Application for Works Approval

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

Works Approval Number	W6579/2021/1
Applicant	OZ Minerals Musgrave Operations Pty Ltd
ACN	640 213 341
File number	DER2021/000448
Premises	West Musgrave Project Mining Licences: M 69/149, L 69/56 and L 69/57
Date of report	20 July 2022
Proposed Decision	Works approval granted

Paul Newell

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

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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 W6579/2021/1 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 which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Application summary and overview of premises

On 2 August 2021, Oz Minerals Musgrave Operations Pty Ltd (the applicant) submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act).

The application is to undertake construction works relating to the development of a copper and nickel mine referred to as the West Musgrave Project (WMP), or premises. The WMP is located in the West Musgrave Ranges of Western Australia approximately 1,300 km north-east of Perth near the intersection of the borders between Western Australia, South Australia and the Northern Territory. The nearest communities include Jameson (Mantamaru) 26 km north, Blackstone (Papulankutja) 50 km east, and Warburton (Milyirrtjarra) 110 km west of the project.

The premises relates to the categories and assessed production / design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined on the cover page of works approval W6579/2021/1. The infrastructure and equipment relating to the premises categories outlined in works approval W6579/2021/1 are described below:

- Ore crushing, beneficiation and tailings disposal
- Crushing and screening of non-ore material for road base and aggregate using mobile plant equipment
- Electric power generation
- Wastewater treatment
- Waste storage and on-site landfilling activities
- Chemical storage associated with processing and refuelling facilities

In accordance with the department's *Guideline: Risk Assessments* (DWER, 2020), this decision report assesses the environmental, public health and amenity risks associated with applicant's proposal to construct, install and where appropriate, commission and operate the infrastructure listed above that make the premises prescribed. Exclusions to the risk assessment are provided in section 2.4.

2.2.1 Ore processing

The proposed WMP ore processing plant has a design capacity of 12.5 million tonnes per annum (Mtpa) with a nominal production rate of 12 Mtpa. On average, the targeted production rate is approximately 22,000 to 26,000 tonnes per annum (tpa) for nickel, and 28,000 to 32,000 tpa for copper using the process steps outlined below and depicted in Figure 1.

1. Crushed ore stockpiling and reclaiming
2. Grinding and classification (three vertical roller mills)
3. Bulk rougher flotation
4. Rougher concentrate re-grind
5. Two stages of cleaner flotation
6. Separation circuits for copper and nickel concentrates
7. Copper and nickel concentrate thickening, filtration and storage
8. Tailings thickening and disposal.

