Government of Western Australia
Department of Environment Regulation

Decision Document

Environmental Protection Act 1986, Part V

Proponent: Big Bell Gold Operations Pty Ltd
Licence: L4496/1988/11

Registered office:	Level 3, 18-32 Parliament Place WEST PERTH WA 6005
ACN:	090 642 809
Premises address:	Bluebird Gold Mine M20/12, M20/45, M20/68, M20/70 - M20/73, M20/77, M20/107, M20/214, M20/249, M20/421, M51/35, M51/132, M51/190, M51/209, M51/211, M51/236-M51/237 M51/254, M51/393, M51/438 - M51/440, M51/455, M51/459, M51/462 – M51/463, M51/483 M51/491 - M51/495, M51/523, M51/572, M51/666, M51/757, M51/762, M51/781, M51/784, M51/788, M51/824, M51/834 and E51/1484. MEEKATHARRA WA 6642
Issue date:	Thursday, 26 September 2013
Commencement date:	Tuesday, 01 October 2013
Expiry date:	Saturday, 30 September 2023

Decision

Based on the assessment detailed in this document the Department of Environment Regulation (DER), has decided to issue an amended licence. DER considers that in reaching this decision, it has taken into account all relevant considerations.

Decision Document prepared by:	Paul Anderson Licensing Officer
Decision Document authorised by:	Alana Kidd Manager Licensing, Resource Industries

Contents

1 Purpose of this Document

This decision document explains how DER has assessed and determined the application and provides a record of DER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DER's assessment and decision making under Part V of the *Environmental Protection Act 1986.* Other approvals may be required for the proposal, and it is the proponent's responsibility to ensure they have all relevant approvals for their Premises.

2 Administrative summary

<table>
<tr><th colspan="4">Administrative details</th></tr>
<tr><td>Application type</td><td colspan="3">Works Approval ☐
New Licence ☐
Licence amendment ☒
Works Approval amendment ☐</td></tr>
<tr><td rowspan="5">Activities that cause the premises to become prescribed premises</td><td colspan="2">Category number(s)</td><td>Assessed design capacity</td></tr>
<tr><td colspan="2">5</td><td>2,500,000 tonnes per annual period</td></tr>
<tr><td colspan="2">6</td><td>2,700,000 tonnes per annual period</td></tr>
<tr><td colspan="2">63</td><td>500 tonnes per year</td></tr>
<tr><td colspan="2">85</td><td>99 cubic metres per day</td></tr>
<tr><td>Application verified
Application fee paid</td><td colspan="3">Date: 17/2/2016
Date: NA</td></tr>
<tr><td>Works Approval has been complied with
Compliance Certificate received</td><td colspan="3">Yes☐ No☐ N/A☒
Yes☐ No☐ N/A☒</td></tr>
<tr><td>Commercial-in-confidence claim</td><td colspan="3">Yes☐ No☒</td></tr>
<tr><td>Commercial-in-confidence claim outcome</td><td colspan="3">NA</td></tr>
<tr><td>Is the proposal a Major Resource Project?</td><td colspan="3">Yes☒ No☐</td></tr>
<tr><td>Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the Environmental Protection Act 1986?</td><td>Yes☐ No☒</td><td colspan="2">Referral decision No:
Managed under Part V ☐
Assessed under Part IV ☐</td></tr>
</table>

Is the proposal subject to Ministerial Conditions?	Yes☐ No☒	Ministerial statement No: EPA Report No:
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the *Environmental Protection Act 1986*)?	Yes☐ No☒ Department of Water consulted Yes ☐ No ☒	
Is the Premises within an Environmental Protection Policy (EPP) Area Yes☐ No☒		
Is the Premises subject to any EPP requirements? Yes☐ No☒		

3 Executive summary of proposal and assessment

Environmental Protection Act 1986 Licence L4496/1988/11 for the Bluebird Gold Mine (Bluebird) was amended on the 21 January 2016. The purpose of the amendment was to include the dewatering operations at the Reedy area constructed under Works Approval W5845/2015/1, contiguous tenements, the addition of a Class I landfill in the Paddy's Project area, and permission to burn untreated green waste for the purposes of emergency response fire training. The Licence was also converted into the latest licence format v2.9.

