



Application for Licence Amendment

Part V Division 3 of the *Environmental Protection Act 1986*

Licence Number	L4496/1988/11
Licence Holder	Big Bell Gold Operations Pty Ltd
ACN	090 642 809
File Number	2010/003418-1
Premises	Bluebird Gold Mine MEEKATHARRA WA 6642 Legal description - G51/9, L20/75, L51/18, L51/51, L51/78, M20/12, M20/45, M20/68, M20/70, M20/71, M20/73, M20/77, M20/107, M20/214, M20/219, M20/249, M20/421, M51/6, M51/12, M51/31, M51/33, M51/35, M51/39, M51/62, M51/75, M51/92, M51/96, M51/132, M51/190, M51/199, M51/200, M51/203, M51/209, M51/211, M51/233, M51/236, M51/237, M51/254, M51/320, M51/321, M51/374, M51/393, M51/437, M51/438, M51/439, M51/440, M51/459, M51/462, M51/463, M51/483, M51/485, M51/486, M51/492, M51/493, M51/494, M51/504, M51/523, M51/539, M51/564, M51/569, M51/572, M51/575, M51/581, M51/491, M51/495, M51/666, M51/668, M51/669, M51/670, M51/671, MW51/672, M51/757, M51/788, M51/784, M51/793, M51/794, M51/795, M51/800, M51/801, M51/819, M51/820, M51/824, M51/834, M51/53 and M51/524 As defined in Schedule 1
Date of Report	26 August 2022
Decision	Revised licence granted

A/Manager, Resource Industries

REGULATORY SERVICES

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

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1. Decision summary

Licence L4496/1988/11 (the Licence) is held by Big Bell Gold Operations Pty Ltd (Licence Holder) for the Bluebird Gold Mine (the Premises).

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed changes to the emissions and discharges during the construction and operation of the Premises. As a result of this assessment, Revised Licence L4496/1988/11 has been granted.

Scope of assessment

1.1 Regulatory framework

In completing the assessment documented in this Amendment Report, the department has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at <https://dwer.wa.gov.au/regulatory-documents>.

1.2 Application summary

On 10 March 2022, the Licence Holder submitted an application to the department to amend the Licence under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The following amendments are being sought:

Construction and operation of:

- Two new wastewater treatment ponds

The capacity of the existing wastewater treatment plant (WWTP) will be increased from the current 99 m³/day up to a new combined capacity of 150 m³/day. The increase in capacity will be achieved by constructing and operating two additional facultative wastewater treatment ponds (see Figure 1). The Licence Holder anticipates a maximum wastewater inflow into the WWTP of 149 m³/day, however expects the average inflow is likely to be well below at 125 m³/day. The WWTP is designed as a containment system for treatment with no discharge to the environment required (i.e. no irrigation area).

The new ponds will be connected in series to the existing ponds, and will each be 80 m long, 30 m wide and 1.8 m high and will have a combined total capacity of 5,136 m³ which includes providing a 400 mm freeboard. The current capacity of the WWTP is 4,836 m³.

The Licence Holder has stated the construction of the ponds will comply with the requirements set out in DWER's 'Water quality protection note 27, *Liners for containing pollutants using engineered soils* (August 2013) (WQPN 27). The Licence Holder has also stated the operation of the ponds will be in accordance with the methods detailed in DWER's 'Water quality protection note 39, *Ponds for stabilising organic matter* (February 2009) (WQPN 39).

No change to the current pipeline infrastructure is required. The ponds will be fenced to prevent access by unauthorised persons and fauna.

