



Application for Licence Amendment

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

Licence Number	L4597/1988/14
Licence Holder	Barto Gold Mining Pty Ltd
ACN	161 566 490
File Number	DER2014/000887-1~13
Premises	Southern Cross Operations MARVEL LOCH WA 6426 Mining Leases M77/7, M77/8, M77/10, M77/26, M77/31, M77/66, M77/72, M77/86, M77/109, M77/112, M77/113, M77/114, M77/133, M77/137, M77/138, M77/159, M77/175, M77/193, M77/197, M77/198, M77/217, M77/221, M77/224, M77/225, M77/239, M77/251, M77/347, M77/352, M77/380, M77/408, M77/424, M77/431, M77/432, M77/525, M77/554, M77/555, M77/593, M77/631, M77/638, M77/640, M77/660, M77/655, M77/668, M77/702, M77/745, M77/721, M77/746, M77/747, M77/722, M77/765, M77/766, M77/768, M77/775, M77/790, M77/791 M77/792, M77/793, M77/794, M77/811, M77/969, M77/977, M77/1009, M77/1036, M77/1052 and M77/1275, Miscellaneous Licences L77/51, L77/87, L77/106, L77/112, L77/113, L77/114, L77/126, L77/128, L77/162, L77/167, L77/168, L77/173, L77/281, L77/290 and General Purpose Leases G77/1-3. As defined in Licence L4597/1988/14
Date of Report	17 February 2025
Decision	Revised licence granted

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

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1. Decision summary

Licence L4597/1988/14 is held by Barto Gold Mining Pty Ltd for the Southern Cross Operations (the Premises), located at Marvel Loch, Western Australia.

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 of infrastructure as part of the licence amendment, and the ongoing operation of the Premises. As a result of this assessment, Revised Licence L4597/1988/14 has been granted.

The Revised Licence issued as a result of this amendment consolidates and supersedes the existing Licence previously granted in relation to the Premises.

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 Application summary

Barto Gold Mining Pty Ltd (the Licence Holder) owns and operates the Southern Cross Operations, located in the eastern wheatbelt region of Western Australia, within the Shire of Yilgarn. The Premises covers approximately 973 km² of tenements with operations centred at Marvel Loch, 30 km south of the town of Southern Cross and 360 km east of Perth. The licence holder currently holds a Licence L4597/1988/14 for the operation of the Premises. The licence regulates dewatering, ore processing, waste storage and disposal activities.

On 18 September 2024, the Licence Holder submitted an application to the department to amend Licence L4597/1988/14 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The following amendments are being sought:

- Approval to construct (and operate) the remaining embankment lifts (stages 3 – 7) on existing tailings storage facility 3 (TSF3) – from RL 446 to RL 456 m AhD (10 meters).
- Approval to construct and operate a new landfill (class II or III putrescible landfill) located at the Frasers site, within mining tenement M77/109.
- Changes to the prescribed premises boundary, through the removal of part lot M77/109 referred to as “Area A”, to allow divestment of this portion of the premises. The change for removal of part lot M77/109 was requested separately to the main application, through an email to the department on 19 November 2024.

Error! Reference source not found. Table 1: below outlines the proposed changes to the existing Licence relating to categories and throughput.

Table 1: Licence amendments

Category	Current throughput capacity	Proposed throughput capacity	Description of proposed amendment
5	2 600 000 tonnes per annual period	No changes proposed	TSF3 lift stage 3-7 to total of 456m RL.
6	6 000 000 tonnes per annual period	No changes proposed	N/A

57	200 tyres	No changes proposed	N/A
64	2 000 tonnes per annual period	No changes proposed	Construction of new landfill (Fraser's Landfill). No change to existing approved Category 64 capacity.

2.2.1 TSF 3 Stage 3 - 7 Embankment Lifts

TSF3 was approved for construction on 8 December 2017 through licence Amendment Notice 2 (AN2). TSF3 consists of two paddock-type cells constructed using upstream methods with dried tailings. The TSF3 design comprises a starter embankment to 442mRL. A final design height of 456mRL was planned through seven subsequent 2m lifts.

AN2, while approving construction of TSF3, did not explicitly state or condition to what height TSF3 may be constructed or subsequent lifts. On 30 July 2021, the department made additional delegated officer derived amendments (condition 1.2.24) to authorise up to stage 2 embankment lifts only, with a maximum embankment elevation of 446m RL (maximum operating height of 445.7m RL).

The starter embankment for TSF3 was completed on 15 November 2019 and construction compliance documentation was submitted to the department in November 2020. Stage 1 lifts for both cells of TSF3 have been completed with construction compliance documentation submitted to the department in September 2023 for Cell 1 and July 2024 for Cell 2. It is expected that construction for stage 2 lift will commence in the near future on TSF3 Cell 1.

The licence holder's processing throughput has increased in 2024 and will ramp up further in 2025. As a result, the Licence Holder is requesting that the remaining 5 subsequent embankment lifts for TSF3 are approved through this licence amendment. The cumulative storage life for stage 2 through 7 based on expected processing numbers is approximately 3.5 years. The total storage capacity at the final construction stage is expected to be approximately 17 million tonnes. Table 2 below outlines the expected storage volume at each stage of construction.

Table 2: Embankment height and the expected storage volume at each stage (Barto Gold Pty Ltd, 2024b)

Stage	Embankment Crest RL (m AHD)	Storage Area (m ²)	Storage Depth (m)	Storage Volume (m ³)	Cumulative Storage Volume (Mm ³)	Cumulative Storage Capacity (t)
0 (Starter)	442	375,338	Varies	1,672,124	1,672,124	2,340,974
1	444	728,880	2	1,278,660	2,950,784	4,131,098
2	446	732,480	2	1,341,441	4,292,225	6,009,116
3	448	850,206	2	1,419,322	5,711,547	7,996,166
4	450	840,346	2	1,579,295	7,290,842	10,207,179
5	452	821,918	2	1,576,805	8,867,647	12,414,706
6	454	820,348	2	1,516,583	10,384,230	14,537,922
7 (Final)	456	813,029	2	1,609,794	11,994,024	16,791,634

2.2.2 Proposed Landfill

L4597/1988/14 currently approves disposal of waste by landfilling at Nevoria Landfill, Axehandle mine landfill, Windmills landfill, Transvaal landfill and Marvel Loch landfill. The Licence Holder is seeking additional approval for the construction of a new landfill (Frasers landfill) within mining tenement M77/109.