Big Bell Gold Operations Pty Ltd (BBGO) applied on the 17 February 2016 to have their Licence amended to include the use of the mined Bluebird East Pit for the storage of tailings.

BBGO currently discharges tailings into the Bassetts West Pit Tailings Storage Facility (BWTSF) however this facility is nearing capacity and an alternative tailings storage facility is required. The Bluebird East Pit Tailings Storage Facility (BBEPTSF) is located 500 metres east of the BWTSF and minimal works would be required to commence tailings discharge into the BBEPTSF. These works would include the installation of tailings discharge and return water pipelines, earth works associated with pipeline corridors and groundwater monitoring bores.

The risk to the environment by discharging tailings into the BBEPTSF is considered low. This determination is based upon:

- Historical groundwater monitoring records for the adjacent BWTSF shows there has been no detrimental impacts to groundwater from the discharge of tailings;
- The BBEPTSF is situated in rocks of very low permeability and the geology is geochemically benign;
- Deposition of low permeability tailings and ongoing consolidation will progressively seal the base of the pit, reducing seepage potential to the rock mass; and
- The majority of the tailings material has elevated carbonate content with a highly alkaline pH and is therefore classified as Non Acid Forming (NAF). This alkalinity, together with the low content of available oxyanion metals and metalloids (mobile enriched metals and the risk of elevated metals content within the tailings solution is low), results in a low potential for metal drainage to occur.

The main emission from the premises which is being assessed in this proposal is the discharge of tailings material into a previously mined pit. Potential impacts on the environment include contamination of the groundwater, soil contamination and harm to vegetation due to pipeline failure and overtopping. An assessment of the potential impacts from the discharge of tailings into an open mined pit, and how those potential impacts will be managed, is covered in more detail in Appendix A of this document. All pipelines, pipeline corridors and groundwater monitoring bores associated with this proposal have also been assessed as part of this Licence amendment.

4 Decision table

All applications are assessed in line with the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987* and DER's Operational Procedure on Assessing Emissions and Discharges from Prescribed Premises. Where other references have been used in making the decision they are detailed in the decision document.

DECISION TABLE			
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
General conditions	L1.2.1 and L1.2.2	Previous condition 1.2.2 has been removed from the Licence as it is unclear what stormwater infrastructure is required to be constructed and maintained, or what if any specific management actions are required. The potential discharge of contaminated stormwater to the environment is considered adequately regulated by the *Environmental Protection Act 1986.*	General provisions of the *Environmental Protection Act 1986.* *Environmental Protection (Unauthorised Discharges) Regulations 2004*
Premises operation	L1.3.1 to L1.3.13	Details of DER's assessment and decision making are included in Appendix A. L1.3.1 has been updated to include the Bluebird East Pit TSF as containment infrastructure for the storage of tailings material. A map showing the location of the Bluebird East Pit TSF has been included in Schedule 1. L1.3.2 requires all pipelines are either fitted with automatic cut-outs in event of failure, provided with secondary containment or provided with telemetry systems and pressures systems to allow the detection of leaks and failures. All tailings discharge and return water pipelines for the BBEPTSF will be located within a bunded corridor along its entire length to mitigate against uncontrolled tailings release to the environment in the event of a pipeline failure. Previous condition 1.3.3 has been removed from the Licence because all licensed	Application supporting documentation Landfill Waste Classification and Waste Definitions 1996 (as amended)

