



Application for Licence Amendment

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

Licence Number	L6868/1989/12
Licence Holder	Billabong Gold Pty Ltd
ACN	613 900 922
File Number	DER2014/001259-1
Premises	Plutonic Gold Mine Mining Tenements: M52/171, M52/170, M52/148, M52/149, M52/150, M52/295, M52/296, M52/301 and M52/300 MEEKATHARRA WA 6642 As defined by the Premises map attached to the Revised Licence
Date of Report	4 September 2023
Decision	Revised licence granted

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

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1. Decision summary

Licence L6868/1989/12 is held by Billabong Gold Pty Ltd (Licence Holder) for the Plutonic Gold Mine (the Premises), located approximately 180 km north-east of Meekatharra.

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 operation of the Premises. As a result of this assessment, Revised Licence L6868/1989/12 has been granted.

2. Scope of assessment

2.1 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>.

2.2 Amendment summary and overview of Premises

The Premises has been in production since 1990. Historically, mining operations have been predominantly surface mining, with numerous mining areas developed across the project tenements. Underground mining was first established in 1995 and ran parallel with surface operations until 2007, when operations shifted to solely underground. Since then, surface mining has been undertaken intermittently with the most recent surface mining campaign completed from 2020 to 2021.

Infrastructure at the Premises comprises open cut pits and associated waste rock dumps, underground mine, processing plant, run-of-mine (ROM) pad, Tailings Storage Facility (TSF) and other ancillary infrastructure to support operations.

Ore treatment processes at the Premises originally consisted of two crushing circuits and two separate process plants. Process Plant 1 was used to treat primary ore, but has not been in operation since the previous cessation of surface mining in 2007. Process Plant 2 remains operational and is used for treating oxide ore via the Carbon-in-Leach (CIL) processing method.

Historically tailings have been discharged to inactive open pits (in-pits TSFs), the above-ground TSF and to underground stopes as paste fill treatment for backfill. Tailings are no longer deposited into in-pit TSFs. Tailings are deposited into the above-ground TSF, which comprises three cells: TSF 1 (closed and rehabilitated), TSF 2 (active and currently receiving tailings material) and TSF 3 (open but at capacity).

The remaining life of mine (LoM) for the Premises is currently estimated at 7-10 years. LoM planning has identified a shortfall in current available tailings storage capacity by March 2024.

On 15 June 2023, the Licence Holder submitted an application (Billabong 2023a) to the department to amend Licence L6838/1989/12 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The following amendments are being sought:

- TSF 2 and TSF 3 embankment raises (upstream construction method) in 2.5 m increments each (stages 9 and 10), raising the total height from 32 m (RL 532 m) to 37 m (RL 537 m).

This amendment is limited only to changes to category 5 activities from the existing Licence. There will be no changes to the existing approved design capacity of category 5, 6, 52, 54, 57 and 89 activities under this licence amendment.

To note: the Licence Holder holds W6323/2019/1 to construct TSF 4 and TSF 5 to the east of

TSF 2 and TSF 3. The Licence Holder has stated that construction of TSF 4 and TSF 5 has not yet commenced and in the immediate short term the development of these is not a feasible option, due to costs and lengthy construction timeframes.

2.2.1 TSF 2 and TSF 3 raises (stages 9 and 10)

TSF 2 and TSF 3 are paddock-type facilities that have been constructed and raised using upstream methods. Both TSFs occupy an approximate total footprint area of 75 ha, with decant water recycled/pumped back to the processing plant via a central decant structure located in each cell.

The Licence Holder is proposing to raise TSF 2 and TSF 3 embankments by a total of 5 m. The embankment crest of TSF 2 and TSF 3 is currently at RL 532.0 m (stage 8). The embankment raises will involve 2x 2.5 m upstream lifts for each TSF (stages 9 and 10 respectively), with the final embankment crest height for TSF 2 and TSF 3 being RL 537.0 m (stage 10) or 37 m.

Storage capacity of each stage of the raised TSF 2 and TSF 3 are shown in Table 1. The storage volume, capacity and life were estimated based on an adopted tailings throughput of 1.56 million tonnes (Mt) per annum, an adopted tailings dry density of 1.40 tonnes per cubic metre (t/m³) and an average beach slope of 1V:100H.

Total storage volume of both TSFs will be approximately 3.21 Mm³ when the embankment is raised to the proposed final stage 10 crest RL 537.0 m. This is equivalent to a total storage capacity of 4.5 Mt and storage life of 35.1 months (or 2.88 years).

Table 1: TSF 2 and TSF 3 staging and storage capacity

Stage	Crest (mRL)	Storage Area (m ²)	Embankment Raise Height (m)	Storage Volume (m ³)	Combined Storage Volume		Storage Life (months)*
					(Mm ³)	(Mt)	
TSF 2							
Stage 9	534.5	362,300	2.5	901,000	0.90	1.3	9.7
Stage 10	534.5	296,900	2.5	869,000	1.77	2.5	9.4
TSF 3							
Stage 9	537.0	353,800	2.5	748,000	2.52	3.5	8.1
Stage 10	537.0	282,000	2.5	699,000	3.21	4.5	7.5

*based on throughput of 1.56 Mt per annum (Billabong 2023b).

Tailings will be delivered to TSF 2 and TSF 3 via a contained (bundled) tailings deposition pipeline. The tailings deposition pipeline will be located around the full perimeter embankment of each facility, with regularly spaced valved (or similar) spigot off-takes at approximately 20 m apart.

2.3 Department of Mines, Industry Regulation and Safety (DMIRS)

The Licence Holder has stated that an activity-specific Mining Proposal and associated Mine Closure Plan for the TSF embankment raises will be submitted to DMIRS to satisfy the requirements of section 82A(2) of the *Mining Act 1978*.

The department referred the application to DMIRS to advise on the geotechnical aspects of

the stages 9 and 10 embankment raises.

