Decision Report

Application for Works Approval

Part V Division 3 of the Environmental Protection Act 1986

Works Approval Number	W6900/2024/1
Applicant	FMR Investments Pty Ltd
ACN	009 411 349
File number	DER2024/000062
Premises	Greenfields Processing Site – Gunga West In-pit Tailings Storage Facility
	Mining Tenements: M15/1836, L15/356, and M15/1272 and Part of mining tenement M15/26 and Lots 102 and 103 on plan 40395 COOLGARDIE, WA 6429
	As defined by the premises map in Schedule 1 and the coordinates in Schedule 2 in the issued works approval
Date of report	5 August 2024
Decision	Works approval granted

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

Table of Contents

1.	Decis	sion summary1								
2.	Scop	e of as	sessment	1						
	2.1	Regula	Regulatory framework1							
	2.2	Overv	ew of premises an application summary	1						
		2.2.1	Proposed premises boundary and occupier status	1						
		2.2.2	Infrastructure and operation of the Gunga West In-Pit TSF	2						
		2.2.3	Geochemical characteristics of tailings	3						
		2.2.4	Characterisation of externally sourced ore	3						
	2.3	Depar	tment of Energy, Mines, Industry Regulation and Safety	4						
3.	Risk a	assess	sment	4						
	3.1	Source	e-pathways and receptors	5						
		3.1.1	Emissions and controls	5						
		3.1.2	Receptors	6						
	3.2	Risk ra	atings	8						
	3.3	Detaile	ed risk assessment for seepage from in-pit TSF	12						
		3.3.1	Overview of risk event	12						
		3.3.2	Hydrological assessment	12						
		3.3.3	Applicant proposed seepage monitoring	13						
		3.3.4	Risk assessment and decision	14						
4.	Cons	ultatio	n	14						
5.	Conc	lusion		15						
Refe	erence	s								

1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction and operation of the premises. As a result of this assessment works approval W6900/2024/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this decision report, the Department of Water and Environmental Regulation (the department; DWER) has considered and given due regard to its regulatory framework and relevant policy documents available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Overview of premises an application summary

FMR Investments Pty Ltd (the applicant) operates the Greenfields toll milling facility, approximately four kilometres (km) north-east of Coolgardie in the Goldfields region of Western Australia. The premises is regulated under licence L4680/1988/13 and has been approved for Category 5 activities under Part V Division 3 of the *Environmental Protection Act 1986* (EP Act). The milling facility uses a three-stages crushing system with a three-ball circuit, a gravity concentrator and a carbon in leach process to toll treat gold ore from external sources. Tailings from the mill are currently disposed of into two above ground tailing storage facilities (TSFs), TSF 3 and 4, located approximately 200m east of the processing plant. Adjacent to TSF 3, TSFs 1 and 2 have been decommissioned and have not received any tailings for over seven years.

On 14 February 2024 the applicant submitted an application to the department for a works approval under section 54 of the EP Act. The application is for the construction and time limited operation of the Gunga West In-Pit TSF located approximately three km north-east of the processing plant and just south of the Great Eastern Highway. The additional TSF capacity provided by the in-pit TSF will allow tailings to thoroughly dry and condense into TSF 3 and 4. The licence holder proposes to construct a pipeline system along the existing access road to connect the processing plant to the Gunga West In-Pit TSF for the transport of tailings and return water. The construction of five groundwater monitoring bores surrounding the pit is also proposed.

The premises relates to the category and assessed design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in works approval W6900/2024/1. The infrastructure, equipment and associated activities are outlined on the works approval and have been considered in accordance with *Guideline: Risk Assessments* (DWER 2020).

2.2.1 Proposed premises boundary and occupier status

The proposed works approval prescribed premises boundary is to include mining tenements: M15/26, M15/1272, M15/1836, miscellaneous licence L15/356 and Lots 102 and 103 on plan 40395 (Figure 1). Transfer of M15/26, M15/1272, and L15/356 from Black Mountain Gold Limited (a wholly owned subsidiary of Horizon Minerals Limited) is currently pending, however an Authorisation to Act letter signed by Horizon Minerals Limited's Managing Director (dated 20 Oct 2022) has been provided as part of the application. This letter states that the applicant is authorised to act for and on behalf of Black Mountain Gold Limited with respect to compliance with the EP Act and that the applicant has authority to carry out the Gunga West Mining Project on the tenements.