DECISION TABLE			
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		containment infrastructure for the storage of tailings are below ground level in-pit type facilities and therefore a perimeter drain cannot be installed. L1.3.3 has been updated to include the freeboard requirements for the BBEPTSF. L1.3.3 requires a minimum freeboard of 500mm or equivalent to contain a 1 in 100 year rainfall event over 72 hours (whichever is greater). Coffey (2016) determined the freeboard requirements in accordance with the document 'Guidelines on the Safe Design and Operating Standards for Tailings Storage' as issued by the Department of Mines and Petroleum in May 1999. Tailings deposition will take place such that a minimum operational freeboard of 300mm is maintained, as well as a total freeboard of 0.9m (allowing for 1:100 yr AEP 72 hour event). L1.3.4 requires daily inspections of the pipelines to ensure tailings and return water is only discharged into the designated outflow points and not accidentally discharged elsewhere due to pipeline failure. BBGO will conduct daily inspections of the tailings discharge and return water pipelines for the detection of leaks. L1.3.4 also requires daily inspections of the embankment freeboard for all containment infrastructure. BBGO has committed to conducting daily inspections of the BBEPTSF to ensure the required freeboard is maintained. Previous conditions 1.3.10 and 1.3.11 have been removed from the Licence because the activities in these conditions are not related to those permitted in the categories of the Licence. L1.3.11 has been included as a new condition to ensure BBGO installs all infrastructure and groundwater monitoring bores at the BBEPTSF in accordance with the Licence amendment application and supporting documentation.	
Monitoring	L3.1.1 to L3.1.4	Condition 3.1.2 has been amended by removing (c) and (d) because there is no reference to six monthly or annual monitoring in any other condition of the Licence.	*Environmental Protection Act 1986* Licence

DECISION TABLE			
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
			L4496/1988/11
Ambient quality monitoring	L3.4.1	L3.4.1 has been updated to include the groundwater monitoring bores at the BBEPTSF so they are part of the ambient groundwater monitoring requirements. Parameter limits applied to the adjacent BWTSF have also been applied to the BBEPTSF groundwater monitoring bores because the same tailings material is being discharged into the pits, and the receiving environment at the pit is the same. Prior to the deposition of tailings into the BBEPTSF, BBGO has committed in their submitted documentation (Section 1.1.4) to collect and have analysed groundwater samples from groundwater monitoring bores BEMB1 to BEMB4. This commitment has been included as a requirement of the Licence in L3.4.1. A map showing the location of the BBEPTSF groundwater monitoring bores has been included in the Licence under Schedule 1. Groundwater monitoring bore BBEWB10 has been removed from the Licence. This groundwater bore was incorrectly associated with groundwater monitoring however it is used as a production bore.	Application supporting documentation
Notification	L4.3.1	L4.3.1 has been updated by including notification requirements following the construction of the BBEPTSF.	N/A
Licence Duration	NA	The Licence duration has been updated in line with DER's Guidance Statement *Licence Duration* to the 30 September 2023.	N/A

5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
28/04/2016	Proponent sent a copy of draft instrument	No comments received. Waiver form received 5/5/2016	NA.
12/05/2016	Licence amended	N/A	N/A

6 Risk Assessment

Note: This matrix is taken from the DER Corporate Policy Statement No. 07 - Operational Risk Management

Table 2: Emissions Risk Matrix

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Severe
Almost Certain	Moderate	High	High	Extreme	Extreme
Likely	Moderate	Moderate	High	High	Extreme
Possible	Low	Moderate	Moderate	High	Extreme
Unlikely	Low	Moderate	Moderate	Moderate	High
Rare	Low	Low	Moderate	Moderate	High

Appendix A

Dewatering - Point source emissions to groundwater including monitoring

The potential impacts of concern when discharging tailings into a disused mined pit void are; contamination of the groundwater due to seepage, soil contamination and harm to vegetation due to pipeline failure, or overtopping of the receiving pit. DER has reviewed the proponent's impact assessment for tailings discharge from the premises and is satisfied that the assessment provided by the proponent has been undertaken in an appropriate manner.