DMIRS had no comments on the Licence amendment for L6868/1989/12, though the department notes that the Mining Proposal assessment is still ongoing. Approval will be required prior to works commencing.

2.4 Aboriginal Heritage Act 1972 and Traditional Owner engagement

Billabong 2023a states that “the proposed activities do not intersect any Registered or Other Heritage Sites.”

The Licence Holder has stated (*Billabong 2023a*) that they are “currently drafting a notification letter to Marputu Aboriginal Corporation RNTBC (Marputu) to advise of the proposed works, noting that these works do not involve any additional clearing or ground disturbance beyond existing disturbance at TSF2 TSF 3, and therefore do not pose a risk to Aboriginal cultural heritage and/or sites. The letter is intended to address stakeholder consultation obligations for the Mining Proposal and Mine Closure Plan for TSF2 and TSF3. *Billabong* will then hold meetings and discussions, as required, to address and TO queries and/or questions.”

3. 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.

3.1 Source-pathways and receptors

3.1.1 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
Construction			
Dust	Earthworks associated with embankment lifts Vehicle movements	Air/windborne pathway	<ul style="list-style-type: none"> Vehicle movement confined to defined haul roads and access roads. Visual inspections conducted to determine need for dust suppression. Materials emplacement and spreading activities restricted during high winds if dust cannot be adequately controlled. Dust generated from embankment construction activities suppressed using water carts on roads, dust suppression water sprays at material loading and

Emission	Sources	Potential pathways	Proposed controls
			hauling areas, and periodic application of approved dust-suppressing agents, if required.
Operation			
Spillage of tailings and decant return water	Leaks, pipeline ruptures or failure of the tailings delivery and return water pipelines	Discharges to land and infiltration to soil	<ul style="list-style-type: none"> • Tailings deposition pipeline and recovery water pipeline constructed of high density polyethylene (HDPE). • Tailings deposition pipeline bunded to contain any potential leaks or spills. • Tailings deposition pipeline located around the full perimeter embankment of each facility (refer to Figure 1), with regularly spaced valved (or similar) spigot off-takes approximately 20 m apart. • Tailings deposition pipeline and water recovery pipeline inspected as part of routine 12-hourly inspections. • Tailings deposition pipeline and recovery water pipeline fitted with leak detection system and flow meters.
Increased Seepage	Deposition of tailings into TSF 2 and 3	Seepage to soil/ground adjacent to the TSFs and infiltration to groundwater	<ul style="list-style-type: none"> • Tailings deposition carried out such that the supernatant pond is maintained around the central decant structure within each facility. • Supernatant pond kept as far a practical from the perimeter embankments at all time (i.e. at a minimum distance of 150 m from the perimeter embankments). • Return water (comprising supernatant water and surface runoff water) removed from within each facility via a dedicated pump installed in the decant tower. • Return water pumped back to the process water pond near the plant for reuse in the process. • Seepage captured from the base of the cells via an underdrainage system and reports to a seepage collection sump. <p><u>TSF Monitoring System</u> – refer to Figure 1:</p> <ul style="list-style-type: none"> • Fourteen vibrating wire piezometers (VWPs) are currently installed along the perimeter embankments of TSF 1, 2 and 3. These monitor the phreatic surface within the perimeter embankment and the tailings material

Emission	Sources	Potential pathways	Proposed controls
			<p>near the embankment.</p> <ul style="list-style-type: none"> • An additional 14 piezometers are to be installed from the current stage 8 embankment crest at RL 532.0 m and into the deposited tailings at an approximate depth of 25 m. • Six monitoring bores are installed around the TSFs which actively monitor for groundwater levels and quality under the existing licence L6868/1989/12. • Four groundwater recovery bores are proposed to lower groundwater levels at the TSFs. The bores are to be located in areas where depth to groundwater ranges from 0 to 2 mbgl.
Discharge of tailings material	Overtopping	Discharges to land and infiltration to soil	<ul style="list-style-type: none"> • Decant water recycled/pumped back to the processing plant via a central decant structure located in each cell. • Sub-aerial and cyclical deposition of tails slurry in discrete layers from multiple discharge points (spigots). • Discharge points systematically changed to ensure even development of the tailings beach and to maximise drying time between successive deposition at a particular location. • Each facility capable of containing water volumes from a 1-in-100-year Annual Exceedance Probability (AEP), 72-hour storm event (217 mm). • Provision for a minimum 500 mm total freeboard, comprising a minimum operational freeboard of 300 mm (vertical height between the tailings beach and embankment crest) and a minimum beach freeboard of 200 mm (vertical height between the 100-year AEP, 72-hour storm water level and top of tailings beach).
Dust lift-off	Tailings surface and embankment walls	Air/windborne pathway	<ul style="list-style-type: none"> • Visual inspections conducted to determine need for dust suppression.