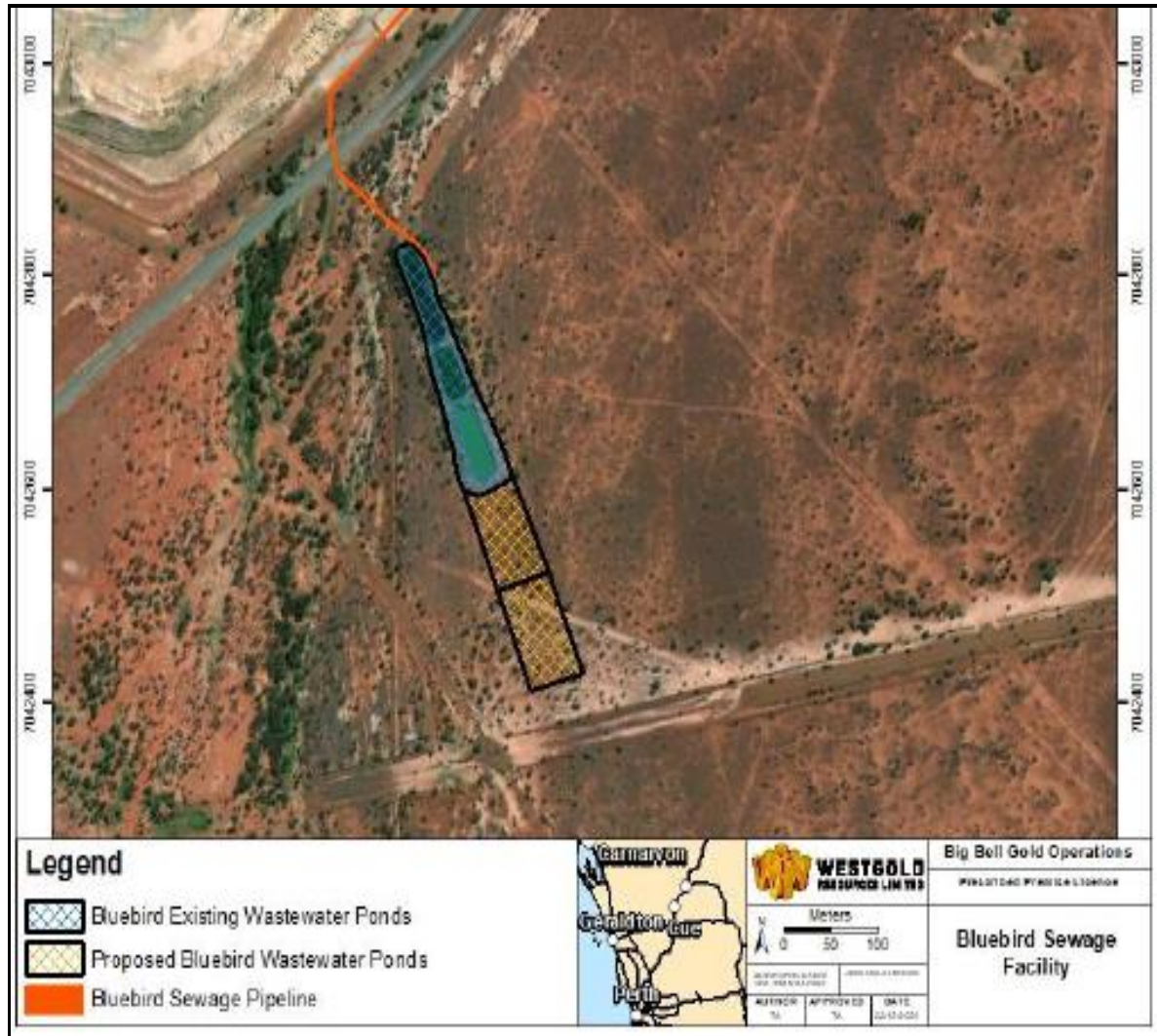


Figure 1: Additional Bluebird Sewage Ponds

-New putrescible landfill on the South Junction/Ascot Waste Rock Dump

The Licence Holder plans to construct a category 89 putrescible landfill at the South Junction/Ascot Waste Rock Landform (South Junction/Ascot WRL) to allow the disposal of cardboard and pulp (rock/dirt) only (see Figure 2). Other putrescible type wastes will continue to be transferred to the nearby Meekatharra Landfill for burial.

Trenches or an area enclosed by earthen or rock bunds will be constructed at the top of the existing South Junction/Ascot WRL, which is located 27 meters above ground level, for the burial of the waste. Only one disposal area will be open at one time. The Licence Holder estimates 1,000 tonnes of cardboard will be buried annually.



Figure 2: South Junction/Ascot WRL landfill and Surprise WRL landfill

-Expansion of the existing inert landfills at the Surprise WRL and Paddy's Flat.

Surprise WRL Landfill

The Licence Holder plans to increase the footprint of the existing inert landfill located at the top of the Surprise WRL (Figure 2). The current trench system for the burial of inert waste will continue to be used as the method of disposal. The capacity of

the landfill will remain the same. The Licence Holder proposes to manage the Surprise WRL Landfill in accordance with the existing conditions in the Licence.

Paddy's Flat Landfill

The existing inert landfill at Paddy's Flat is nearing capacity and the Licence Holder proposes to construct and operate a new inert landfill adjacent to the existing facility (see Figure 3). The types of waste (inert) and volumes buried will remain unchanged.

The new inert landfill will be located on top of a historical Ron-of-Mine (ROM) pad which sits 10 metres above the natural surrounding ground level. Trenches will be constructed for the burial of waste with only one trench being open for deposition of waste at one time.



Figure 3: Paddy's Flat Landfill

-New dewatering discharge location into Lake Annean

The Licence Holder proposes to expand (cutback) the existing Baileys East, Baileys South and Baileys North pits. Dewatering activities will be required to allow mining below the water table with excess to project requirements (used for dust suppression) being discharged to Lake Annean (Baileys Island pits discharge point). Discharge of hypersaline dewatering water to Lake Annean is already authorised under the Licence, however the Licence Holder is proposing to discharge to a new location at the lake. A new dewatering pipeline running west from the pits to Lake Annean is proposed (see Figure 4 below).