Ownership of Lot 103 is held by Northern Star Limited. The applicant holds an Access

Agreement with Northern Star Limited allowing them to operate an existing pipeline and bores associated with Licence L4680/1988/13. The Access Agreement has been amended to include the Gunga In-Pit TSF infrastructure.



Figure 1. Proposed premises boundary

2.2.2 Infrastructure and operation of the Gunga West In-Pit TSF

Gold tailings generated at the Greenfieds processing plant will be deposited into the Gunga West in-pit TSF. The pit is approximately 60 metres deep and has a surface area of 4.8 hectares. Tailings deposition will occur subaerially or sub-aqueously via a single discharge point at the northern side of the pit with tailings flowing in a southerly direction. As soon as a suitable sized pond has formed in the centre of the pit, reclaiming of the decant effluent will begin via a decant pump located on a floating pontoon. The pump will have a working capacity of over 145 tonnes per hour and will be accessible via a ramp on the south-eastern side for maintenance. The removed effluent will be transported and reused at the processing plant. On average, the applicant is expecting a 65% water return.

High density polyethylene (HDPE) pipelines will transport tailings and decant water. Pipelines nominal diameter will measure 200mm for tailings and 160mm for return water. Tailings pipelines will run along the existing access road on tenement L15/356 and Lot 103 and will follow the northern boundary of Lot 102 and TSFs 2 and 1 to the processing plant. Return water pipes will follow a very similar route but will also connect the return water pond to the processing plant where the return water will be reused. All pipelines will be contained within earthen bunded corridors and will be fit with isolation valves or flow and leak detection sensors. Inspections will take place twice daily when active to reduce any environmental impact in case of rupture. The access road will provide an entry point to access the pipeline.

Currently there are no groundwater monitoring bores surround the West Gunga in-pit TSF, therefore construction of bores will be necessary to monitor water quality and any mounding associated with seepage. Construction of the five proposed bores will be undertaken in

accordance with *Water Quality Protection Guideline* no 4 (Water and Rivers Commission 2000) and *The Minimum Construction Requirements for Water* Bores in Australia (National Uniform Drillers Licensing Committee 2020). While it is expected that groundwater conditions will be similar to those at TSF 3 and 4 near the toll milling facility, the lack of groundwater monitoring data surrounding the TSF, means that a baseline will need establishing. Further details are provided in section 3.3.

Day to day operations and any emergencies of the Gunga West in-pit TSF will be managed in accordance with the CMW Operations Manual provided with the application supporting documentation. This document is to be reviewed annually to ensure it remains current and accurate.

2.2.3 Geochemical characteristics of tailings

In 2012 SGS Australia Pty Ltd conducted sampling of the tailings' characteristics at the mill (GMW 2023a). The results reported indicated that none of the minor element enrichments were significant. Elemental sulphate testing, as one of the determining factors of acid mine drainage, showed a low net acid producing potential and non-acid generating. Table shows the pH, Total Dissolved solids (TDS) and Cyanide results (CN) from tailings and process return water samples. Cyanide results are shown as weak acid dissociable (WAD) CN, total CN and Free CN. Tailing properties are not expected to have changed since the study. Physical properties of TSF 3 dry tailings were analysed as part of an amendment application to raise TSF 3 embankment. Tailings were characterized as silt with a lack of plasticity.

Parameter	рН	TDS (mg/L)	WAD CN (mg/L)	Total CN (mg/L)	Free CN (mg/L)	
Tailings Discharge Water	9.1	154,000	52	170	42	
Process Return Water	7.1	173,000	11	210	19	

Table . Results of tailings and process return water testing during the 2012 analysis conducted by SGS Australia Pty Ltd.