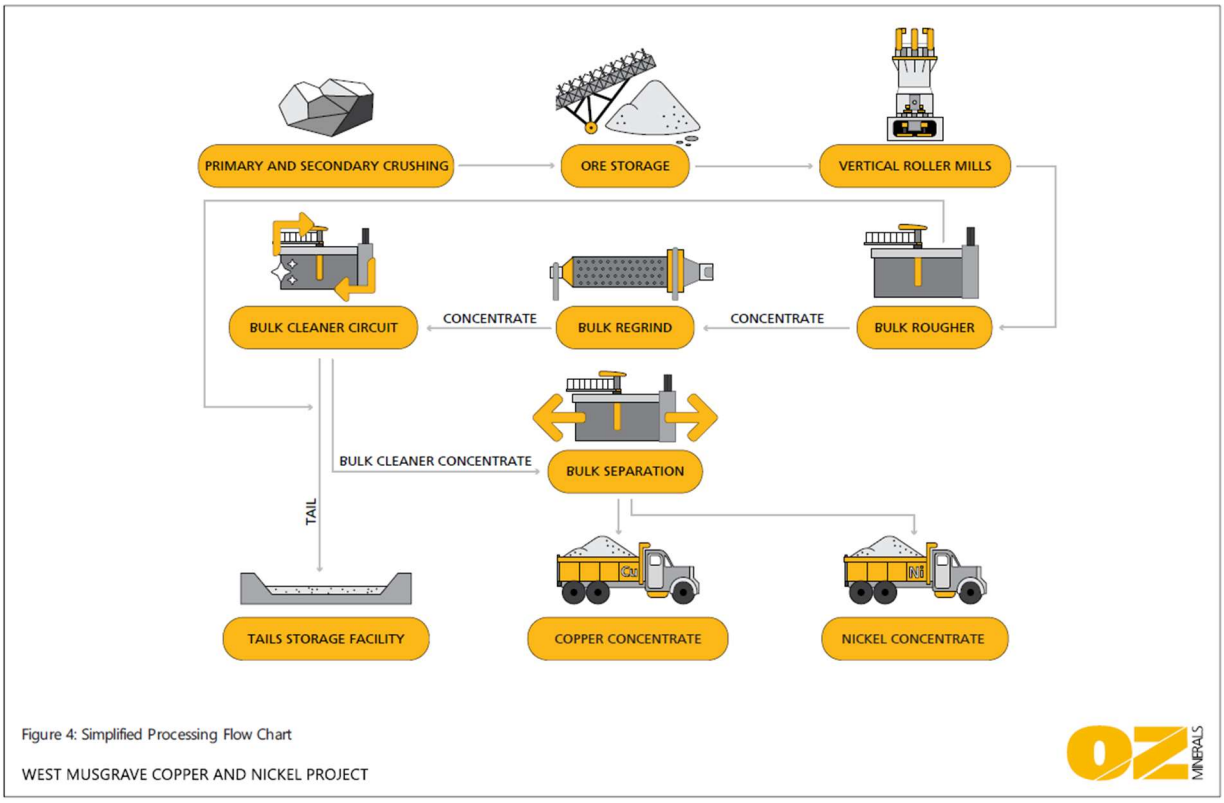

Figure 1: WMP ore processing flow chart

A general site layout is presented in Figure 1 of the works approval. Construction of the processing facility is expected to be complete in 2024, with a 26 week commissioning period to commence soon after construction.

Commissioning

The WMP processing plant will be commissioned to ensure that infrastructure operates in accordance with manufacturer specifications and at the efficiencies required to achieve the desired product quality and waste outputs during operations. Commissioning will be undertaken in 7 stages over approximately 26 weeks:

1. Verification of plant and equipment – ensuring installation complies with relevant standards, specifications and design intent. No equipment is operated in this phase.
2. Dry commissioning – items of the WMP are readied for use and/or energised without material being input through the system.
3. Wet commissioning – testing individual or grouped items of plant equipment with for example, air or water (non-ore) to demonstrate stable operation.

4. Ore commissioning – as with wet commissioning but with the introduction of ore and process fluids that will be processing inputs during operations. This process involves equipment checks, control sequences being checked under load and control loops being tuned.
5. Performance verification – determination that individual or grouped items of the plant can perform to pre-defined parameters that are representative of operations. The readiness of the processing facility to operate are considered, specifically in relation to:
    - the availability of suitable materials (including ore, reagents, lubricants and fuel);
    - maintenance and other consumables;
    - availability of trained operations workforce;
    - availability of suitable sampling equipment; and
    - readiness of site assay and metallurgical laboratory facilities.
    - First discharge of processing waste/tailings to the Tailings Storage Facility anticipated 2 years after commencement of construction (refer to section 2.2.2).
    - Tailings pipeline and spigot valve positions are inspected prior to the first tailings waste being pumped. Leak detection alarms will be muted initially to allow flow to be stabilised although the duration of this will be minimised to avoid undetected leakage.
6. Area acceptance and commissioning closeout – sign off and finalisation of commissioning activities. A Processing Plant Performance Test Report is prepared to summarise the outcomes achieved during commissioning.

Product

Processed copper and nickel concentrate will be deposited in concrete bunkers where they will then be removed by front end loader for stockpiling within the concrete-lined concentrate storage shed.