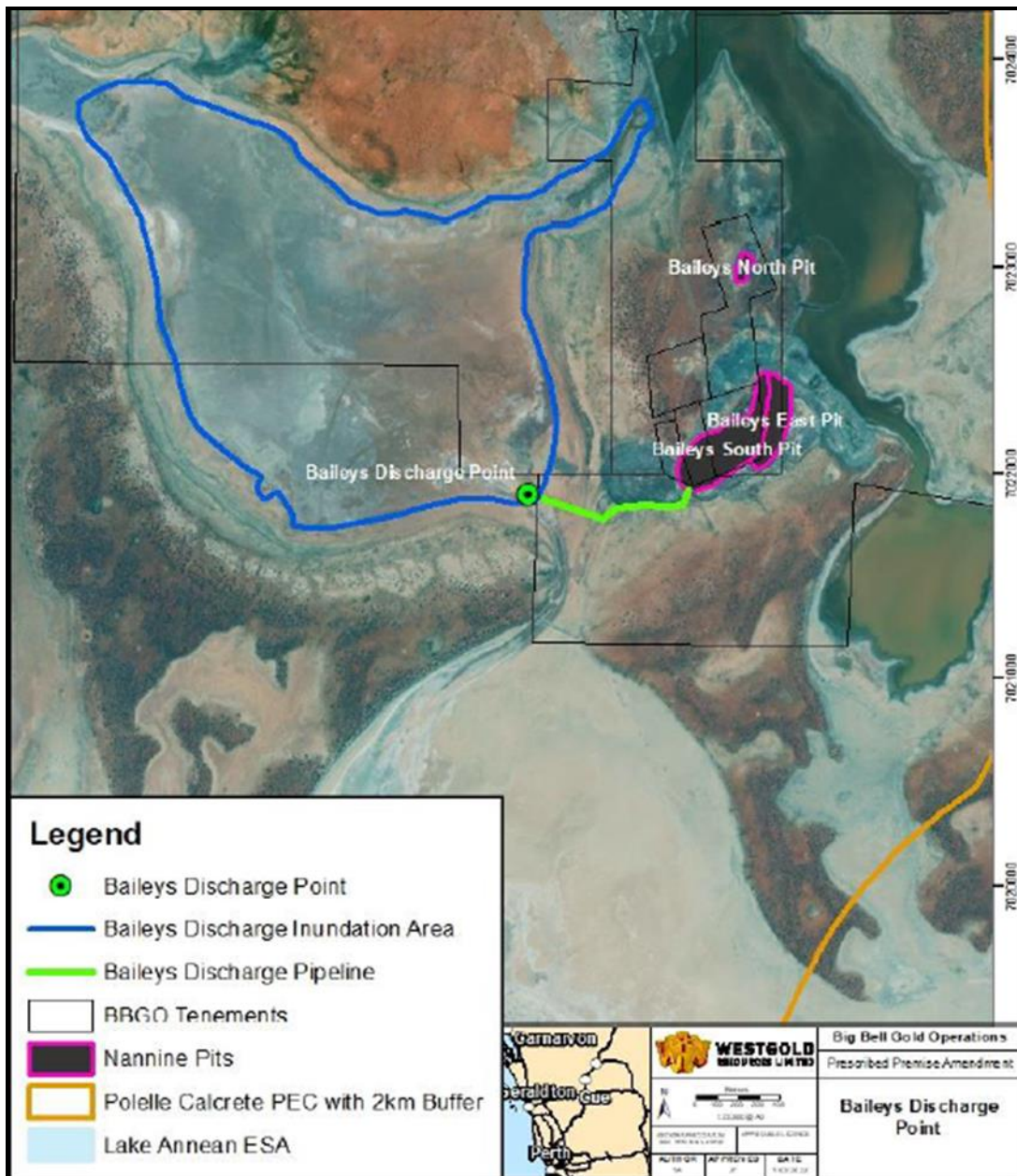


Figure 4: Baileys Discharge to Lake Annean

The Licence Holder expects to discharge a total of up to 2,200,000 tonnes of dewatering water to Lake Annean over a two year period; however has not requested an increase in the current Licence throughput of 5,953,000 tonnes per annual period for category 6. The Licence Holder expects the majority of the dewatering discharge to Lake Annean will occur in the first year with the dewatering of the pit lakes. Following the dewatering of the pit lakes, only dewatering of groundwater inflows will be required to maintain dry mining pits.

Dewatering of the mined pits will occur using in-pit sumps which will be located within each mine void. The dewatered water will then be transferred to Lake Annean by newly installed dewatering pipelines. The discharge outlet will be located within the deeper parts of the lake basin to prevent backflow of saline water into creek lines and tributaries.

The discharge outlet will be capped, with a series of perforations cut into the side of the pipeline at the termination point to allow a diffuse flow to minimise scouring or

erosion of the lakebed surface. The discharge outlet will also be positioned on a rubber conveyor belt to further reduce the effects from scouring.

Further detail is provided in Section 2.3 below.

Table 1 below outlines the proposed changes to the existing Licence

Table 1: Proposed design or throughput capacity changes

Category	Current design/throughput capacity	Proposed design/throughput capacity	Description of proposed amendment
5	2,500,000 tonnes per annual period	No change	Not applicable
6	5,953,000 tonnes per annual period	No change	Inclusion of an additional dewatering discharge location. No change to the annual discharge amount.
54	99 m ³ /day under a category 85	150 m ³ /day	The Licence Holder proposes to upgrade the existing wastewater treatment plant by adding an additional two wastewater treatment ponds.
63	3,000 tonnes per annual period	No change	Expansion of the existing inert landfills. No change in capacity.
64	Not applicable – new category	1,000 tonnes per annual period	Inclusion of a new inert/putrescible landfill on the South Junction/Ascot Waste Rock Dump

2. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk assessments* (DWER 2020).

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

2.1 Source-pathways and receptors

2.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction and operation which have been considered in this Amendment Report are detailed in Table 2 below. Table 2 also details the proposed control measures the Licence Holder has proposed to assist in controlling these emissions, where necessary.

Table 2: Licence Holder controls

Emission	Sources	Potential pathways	Proposed controls
Dust	Vehicle movements, earthworks, cover material stockpiles, covering of waste.	Air/windborne pathway	Water carts are used as required to wet down roads and earth works.
Windblown waste	Burial of cardboard materials	Air/windborne pathway	Waste placed within trenches below ground level. Trenches covered once capacity is reached. Regular windblown waste retrieval.
Contaminated stormwater	Stored and buried wastes at landfill areas.	Seepage through to groundwater Runoff to surface water	Located on elevated WRL area approximately 30 m about surrounding natural ground level. Surface water greater than 100 m away. Below ground trench method use for the storage and burial of waste. Bunding constructed on all sides of the trench to divert uncontaminated stormwater.
Saline dewatering effluent	Dewatering of the Baileys pits	Direct discharge to Lake Annean	The discharge outlet will be located within the deeper parts of the lake basin to prevent backflow of saline water into creek lines and tributaries and to avoid lake edges (riparian zones). The discharge outlet will be capped, with a series of perforations cut into the side of the pipeline at the termination point to allow a diffuse flow to minimise scouring or erosion of the lakebed surface. Discharge outlet will be positioned on a rubber conveyor belt to further reduce the effects from scouring. Daily inspections of discharge outlet will be undertaken.
Saline dewatering effluent	Dewatering of the Baileys pits	Direct discharge to land from pipeline failure	Pipelines will follow established routes (built for the same purpose) which are aligned with transport corridors and will aid in containing any spills. Pipelines will be located within v-drains capable of capturing any leakages/spills. Daily inspections of pipelines and make repairs immediately as required. Constructed from HDPE material.
Nutrient rich	Storage and	Seepage	The pond liner material and the method of

Emission	Sources	Potential pathways	Proposed controls
wastewater	treatment of sewage in wastewater ponds	through pond liner to underlying soils	construction, including integrity testing and certification, will be conducted in accordance with the requirements set out in DWER's 'Water quality protection note 27, <i>Liners for containing pollutants using engineered soils</i> (August 2013). Groundwater is greater than 10 meters below ground level (mbgl) at this location.
Nutrient rich wastewater	Storage and treatment of sewage in wastewater ponds	Direct discharge to land from overtopping of the pond embankment	A minimum freeboard of 500 mm will be maintained while containing rainfall from a 20-year recurrence interval wet season. Daily inspections of ponds to confirm the required freeboard is being maintained. Designed with sufficient capacity to store and treat up to 150 m ³ of wastewater per day including provision for rainfall.