2.2.4 Characterisation of externally sourced ore

To moderate any risk associated with accepting externally sourced gold ore the applicant has implemented a *New Ore Source Characterisation Testwork Procedure.* The procedure involves the following steps:

- 1. Testing of any externally sourced ore to include the following parameters:
 - pH
 - electrical conductivity
 - Total Sulphur (S)
 - multi element metal analysis: Antimony (Sb), Arsenic (As), Cadmium (Cd), Copper (Cu), Chromium (Cr), Gold (Au), Iron (Fe), Lead (Pb), Magnesium (Mg), Mercury (Hg), Nickel (Ni), Silver (Ag), and Zinc (Zn);
 - mineralogical examination for fibrous components (i.e., asbestos) or
 - a geological declaration confirming the absence of fibrous material in the ore source.
- 2. Additional testing to be undertaken when Total Sulfur weight percentage is above 0.05 on more than 50% of the samples:
 - Acid Neutralisation Capacity (ANC);
 - Total Inorganic Carbon (TIC);

- Net Acid Generation (NAG); and
- NAG pH.
- 3. Results from step two to be categorised in accordance with *Preventing Acid and Metalliferous drainage* (2016) into:
 - non-acid forming
 - uncertain
 - potentially acid forming low capacity
 - potentially acid forming

or in accordance with *Draft Guidance – Materials Characterisation Baseline Data Requirements for Mining Proposals* when data falls outside the above categories.

4. Where the analysis shows that the ore falls into category two, three or four of point 3, a further report by a qualified Geochemist is requested to determine the long term impact of tailings storage. Results are then considered by the applicant.

2.3 Department of Energy, Mines, Industry Regulation and Safety

Assessment of the structural integrity of the pit is not within the scope of this works approval but falls under the responsibilities of the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS). The applicant requested an amendment of mining proposal 122609 to include the Gunga West In-Pit TSF. The amendment is undergoing assessment and has not, been finalised by DEMIRS at the time of writing this report. DWER sought technical advice from DEMIRS on 8 March 2024 in relation to any possible concern on the design and stability of the in-pit TSF. The advice received is summarised below:

- Mining proposal registration 122609 has been submitted to DEMIRS and it includes the proposed Gunga West Pit TSF;
- The TSF has a low hazard rating and is classified under category 3;

(For more details and a definition of hazard ratings please refer to DEMIRS Code of *Practice 'Tailings storage facilities in Western Australia'*)

- While only minor instability of the Gunga West Pit walls has been found, monitoring must occur;
- There are no safety concerns with the operations of the pit, including decant water system and tailings deposition;
- It is acknowledged that a minimum freeboard of 1m is to be maintained to store a 1% AEP 72-hour duration storm event;
- The following proposed conditions are likely to be added to the mining proposal to ensure all hazards associated with the project are managed:
 - o daily inspections of the TSF by site personnel to ensure normal operation;
 - o triennial review of the TSF (when active) by an engineer or geotechnical specialist;
 - report specified above to be submitted to DEMIRS where any arising issues are addressed;
 - a further report to be submitted at the time of decommissioning to determine rehabilitation and remedial actions.
- It is the applicant's responsibility to ensure the mining approvals conditions are met.

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). For a risk event to occur there must be an emission, an actual or likely pathway of exposure and a resulting potential adverse effect on the receptor.

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 considered in this decision report are detailed in Table 2 below. Table also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Emission	Sources	Potential pathways	Proposed controls					
Construction								
Dust	Construction and installation of TSF related infrastructure including pipelines, decant water recovery system and bores. Vehicle movement.	Air / windborne pathway	 Regular visual monitoring. Water carts to be used across active work area to minimise dust. Speed restriction to apply to all vehicles. Stakeholders' complaints will be acted upon with the implementation of appropriate measures. 					
Time Limited O	Time Limited Operation							
Tailings slurry / supernatant water discharge to in- pit TSF	Pipeline leaks or rupture	Direct discharge	 Tailings pipelines will be constructed within earthen bunded corridors with scour pits or sumps. Isolation valves or flow and leak detection sensors will be fitted. Two daily routine inspections will be undertaken. Should a pipeline leak or rupture a shutdown of the affected section will follow until issue has been resolved. Decant water pump will be of no less than 145 tph working capacity. 					
	Overtopping of Gunga West In-pit TSF		 Minimum freeboard of 1m (RL 396.5m AHD) will be applied. This includes an allowance for the temporary storage of the 1:100 years or 1% average exceedance probability storm event. TSF will be operated in accordance with the Operational Manual (part of the supporting documents supplied with the application form, Appendix E) 					