The proposed Class II and III (Category 64) landfill site will be constructed and operated according to existing conditions on the licence, and the *Environmental Protection (Rural Landfill) Regulations 2002*.

Domestic (putrescible and non-putrescible), non-recyclable waste produced at the Frasers Project will be disposed of into this landfill facility. Recyclable materials, such as metals, rubber, plastic, paper, glass, and fabric products, will be segregated from other waste and removal offsite.

The proposed landfill design is a trench-based system which incorporates a maximum open excavation of 30m long by 4 m wide and up to 4 m deep. Base of trench will have a minimum 2 meters depth to ground level and will be located within the Frasers West waste rock landform (WRL). Excavated overburden material will be placed around the edge of the landfill to create a safety bund of 0.5m minimum height or half the height of the largest wheel for the vehicles using this facility.

Excavated material will also be used to cover waste on a weekly basis or as required per licence conditions. The excavated overburden stored alongside the long edges of the excavation will also prevent water inflow. The empty trench will be filled with waste by tipping over the edge. There will be no vehicle access into the cell. At least once a month the waste will be compacted with a layer of overburden soil to reduce odours and pest species. If filled, a new trench is dug in front of the first trench and the resultant overburden is used to compact and backfill the previous trench. The vehicle access ramp into the trench will offer egress for both humans and fauna to enter and exit the excavation safely.

For the initial phase of the project, before the landfill is established, all waste will be removed and disposed at the appropriate landfill facility within the Shire of Yilgarn.

2.2.3 Changes to Prescribed Premises Boundary

In December 2022, the Licence Holder and Cygnet entered into an agreement for the sale of 46 tenements in the Southern Cross region. This sale didn't include mining tenement M77/109, but did include a sale of the mineral rights to a portion of mining tenement M77/109, know as 'Area A' and detailed below in Figure 1.

As part of this application, the Licence Holder would like to annex 'Area A' from its prescribed premise boundary, which would allow Cygnet to apply for its own licence. There are no discharge points or licensed infrastructure on this portion of tenement M77/109.

The Department has determined to grant this request.

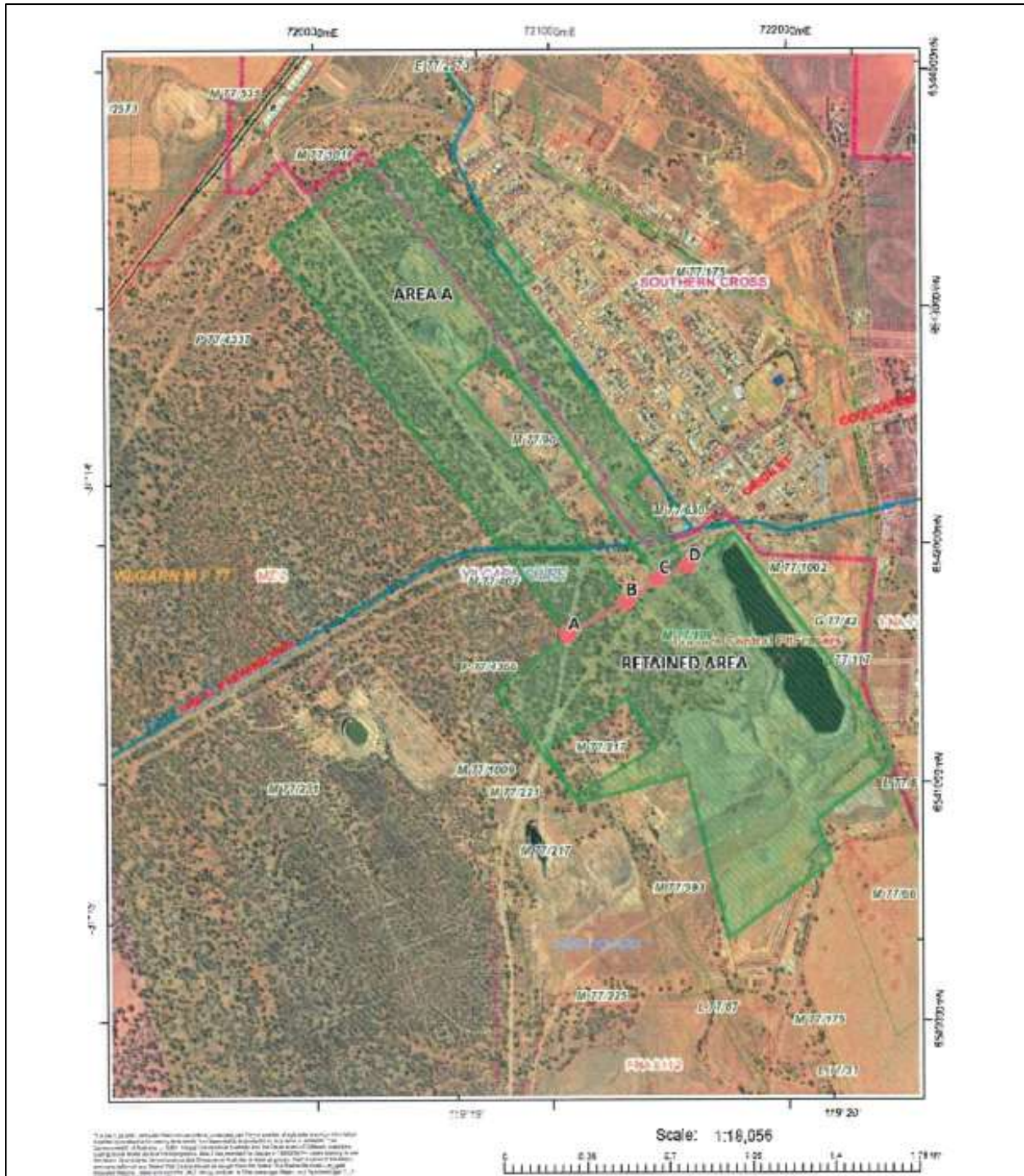


Figure 1: Area A from M77/109 to be excised from Licence

2.2.4 Department initiated amendment

In July 2020, the Government announced a package of regulatory reforms to streamline approval processes and to aid economic recovery post COVID-19. With these reforms, the CEO implemented an administrative renewal process to fast-track the renewals for licences determined to be lower risk.