2.1.2 Receptors

In accordance with the *Guideline: Risk assessments* (DWER 2020), the Delegated Officer has excluded employees, visitors and contractors of the Licence Holder's from its assessment. Protection of these parties often involves different exposure risks and prevention strategies, and is provided for under other state legislation.

Table 3 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises (*Guideline: Environmental siting* (DWER 2020)).

Table 3: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Town of Meekatharra	Is approximately 12 km north of the nearest prescribed activity as part of this amendment. Screened out as a receptor. Separation distance considered too great.
Environmental receptors	Distance from prescribed activity
Lake Annean A detailed description of Lake Annean is provided in section 2.3.2	Excess dewatering effluent directly discharged into Lake Annean.
Riparian vegetation The Lake Annean lakebed is largely unvegetated. The riparian vegetation dominated by salt tolerant species.	Located on lake edge surrounding the expected dewatering discharge inundation areas.
Flora - Two priority flora species (<i>Tecticornia</i> sp. nov and <i>Eromophila</i> sp. Nov) have been recorded within the vicinity of the Nannine	Clearing Permit CPS 9070/1 has been conditioned to ensure no clearing occurs within 10m of these species.

Project area.	All dewatering activities are located south of and downstream of these flora species.
Groundwater at the Premises	<p>Groundwater depth varies across the premises. In some areas it is 6 to 18 metres below ground level (mbgl) (DWER GIS database) and in other areas 20-60 mbgl.</p> <p>According to the Groundwater Dependent Ecosystem (GDE) Atlas managed by the Bureau of Meteorology, Lake Annean is considered to be an ecosystem that relies on the surface expression of groundwater. Groundwater in this area is considered hypersaline due to the high salinity of the lake surface.</p>

2.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for those emission sources which are proposed to change and takes into account potential source-pathway and receptor linkages as identified in Section 2.1. Where linkages are incomplete they have not been considered further in the risk assessment.

Where the Licence Holder has proposed mitigation measures/controls (as detailed in Section 2.1), these have been considered when determining the final risk rating. Where the Delegated Officer considers the Licence Holder's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the licence as regulatory controls.

Additional regulatory controls may be imposed where the Licence Holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 4.

The Revised Licence L4496/1988/11 that accompanies this Amendment Report authorises emissions associated with the operation of the Premises.

The conditions in the Revised Licence have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 4. Risk assessment of potential emissions and discharges from the Premises during construction and operation

Risk Event					Risk rating ¹ C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls				
Construction								
Vehicle movements, earth moving and construction activities.	Dust	Air/windborne pathway causing impacts to vegetation	Priority flora	Refer to Section 2.1	C = slight L = Rare Low Risk	Y	No conditions	No specific conditions regarding the regulation of dust emissions from construction activities have been applied to the Licence. General provisions of the EP Act apply regarding Environmental Harm.
Operation								
Acceptance and burial of wastes at the Landfill Vehicle movements	Dust	Air/windborne pathway causing impacts to vegetation	Priority flora	Refer to Section 2.1	C = Slight L = Rare Low Risk	Y	No conditions	No specific conditions regarding the regulation of dust emissions from landfill activities have been applied to the Licence. General provisions of the EP Act apply regarding Environmental Harm.
Acceptance, storage and burial of wastes at a Landfill facility	Windblown waste	Air/windborne pathway resulting in unsuitable habitat for fauna.	Fauna	Refer to Section 2.1	C = Slight L = Rare	Y	Conditions 1.1.6, 1.1.7, 1.1.8, 1.1.9, 4.1.1, 4.1.2, 4.1.3 and 4.2.1	Licence Holder proposed controls have been applied as conditions of

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Risk Event					Risk rating ¹ C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls				
					Low Risk			the Licence. Standard administrative and reporting conditions have been applied to the Licence.
	Contaminated stormwater	Overland runoff potentially contaminating surrounding soils and causing vegetation stress or death.	Vegetation Soil	Refer to Section 2.1	C = Slight L = Unlikely Low Risk	Y	Conditions 1.1.6, 1.1.10 , 1.1.11, 1.1.12, 1.1.13, 4.1.1, 4.1.2, 4.1.3 and 4.2.1	Licence Holder proposed controls have been applied as conditions of the Licence. Standard administrative and reporting conditions have been applied to the Licence.
Treatment of sewage in wastewater treatment ponds	Nutrient rich wastewater	Overtopping of pond embankments contaminating surrounding land affecting soil quality and causing vegetation stress or death.	Vegetation Soils	Refer to Section 2.1	C = Slight L = Unlikely Low Risk	Y	Conditions 1.1.1, 1.1.3 , 1.1.4, 1.1.9, 1.1.10 , 1.1.11, 1.1.12, 1.1.13, 4.1.1, 4.1.2, 4.1.3, 4.2.1, and 4.3.1	The Licence Holder has committed to constructing and operating the new wastewater treatment ponds in accordance WQPN 27 and WQPN 39 respectively. These commitments have been included as conditions of the Licence. Licence Holder has committed to weekly inspections of the ponds. This

Risk Event					Risk rating ¹ C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls				
								<p>commitment has been included as a condition of the Licence.</p> <p>Standard conditions relating to construction of the ponds to be generally located as identified in the submitted application have been applied to the Licence.</p> <p>Standard administrative and reporting conditions have been applied to the Licence.</p>
		Seepage through liner contaminating underlying groundwater and impacting surrounding vegetation and soils through surface expression.	Groundwater Vegetation	Refer to section 2.1	C = Slight L = Unlikely Low Risk	Y	Conditions 1.1.9, 1.1.10, 1.1.11, 1.1.12, 1.1.13, 4.1.1, 4.1.2, 4.1.3, 4.2.1, and 4.3.1	<p>The Licence Holder has committed to constructing and operating the new wastewater treatment ponds in accordance WQPN 27 and WQPN 39 respectively. These commitments have been included as conditions of the Licence.</p> <p>Standard conditions relating to construction of</p>