Table 2: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
			Two routine visual inspections per shift will be undertaken to confirm freeboard.
	Tailings seepage to groundwater with	Vertical infiltration	 Installation of groundwater monitoring network will be established to detect seepage
	subsequent groundwater contamination and groundwater mounding	and horizontal migration	 Removal of water within the pit prior to tailings deposition
gi m			 In line with licence L4680/1988/13, a seepage management plan to be implemented if groundwater exceeds 6-meter below ground level (mbgl).
			 A monitoring program will include monthly sampling of standing water level, to be increased to fortnightly sampling when groundwater is less than five meters below ground.

3.1.2 Receptors

In accordance with the *Guideline: Risk Assessment* (DWER 2020), the Delegated Officer has excluded the applicant's employees, visitors, and contractors from its assessment. Protection of these parties often involves different prevention strategies and is provided for under other state legislation outside the scope of this report.

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

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

Human receptors	Distance from prescribed activity
Coolgardie township	Approximately 5 km south-west of the proposed TSF and 3.5 Km south-west of the processing plant where the tailings and return water piping network starts.
	Given the distance and the unlikelihood of this receptor to be impacted by the activities, it will not be considered further in the risk assessment.
Great Eastern Highway	141 m north of the proposed in-pit TSF
Cultural Receptors	Distance from prescribed activity
Aboriginal heritage places	Four registered Aboriginal heritage places 1.8Km or more south-west of the premises. Given the distance and the unlikelihood of these receptors to be impacted by the activities, they will not be considered further in the risk assessment.

National Heritage Place - Goldfields Water Supply Scheme WA (Mundaring to Kalgoorlie – Place ID 106007)	Approximately 220m from the proposed Gunga west in-pit TSF.			
	Remaining elements include the former steam powered pump stations, reservoirs tanks and pipelines.			
Environmental Receptors	Distance from prescribed activity			
 Acacia kempeana (Witchetty Bush) and Acacia aneura (Mulga) are dominant. Floristic composition includes Eucalyptus loxophleba (York gum), Eucalyptus salmonophloia (Salmon gum) 	Within the prescribed premises boundaries surrounding the in-pit TSF and the associated infrastructure.			
Groundwater	The premises is located within the Goldfields Proclaimed Groundwater Area and is therefore subject to the <i>Rights in Water and Irrigation Act 1914</i> .			
	Groundwater occurs within fracture rock aquifers and is expected to be low in volume.			
	Groundwater in the region is saline to hypersaline (>150,000mg/L) with a highly variable pH generally neutral to acidic.			
	There are no groundwater bores registered within 2.5 km hydraulically downgradient of the TSF			
Surface water	Brown Lake is an ephemeral Salt Lake located 5 km to the east of the premises boundary. Surface water typically drains to the east-southeast, towards Brown Lake.			
	Two ephemeral drainage lines intersect the proposed pit and the proposed tailings and return water pipeline system.			
Vulnerable fauna Leipoa ocellata (Maleefowl) 	Five mounds are located within the premises with one found 6 metres east of the pipeline infrastructure. The mounds are likely to be inactive and vary in age from 5 to 200 years.			
 Species of birds 'in need of special protection' under the Biodiversity Conservation Act 2016: Falco peregrinus (Peregrine Falcon) 	May be visitors at the premises.			
 Priority 3 Species of mammal under the <i>Biodiversity</i> <i>Conservation Act 2016</i> Nyctophilus major tor (Central long-ear bat) 	May be visitors at the premises.			

3.2 Risk ratings

For each identified emission source, risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020). Risk ratings consider 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 applicant 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 applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

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

Works approval W6900/2024/1 that accompanies this decision report authorises construction and time-limited operations. The conditions in the issued works approval, as outlined in Table 4 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of the premises. A risk assessment for the operational phase has been included in this decision report, however licence conditions will not be finalised until the department assesses the licence application.