This work has reduced timeframes of assessments however, the CEO proposed to streamline the process further. Where identified as being appropriate to action, the department is extending the duration of licences that are due to expire up to 30 June 2026 (amend to extend). This

licence has been identified as a licence suitable to process as an administrative extension to the licence duration. Therefore, the expiry date for L4597/1988/14 has been extended for a period of 5 years until 25/09/2030.

The amendment is administrative in nature therefore it does not alter the risk profile of the premises, providing that activities, emissions and receptors as stated in existing approvals remain unchanged.

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 3 below. Table 3 also details the proposed control measures the Licence Holder has proposed to assist in controlling these emissions, where necessary.

Table 3: Licence Holder controls

Emission	Sources	Potential pathways	Proposed controls
Construction controls			
Dust	Dust associated with construction of landfill and TSF embankment lifts	Air/windborne pathway	<ul style="list-style-type: none"> Land disturbance will be kept to the minimum necessary for development of the project. Dust will be managed by watering unsealed roads with a water cart. Vehicles are restricted to defined roads and are required to travel at safe operating speeds on unsealed roads and will be restricted from accessing rehabilitated surfaces except for management purposes. Ambient dust monitoring in Marvel Loch town (Required by Existing Condition 39) Visual dust monitoring
Noise	Noise associated with construction of landfill and TSF embankment lifts	Air/windborne pathway	<ul style="list-style-type: none"> Generator sets will be maintained and serviced to manufacturer's specifications to ensure efficient running and optimum fuel consumption, thereby minimising exhaust emissions. Diesel engines will be serviced to

Emission	Sources	Potential pathways	Proposed controls
			<p>maintain efficiency and minimise harmful combustion products</p> <ul style="list-style-type: none"> Emissions from mining, ore processing and associated activities will be detailed in the National Pollutant Inventory (NPI) report submitted annually to DWER.
Operation controls – TSF3			
Dust	Dust emissions associated with deposition and dried tailings	Air/windborne pathway	<ul style="list-style-type: none"> The TSF will be operated using sub aerial deposition methodology and will not generate dust. Following deposition tailings are wet, preventing generation of excess dust. Once tailings dry the saline properties cause a strong salt crust to form, which minimises mobilisation of dust. Ambient dust monitoring in Marvel Loch town (Required by Existing Condition 39) Visual dust monitoring
Sediment laden stormwater	Runoff of stormwater from TSF	Overland runoff	<ul style="list-style-type: none"> Visual monitoring of vegetation health and embankment stability. Embankment downstream slope covered with rock armour to protect from erosion. A toe drain will be constructed around the base of TSF3 to capture any sediment laden run off from TSF3 embankments.
Tailings discharge	Tailings seepage from TSF	Seepage infiltration/groundwater mounding	<ul style="list-style-type: none"> The base of the TSF is clay lined The TSF will be operated to ensure the water pond around the decant facility is as small as practical in order to minimise the risk of seepage in accordance with operating manual. The TSF has an underdrainage system to minimise potential seepage. Seepage collect in downstream trenches is pumped back to the process dam at the processing plant. Existing condition 8 requires TSFs to have a seepage collection and recovery system to capture seepage from the TSF. A decant structure in each cell is incorporated into the design to recover water liberated from the tailings slurry. Recovered water will be pumped from the structures for re-use in the process

Emission	Sources	Potential pathways	Proposed controls
			<p>plant.</p> <ul style="list-style-type: none"> A supervising engineer will monitor TSF3 construction raises and suitable quality assurance procedures will be implemented; Monitoring bores are present surrounding TSF3 to detect impacts, specified management triggers and contingency actions. Existing conditions 9, 10 and 38 of the licence outline groundwater monitoring requirements including a 4 meters below ground level (mbgl) limit and a 6 mbgl target for standing water levels within groundwater monitoring bores. Condition 10 requires a groundwater management plan to be submitted in the event the target level is reached. Existing condition 11 requires the licence holder to undertake an annual water balance for TSFs to better understand water management within the TSFs
Tailings	Overtopping of TSF	Direct discharge to land	<ul style="list-style-type: none"> Existing condition 8 requires the Licence Holder to manage TSFs such that a minimum top of embankment freeboard of 300 mm is maintained across the full surface of the TSF
Tailings / Return water	Tailings delivery/return water pipeline failure	Direct discharge to land	<ul style="list-style-type: none"> Telemetry, auto cut-offs, bunding and visual monitoring. Clean up response, reporting, spill containment measures Existing condition 1 requires the licence holder to ensure all tailings and return water pipelines to either be equipped with telemetry systems and pressure sensors, equipped with automatic cut-outs or provided with secondary containment. Existing condition 3 requires the licence holder to undertake daily inspections of tailings and return water pipelines
Operation of Frasers Class II or III putrescible landfill			
Odour	Accumulation of putrescible waste	Air/windborne pathway	<ul style="list-style-type: none"> Waste in tipping area will be covered in line with the licence requirements. Existing condition 18 requires wastes to be covered on a weekly basis.
Landfill	Contaminated	Seepage through base	<ul style="list-style-type: none"> Only accepting waste types permitted

Emission	Sources	Potential pathways	Proposed controls
Leachate	water in areas of landfill trenches	of landfill cell to groundwater	<p>in the licence</p> <ul style="list-style-type: none"> Landfill will be constructed within waste rock landform Maintaining undisturbed groundwater separation of more than 2 metres between base of waste disposal area and the highest groundwater level. Waste will be covered weekly minimising the generation of leachate
Contaminated stormwater runoff	Runoff	Air/windborne pathway	<ul style="list-style-type: none"> Landfill trenches will be enclosed by earthen bunds minimising contact between stormwater runoff and waste
Windblown waste	Landfilling of inert putrescible waste	Direct to discharge to land	<ul style="list-style-type: none"> Waste is placed in defined trenches Waste with a higher potential to become airborne will be covered as soon as practicable after deposit or by the end of the working week after deposit. Adherence to tipping heights and area and minimum covering requirements according to waste types in accordance with licence conditions (conditions 14 -18). Tipping Area would be restricted to a maximum linear length of 30 metres. Existing condition 20 requires the licence holder to collect windblown waste on a weekly basis.

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.