Risk Event					Risk rating ¹ C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls				
								ponds to be generally located as identified in the submitted application have been applied to the Licence. Standard administrative and reporting conditions have been applied to the Licence.
Dewatering of mine pits with surplus dewater discharged directly to Lake Annean	Saline dewatering effluent from mined pits	Direct discharge causing impacts to surface water quality, lake biota, groundwater, riparian vegetation, scouring of the lakebed and secondary impacts to migratory birds.	Lake ecosystems Riparian vegetation Groundwater Migratory bird species	Refer to section 2.1	Refer to detailed risk assessment in Section 2.3 below.	Y	Conditions 1.1.9, 1.1.10 , 1.1.11, 1.1.12, 1.1.13, 2.1.1, 2.3.1 , 2.3.2 , 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1 , 3.5.1 , 3.5.2 , 3.5.3 , 4.1.2, 4.1.3 and 4.2.1 , 4.2.2 and 4.3.1.	Refer to detailed risk assessment in Section 2.3 below.
Pipeline leakage/rupture causing discharge to surrounding environment	Saline dewatering effluent from mined pits	Direct discharge causing contamination of surrounding land with saline water affecting soil quality and causing vegetation stress or death.	Surrounding soils Native vegetation	Refer to section 2.1	C = Moderate L = Possible Medium Risk	Y	Conditions 1.1.4, 1.1.5, 1.1.10 , 1.1.11, 1.1.12, 1.1.13, 4.1.1, 4.1.2, 4.1.3 and 4.2.1	Licence Holder controls will be applied as conditions of the Licence. Standard administrative and reporting conditions have been applied to the Licence.

Risk Event					Risk rating ¹ C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls				
Dewatering of mine pits with surplus dewater used for dust suppression onsite.	Saline dewatering effluent	Overspray or runoff causing impacts to native vegetation and soils.	Vegetation Soils	Refer to section 2.1	C = Slight L = Unlikely Low Risk	Y	Condition 1.1.5, 4.1.1, 4.1.2, 4.1.3 and 4.2.1	Existing conditions sufficient for regulating the use of dewatering effluent for dust suppression. No additional conditions required.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guideline: Risk assessments* (DWER 2020).

Note 2: Proposed Licence Holder's controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

2.3 Detailed risk assessment – Impacts to Lake Annean (surface water and riparian vegetation) and secondary impacts on migratory bird species.

2.3.1 General characterisation of emission

The quantity of water contained within each pit (pit lake) requiring dewatering and the time required to dewater the pit is described below and shown in Table 5. The expected inflows to maintain a dry pit floor are also shown.

- Bailey's north – 10,453 m³. Dewatering the pit lake is expected to take less than a week. Modelling (Rockwater, 2022) shows groundwater inflows requiring continuous dewatering are expected to be 1,490 m³/day.
- Bailey's south and east pits – 1,269,440 m³. Dewatering of the pit lakes are expected to take up to 9 months at 86 litres per second (L/s) and as little as 4 months at 250 L/s. Modelling (Rockwater, 2022) shows groundwater inflows requiring continuous dewatering are expected to be 2,050 m³/day.

Table 5 below provides a water balance for the dewatering of the Baileys North, Baileys South and Baileys East pits.

The quality of the water contained within the Baileys North, Baileys South and Baileys East pits has been analysed on four separate occasions from 2017 to 2021 with the latest sampling conducted in September 2021. Water quality results indicate the waters are classified as sodium-chloride type waters and are highly saline with a median Total Dissolved Solids (TDS) range of between 260,000 to 325,000 mg/L. Nitrate concentrations in the pit waters were high (up to a maximum of 120 mg/L in the Baileys North) however this is more common in internally draining semi-arid regions in Australia. In these regions, nitrate is derived from cyanobacterial crusts on soils surfaces and from leaching from termite mounds, and these sources can give rise to nitrate concentrations in groundwater that often exceed 100 mg/L (Barnes et al., 1992). Elevated nitrate levels in mined pits waters can also be associated with the use of explosives (ammonia nitrate) in the mining industry. A full list of the latest water quality results for each pit is provided in pages 34 to 41 of the Supporting Document (2022).

Table 5: Baileys Island pit dewatering water balance

Month	Baileys Island - all pits (Starting Water Volume 1,279,893m ³)					
	Scenario 1: Dewatering at 250 L/s		Scenario 2: Dewatering at 100 L/s		Scenario 2: Dewatering at 86 L/s	
	Maximum Abstracted Volume (m ³)	Pit Water Volume (m ³)	Maximum Abstracted Volume (kL)	Pit Water Volume (kL)	Maximum Abstracted Volume (kL)	Pit Water Volume (kL)
YEAR 1						
1	0	1,279,893	0	1,279,893	0	1,279,893
2	648,000	694,793	259,200	1,083,593	222,912	1,119,881
3	648,000	109,693	259,200	887,293	222,912	959,869
4	109,693	0	259,200	690,993	222,912	799,857
5	62,900	0	259,200	494,693	222,912	639,845
6	62,900	0	259,200	298,393	222,912	479,833
7	61,500	0	259,200	102,093	222,912	319,821
8	61,500	0	102,093	0	222,912	159,809
9	61,500	0	62,900	0	159,809	0
10	61,500	0	62,900	0	62,900	0
11	61,500	0	61,500	0	62,900	0
12	61,500	0	61,500	0	61,500	0
YEAR 1 Total	1,900,493		1,906,093		1,907,493	
YEAR 2						
13	61,500	0	61,500	0	61,500	0
14	61,500	0	61,500	0	61,500	0
15	61,500	0	61,500	0	61,500	0
16	61,500	0	61,500	0	61,500	0
17	61,500	0	61,500	0	61,500	0
18			61,500	0	61,500	0
19			61,500	0	61,500	0
20			61,500	0	61,500	0
21			61,500	0	61,500	0
22					61,500	0
YEAR 2 Total	307,500		553,500		615,000	
Total Dewatered	2,207,993		2,459,593		2,522,493	

2.3.2 Description of the receiving environment

Lake Annean is a large inland salt lake system located in the Mid-West region of Western Australia. The lake covers an area of 120 km² and is situated about 40 kilometres southwest of Meekatharra.