Table 4: Risk assessment of potential emissions and discharges from the premises during construction and operation

Risk events					Risk rating ¹	Annlinent	Conditions ² of works approval	
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls	C = consequence L = likelihood	controls sufficient?		Justification for additional regulatory controls
Construction	Construction							
Construction and installation Gunga West In-pit TSF infrastructure Construction of monitoring bores Vehicle movement	Dust	<i>Pathway:</i> Air / windborne pathway <i>Impact:</i> human and ecological health as well as amenity	Nearby national heritage place Great Eastern Highway Native Vegetation	Refer to section 3.1	C = Slight L = Unlikely Low Risk	Y	Condition 1	Some dust emissions are expected during construction activities; however, it is expected to be minimal and of short duration. Applicant's controls have been conditioned within the works approval in accordance with DWER <i>Guideline: Risk</i> <i>Assessments nominal</i>
Time Limited Operat	ions							
Deposition of tailings into Guga West Pit	Tailings / return decant water	Pathway: overland runoff, direct discharge, from pipe rapture Impact: Heavy metal contamination of soil inhibiting vegetation growth / smothering of vegetation	Native Vegetation Surface water lines	Refer to section 3.1	C= Minor L= Unlikely Medium Risk	Y	Condition 1, 11	The Delegated Officer considers the applicant's proposed controls sufficient to reduce the risk associated with pipeline leaks / rupture. Applicant's controls have been conditioned within the works approval in accordance with DWER <i>Guideline: Risk</i> <i>Assessments</i>

OFFICIAL

Risk events					Risk rating ¹	Annlinent			
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls	C = consequence L = likelihood	controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls	
		Pathway: overland runoff, from overtopping Impact: contamination of soil through heavy metals, hypersaline effluent inhibiting vegetation growth			C= Moderate L= Unlikely Medium Risk	Υ	Condition 11	The Delegated Officer considers the applicant's proposed controls of a 1 meter freeboard, the removal of the decant water and the visual inspection frequency sufficient to reduce the risk of direct discharge of tailings and return decant effluent to land. Applicant's controls have been conditioned within the works approval in accordance with DWER <i>Guideline: Risk</i> <i>Assessments</i>	
	Tailings seepage	Pathway: Vertical infiltration and horizontal migration Impact: Groundwater mounding with potential surface expression of hypersaline groundwater	Native vegetation (soil health) Groundwater aquifer	Refer to section 3.1	C= Moderate L= Possible Medium Risk	Υ	Conditions 1, 11, 4 and 14	Refer to section 3.3 for detailed risk assessment.	

OFFICIAL

Risk events					Risk rating ¹	Applicant		
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls	C = consequence L = likelihood	controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
		Pathway: Vertical infiltration and horizontal migration Impact: Groundwater contamination from geochemical components in gold tailings	Groundwater aquifer Groundwater users	Refer to section 3.1	C= Moderate L= Unlikely Medium Risk	Y	Conditions 1, 11, 4 and 14	The Delegated Officer considers that the proposed Characterisation and testing procedure for the ore accepted at the premises will decrease the risk of contamination. Monitoring will also allow the works approval holder to detect any changes in water quality. Groundwater quality in the region is saline to hypersaline therefore not suitable for livestock grazing/or other beneficial use. Groundwater extraction does occur, but its main use is for mining operations. Applicant's controls have been conditioned within the works approval in accordance with DWER <i>Guideline: Risk</i> <i>Assessments</i>

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

Note 2: Proposed applicant controls are depicted by standard text. Bold and underline text depicts additional regulatory controls imposed by department.

3.3 Detailed risk assessment for seepage from in-pit TSF

3.3.1 Overview of risk event

The Gunga West In-Pit TSF is approximately 500m long, with a varying width from 40m on the northern side to 120 m on the southern. Its estimated volume is 0.95 cubic megameters sufficient to store approximately 1,250 000 tonnes of tailings slurry. Annual tailings production at the mill has been estimated to be approximately 1,000,000 tonnes per year resulting in an approximate TSF life of mine of 15 months. Deposited tailings are expected to have an initial moisture content of around 60% decreasing by up to one third, based on the stage of deposition. Placement of tailings into the TSF will lead to some degree of seepage through the walls and the base of the TSF. Seepage can result in groundwater contamination (already sufficiently addressed in section 3.2) and groundwater mounding from the additional pressure on the natural groundwater. Depending on the severity of the outward and upward groundwater displacement, hypoxic conditions (caused by water logging) and exposure to hypersaline water can ocur, leading to vegetation stress and death.