Table 4 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 4: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Marvel Lock townsite residences (population of 48 people)	Approximately 1.5 km west of TSF3
Southern Cross townsite residences	Approximately 850 meters north and east of Fraser landfill.

Environmental receptors	Distance from prescribed activity
Groundwater	Groundwater consists of hypersaline water and is generally located approximately 15 to 45 meters below ground level (mbgl) across the Premises. Groundwater has minimal beneficial use outside of mineral processing. All monitoring bores and wells within 5 km of the prescribed premises boundary are for industry and/or mining purposes. No agricultural abstraction bores were located.
Remnant native vegetation	Within prescribed premises. Eucalyptus and Acacia dominated woodlands. Adjacent to TSF3 and to the Fraser's landfill.
Parker Range Vegetation Complex -Priority 3 Ecological Community	Within Premise boundary and adjacent to TSF3
<i>Threatened and/or priority flora:</i> <ul style="list-style-type: none"> • <i>Hakea pendens</i> (P3) • <i>Rinzia fimbriolata</i> (P1) 	Within Premise boundary and adjacent to TSF3
<i>Lake Polatis drainage system</i>	1 km west of TSF3
Cultural Receptors	Distance from prescribed activity
Aboriginal heritage site: ID19258 (artefact/scatter)	Within mining tenement M77/239, 400m south of TSF 3

Figure 2 shows the location of select sensitive receptors from TSF3. No figure is provided to show the distance from sensitive receptors to the proposed Frasers landfill site.

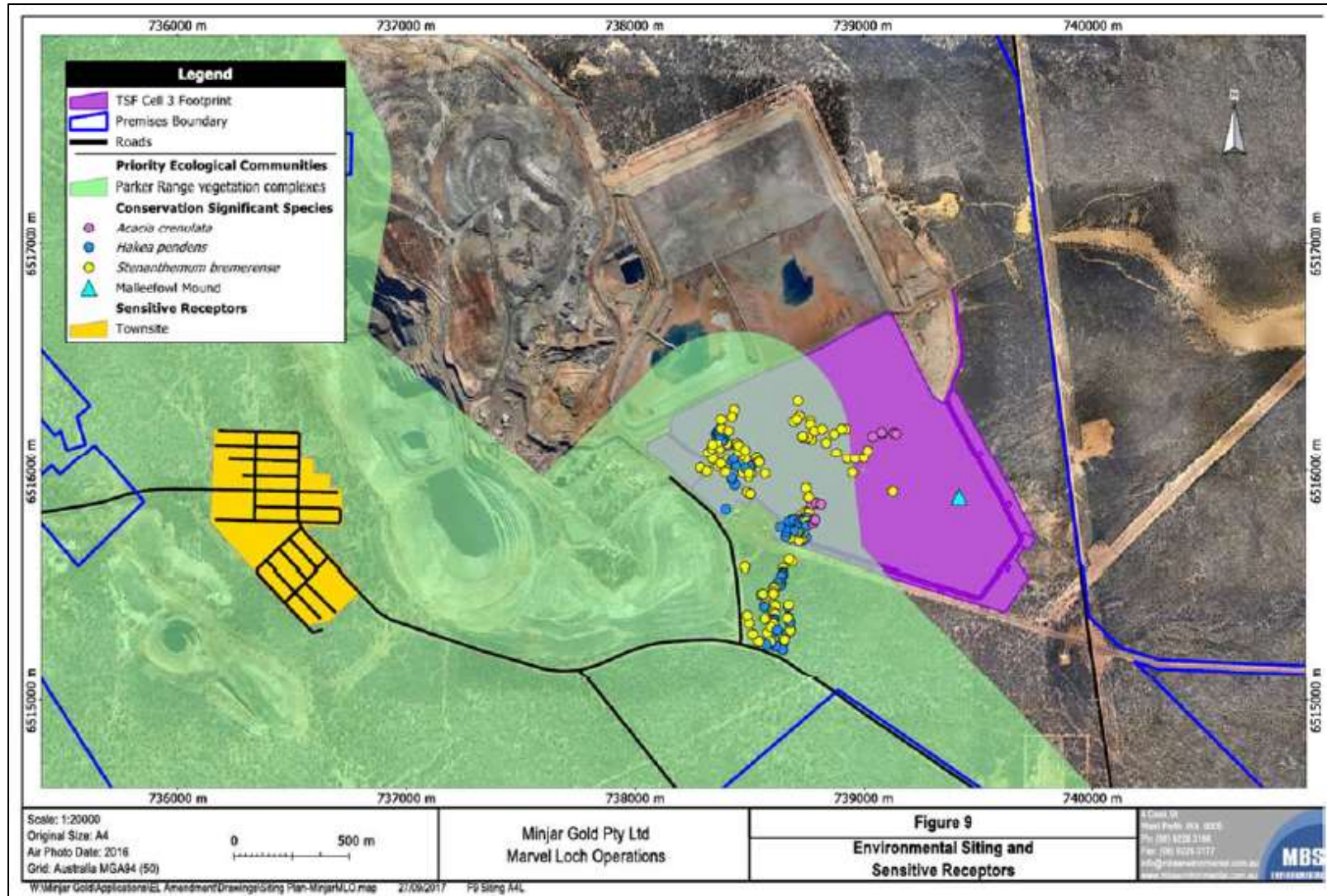


Figure 2: Distance to sensitive receptors (TSF3 only)

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 5.

The Revised Licence L4597/1988/14 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 5. Risk assessment of potential emissions and discharges from the Premises during construction and operation

Risk Event					Risk rating C = consequence L = likelihood	Applicant controls sufficient?	Conditions of licence	Justification for additional regulatory controls
Source/Activities	Potential emissions	Potential pathways and impact	Receptors	Applicant controls				
Construction								
Construction of landfill trenches	Dust	Pathway: Air/windborne pathway Impact: Health and amenity	Residence of Southern Cross located 800 m from landfill area	Refer to section 3.1	C = Minor L = Unlikely Medium Risk	Y	Updated Condition 24	Fraser’s landfill will be constructed within a waste rock landform on an active mine site. The additional dust and noise emissions generated from constructing the landfill trenches is expected to be minimal compared to background emissions and is unlikely to have a significant impact on nearby residences. No additional regulatory controls are therefore required. The licence holder’s proposed
	Noise			Refer to section 3.1	C = Minor L = Unlikely Medium Risk	Y	N/A	