Background

Coffey Mining Pty Ltd (Coffey) was employed by BBGO to conduct a geotechnical assessment of the mined Bluebird East Pit (BBE) to determine its suitability as a tailings storage facility (TSF), and the management controls required during its operation.

BBGO currently deposit tailings into the BWTSF which is a historical mined pit and is located directly adjacent to the BBEPTSF.

Operations

The design concept for the tailings storage is similar to other in-pit facilities, in that it incorporates a tailings slurry discharge single spigot point over the pit rim, surface return water recovery system at the other end of the pit, and perimeter monitoring bores located adjacent to the pit rim.

The BBEPTSF will have a storage volume of approximately 9.4 million cubic metres (m^3). Coffey (2016) have estimated a total of 12.2 million tonnes of tailings will be stored in the proposed BBEPTSF, based on a tailings dry density of approximately 1.3 tonnes per m^3.

Tailings deposition into the BBEPTSF will be into the southern end of the pit. Supernatant water liberated from the tailings slurry will be recovered by a centrifugal pump located at the northern end of the pit. The tailings deposition plan has been designed to position the pond of supernatant water adjacent to the access ramp to the pit, from where the decant pump will be deployed. As the tailings surface rises within the pit, the pond of supernatant water will rise up the access ramp and the decant pump will be withdrawn up the ramp. Water recovered by the decant pump will be pumped back to the process water dam for re-use in the process plant.

There is no new area of disturbance associated with the proposal to construct the BBEPTSF. No land clearing or disturbance is required. The disturbance associated with providing the bunded pipeline corridor for the tailings pipeline from the plant to the pit occurs within the existing mine area.

No underdrainage system is proposed for the BBETSF, as there is a significant quantity of groundwater in the pit and BBGO has advised it is not feasible to remove this water prior to commissioning. This will impact on consolidated tailings densities. However, the tailings in-situ density is expected to be acceptable as the tailings have relatively good settling characteristics (Coffey, 2015) and supernatant water will be continuously removed from the TSF during operations.

As part of BBEPTSF construction, Coffey (2016) has recommended a minimum of four additional monitoring bores be installed around the pit. The bores should be constructed to the depth of the first water yielding zone at or below the base of the pits and need to have sufficient diameter for entry of a sampling pump.

Environmental setting

The primary land use remains pastoral (cattle and sheep) with gold mining and other mineral developments. The nearest sensitive premise is the town of Meekatharra and is located 12 km away in a northerly direction.

The Bluebird mine is located in the upper reaches of the Murchison catchment, east of a regional divide where low gradient drainages follow palaeodrainage lines marked by occasional playa lakes.

The principal drainage is the Hope River palaeodrainage system (a tributary of the Murchison system) that flows to the north-west from Lake Annean, south of Bluebird Mine. The catchment contains a series of salt lakes which may link together and flow in periods of exceptional rainfall. In the Bluebird area surface waters typically flow south over low broad slopes with grooved vegetated drainage lines linking it to tributaries of the North Creek system. These drainage lines ultimately flow into Lake Annean. Extensive historic mining developments have resulted in significant alteration to surface drainage on most leases in this region.

Water levels and salinity were monitored in the pit bores when they were accessible and until they were mined out or became dry. The salinity values show gradual increases during the period of pumping from the bores and pit, reaching between 2,000 and 5,000 mg/L TDS from 2001 and 2004.

BBE pit surface water was sampled in 1995, 2000 and 2015. The sampling results were compared to Australian and New Zealand Environment and Conservation Council (ANZECC) stock-water guidelines and Department of Health (DOH) domestic-non-potable groundwater use. No pit water results exceed the ANZECC 2000 livestock guideline values. Pit water exceeds the non-potable water guideline value for chloride. The pit water salinity increased from 1,450 mg/L TDS in 1995; to 3,200 to 4,000 in 2011, and 3,300 mg/L TDS in 2012. The increase in TDS from 1995 is a result of evaporation exceeding rainfall and groundwater influence. Sampling at various depths to 30 m in 2011 and 2012 showed there is little or no salinity stratification in the pit lake.