3.3.2 Hydrological assessment

The most recent hydrogeological assessment for the Gunga West Pit (CMW Geosciences 2024b) submitted as part of the application indicates that:

- Historically three known groundwater campaigns have taken place around the pit in 1998, 2012 and 2016 with drilling occurring at depth of up to 180m. Little or no groundwater was found.
- There are currently no bores surrounding the pit, and no targeted investigations were undertaken by the applicant in the area surrounding the pit. The hydrological conceptual model was therefore based on hydrological principles, historical weather data, and previous studies.
- The Gunga West pit sits within part of the Yilgarn Craton where Archaean greenstone belts are intruded by granitoid rocks. Regional hydrology shows that aquifers in the region are generally within fractured rock and contain low water volumes. At the premises basal sandstone unit preserved within paleochannels is the likely aquifer type to be found.
- Water quality is anticipated to be similar to that at the Greenfield mill. Groundwater pH measurements at the mill show values varying from 5.1 to 7.1 and salinity of 6,000 to 90,000 mg/L.
- The pit is positioned at the top of the catchment and local topography indicates that groundwater flow is in an easterly direction with a low rate of recharge dictated by the saline conditions and low permeability of the soil. Recharge occurs to the west of the pit on elevated ground while discharge is likely to occur into Brown Lake, 6 Km south of the site.
- The monthly water balance analysis predicts an average water return of 65% from the tailings' slurry deposited in the TSF. To ensure that the return water system can deal with the removal 1:100 year or 1% AEP 72-hour duration storm event (approximately 9600 m³), a capacity of 3,487 m³/day is required.

The purpose of a hydrological report is to undertake an in depth study of local conditions to predict the extent of the risk event and develop suitable to controls to avoid an implication to surrounding receptors. In this instance, given the lack of available data no concrete conclusions were drawn, instead, the applicant proposes to:

- Proactively remove supernatant effluent and
- Set a groundwater monitoring network to assess baseline data and any departure from that baseline on an ongoing basis.

3.3.3 Applicant proposed seepage monitoring

The applicant proposes the construction of five monitoring bores two upgradient and three downgradient of the pit. The proposed monitoring parameters and frequency are outlined in Table 4. Samples will be initially collected to establish a baseline as well as to confirm flow direction. A baseline will ensure that any changes to groundwater quality can be detected after tailings deposition starts. To address the uncertainty associated with groundwater conditions, the groundwater monitoring plan is to be reviewed annually to determine whether improvements can be made. Additionally, monitoring bores exact location may change slightly to that proposed due to practicalities such as viable access. The applicant acknowledges that the department may apply a 6 mbgl trigger level and a 4 mbgl limit consistent with condition 16 of licence L4680/1988/13. Condition 16 of the licence provides that when the trigger value for standing water level around the other TSFs on the premises is exceeded in any of the monitoring points, a seepage management plan must be submitted to the department within 15 days. This ensures seepage can be better managed and the damage to sensitive receptors can be minimised.

Parameter	Details
Groundwater level	 samples collected monthly (15 days apart) or fortnightly - where groundwater is less than 5 meters below ground level (mblgl)
Groundwater quality	 samples collected quarterly all sampled to be collected and preserved in accordance with AS/ANZ 5667.1 standards all samples to be analysed by a NATA accredited laboratory samples to assess the following parameters: pH Total dissolved solids (TDS) Total cyanide (TCN) Free cyanide (FCN) WAD cyanide Total Alkalinity (CaCO3) Chloride (CI) And the total metals suite comprising of: Aluminium (AI) Arsenic (As) Cadmium (Cd) Calcium (Ca) Chromium (Cr) Copper (Cu) Iron (Fe) Lead (Pb) Maganese (Mn) Mercury (Hg) Nickel (Ni) Potassium (K) Selenium (Se) Sodium (Na) Zinc (Zn)