Risk Event					Risk rating C = consequence L = likelihood	Applicant controls sufficient?	Conditions of licence	Justification for additional regulatory controls
Source/Activities	Potential emissions	Potential pathways and impact	Receptors	Applicant controls				
								controls for managing dust emissions have been conditioned within the licence.
Construction of stages 3-7 TSF 3 embankment lifts	Dust	Pathway: Air/windborne pathway Impact: Health and amenity	Residence at Marvel Loch townsite, 1.5 km west of the TSF3	Refer to section 3.1	C = Minor L = Unlikely Medium Risk	Y	Updated Condition 24	Marvel Loch has a population of 48 people and is approximately 1.5 km to the west of TSF3. Existing mine site infrastructure, such as the Marvel Loch pit and waste rock dump are located on the western side of TSF3 in-between the townsite and TSF3. Dust and noise emissions are not expected to be significant during the construction of the embankment lifts. Construction activities will occur in short term bursts of activity and will be localized. The applicant's proposed controls and the distance to receptors means it is unlikely for significant impacts to occur. The licence holder's proposed controls for managing dust emissions have been conditioned within the licence.
	Noise			Refer to section 3.1	C = Minor L = Unlikely Medium Risk	Y	N/A	
Operation								

Risk Event					Risk rating C = consequence L = likelihood	Applicant controls sufficient?	Conditions of licence	Justification for additional regulatory controls
Source/Activities	Potential emissions	Potential pathways and impact	Receptors	Applicant controls				
Operation of TSF3 at maximum embankment height of 456m RL	Dust (associated with dried tailings)	Pathway: Air/windborne pathway Impact: Health and amenity	Residence at Marvel Loch townsite, 1.5 km west of the TSF3	Refer to section 3.1	C = Minor L = Rare Low Risk	Y	N/A	Following deposition tailings are wet, preventing generation of excess dust. Once tailings dry the saline properties cause a strong salt crust to form, which minimises mobilisation of dust.
	Seepage	Infiltration through base of the TSF to soil profile and groundwater resulting in groundwater mounding	Native vegetation (PEC and priority flora) Groundwater	Refer to section 3.1	C = Moderate L = Possible Medium Risk	N	Existing conditions 9 – 10- groundwater Recovery Plan Existing condition 8 – seepage management Existing condition 11 - TSF water balance Existing condition 37: Process monitoring Existing condition 38 – groundwater monitoring with SWL limit <u>New condition 47: Specified</u>	Refer section 3.3

Risk Event					Risk rating C = consequence L = likelihood	Applicant controls sufficient?	Conditions of licence	Justification for additional regulatory controls
Source/Activities	Potential emissions	Potential pathways and impact	Receptors	Applicant controls				
							action	
	Tailings /decant water	Direct discharge to land from pipeline failure resulting in impacts to health of vegetation	Native vegetation	Refer to section 3.1	C = Minor L = Unlikely Medium Risk	Y	Existing condition 1 – pipeline requirements Existing condition 3 – pipeline inspections	Existing conditions adequately manage this risk event. No additional regulatory controls are required.
		Direct discharge to land from overtopping of TSF resulting in impacts to health of vegetation		Refer to section 3.1	C=Moderate L=Rare Medium Risk	Y	Existing condition 8 and 4– Freeboard requirement Existing condition 3 – TSF inspections	Existing conditions adequately manage this risk event. No additional regulatory controls are required.
Operation of Frasers Class II or III putrescible landfill	Leachate	Infiltration through soil profile to groundwater causing contamination of groundwater	Groundwater	Refer to section 3.1	C = Minor L = Rare Low Risk	Y	Existing condition 14 & 15: waste acceptance Existing condition 16: waste processing Existing condition 17 & 18 – waste cover requirements	Landfill trenches will be constructed within a waste rock landform many meters above ground level. The base of the landfill will be more than 2 m above groundwater level in accordance with the rural landfill regulations. Existing conditions adequately manage this risk event. No additional regulatory controls are required.

Risk Event					Risk rating C = consequence L = likelihood	Applicant controls sufficient?	Conditions of licence	Justification for additional regulatory controls
Source/Activities	Potential emissions	Potential pathways and impact	Receptors	Applicant controls				
	Contaminated stormwater	Overland runoff resulting in impacts to ecological health	Native vegetation	Refer to section 3.1	C = Slight L = Unlikely Low Risk	Y	Updated Condition 24	Licence holder's proposed controls (bundled trenches) will be conditioned within the licence.
	Windblown waste	Direct discharge to land resulting in impacts to ecological health	Native vegetation	Refer to section 3.1	C = Slight L = Unlikely Low Risk	Y	Existing conditions 14 - 18) – cover requirements. Existing condition 20 - windblown waste	Existing conditions adequately manage this risk event. No additional regulatory controls are required.
	Odour	Pathway: Air/windborne pathway Impact: Amenity	Residence at Southern Cross townsite, 800m from landfill	Refer to section 3.1	C = Slight L = Unlikely Low Risk	Y	Existing condition 17 & 18 – waste cover requirements	Existing conditions adequately manage this risk event. No additional regulatory controls are required.

3.3 Detailed risk assessment for Seepage from TSF3

3.3.1 Summary of risk event

Seepage occurs as a natural process of TSFs during the drying process of tailings slurry once delivered to the facility. TSFs are designed to allow drainage to assist this process in removing excessive moisture in the tailings. As the tailings are dried through evaporation and seepage, they harden, allowing continued tailings deposition at the site. The tailings supernatant that leaches out from the base of the TSF has the potential to impact on the local superficial aquifer underlying the TSF, through contamination and groundwater mounding. The groundwater aquifer and native vegetation at the surface are the primary receptors that may be impacted by tailings seepage.

To inform this detailed risk assessment, the department has assessed groundwater monitoring information provided by the Licence Holder as part of their most recent Annual Environmental Report for the reporting period 1 October 2023 – 30 September 2024. The assessment of groundwater performance for TSF3 primarily considers the 21 series monitoring bores, installed surround TSF3 in 2021. Figure 3 provides the location of monitoring bores in the network.

