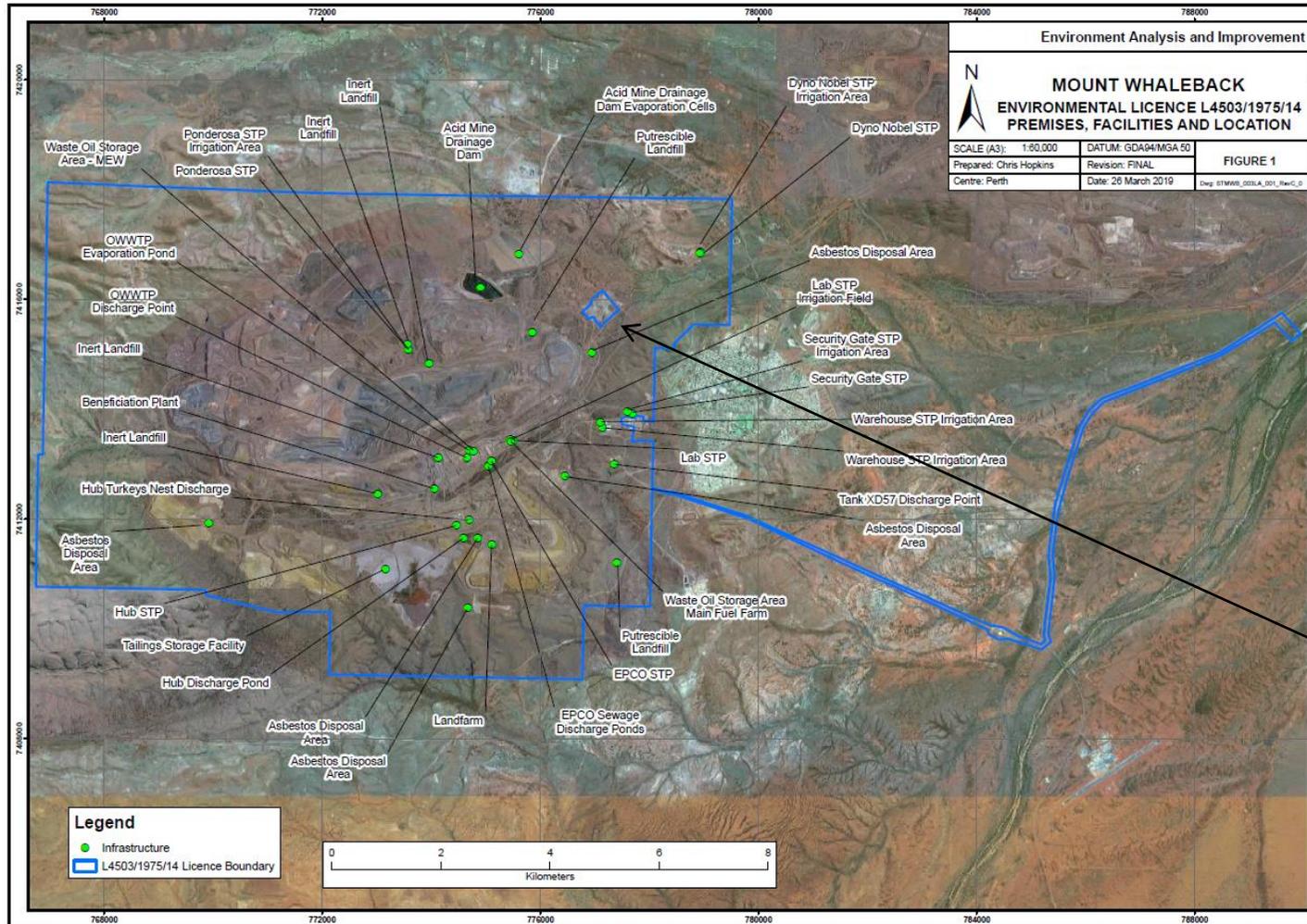
Table 5.3.1: Notification requirements			
Condition or table (if relevant)	Parameter	Notification requirement¹	Format or form²
-	Breach of any limit specified in the licence	Part A: As soon as practicable but no later than 5pm of the next usual working day. Part B: As soon as practicable	N1
Table 3.6.1	Target exceedance	Within 21 calendar days	ET1
Table 1.2.5	<p><u>Subject to condition 1.2.11, within 28 days of the completion of the works specified in Table 1.2.5, the licence holder must submit to the CEO a Compliance Report certified by a suitably qualified professional engineer that:</u></p> <p>(a) <u>lists and describes the completed works and any associated items of infrastructure and equipment listed in Table 1.2.5;</u></p> <p>(b) <u>certifies whether or not each item of infrastructure or component of infrastructure specified in Table 1.2.5 has been constructed with no material defects and to the requirements specified in Table 1.2.5;</u></p> <p>(c) <u>contains ‘as constructed’ plans for each item of infrastructure or component of infrastructure specified in Table 1.2.5;</u></p> <p>(d) <u>is signed by a person authorised by the licence holder and contains the printed name and position of that person within the company.</u></p> <p><u>Where an item of infrastructure or component of infrastructure has been certified as not being constructed, or does not comply with the corresponding requirements, or contains material defects, the licence holder must:</u></p> <p>(a) <u>correct the non-compliant or defective works, prior to re-certifying; or</u></p> <p>(b) <u>provide to the CEO a description of, and explanation for, any departures from the requirements specified in Table 1.2.5 that do not require rectification and do not constitute a material defect along with the Compliance Report.</u></p>	<u>Within 7 days of the completion of construction</u>	<u>None specified</u>