DWER describes Lake Annean as a good example of a seasonal/intermittent saline/brackish lake and marsh system. The lake plays an important ecological and hydrological role in the landscape and provides habitat and refuge for significant invertebrate and vertebrate fauna (DoE, 2015b).

Lake Annean is listed as a Directory of Important Wetlands in Australia because it supports foraging and breeding habitat for a number of Federally-listed migratory and marine bird species as well as various other water bird species.

Salinity levels within Lake Annean when water is present are considered hypersaline with TDS readings normally greater than 150,000 mg/L.

Lake Annean is a mega scale irregular sump land, with numerous microscale and macroscale elongate islands and peninsulas, while a natural peninsula (ridge) almost separates the wetland into two lakes. An anastomosing creek system enters the north-east corner of the lake with a catchment extending 30 km north to near Meekatharra. Additional minor creeks flow from the landscape into the west and north sides of the lake. The catchments are all moderately disturbed from pastoral and mining related activities (DoE, 2015b).

Surface water held in the lake drains northwards via Hope River into the Murchison River. Inundation over parts of the lake occurs periodically in most years, while the whole lake occasionally fills from episodic flooding (probably every five to ten years) caused by large summer-autumn rain events associated with tropical storms moving from the north-west. At its deepest point, the depth of the surface water can reach up to a metre after large flooding events.

Background sediment samples were collected from various locations within Lake Annean and were sent to an accredited laboratory for analysis. The results were then compared with ANZG 2018 sediment guidelines. The comparison shows half of the sediment sample locations exceeded Chromium and Nickel Default Guideline Value and two samples exceeded the Nickel Guideline Value. All samples were below the guideline values for Cadmium, Copper, Lead, Zinc, Arsenic and Mercury.

2.3.3 Potential impacts from emission

The Licence Holder engaged consultants (Rockwater, 2022) to complete a hydrogeology and dewatering assessment of the area to determine the most suitable location for the discharge to Lake Annean. The recommended site determined the discharged water would only saturate an unvegetated area of the lake and not impact any areas of fringing native vegetation (see Figure 4 above). The ponded water is expected to cover approximately 1.2% of the total lake area.

Analysis of water from Lake Annean during September 2021 indicates the discharge water will be of similar chemical composition to Lake Annean samples, however with a higher salinity (380,000 mg/L TDS compared with 110,000 TDS respectively). Sampling results from 2016 show salinity levels in Lake Annean can be a lot higher (160,000 mg/L TDS) and is dependent on recent rainfall events reducing salt concentrations (dilution) in the lake waters.

The groundwater beneath the lake is expected to have the same chemical composition, including salinity levels, as the water contained within the pits as a result of the location of the pits within the same area as the lake discharge. As a result, impacts from the dewatering discharge on the underlying groundwater are not expected.

Salt is expected to be deposited as a result of the ponded area drying, however this will be

dispersed by flood water flows in the lake as part of the inundation and drying cycle which naturally occurs at inland salt-lake systems in this area.

Increased metal concentrations could also have an impact at Lake Annean. Selenium and mercury are the contaminants of principal concern in closed saline-water systems due to the ability of these elements to be biomagnified in food webs that typically develop under conditions where there are high evaporation rates (Tanner *et al.*, 1999 and Wurtsbaugh *et al.*, 2011). Closed saline-water systems such as the discharge area in Lake Annean generally contain algae, brine shrimp, aquatic insects and insect larvae which form a food source for various bird species including migratory. The trophic transfer of selenium and mercury in this food web has the potential to affect bird populations through impacts on developing embryos in eggs. The principal environmental receptors for these elements are therefore birds rather than toxicity to organisms in the water column (which is assumed in the ANZECC guidelines). Consequently, the criteria for mercury and selenium levels in water and in biomass in the water body must be developed at a sufficiently low level to ensure bird populations are protected, even if the concentrations in the water column appear to be harmless to aquatic organisms.

Results from analysing water samples taken from each of the pits and Lake Annean indicate the concentration levels for Mercury are below a level of detection (less than 0.00005 mg/L). Therefore, no impacts from mercury are expected. Results from analysing water samples taken from the three pits indicate the median concentration level for Selenium ranged from 0.0645 to 0.19 mg/L. Current standards do not provide data to derive a reliable trigger value for Selenium, however results from analysing water samples taken from each of the pits (September 2021), indicate the concentration levels for Selenium (median 0.0645 to 0.19 mg/L) are comparable with water samples taken from Lake Annean which were shown to be below 0.1 mg/L and are considered low.

Nitrate concentrations in the pit waters were high (up to a maximum of 120 mg/L in the Baileys North) however, elevated nitrate levels in the mine discharge to Lake Annean are unlikely to cause significant eutrophication problems. This is because the productivity of the ephemeral aquatic ecosystem in this lake is probably limited by the availability of phosphorus rather than nitrogen, and cyanobacteria in the lake are probably able to produce all of the nitrogen they require for growth by the fixation of atmospheric nitrogen.

Impacts on riparian vegetation at Lake Annean could occur as a result of discharging highly saline water, however the lakebeds are dominated by salt tolerant species, naturally high in salinity and largely unvegetated. Therefore, the dewatering effluent is not expected to have an impact on riparian vegetation.

Other potential impacts from discharging dewatering effluent into Lake Annean includes scouring of the lake bed.

2.3.4 Criteria for assessment

Department of Water, *Western Australian water in mining guidelines*, Report no. 12, May 2013.

Relevant water quality criteria for comparison include ANZECC guidelines for marine water quality with a 95% species protection level, as these are considered to be the most appropriate guidelines in terms of providing a point of reference. It must be noted that no guideline exists to compare hypersaline waters.

Relevant sediment quality criteria for comparison include ANZECC sediment quality guidelines.

2.3.5 Proposed applicant controls

Dewatering discharge outlet will be located in the playa, avoiding the lake edges and creek

lines to minimise impacts on riparian vegetation, shallow and fringing habitats and potential drought refuge areas for biota.