3.3.2 Review of Groundwater monitoring data

Groundwater levels TSF3

Seepage from TSF3 from continued tailings deposition at increase embankment heights may result in changes to the localised hydrogeological flow regime surrounding the TSF3 (due to increased hydraulic head). Where groundwater mounding is severe, it may affect the health of native vegetation that may exist at the surface close to TSF3, through inundation of the root zone and salt stress (i.e., through exposure to hypersaline groundwater). This can cause severe impacts to health and appearance, and even resulting in death, of vegetation.

The TSF3 starter embankment was constructed in November 2019 with tailings deposition occurring in early 2020. The 21 series bores were installed around TSF3 in early 2020. Six locations were chosen with 2 bores (A series deeper bore and a B series shallower bore) constructed at each location. All the shallower B series bores have been dry since construction except for 21/B6.

Figure 4 outlines the standing water levels (SWL) (in meters below top of casing (mbtoc)) over the last two years within the monitoring bores surrounding TSF3. The shallowest groundwater level observed around TSF3 in 2024 was observed in monitoring bore 21/B6 at 15 mbtoc. Over time, SWL at groundwater monitoring bores around TSF3 have remained relatively stable since the 2022 annual period, with the exception of bore 21/A2 which demonstrates a rising trend. At the time of this assessment none of the monitoring bores associated with TSF3 have exceeded the SWL limit of 4.0mbgl, specified within the licence.

There are no strong indications of groundwater mounding observed at any of the monitoring bores immediately adjacent to TSF3 (except for bore 21/A2) at this stage. However, the next 5 stages of embankment lifts for TSF3 are planned to occur over the next 3.5 years. These embankment raises will increase the storage capacity of TSF3 significantly from 6 million tonnes to 17 million tonnes. In turn this will increase the hydraulic head under the TSF which is likely to cause some mounding of the groundwater table in the future. It is important that the monitoring bore network is sufficient to ensure groundwater mounding is identified and management actions (groundwater recovery) is implemented before impacts to vegetation occurs.