Note 1: Notification requirements in the licence shall not negate the requirement to comply with s72 of the Act

Note 2: Forms are in Schedule 2

Appendix 1: Updated Maps from Schedule 1

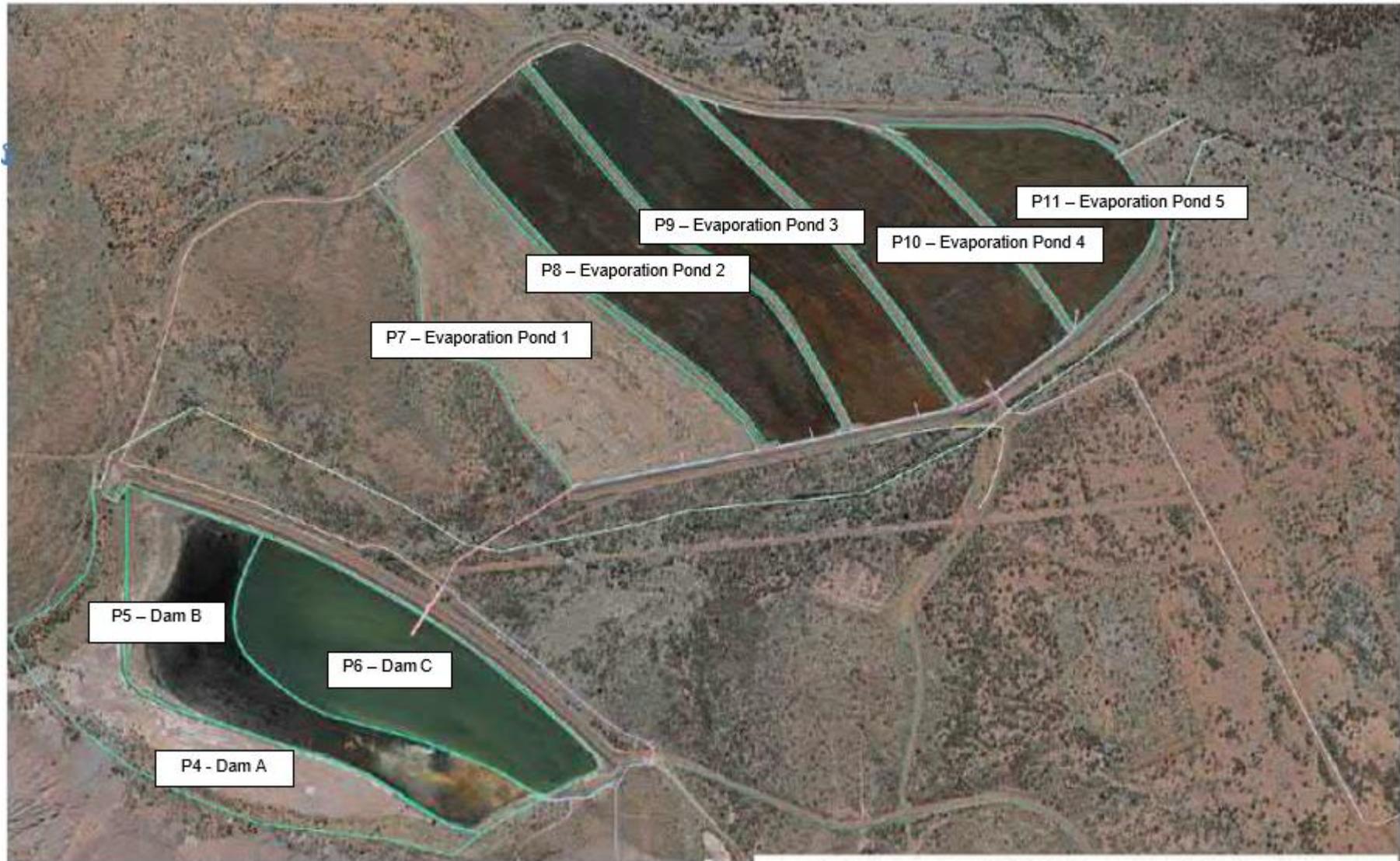
Prescribed Boundary Map



Area excluded from premises boundary

GPS Location ID Waypoint (GDA94 MGA50)	Eastings	Northing
A	777446	7415805
B	777114	7415493
C	776994	7415638
D	777006	7415647
E	776976	7415683
F	776957	7415669
G	776944	7415683
H	776891	7415640
I	776779	7415779
J	776945	7415921
K	776921	7415956
L	776968	7415995
M	776954	7416014
N	777140	7416161

AMD Facility Process Points



Ambient Groundwater Monitoring Network



Legend

- ▲ Whaleback ARD Monitoring Points
- Licenced Points

		MOUNT WHALEBACK
ARD Monitoring Points		FIGURE 1
SCALE: 1:12,000	DATUM: GDA94/MGA 50	
Prepared: Sandra Carles	Revision: FINAL	
Centre: Perth	Date: 1/05/2019	

Appendix 2: Key documents

	Document title	In text ref	Availability
1	L4503/1975/14, Mt Whaleback/Orebody 29/30/35 licence Amendment Notice 1 – 20 April 2017 Amendment Notice 2 – 06 November 2017	licence	Accessed at www.dwer.wa.gov.au
2	DER, July 2015. Guidance Statement: Regulatory principles. Department of Environment Regulation, Perth.	N/A	Accessed at www.dwer.wa.gov.au
3	DER, October 2015. Guidance Statement: Setting conditions. Department of Environment Regulation, Perth.	N/A	Accessed at www.dwer.wa.gov.au
4	DER, February 2017. Guidance Statement: Risk Assessments. Department of Environment Regulation, Perth.	N/A	Accessed at www.dwer.wa.gov.au