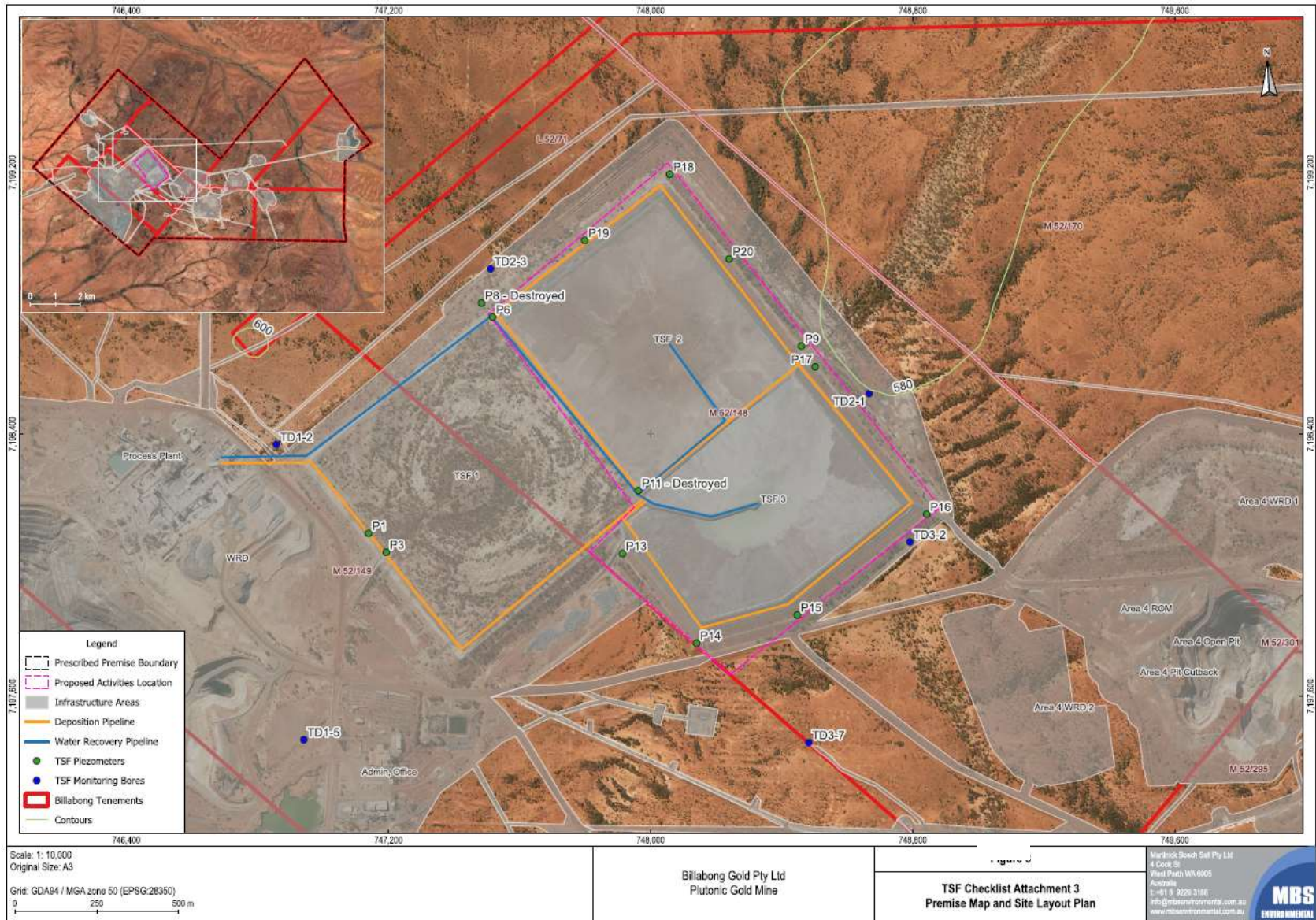


Figure 1: TSF pipelines and monitoring locations

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3.1.2 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.

A camp is located approximately 2 km from TSF 2, but as it is operated by the Licence Holder it is not considered a sensitive receptor.

Table 3 and Figure 2 below provides a summary of potential 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: Environmental receptors and distance from prescribed activity

Environmental receptors	Distance from prescribed activity
East Murchison Groundwater Area Gascoyne River and Tributaries Surface Water Area	Located within Proclaimed groundwater and surface water areas.
Aboriginal Sites and Heritage Places	Heritage Site 6745 – 1.4 km. Other Heritage Site 6747 – 365 m. These sites not within the TSF 2 and 3 areas.
Gascoyne River	4.5 km east of the premises boundary.
Watercourses	No significant named watercourses intersect the premises boundary. Unnamed drainage lines within premises boundary but not within TSF 2 and 3 areas. The Gascoyne River is the major surface water feature in the catchment and is located approximately 4.5 km from the TSFs.
Groundwater	Regional groundwater levels within the alluvial aquifer is approximately 5 m below ground level (mbgl), and ranges from approximately 10 – 30 mbgl for the fractured rock aquifer. Regional groundwater flow within the shallow alluvial aquifer has been observed to be in a northwesterly direction and discharges to the Gascoyne River. Groundwater flow within the fractured rock aquifer is dependent on the orientation of the fracturing and faulting. Groundwater level data collected from bores installed and screened within the fractured rock aquifer indicate a drainage gradient towards the south (i.e. groundwater flow from the north). Groundwater within the shallow alluvial aquifer is slightly brackish (total dissolved solids (TDS) is approximately 1,500 mg/L). Groundwater from the fractured rock aquifer shows a similar hydrochemistry to the alluvial / calcrete aquifer and is fresh to slightly

Environmental receptors	Distance from prescribed activity
	<p>brackish (TDS between 700 and 1,200 mg/L).</p> <p>Regional groundwater flow direction is in a southwesterly direction towards the Main Pit. Groundwater dewatering associated with the dewatering may have formed a groundwater sink around the main pit. However, groundwater mounding can occur in the area covered by the TSF 1, 2 and 3; groundwater flow directions can vary locally due to groundwater mounding.</p>
Threatened Ecological Community (TEC)	Priority 3 TEC within the premises boundary, but is located greater than 3 km from TSF 2 and 3.