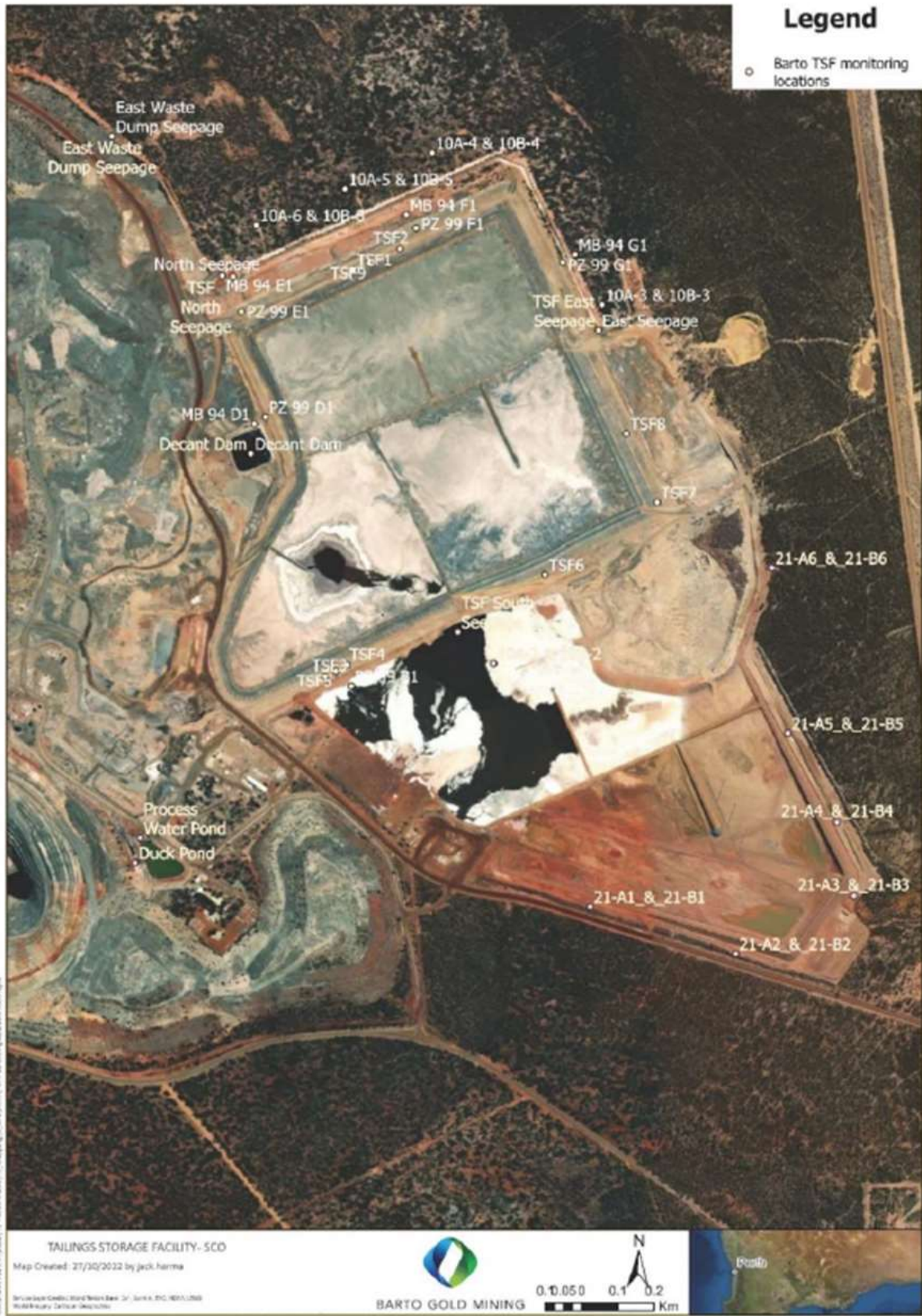


Figure 3: Location of groundwater monitoring bores surrounding TSF3

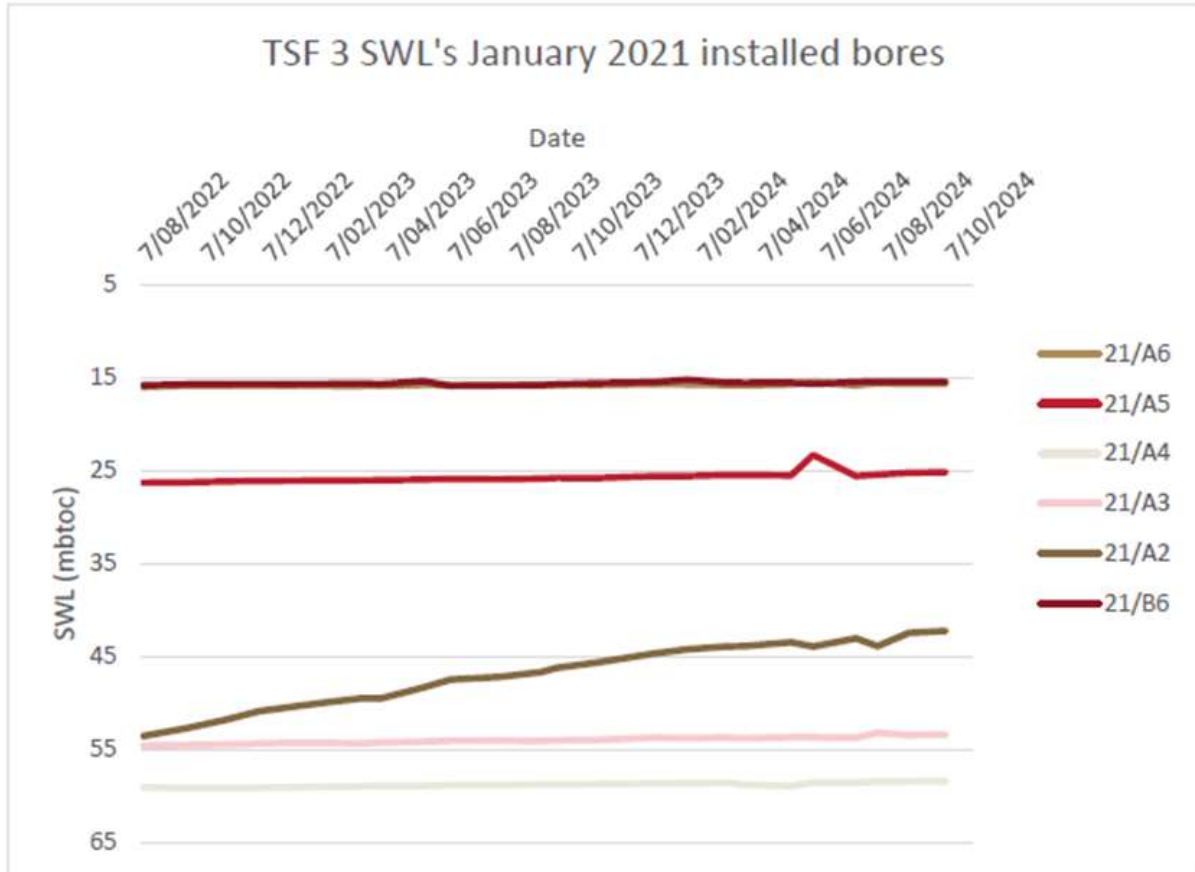


Figure 3: TSF3 – 21 Series Bores standing water levels since construction (graph sourced from Barto Gold Mining Pty Ltd, 2024a)

Groundwater levels surrounding TSF1 and TSF2

In addition to the currently operational TSF3, TSF facilities licensed under L4597/1988/14 also include TSF1, TSF2 and TSF2E. Deposition is not currently being undertaken at these TSFs.

During the construction of the original Marvel Loch TSF (1/2) in 1993/1994, monitoring bores referred to ‘94 series monitoring bores’ were installed close to the toe of the TSF. Historically there has been some seepage issues associated with TSF1 and TSF2, with monitoring bore MB94-G1 (see Figure 3) continuously breaching the standing water level limit of 4.0mbgl conditioned within licence L4597/1988/14. This has been occurring since 2017.

In November 2019, Tianya SXO Mining Pty Ltd (former licence holder) submitted a Groundwater Recovery Plan, in response to the ground water at MB94-G1 exceeding the limit in accordance with condition 9. At the time, the former licence holder stated that with deposition into TSF2 and TSF2E ceasing, and the commissioning of TSF3 will reduce the seepage from TSF2 and TSF2E and as such the groundwater within the areas affected will return to within the licence limits. Following the submission of the Groundwater Recovery Plan, it is understood that in 2019-2020, a seepage drainage and collection system was installed to capture seepage. Currently standing water levels within MB94-G1 remain steady, however they remain above the 4mbgl limit.

Review of water balance performance

A water balance for the sites TSF’s between July 2019 and June 2024 was provided as part of the application. In general, inflow and outflow of water balance is considered broadly stable, remaining within +/- 5% in most years between 2019 and 2024. Between June 2020 and July 2021, inflow exceeded outflow by 83,299 m³. This represents approximately 5.05% of total

inflow and coincides with early deposition of tailings in TSF3.

The department notes that the water balance for the TSF considers TSF1, TSF2, TSF2E, TSF3_1 and TSF3_2 in unison. Whilst the performance of the water balance of TSF3 is considered to be acceptable, it is noted that there is uncertainty in data due to the model being based on the wider TSF network.

Groundwater quality

Seepage from TSF3 can affect the quality of groundwater as it may contain potential contaminants (i.e., cyanide, metals and metalloids) that occur in the tailings. Impacted groundwater may have reduced potential for beneficial use. Groundwater at the premises is generally hypersaline and has limited uses, primarily abstracted for mining and ore processing purposes in the region. Tailings contaminants are typically informed by the geochemistry of the processed ore material. Consequently, seepage. The tailings characteristics have been assessed as being non-acid forming (Coffey Services Australia Pty Ltd, 2017)

Monitoring results from the 21a and 21B series bores indicated that (sourced from Barto Gold Pty Ltd, 2024a):

- Weak acid dissociable cyanide (WAD CN) concentrations generally in the range <0.004 up to 0.065mg/L.
- The pH values were between 4.3 and 8.4; and
- Total dissolved solids (TDS) values were between 3,500 and 84,000mg/L.