The dewatering discharge outlet will be designed with energy diffusion devices (i.e. perforated pipe work) to minimise scouring of the lake bed. The discharge outlet will also be positioned on a rubber conveyor belt to further reduce the effects from scouring.

The dewatering discharge outlet is located so as to direct flows to deeper parts of the basin and prevent backflow of saline water into creeks and tributaries.

2.3.6 Applicant proposed monitoring program

The Licence Holder proposes the following monitoring program:

- Monthly visual monitoring of sediment at the discharge point;
- Quarterly sediment sampling at each established baseline location for laboratory analysis of major components;
- Daily visual inspections of the dewatering pipelines include vegetation health near the dewatering pipeline;
- Record the monthly volumes of water dewatered from each pit;
- Continuous monitoring of the volumes of dewatering effluent discharged to Lake Annean on a monthly basis;
- Quarterly comprehensive analysis of the dewatering discharge to Lake Annean; and
- Biannual visual inspections and photographs to monitor vegetation health at baseline locations.

The Licence Holder's controls have been conditioned in accordance with the *Guideline: Risk Assessments* (DWER, 2017).

2.3.7 Consequence of Risk Event

The impact to Lake Annean from the discharge of saline dewatering effluent has been determined by the Delegated Officer to be low level for on-site impacts, and minimal for off-site impacts. Therefore, the Delegated Officer considers the consequence of direct discharge of dewater into Lake Annean to be **Minor**.

2.3.8 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of Lake Annean being impacted (including secondary impacts on bird species) by the discharge of mine dewater is that it could occur at some time. Therefore, the Delegated Officer considers the likelihood of direct discharge of mine dewater impacting surface water quality and riparian vegetation within Lake Annean to be **Possible**.

2.3.9 Overall rating of the risk of discharge of mine dewater impacting on Lake Annean

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix and determined that the overall rating for the risk of discharge from operations is **Medium**.

3. Consultation

Table 6 provides a summary of the consultation undertaken by the department.

Table 6: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website (24/05/2022)	None received	N/A
Licence Holder was provided with draft amendment on 15/08/2022	Applicant waived the comment period	Documents prepared for final signing

4. Conclusion

Based on the assessment in this Amendment Report, the Delegated Officer has determined that a Revised Licence will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

4.1 Summary of amendments

Table 7: Summary of licence amendment

provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the Revised Licence as part of the amendment process.

Table 7: Summary of licence amendment

Condition no.	Proposed amendments
1.1.1	Condition amended to include the name of the containment infrastructure for the treatment of wastewater.
1.1.3	Condition for freeboard requirements amended to include the Bluebird Sewage Infrastructure Ponds
1.1.5	Condition amended to include discharge to Lake Annean as an approved dewatering discharge location.
1.1.6	Condition amended to include the requirements for the management of putrescible wastes.
1.1.7	Condition amended to include cover material requirements for putrescible wastes.
1.1.9	Condition amended to include capacity limits for new categories 54 and 64.
1.1.10	Condition amended to include construction requirements for the new landfill, landfill extensions, bluebird sewage ponds and pit dewatering infrastructure.
2.3.1	Condition amended to include the Baileys Discharge Point as an emission point to surface water. Also, Lake Annean Discharge Point 2 name updated to Boomerang discharge point.
2.3.2	Condition amended to include the Total Recoverable Hydrocarbons limit for discharge at the new Baileys Discharge Point. Also, Lake Annean Discharge Point 2 name updated to Boomerang discharge point.

3.2.1	Condition amended to include the requirement for the monitoring of volumes of dewatering water discharge to Lake Annean at the Baileys Discharge Point. Also, Lake Annean Discharge Point 2 name updated to Boomerang discharge point.
3.5.1	Condition amended to include the requirement for the monitoring of dewatering effluent discharged at the new Baileys Discharge Point. Also, Lake Annean Discharge Point 2 name updated to Boomerang discharge point.
3.5.2	Condition amended to include lake sediment monitoring at the location's potential impacted from dewatering discharge at the Baileys Discharge Point.
3.5.3	New condition for the monitoring of riparian vegetation at the Baileys Discharge Point as proposed by the Applicant.
4.2.1	Condition amended requiring information obtained from ambient soil monitoring and surveying riparian vegetation quality is presented in the Annual Environmental Report.
-	Definition of facultative pond included into Definitions table.
Schedule 1: Maps	Premises map updated with new map.
	Figure 4 updated to new map which identifies all three discharge locations to Lake Annean. Original map deleted.
	Figure 7 – Lake Annean Discharge Point and Lake Annean Discharge point 2 maps deleted. These discharge points are now shown in new Figure 4.
	Figure 8A – New map for the Baileys sediment monitoring locations
	Figure 8B – New map for the Baileys riparian vegetation monitoring locations
	Figure 12 updated to include the Paddy's Flat Landfill extension.
	Figure 15 a new updated map to show the new landfill location and landfill extension at the Yaloginda landfill area. The two previous Yaloginda landfill maps have been deleted.
	Figure 19 updated to show the extended Bluebird Sewage Facility

References

1. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
2. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
3. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
4. DWER 2013, Water quality protection note 27, *Liners for containing pollutants using engineered soils*, Perth, Western Australia.
5. DWER 2009, Water quality protection note 39, *Ponds for stabilising organic matter*, Perth, Western Australia.
6. Rockwater (2022). Hydrogeology & Dewatering Assessment of North & South Pits, Baileys Island. Report for Westgold Resources. February 2022.
7. Supporting document (2022). Westgold Resources Limited, Big Bell Gold Operations Pty Ltd, Supporting Document Amendment to Licence L4496/1988/11, March 2022
8. ANZECC. Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Paper No.4, Volume 3) Primary Industries – Rationale and Background Information.
9. DoE, 2015b. Department of the Environment. (2015b) *Directory of Important Wetlands in Australia – Information Sheet*.
10. Barnes et al., 1992. Barnes, C.J., Jacobson, G. and Smith, G.D., 1992. The origin of high-nitrate ground waters in the Australian arid zone. *Journal of Hydrology*, 137, 181-197.
11. ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality – Sediment quality guideline values, 2018.
12. Wurtsbaugh et al., 2011. *Science of The Total Environment*, Volume 409, Issue 20, Pages 4425-4434, *Biostrome communities and mercury and selenium bioaccumulation in the Great Salt Lake (Utah, USA)*, 15 September 2011