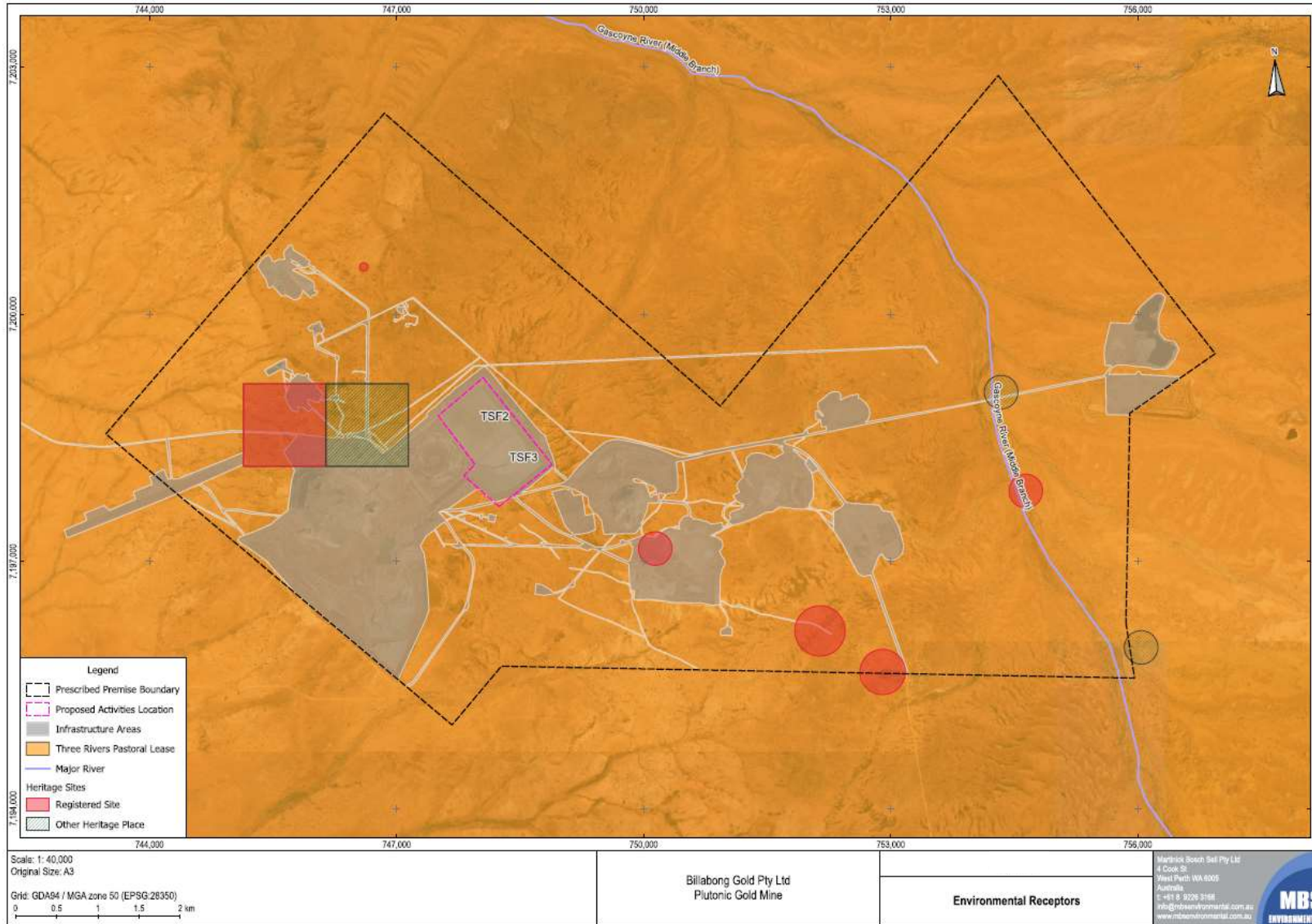


Figure 2: Distance to sensitive receptors

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IR-T15 Amendment report template v3.0 (May 2021)

3.1.3 Hydrogeology

Existing licence L6868/1989/12 requires standing water levels (SWLs) of TD1-2 and TD1-5 to be monitored on a quarterly basis, the SWLs in these bores are required to be deeper than 7 mbgl.

The licence does not limit SWL for the remaining monitoring bores (TD2-3, TD3-1, TD3-2 and TD3-7). The SWL for the active TSF monitoring bores are shown in Table 4.

Table 4: 2019 – 2022 SWL (mbgl) results for active TSF monitoring bores (Billabong 2023a)

Bore ID	2019				2020				2021				2022			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
TD1-2	13.66	13.58	13.55	13.53	13.3	12.87	12.95	12.75	12.72	12.7	12.7	12.81	NR	12.05	12.8	11.94
TD1-5	18.75	19.17	19.23	18.82	18.3	18.33	18.3	Dry	18.32	18.34	18.38	18.44	NR	18.26	18.25	18.33
TD2-3	4.86	4.64	4.69	4.48	4.13	4.11	4	3.95	3.98	3.95	3.96	3.87	NR	3.65	NR	3.59
TD3-1	3.01	2.77	2.86	2.65	2.69	2.52	2.7	Dry	2.5	2.19	2.35	2.45	NR	2.26	NR	1.79
TD3-2	2.88	2.2	2.26	4.05	Flooded	1.45	2.67	3.01	3.1	3.06	3.27	2.54	NR	Flooded	NR	2.52
TD3-7	5.77	5.72	5.69	5.42	4.86	4.83	5.1	5.15	4.88	4.82	4.84	4.82	NR	4.67	4.45	4.46

*NR - denotes no record for the quarter is available due to faulty monitoring equipment.

Billabong 2023a states that “currently groundwater level stands at 10.94 and 17.56 mbgl at TD1-2 and 1-5 respectively”.

Groundwater monitoring conducted in November 2022 indicates that all the remaining groundwater monitoring bores show shallow groundwater levels ranging from 1.79 mbgl at TD2-3 to 4.46 at TD3-7.

Tables 5 and 6 show the existing groundwater water quality results for TD1-2, TD1-5, TD3-1, TD2-3, TD3-2 and TD3-7 (MBS 2023).

The results show that concentrations of Arsenic, Copper, Nickel and WAD Cyanide remained below the licence limits in all TSF monitoring bores.