Regional groundwater flow direction is towards south-southwest of the BBE pit, whilst local groundwater flow direction is generally towards the pit itself as the mine ‘void’ acts as a groundwater sink. Natural groundwater table was reportedly to be approximately 15m below surface at 455m RL, whilst post-mining water level in the open pit was expected to be around 405m RL, i.e. 65m below surface (BFP,1995). The groundwater was generally fresh to brackish (900 to 1,400 mg/L TDS) with some more-saline water (3,000 to 3,900 mg/L TDS) at the northern end of the BBE pit. The low salinity indicates generally favourable conditions for groundwater recharge from rainfall infiltration.

Groundwater levels in the pit have been relatively stable, with little seasonal variation since dewatering ceased. This indicates that interconnectivity between the groundwater and percolating surface water is limited.

Experiences from existing Basset West Tailings Storage Facility (BWTSF)

The BWTSF is currently used for tailings disposal at Bluebird and is located about 500 m east of the BBEPTS. The BWTSF is a previously mined pit and was commissioned as a TSF in November 1999 and operated until May 2004 when it was put under care and maintenance. Tailings deposition resumed between August 2007 and October 2008 when the plant was again put under care and maintenance. The previous occupier re-commissioned the facility in January 2013 and tailings deposition continued until January 2014. Tailings disposal into the BWTSF recommenced in February 2016.

Bassett’s West pit was mined from 1996 to 1999. The pit was dewatered by pumping from up to five bores, with peak extraction of 2,000 cubic metres per day in 1997/98. Most of the pumping was from two bores, one at each end of the pit, as the mineralised zone formed the main aquifer and much of

the groundwater flow was from along-strike. The pit was used from November 1999 as the sole tailings storage. Some pumping continued from the bores at the ends of the pit until 2010 to supply water for processing ore. Groundwater levels in the bores along-strike of the pit recovered to about pre-mining levels by 2004 and then remained constant or gradually declined. The levels in bores in the footwall remained low, showing that there was little seepage from the tailings into the low permeability rocks of the footwall and hanging-wall. Cyanide levels remained low, even in the along-strike bores: less than 0.1 mg/L and generally less than 0.02 mg/L, indicating low rates of seepage from the tailings storage even though the mineralised horizon had moderately high permeability. By analogy, seepage rates from the BBEPTS should also be low. Groundwater quality around the BWTSF has generally remained stable or improved.

Risk assessment

Emission Description
Emission: Discharge of mine tailings into a mined pit.
Impact: Contamination of groundwater from TSF seepage.
Controls: The Licensee has committed to:

- undertaking quarterly sampling and monitoring of four groundwater monitoring bores surrounding the BBEPTSF; and
- measuring the effect of seepage on the downstream groundwater quality using baseline values.

Deposition of low permeability tailings and ongoing consolidation will progressively seal the base of the pit, reducing seepage potential to the rock mass.

The BBE Pit is situated in rocks of very low permeability and the geology is geochemically benign (Coffey, 2016). As a result of deep weathering, limited aerial extent and the rapid deposition of extremely low permeability tailings into the base of the pit, Coffey anticipates seepage from the pit to the regional groundwater to be less than 2 m^3/day.

BBGO will install a water recovery pump to reduce the supernatant water in the BBEPTSF.

The majority of tailings material is classified as NAF (tailings materials contain elevated carbonate content) with a highly alkaline pH. This alkalinity, together with the low content of available oxyanion metals and metalloids (mobile enriched metals and the risk of elevated metals content within the tailings solution is low), results in a low potential for metal drainage to occur.