Shed doors will remain closed unless where transport truck ingress and egress is required. To minimise the risk of wheel-carried contaminants entering and exiting the storage shed, entrance and exit roads would be concreted for at least 20 m and roads would drain back to a common sump to allow reclaim of tracked concentrate material. Prior to leaving the shed, the truck driver will sweep off visible spillage from the concentrate container of trailer.

Process water pond

A process water pond with a capacity of up to 50,000 m^3 will be constructed for the management of feed water to the processing plant. Inputs to the pond will include groundwater from the borefield, thickener overflow waters, TSF decant water and water pumped from sumps located around the WMP. The pond will be lined using a 1.0 mm high density polyethylene (HDPE) plastic liner and equipped with Leak Detection and Removal System, which will remove seepage to an external sump.

2.2.2 Tailings storage

Tailings from the processing facility will undergo thickening to achieve a deposited density of 60–65% solids by mass. Discharge from the tailings thickener underflow would be pumped to the tailings hopper and then via two stage pumping to the TSF. The tailings thickener overflow would report by gravity to the process water dam.

Soil investigations at the TSF location have identified a natural foundation comprising approximately 2 m layer of aeolian sand overlying a 2 m layer of calcrete hardpan, both underlaid by a deep profile of well-graded soil (Garford Formation). Other areas of the proposed

TSF location will be over calcareous stony soils, which are dominated by weathered calcrete/silcrete peneplain covered by a thin (or non-existent) layer of sand.

Underlying calcrete base of the proposed TSF is strongly alkaline with a pH ranging between 8.3 and 9.1. The assumed permeability of the underlying calcrete foundation is 1 x 10^{-7} m/s, based on seepage modelling (Golder, 2021; Oz Minerals, 2022). However, further geotechnical investigation shows that the average permeability of the TSF foundation is closer to 10^{-6} m/s with some core logs identifying substrate with a permeability of 2.1 x10^{-5} m/s, consistent with that of sand or mudstone (Golder, 2021).

The applicant proposes to dig to the calcrete foundation to connect the starter embankment, which will have a similar permeability and constructed from graded, non-dispersive clayey fill sourced locally. The assumed permeability of the starter embankment through modelling is 1 x 10^{-8} m/s with connection to the calcrete base (where present) achieved through removing loose, unstable soils to a depth of two metres and rip and recompact fractured and/or brecciated hardpan calcrete encountered (Golder, 2021).

The starter embankment will accommodate the first 18 months of ore processing, equivalent to approximately 14 Mt of tailings material.

To allow for seepage recovery during operations, an underdrainage system will be constructed with seepage collection within approximately 50 m and 100 m upstream of the toe. Underdrainage will also be constructed for seepage collection beneath the two decant pond locations, which will act to reduce horizontal migration of seepage toward the TSF embankments (Figure 2).

Deposition of tailings will be managed to achieve a beach slope of approximately 1V:100H, encouraging the creation of a localised supernatant pond in each cell to allow recovery using a floating turret decant for return to the processing plant. The proposed floating decant will be capable of pumping water from a supernatant pond to a minimum depth of 250 mm.

Collected supernatant or seepage water will be returned directly to the process water pond located at the processing plant.

Tailings transport

Tailings pipeline will be installed within a dedicated pipeline corridor within a bunded trench, nominally 0.8 m deep. The trench would be graded to sumps to allow for the collection of spilled material, with a leak detection system installed and capable of remote operator shutdown features in the event of a substantial leak or failure. A maintenance access track will follow the tailings and return water pipeline to allow for visual inspection.