Table 5: Water quality results – TSF monitoring bores

Guideline		pH	TDS	SO ₄	Al	Sb	As	Cd	Cr	Co	Cu	Pb	Mn	Mo
Units		pH units	mg/L											
<i>Licence Limit</i>							<0.5				<1.0			
TD1-2	Q4 2022	7.94	1,350	312	<0.01	<0.001	0.046	0.0016	<0.001	0.008	<0.001	<0.001	<0.001	<0.001
	Q3 2022	8.03	1,350	327	<0.01	<0.001	0.045	<0.0001	0.014	0.011	0.001	<0.001	<0.001	<0.001
	Q2 2022	7.96	1,250	359	<0.01	<0.001	0.041	<0.0001	0.014	0.009	0.014	<0.001	0.002	<0.001
	Q1 2022	7.88	1,470	317	<0.01	<0.001	0.039	<0.0001	0.015	0.01	<0.001	<0.001	0.005	<0.001
TD1-5	Q4 2022	7.58	1,460	256	<0.01	<0.001	0.003	<0.0001	0.005	0.082	0.004	<0.001	0.002	0.002
	Q3 2022	7.49	1,410	232	<0.01	<0.001	0.003	<0.0001	0.005	0.24	<0.001	<0.001	<0.001	0.002
	Q2 2022	7.41	1,140	236	<0.01	<0.001	0.002	<0.0001	0.005	0.09	0.004	<0.001	0.001	0.002
	Q1 2022	7.43	1,370	208	<0.01	<0.001	<0.001	<0.0001	0.004	0.084	0.003	<0.001	0.007	0.002
TD3-1	Q4 2022	6.87	3,120	938	<0.01	<0.001	<0.001	0.0006	<0.001	0.358	0.002	<0.001	0.22	<0.001
	Q3 2022	6.86	3,470	1,070	<0.01	<0.001	0.001	0.0006	<0.001	0.364	0.003	<0.001	0.038	<0.001
	Q2 2022	6.62	2,890	1,040	<0.01	<0.001	0.001	0.0007	0.002	0.432	0.001	<0.001	0.036	<0.001
	Q1 2022	6.48	1,920	525	<0.01	<0.001	<0.001	-	0.0002	<0.001	0.172	0.001	<0.001	0.842
TD2-3	Q4 2022	8.34	3,210	579	<0.01	0.001	0.013	<0.0001	0.028	0.252	<0.001	<0.001	<0.001	0.002
	Q3 2022	8.38	3,260	584	<0.01	0.002	0.011	<0.0001	0.025	0.24	<0.001	<0.001	<0.001	0.002
	Q2 2022	8.32	2,660	573	<0.01	0.002	0.012	<0.0001	0.024	0.27	<0.001	<0.001	<0.001	0.002
	Q1 2022	8.31	2,890	549	<0.01	0.001	0.011	-	<0.0001	0.024	0.283	0.001	<0.001	<0.001
TD3-2	Q4 2022	7.35	890	56	<0.01	<0.001	0.002	<0.0001	0.007	0.032	0.001	<0.001	<0.001	<0.001
	Q3 2022	7.38	756	180	0.02	<0.001	0.002	<0.0001	0.004	0.025	0.002	<0.001	0.002	<0.001
	Q2 2022	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Guideline	pH	TDS	SO ₄	Al	Sb	As	Cd	Cr	Co	Cu	Pb	Mn	Mo	
Units	pH units	mg/L												
Licence Limit						<0.5				<1.0				
	Q1 2022	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
TD3-7	Q4 2022	8.15	382	56	<0.01	<0.001	0.001	<0.0001	0.01	<0.004	0.001	<0.001	<0.001	0.004
	Q3 2022	8.22	394	60	<0.01	<0.001	<0.001	<0.0001	0.01	0.001	0.002	<0.001	<0.001	0.004
	Q2 2022	8.08	350	52	<0.01	<0.001	<0.001	<0.0001	0.011	<0.001	0.003	<0.001	<0.001	0.005
	Q1 2022	8.09	370	50	<0.01	<0.001	<0.001	<0.0001	0.012	0.001	0.002	<0.001	<0.001	0.005

Table 6: Water quality results – TSF monitoring bores (cont...)

Guideline	Ni	Se	Tl	U	Zn	B	Fe	Hg	WAD-CN	F	Nitrogen	Phosphorus	
Units	mg/L												
Licence Limit	<0.1								<0.8				
TD1-2	Q4 2022	0.003	<0.01	<0.001	<0.001	0.028	<0.001	<0.05	<0.0001	<0.004	0.2	49.3	<0.05
	Q3 2022	0.002	<0.01	<0.001	<0.001	0.021	1.62	<0.05	<0.0001	<0.040	0.2	41.9	<0.05
	Q2 2022	0.009	<0.01	<0.001	<0.001	0.038	1.8	<0.05	<0.0001	0.006	0.2	46.3	0.08
	Q1 2022	0.003	<0.01	<0.001	<0.001	0.034	1.78	0.07	<0.0001	<0.004	0.2	49.1	0.05
TD1-5	Q4 2022	0.003	<0.01	<0.001	<0.001	0.245	0.42	<0.05	<0.0001	<0.004	<0.1	35.2	<0.05
	Q3 2022	0.001	0.02	<0.001	<0.001	0.262	0.34	<0.05	<0.0001	<0.004	0.1	38.1	0.15
	Q2 2022	0.003	<0.01	<0.001	<0.001	0.253	0.4	<0.05	<0.0001	0.032	0.1	41.5	0.07
	Q1 2022	0.004	<0.01	<0.001	<0.001	0.257	0.35	<0.05	<0.0001	<0.004	<0.1	42.8	<0.05
TD3-1	Q4 2022	0.095	<0.01	<0.001	<0.001	0.062	0.5	6.51	<0.0001	0.012	<0.1	4.7	0.09
	Q3 2022	0.092	<0.01	<0.001	<0.001	0.048	0.41	0.36	<0.0001	<0.040	<0.1	1.8	<0.01