The adjacent BWTSF indicated low rates of seepage from the tailings storage and by analogy, seepage rates from the BBEPTS should also be low. Groundwater quality around the BWTSF has generally remained stable or improved.

Risk Assessment
Consequence: Moderate
Likelihood: Possible
Risk Rating: Moderate

Regulatory Controls
L3.4.1 requires quarterly spot monitoring of the 4 groundwater monitoring bores at the BBETSF for assessment of the ambient groundwater quality. Parameters to be analysed include standing water levels, heavy metals, total dissolved solids and WAD cyanide.

L4.2.1 requires annual reporting of L3.4.1 monitoring results with a comparison against ANZECC Livestock Drinking Water Guidelines and an assessment against previous monitoring results, so that any changes and trends in water quality can be detected. Early detection of groundwater

contamination (and the potential implementation of mitigating measures) will reduce the likelihood of impacts occurring off the Premises.

Residual Risk
Consequence: Moderate
Likelihood: Possible
Risk Rating: Moderate

Emission Description
Emission: Discharge of tailings or tailings decant return water to land as a result of a pipeline failure.
Impact: Soil contamination and vegetation harm with tailings solids and liquors containing cyanide.
Controls: All tailings and decant return water pipelines are located within bunded corridors designed to contain any spilt tailings and are inspected twice a day. Management of the tailings and decant return water pipelines in accordance with BBGO's tailings storage facility operations manual. Pipeline corridors are installed into previously mined areas reducing disturbance to vegetation (Application supporting documentation, Section 6.1).

Risk Assessment
Consequence: Minor.
Likelihood: Possible.
Risk Rating: Moderate

Regulatory Controls
L1.3.2 requires all pipelines are either fitted with automatic cut-outs in event of failure, provided with secondary containment or provided with telemetry systems and pressures systems to allow the detection of leaks and failures. BBGO has indicated that all tailings discharge and return water pipelines will be located within a bunded corridor along its entire length to mitigate against uncontrolled tailings release to the environment in the event of pipeline failure.

L1.3.5 requires daily inspections of the pipelines to ensure tailings and return water is only discharged via the designated outflow points and not accidentally discharged elsewhere due to pipeline failure. BBGO will conduct twice daily (once per 12 hour shift) inspections of the tailings discharge and return water pipelines for the detection of leaks. If a spill occurs within the bunded area, the routine inspections will limit the spill time to a maximum of 12 hours before action can be taken to stop the discharge. This will also reduce the likelihood of overtopping of the bunded area due to restricting the volume of material discharged so the bunding capacity is not exceeded.

Residual Risk
Consequence: Minor
Likelihood: Possible
Risk Rating: Moderate

Emission Description
Emission: Discharge of tailings to the environment as a result of overtopping.
Impact: Soil contamination and vegetation harm with tailings solids and liquors containing cyanide..
Controls: Tailings deposition will be managed in accordance with the tailings storage facility operations manual. The decant water pond will be managed to minimise the pond and keep water away from the pit walls and maintaining a total freeboard of 900mm. A 3 m earthen safety bund is also in place around the perimeter of the BBEPTSF preventing the ingress of stormwater which would reduce the freeboard capacity, and reducing the likelihood of discharge of tailings to the environment due to overtopping. Vegetation surrounding the BBEPTSF is heavily cleared as a result of mining activities

Risk Assessment
Consequence: Moderate.

Likelihood: Rare.
Risk Rating: Moderate

Regulatory Controls
L1.3.4 of the Licence requires a minimum freeboard of 500 mm or equivalent to contain a 1 in 100 year rainfall event over 72 hours (whichever is greater).

L1.3.5 of the Licence requires daily inspections of the embankment freeboard, recording of those inspections, and where those inspections identify that an appropriate level of environmental protection is not being maintained, the Licensee is to take corrective action.

Residual Risk
Consequence: Moderate
Likelihood: Rare
Risk Rating: Moderate