5	DER, February 2017. Guidance Statement: Decision Making. Department of Environment Regulation, Perth.	N/A	Accessed at www.dwer.wa.gov.au
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7	Smolders, A.J., Lamers, L.P., Lucassen, E.C., van der Velde, G. and Roelofs, J.G., 2006. Internal eutrophication: How it works and what to do about it-a review. <i>Chemistry and Ecology</i> , 22(2) , 93-111.	Smolders et al., 2006	available at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.495.5814&rep=rep1&type=pdf .
8	Van Dam, R.A., Hogan, A.C., McCullough, C.D., Houston, M.A., Humphrey, C.L. and Harford, A.J., 2010. Aquatic toxicity of magnesium sulfate, and the influence of calcium, in very low ionic concentration water. <i>Environmental Toxicology and Chemistry</i> , 29(2) , 410-421.	Van Dam et al., 2010	<i>Environmental Toxicology and Chemistry</i>
9	ANZECC, ARMCANZ 2018 95% species protection freshwater guidelines	ANZECC, ARMCANZ 2018 95%	Available at: https://www.waterquality.gov.au/anz-guidelines/resources/previous-guidelines/anzecc-armcanz-2000
10	RPS, Risk Assessment, Mount Whaleback AMD Facility, 5 December 2016	RPS, 2016	DWER records (A1339711)
11	Email titled "DER WB Licence L4503/1975/14 - AMD risk assessment" dated 08/12/2016 12:43pm and authored by BHP Billiton Iron Ore Pty Ltd	N/A	DWER records (A1878263)
12	DWER's Contaminated Sites Review, Mt Whaleback AMD review, 20 December 2016	N/A	DWER records (A1347799)
13	Email titled "Application to Amend Whaleback Environmental Licence L4503/1975/14" dated 30/10/2018 07:09am and authored by BHP Billiton Iron Ore Pty Ltd	N/A	DWER records (A1733548)