 Table 4: Proposed monitoring parameters

3.3.4 Risk assessment and decision

The Delegated Officer acknowledges that the extent of any groundwater mounding risk cannot be determined given the lack of relevant and site specific data. Hydrological principles used by the applicant are reasonable in nature however, a number of assumptions are too general to draw valid conclusions. For instance, mean annual rainfall and evaporation rates (195mm and 2,677mm respectively) are based on 2022 alone while the mean evapotranspiration value considered (1,150mm) was obtained from recorded data between 1961 and 1990. Additionally, the evaporation rate calculated using a pan factor may not accurately reflect the magnitude and variability of the evaporation at the premises in-pit TSF (McJannet et al., 2017; McJannet et al., 2022). All these factors may in turn affect the calculated seepage rate.

Given the uncertainty around the extend of groundwater mounding to be expected a likelihood rating of 'possible' has been determined for this risk event with a consequence of 'moderate' due to the potential impact on native vegetation health at the surface from hypersaline groundwater entering the root zone. This has resulted in a risk rating of 'medium'.

The applicant's proposed controls, such as removal of decant water and the installation of a suitable monitoring network around the pit for groundwater quality and standing water level, have been conditioned. A requirement to undertake a minimum of four weeks of baseline monitoring has also been conditioned.

The Delegated Officer has also determined that it is necessary to apply a standing water level limit to the monitoring bores surrounding the in-pit TSF to ensure that groundwater levels do not impact vegetation during time limited operations. It is recommended that during the licence amendment process that the trigger level (6mbgl) and associated management actions (seepage management plan) required by condition 16 of the existing licence should be extended to include the monitoring bores surrounding this new in-pit TSF.

4. Consultation

Table Table 5 provides a summary of the consultation undertaken by the department.

Table 5: Consultation

Consultation method	Comments received	Department response
The application was advertised on the department's website on 25 March 2024	No comments received	N/A
Local Government Authority was advised of proposal on 25 March 2023	No comments received	N/A
DEMIRS was advised of the proposal on 8 March 2024.	DEMIRS replied on 26 March 2024. Advice provided is shown in section 2.3 of the report.	Noted.
Applicant was provided with draft documents on 03/05/2024	No comments.	Noted.

5. Conclusion

Based on the assessment in this decision report, the delegated officer has determined that a works approval will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

References

- 1. Australian Government 2016, Preventing acid and metalliferous drainage Leading Practice Sustainable Development Program for the Mining Industry. Canberra
- 2. CMW Geoscience (CMW) 2023a, Gunga West Pit Tailings Storage Facility (GWPTSF), Design Report Ref: PER 2023-0024AB Rev 1, Western Australia.
- 3. CMW Geoscience (CMW) 2023b, *Gunga West Pit Tailings Storage Facility (GWPTSF): Hydrogeological Report,* Ref: PER 2023-0024AB Rev 1, Western Australia.
- 4. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
- 5. Department of Mines and Petroleum 2013, Tailings storage facilities in Western Australia – code of practice: Resources Safety and Environment Divisions, Department of Mines and Petroleum, Perth Western Australia.
- 6. Department of Mines and Petroleum 2016, *Draft Guidance Materials Characterisation Baseline Data Requirements for Mining Proposals.* Perth, Western Australia.
- 7. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
- 8. DWER 2020, Guideline: Risk Assessments, Perth, Western Australia.
- 9. McJannet, D., Hawdon, A., Van Niel, T., Boadle, D., Baker, B., trefry, M. and Rea, I., 2017. Measurements of evaporation from a mine void lake and testing of modelling approaches. *Journal of Hydrology*, **555**, 631-647.
- 10. McJannet, D., Carlin, G., Ticehurst, C., Greve, A. and Sardella, C., 2022. Determination of evaporation from a tailings storage facility using field measurements and satellite observations. *Mine Water and the Environment*, **41**, 176-193.
- 11. National Uniform Drillers Licensing Committee 2020, Minimum Construction Requirements for Water Bores in Australia, Australia.
- 12. Water and Rivers Commission 2000, *Water Quality Protection Guidelines No. 4 Mining and Mineral Installation of minesite groundwater monitoring bores,* Western Australia.