3.3.3 Licence Holder's controls and existing licence conditions

The Licence Holder has proposed controls to mitigate and reduce the impacts of seepage to the surrounding environment. As per the existing licence, there are also conditions to ensure that seepage will be adequately minimised and managed. These include:

- The base of the TSF3 is clay lined.
- TSF3 is operated to ensure the water pond around the decant facility is as small as practical in order to minimise the risk of seepage in accordance with operating manual.
- The TSF3 has an underdrainage system to minimise potential seepage. Seepage collect in downstream trenches is pumped back to the process dam at the processing plant. Existing condition 8 requires TSFs to have a seepage collection and recovery system to capture seepage from the TSF.
- A decant structure in each cell is incorporated into the design to recover water liberated from the tailings slurry. Recovered water will be pumped from the structures for re-use in the process plant.
- A supervising engineer will monitor TSF3 construction raises and suitable quality assurance procedures will be implemented.
- Monitoring bores are present surrounding TSF3 to detect impacts, specified management triggers and contingency actions. Existing conditions 9, 10 and 38 of the licence outline groundwater monitoring requirements including a 4 mbgl limit and a 6 mbgl target for standing water levels within groundwater monitoring bores. Condition 10 requires a groundwater management plan to be submitted in the event the target level is reached.
- Existing condition 11 requires the licence holder to undertake an annual water balance for TSFs to better understand water management within the TSFs.

3.3.4 Decision

The department has assessed the risk of seepage associated with the operation of TSF3 embankment raises for Cells 1 and 2 to a maximum embankment height of 456 m RL (stages 3-7) and has determined that it will likely increase the pressure of the hydraulic head, subsequently increasing the potential for groundwater mounding to impact vegetation.

Over time, SWL at groundwater monitoring bores around TSF3 have remained relatively stable, with the exception of bore 21/A2 which demonstrates a rising trend. No explanation for this trend has been given. Monthly SWLs should continue to be measured in the subsequent reporting period, with commentary on the rising trend of 21/A2 provided in future annual reports.

Given the nature of the paddock-style TSF, previous monitoring bore data and the significant increase in tailings storage capacity as a result of the embankment raises over the next 3.5 years it has been determined that the likelihood of additional groundwater mounding occurring in the area around TSF3 is **'possible'**.

Seepage from continued tailings deposition can result in further mounding around the TSF, to a level where groundwater may impact the root zone of surrounding vegetation. The 4mbgl limit for SWL has been breached in the past (albeit within bores for the neighboring TSF cells), and although there are management actions in place, it is possible for an exceedance to occur again, if proper tailings and water management is not adequately undertaken. The consequence rating for this event is therefore considered **'moderate'**. The risk rating for this risk event has therefore been assessed as **'medium'** risk.

The Delegated Officer has determined to approve the construction of embankment lifts 3-7 as the risk of groundwater mounding impacting native vegetation is deemed acceptable noting the existing conditions the licence holder is already required to comply with (i.e. limits and trigger levels for SWL in monitoring bores surrounding the TSF and groundwater recovery actions required by condition 10).

It has been determined however that due to the significant increase in tailings storage capacity over the next 3.5 years, a review of the groundwater bore monitoring network surrounding TSF3 is to be undertaken to ensure that it is adequate to monitoring mounding impacts in TSF3's zone of influence.

4. Consultation

Table 1 provides a summary of the consultation undertaken by the department.

Table 1: Consultation

Consultation method	Comments received	Department response
The Shire of Yilgarn was advised of proposal 3 December 2024	The shire responded on 20 December 2024 stating that: "the Shire of Yilgarn has no objections to the request for Barto Gold Mining Pty Ltd to amend their licence (L4597/1988/14) under Division 3 Part V of the Environmental Protection Act 1986 (EP Act)".	Noted
Licence Holder was provided with draft amendment on 4 February 2025.	Comments received 7 February 2025. Refer to Appendix 1	Refer to Appendix 1

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

Table 2: Summary of licence amendments

Condition no.	Proposed amendments
Front page	Premises details updated to exclude part of M77/109 and to refer to new premises map in Schedule 1. Expiry date updated to 25/09/2030
9	Condition 9 wording updated to improve clarity. Intent of condition remains the same.
11	Condition 11 updated to clarify that water balance is to be calculated for the <i>active</i> TSF.
16	Table 4 updated to add reference to Fraser's landfill and new figure 21.
24	Table references updated Construction requirements for TSF3 embankment lifts 3-7 and Fraser's landfill added to table.
26	Words 'until the end of stage 2' removed. Embankment and operating heights for Stages 3-7 added to table.
44	Table 13 updated to clarify what format data from the monitoring required in Table 11 should be provided in the annual environmental report.
47	Specified action added to the licence to require a groundwater monitoring bore investigation around TSF3.
Schedule 1: Maps	Figure references updated New Figure 1b added New Figure 21: Fraser's landfill added
Schedule 2: Design drawings	Figure references updated New Figures 28-33 added.

References

1. Barto Gold Mining Pty Ltd, 2024a, Southern Cross Operations L4597/1988/14, Annual Environmental Report 2023-2024, revision 0.1, submitted to the department 29/10/2024.
2. Barto Gold Mining Pty Ltd 2024b, Application for licence amendment L4597/1988/14 Supporting Documentation & Attachments (1A, 2, 3B, 6A, 7 & 10), Marvel Lock TSF 3 – add staged lifts 3-7 to licence, Frasers Landfill – add to licence, 18 September 2024.
3. Coffey Services Australia Pty Ltd, 2017, Minjar Gold Pty Ltd, Southern Cross Operations Tailings Storage Facility Design Report GEOTPERPT50031AA, Burswood, Western Australia,
4. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
5. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
6. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.

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

Condition	Summary of Licence Holder's comment	Department's response
Page 1	Remove tenement P77/3792 – this is a dead tenement	Licence updated with requested changes.
Page 6	Change the name of Decant Water Ponds 3 and 4 to 'TSF 1,2 & 3 decant water ponds'	
Condition 24	Barto's intends to use a stronger PN 20 pressure rated pipe with larger diameter (600mm) and black in colour. This will meet the 400L/s required specified in the supporting document of 2022 provided to DWER.	
Condition 33 Table 8	Remove Achilles North as an emission reference point – this pit has been backfilled.	
Condition 35 Table 9b	Remove Achilles North pit as a pit water source – this pit has been backfilled.	
Condition 37 Table 10	Remove Achilles North as a dewatering discharge point – this pit has been backfilled. please add Frasers Landfill to the last row and remove Transvaal Pit	
Condition 38, Table 11	Remove AXEMB1 and AXEMB2 as these were destroyed as part of pit development	
Pg 27, Premise Map	Update figure to show the removal of the section of M77/109 controlled by Cygnet	