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Guideline		Ni	Se	Tl	U	Zn	B	Fe	Hg	WAD-CN	F	Nitrogen	Phosphorus
Units		mg/L											
Licence Limit		<0.1								<0.8			
	Q2 2022	0.09	<0.01	<0.001	<0.001	0.049	0.49	0.13	<0.0001	0.047	<0.1	2.8	0.04
	Q1 2022	<0.001	0.026	<0.01	<0.001	<0.001	0.025	0.46	5.47	<0.004	<0.1	16.9	0.01
TD2-3	Q4 2022	<0.001	0.01	<0.001	<0.001	0.005	1.49	<0.05	<0.0001	0.008	0.2	90.2	0.03
	Q3 2022	0.001	0.02	<0.001	<0.001	<0.005	1.37	<0.05	<0.0001	0.022	0.2	101	0.1
	Q2 2022	<0.001	0.01	<0.001	<0.001	0.006	1.41	<0.05	<0.0001	0.078	0.2	106	0.07
	Q1 2022	0.002	0.001	0.01	<0.001	<0.001	0.01	1.37	<0.05	0.01	0.2	110	0.05
TD3-2	Q4 2022	0.003	<0.01	<0.001	<0.001	0.015	0.4	<0.05	<0.0001	<0.004	<0.1	26.8	<0.05
	Q3 2022	0.002	<0.01	<0.001	<0.001	0.025	0.24	<0.05	<0.0001	<0.040	<0.1	18.6	<0.05
	Q2 2022	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Q1 2022	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TD3-7	Q4 2022	0.005	<0.01	<0.001	<0.001	0.037	0.37	<0.05	<0.0001	<0.004	0.2	9.9	0.03
	Q3 2022	0.005	<0.01	<0.001	<0.001	0.028	0.31	<0.05	<0.0001	<0.004	0.2	1	0.02
	Q2 2022	0.006	<0.01	<0.001	<0.001	0.038	0.34	<0.05	<0.0001	<0.004	0.2	7.8	0.03
	Q1 2022	0.015	<0.01	<0.001	<0.001	0.045	0.32	<0.05	<0.0001	0.006	0.2	8	0.01

Billabong 2023a states that water balance models were undertaken to examine expected inflows and outflows for the facilities. Inflows included rainfall and slurry water. Outflows included evaporation, seepage losses and water retained in the tailings (pore water).

The following assumptions / parameters were used in the analyses:

- Average annual rainfall of 260.8 mm
- Average annual evaporation of 3,505 mm
- Conservative slurry input of 1.56 Mtpa at 46.2% solids
- Runoff coefficient of 0.5 (over the tailings surface during operations)
- Evaporation pan factor of 0.65
- Average storage area: ~35.5 ha (TSF 2) and ~28.5 ha (TSF 3)
- Operating pool area: ~6.15 ha (TSF 2) and ~6.31 ha (TSF 3) (estimated based on a normal operating pond of ~5 days of slurry water, or an equivalent pool radius ~140 m)
- Running beaches area estimated based on 6 spigots (at nominal 20 m intervals) operating at any time and the adjacent beach areas remaining wet: ~3 ha (for both TSFs)
- Estimated seepage flow the downstream side of each facility: ~114.5 m³/day (TSF 2) and ~121.5 m³/day (TSF 3)
- Average permeability of foundation soils and rock under TSFs 1×10^{-7} m/s/m².

The water balance calculations are summarised in Table 7.

Table 7: TSF water balance summary (Tetra Tech Coffey 2023)

Inflows (m ³)		Outflows (m ³)	
Case 1: Raised TSF2 - Operations (Stages 9 and 10)			
Slurry water	1,822,859	Return water	779,015
Rainfall	58,224	Evaporation	208,454
Other water inflows	0	Evapo-Transpiration	15,392
		Seepage (conservative)	330,347
		Retention	547,874
Total inflow	1,881,083 m³	Total outflow	1,881,083 m³
Case 2: Raised TSF3 - Operations (Stages 9 and 10)			
Slurry water	1,822,859	Return water	763,033
Rainfall	49,304	Evaporation	212,099
Other water inflows	0	Evapo-Transpiration	11,210
		Seepage (conservative)	337,948
		Retention	547,874
Total inflow	1,872,164 m³	Total outflow	1,872,164 m³

Tetra Tech Coffey 2023 states that the analyses indicated that:

- *Raised TSF2 Operations (Stages 9 and 10): an annual average water return of 43% of the tailings slurry water will be available for recovery under average climatic conditions.*
- *Raised TSF3 Operations (Stages 9 and 10): an annual average water return of 42% of the tailings slurry water will be available for recovery under average climatic conditions.*

The results also indicate that water recovery will vary according to the TSF management,

specifically, the pond size and running beaches. To maximise water recovery, the TSF should be operated to ensure the water pond around the decant facility is as small as practical. In addition, the actual water quantity available for return to the plant will vary depending on the following factors:

- Slurry density;
- Continuity of tailings discharge;
- Distance between the discharge point and decant pond;
- Size of the decant pond and running beaches from where evaporation is greatest;
- Weather conditions prevailing at the time of operation; and
- The efficiency of the underdrainage and decant systems during operation.

A two-dimensional seepage analysis was undertaken to estimate the seepage flow (discharge) through the perimeter embankment to the downstream side and to determine the position of phreatic surface for use in the TSF 2 and 3 embankment stability analyses. The seepage analysis was carried out using the groundwater module of the Rocscience software package referred as 'SLIDE'.

The seepage flow (discharge) through the perimeter embankment to the downstream side, estimated from seepage analyses (SLIDE), is summarised in Table 8. The effective perimeter length for TSF 2 was estimated to be 1,260 m across two embankment sides (northern and northeastern). The effective perimeter length TSF 3 was estimated to be 1,645 m. The shared embankments between TSF 1 and 2 (on the western side of TSF2), and TSF 2 and 3 were excluded from effective length calculation.