Appendix 1: Summary of Licence Holder's comments on risk assessment and draft conditions

Condition	Summary of Licence Holder's comment	Department's response
N/A	No comments provided for risk assessment or draft conditions	N/A

Appendix 2: Application validation summary

SECTION 1: APPLICATION SUMMARY				
Application type				
Works approval	<input type="checkbox"/>			
Licence	<input type="checkbox"/>	Relevant works approval number:		None <input type="checkbox"/>
		Has the works approval been complied with?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Has time limited operations under the works approval demonstrated acceptable operations?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	
		Environmental Compliance Report / Critical Containment Infrastructure Report submitted?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Date Report received:		
Renewal	<input type="checkbox"/>	Current licence number:		
Amendment to works approval	<input type="checkbox"/>	Current works approval number:		
Amendment to licence	<input checked="" type="checkbox"/>	Current licence number:	L4496/1988/11	
		Relevant works approval number:	N/A	<input checked="" type="checkbox"/>
Registration	<input type="checkbox"/>	Current works approval number:	None	<input type="checkbox"/>
Date application received	10 March 2022			
Applicant and Premises details				
Applicant name/s (full legal name/s)	Big Bell Gold Operations Pty Ltd			
Premises name	Bluebird Gold Mine			

Premises location	Legal description - G51/9, L20/75, L51/18, L51/51, L51/78, M20/12, M20/45, M20/68, M20/70, M20/71, M20/73, M20/77, M20/107, M20/214, M20/219, M20/249, M20/421, M51/6, M51/12, M51/31, M51/33, M51/35, M51/39, M51/62, M51/75, M51/92, M51/96, M51/132, M51/190, M51/199, M51/200, M51/203, M51/209, M51/211, M51/233, M51/236, M51/237, M51/254, M51/320, M51/321, M51/374, M51/393, M51/437, M51/438, M51/439, M51/440, M51/459, M51/462, M51/463, M51/483, M51/485, M51/486, M51/492, M51/493, M51/494, M51/504, M51/523, M51/539, M51/564, M51/569, M51/572, M51/575, M51/581, M51/491, M51/495, M51/666, M51/668, M51/669, M51/670, M51/671, MW51/672, M51/757, M51/788, M51/784, M51/793, M51/794, M51/795, M51/800, M51/801, M51/819, M51/820, M51/824, M51/834, M51/53 and M51/524
Local Government Authority	Shire of Meekatharra
Application documents	
HPCM file reference number:	2010/003418-1
Key application documents (additional to application form):	Westgold Resources Limited, Big Bell Gold Operations Pty Ltd, <i>Supporting Document Amendment to Licence L4496/1988/11</i> , March 2022
Scope of application/assessment	
Summary of proposed activities or changes to existing operations.	<p>Construction and operation of:</p> <ul style="list-style-type: none"> • New dewatering discharge location into Lake Annean • Two new wastewater treatment ponds with a combined capacity of 150 m³/day • New inert/putrescible landfill on the South Junction/Ascot Waste Rock Dump • Expansion of the existing inert landfills at the Surprise WRD and Paddy's Flat.

Category number/s (activities that cause the premises to become prescribed premises)

Table 1: Prescribed premises categories

Prescribed premises category and description	Assessed production or design capacity	Proposed changes to the production or design capacity (amendments only)
Category 6: Mine dewatering	5,953,000 tonnes per annual period	No change
Category 63: Class I inert landfill	3,000 tonnes per annual period	No Change
Category 85: Sewage facility Note: Update to category 54: Sewage facility	99 m ³ per day	Increased to 150 m ³ per day under a new category 54
Category 89: Putrescible landfill site	1,000 tonnes per annual period	Not applicable – new category

Legislative context and other approvals

Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Referral decision No: Managed under Part V <input type="checkbox"/> Assessed under Part IV <input type="checkbox"/>
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Ministerial statement No: EPA Report No:
Has the proposal been referred and/or assessed under the EPBC Act?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Reference No:

Has the applicant demonstrated occupancy (proof of occupier status)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Certificate of title <input type="checkbox"/> General lease <input type="checkbox"/> Expiry: Mining lease / tenement <input type="checkbox"/> Expiry: Other evidence <input type="checkbox"/> Expiry:
Has the applicant obtained all relevant planning approvals?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	Approval: Expiry date: If N/A explain why? Not required for the proposed mining operations
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	CPS No: 9070/2 Note: Clearing for new wastewater ponds exempt under Regulation 5, item 20.
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Application reference No: N/A Licence/permit No: N/A
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Application reference No: N/A Licence/permit No: GWL205844 (1)

<p>Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?</p>	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	<p>Name: Lake Annean Type: Listed in the Directory of Important Wetlands in Australia (Ref no WA056). Has Regulatory Services (Water) been consulted? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Regional office: Mid-West Gascoyne</p>
<p>Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	<p>Name: N/A Priority: P1 / P2 / P3 / N/A Are the proposed activities/ landuse compatible with the PDWSA (refer to WQPN 25)? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/></p>
<p>Is the Premises subject to any other Acts or subsidiary regulations (e.g. <i>Dangerous Goods Safety Act 2004</i>, <i>Environmental Protection (Controlled Waste) Regulations 2004</i>, <i>State Agreement Act xxxx</i>)</p>	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	<p><i>Mining Act 1978</i> <i>Rights in Water and Irrigation Act 1914</i> <i>Dangerous Goods Safety Act 2004</i></p>
<p>Is the Premises within an Environmental Protection Policy (EPP) Area?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	
<p>Is the Premises subject to any EPP requirements?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	
<p>Is the Premises a known or suspected contaminated site under the <i>Contaminated Sites Act 2003</i>?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	<p>Classification: N/A Date of classification: N/A</p>