14	Email titled "RE: Application to Amend Whaleback Environmental Licence L4503/1975/14" dated 13/11/2018 03:38pm and authored by BHP Billiton Iron Ore Pty Ltd	N/A	DWER records (A1738775)
15	Email titled "Removal of the Production Rate Increase for the Whaleback L4503 Licence Amendment Application" dated 27/11/2018 12:33pm and authored by BHP Billiton Iron Ore Pty Ltd	N/A	DWER records (A1742853)
16	Email titled "RE: L4503 Whaleback / OB29 AMD sulfate" dated 20/03/2019 07:09am and authored by BHP Billiton Iron Ore Pty Ltd	N/A	DWER records (A1774314)
17	Email titled "RE: L4503 Whaleback / OB29 AMD sulfate" dated 01/05/2019 03:52pm and authored by BHP Billiton Iron Ore Pty Ltd	N/A	DWER records (A1789514)
18	Email titled "FW: REQUEST FOR ADVICE /COMMENT ON AIR QUALITY CRITERIA - L4503/1975/14 - BHP Billiton Iron Ore Mt Whaleback/Orebody" dated 13/01/2020 08:48am and authored by DWER	N/A	DWER records (A1878260)
19	Email titled "RE: REQUEST FOR ADVICE /COMMENT ON AIR QUALITY CRITERIA - L4503/1975/14 - BHP Billiton Iron Ore Mt Whaleback/Orebody" dated 20/01/2020 11:43am and authored by Environmental Health Directorate / Public and Aboriginal Health Division	N/A	DWER records (A1878243)
20	Email titled "APPLICATION FOR AN AMENDMENT TO LICENCE (L4503/1975/14) INCLUSION OF ACID MINE DRAINAGE REQUIREMENTS & DUST REGULATION UPDATES IN LICENCE REVIEW" dated 17/02/2020 03:54pm and authored by DWER	N/A	DWER records (A1868646)
21	Email titled "RE: L4503 Whaleback / OB29 New Inert Landfill" dated 26/03/2020 11:02am and authored by BHP Billiton Iron Ore Pty Ltd	N/A	DWER records (A1778832)
22	Email titled "RE: APPLICANT NOTIFICATION - L4503/1975/14 - NOTICE OF PROPOSED AMENDMENT TO LICENCE" dated 23/03/2020 09:00am and authored by BHP Billiton Iron Ore Pty Ltd	N/A	DWER records (A1878230)
23	Email titled "RE: APPLICANT NOTIFICATION - L4503/1975/14 - NOTICE OF PROPOSED AMENDMENT TO LICENCE" dated 23/03/2020 09:37am and authored by BHP Billiton Iron Ore Pty Ltd	N/A	DWER records (A1878265)