Table 8: Results of seepage analysis

Location/Case	Flux (m ³ /day) per metre run	Effective length (m)	Estimated seepage to the downstream side (m ³ /day)
TSF 2	0.091	1,260	114.5
TSF 3	0.074	1,645	121.5

The results indicate that the position of the phreatic surface in the perimeter embankment will depend on the supernatant water pond size and level, as well as the permeability of the deposited tailings and foundation.

3.2 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 3.1. 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 3.1), 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 9.

The Revised Licence L68681989/12 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 9. 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								
Earthworks associated with embankment lifts Vehicle movements	Dust	Air/windborne pathway causing impacts to health and amenity	Vegetation Aboriginal Sites and Heritage Places	Refer to Section 3.1	C = Slight L = Unlikely Low Risk	Y	No conditions imposed. The general provisions of the EP Act apply.	N/A.
Operation								
Leaks, pipeline ruptures or failure of the tailings delivery and return water pipelines	Spillage of tailings and decant return water	Discharges to land and infiltration to soil resulting in contamination	Soil and vegetation	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	N	Existing conditions on licence relating to: <ul style="list-style-type: none"> Condition 7 - TSF operational requirements. Condition 8 – Pipeline requirements. Under this amendment the following conditions have been added: <ul style="list-style-type: none"> Condition 9 – Inspection of infrastructure for the TSF 2 and TSF 3 supernatant ponds, pipelines and freeboard. Condition 11 – Construction requirements for TSF 2 and TSF 3. 	During this amendment the requirement to undertake inspection of infrastructure for TSF 2 and TSF 3 has been added. During this amendment construction requirements for TSF 2 and TSF 3 have been included as per <i>Billabong 2023a</i> .
Deposition of tailings into TSF 2 and 3	Seepage	Seepage from the TSFs potentially contaminating the soil and impacting on the water quality of the	Groundwater	Refer to Section 3.1	C = Moderate L = Possible Medium Risk	N	Existing conditions on licence relating to: <ul style="list-style-type: none"> Condition 7 - TSF operational requirements. Condition 22 – Monitoring 	During this amendment to licence has been updated with the following: <ul style="list-style-type: none"> Condition 7 to

Licence: L6868/1989/12

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				
		groundwater					<p>of ambient groundwater quality.</p> <p>Under this amendment the following conditions have been added:</p> <ul style="list-style-type: none"> • Condition 9 – Inspection of infrastructure for the TSF 2 and TSF 3 supernatant ponds, pipelines and freeboard. • Condition 11 – Construction requirements for TSF 2 and TSF3. • Condition 21 – Water balance. 	<ul style="list-style-type: none"> • include further operational requirements in particular around deposition, return water and the supernatant pond. • Condition 9 included requiring the Licence Holder to undertake inspection of infrastructure for TSF 2 and TSF 3. • Condition 11 updated to include construction requirements for TSF 2 and TSF 3 as per <i>Billabong 2023</i>. • Condition 21 has been included requiring the Licence Holder to undertake a monthly water balance and provide this information within the Annual Environmental Report.
Overtopping	Tailings	Discharges to land and infiltration to	Soil and	Refer to	C = Moderate	N	Existing condition 7 on licence relating to TSF	During this amendment,

Licence: L6868/1989/12

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				
	material	soil resulting in contamination	vegetation	Section 3.1	L = Rare Medium Risk		operational requirements. Under this amendment the following conditions have been added: <ul style="list-style-type: none"> • Condition 9 – Inspection of infrastructure for the TSF 2 and TSF 3 supernatant ponds, pipelines and freeboard. • Condition 11 – Construction requirements for TSF 2 and TSF 3. 	condition 7 has been updated to include further operational requirements in particular around deposition, return water and the supernatant pond. Condition 9 has been included requiring the Licence Holder to undertake inspection of infrastructure for TSF 2 and TSF 3. Condition 11 has been updated to include construction requirements for TSF 2 and TSF 3 as per <i>Billabong 2023a</i> .
Tailings surface and embankment walls	Dust lift-off	Air/windborne pathway causing impacts to health and amenity	Vegetation Aboriginal Sites and Heritage Places	Refer to Section 3.1	C = Slight L = Unlikely Low Risk	N	Condition 9 – Inspection of infrastructure for the TSF 2 and TSF 3 supernatant ponds, pipelines and freeboard.	During this amendment the requirement to undertake inspection of infrastructure for TSF 2 and TSF 3 has been added.

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. **Underline text** depicts additional regulatory controls imposed by department.

4. Consultation

Table 10 provides a summary of the consultation undertaken by the department.

Table 10: Consultation

Consultation method	Comments received	Department response
DMIRS advised of proposal on 18 July 2023	DMIRS replied on the 24 August 2023 advising that they had no comments on this licence amendment application.	Noted.
Licence Holder was provided with draft amendment on 31 August 2023	The Licence Holder responded on 01 September 2023 (Billabong 2023b) and waived the remaining consultation period.	N/A.

5. 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.

5.1 Summary of amendments

Table 11 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 11: Summary of licence amendments

Condition no.	Proposed amendments
Licence history	Updated to remove reference to previous versions of the Licence and associated works approval; and include this amendment.
Conditions 1, 2, 3, 4, 5, 6, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22 and 26	Administrative changes including numbering updates.
Previous condition 1.2.6	Deleted, and incorporated into new condition 7.
Condition 7, Table 4	Included in line with the new licence format. Previous conditions 1.2.7 (for the TSFs) and 1.2.8 (for the WWTP ponds) deleted and now included within Table 4. Additional operational requirements for TSF 2 and TSF 3 have been included in line with the controls proposed by the Licence Holder.
Condition 8	Removal of reference to 'environmentally hazardous substances' and replaced with 'tailings and decant water'.
Condition 9	Inclusion of condition 9 relating to the inspection of infrastructure associated with TSF 2 and TSF 3 in particular the supernatant pond, pipelines and embankment freeboard.
Previous condition 1.2.11	Deleted and replaced with new condition 11.

Condition no.	Proposed amendments
Condition 11	Updated to new licence format. Previous reference to TSF 2 and TSF 3 lifts to RL 532.0 m removed. The Licence Holder provided Stage 8 (to RL 532.0 m) compliance documentation for TSF 2 and TSF 3 on 21 March 2023 and 11 July 2023 (respectively). During the amendment, construction requirements for TSF 2 and TSF 3 stages 9 and 10 have been included.
Condition 21	Inclusion of the requirement for a monthly water balance for TSF 2 and TSF 3.
Previous condition 4.1.1	Deleted, in line with the current licence format.
Conditions 23 and 24	Included in line with the current licence format and replaces the previous conditions 4.1.3 and 4.1.2.
Condition 25	Included in line with the current licence format and replaces the previous condition 4.2.1. Updated to specify the information / result required for submission within the Annual Environmental Report.
Conditions 27 and 28	Included in line with the current licence format.
Condition 29	Updated to specify requirements for the Environmental Compliance Report required by condition 12 for condition 11.
Definitions	Updated as required.
Schedule 1, Figures	Updated as required. Inclusion of new Figures 1, 6 and 7 to 11. Removal of Figures not associated with conditions of the Licence.
Schedule 2	Removal of Forms WR1, LR2 and GR1 as the format for this data within the Annual Environmental Report does not need to be specified.

References

1. Billabong Gold Pty Ltd (Billabong) 2023a, *Plutonic Gold Mine Environmental Licence Amendment (L6868/1989/12) Supporting Documentation*, June 2023 (A2184764).
2. Billabong 2023b, *RE: Notification: Proposed Amendment to Licence L6868/1989/12*, received 01 September 2023 (A2200321).
3. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
4. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
5. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
6. MBS Environmental (MBS) 2023, *Plutonic Gold Mine Annual Environmental Report Prescribed Premise Licence L6868/1989*, prepared for Billabong Gold Pty Ltd, March 2023 (DWERDT760516).
7. Tetra Tech Coffey 2023, *Plutonic Gold Mine TSFs 2 and 3 Raise Design, Design Report (754-PERGE314660_R02Rev0)*, prepared for Billabong Gold Pty Ltd, 30 May 2023 (A2188607).

Appendix 1: Application validation summary

SECTION 1: APPLICATION SUMMARY					
Application type					
Amendment to licence	<input checked="" type="checkbox"/>	Current licence number:	L868/1989/12		
		Relevant works approval number:		N/A	<input type="checkbox"/>
Registration	<input type="checkbox"/>	Current works approval number:		None	<input type="checkbox"/>
Date application received		15 June 2023			
Applicant and Premises details					
Applicant name/s (full legal name/s)		Billabong Gold Pty Ltd (ACN 613 900 922)			
Premises name		Plutonic Gold Mine			
Premises location		Mining Tenements: M52/171, M52/170, M52/148, M52/149, M52/150, M52/295, M52/296, M52/301 and M52/300 MEEKATHARRA WA 6642			
Local Government Authority		Shire of Meekatharra			
Application documents					
HPCM file reference number:		DER2014/001259-1			
Key application documents (additional to application form):		<ul style="list-style-type: none"> Plutonic Gold Mine Environmental Licence Amendment (L6868/1989/12) Supporting Documentation Appendix 1 – Letter of Authority Appendix 2A – TSF 2 and 3 Raise Design Report Appendix 2B – TSFs 2 & 3 Raise Design Report Appendices A-E Appendix 2C – TSF 2 and 3 Raise Design Hydrogeological Assessment Appendix 2D – TSF 2 and 3 Raise Design Report Appendices F-L Appendix 3 – TSF 2 and 3 Operations Manual Appendix 4 – TSF Category Checklist 			
Scope of application/assessment					
Summary of proposed activities or changes to existing operations.		Licence amendment for: <ul style="list-style-type: none"> TSF 2 and TSF 3 embankment raises (upstream construction method) in 2.5 m increments each (Stages 9 and 10), raising the total height from 32 m (RL 532 m) to 37 m (RL 537 m). 			

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 5: Processing or beneficiation of metallic or non-metallic ore	5,000,000 tonnes per annual period	No change
Category 6: Mine dewatering	1,300,000 tonnes per annual period	No change
Category 52: Electric power generation	27.2 MW (natural gas)	No change
Category 54: Sewage facility	140 m ³ /day	No change
Category 57: Used tyre storage (general)	200 tyres	No change
Category 89: Putrescible landfill site	5,000 tonnes per annual period	No change

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 checked="" type="checkbox"/> No <input type="checkbox"/>	Certificate of title <input type="checkbox"/> General lease <input type="checkbox"/> Expiry: Mining lease / tenement <input checked="" 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? Mining tenure
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 8616 (TSF 4/5) expires 4/10/2024; and CPS 8651 (Area 4 and Perch) expires 15/11/2024 No additional clearing is proposed.

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 No clearing is proposed.
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"/>	Licence/permit No: GWL151450 for the abstraction of 4,750,000 kL/annum from the Plutonic borefields
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Name: East Murchison Groundwater Area Gascoyne River and Tributaries Surface Water Area Type: Proclaimed Groundwater Area/Surface Water Area Has Regulatory Services (Water) been consulted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Regional office: Mid-West Gascoyne
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Name: N/A Priority: 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"/>
Is the Premises subject to any other Acts or subsidiary regulations (e.g. <i>Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx</i>)	Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>	<i>Mining Act 1978 - current Mine Closure Plan (REG ID 72068)</i> <i>Dangerous Goods (DG) Licence DGS011641 (expires 28/06/2026)</i> <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>
Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	N/A
Is the Premises subject to any EPP requirements?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	N/A
Is the Premises a known or suspected contaminated site under the <i>Contaminated Sites Act 2003</i> ?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Classification: possibly contaminated – investigation required (PC–IR) Date of classification: 07/07/2016