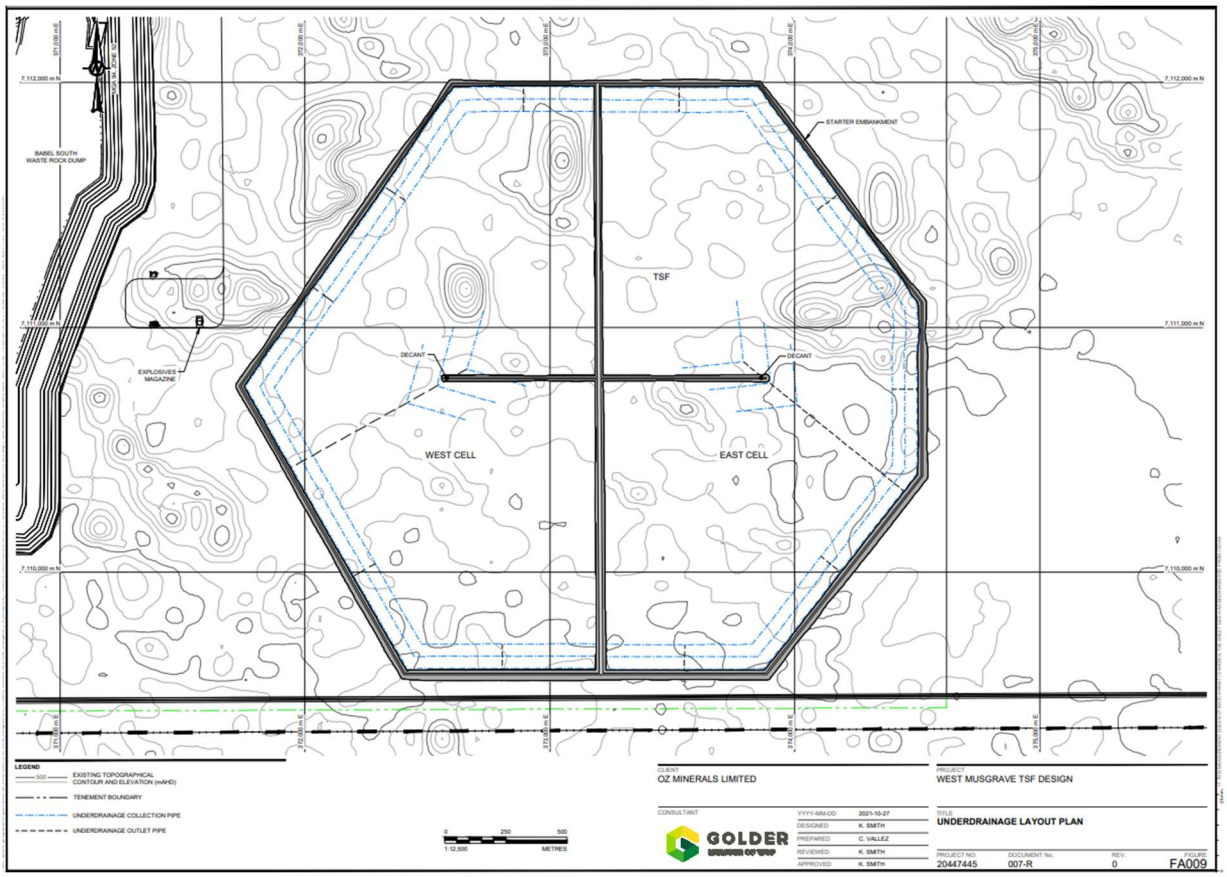

Figure 2: Tailings storage facility underdrainage

The TSF is expected to reach a final height of up to 48.3 m (513.3 m RL) using an upstream raise method that sources lift material from dried, compacted tailings. Maximum rate of rise will be approximately 2 m/year at full operations. However, this assessment is limited to the construction and time limited operation of the initial TSF constructed with a starter embankment to 6.0 m above ground level (refer to section 2.4 on exclusions to this assessment).

Key finding: Seepage modelling conducted in support of the application assumes a lower permeability of the TSF base than what has been identified through later soil investigation. Therefore seepage rates are likely to exceed the assumed rates presented through modelling. Limited borehole investigations also identify significant inconsistency in the soil structure of the TSF base, meaning that some areas will be significantly more permeable than others.

The TSF is located over a palaeochannel, which has the potential to transport contaminants to sensitive environmental receptors to the south.

Embankment lifts to allow an increase in capacity of the TSF will require separate assessment and approval, and are therefore beyond the scope of this assessment.

2.2.3 Mobile crushing and screening

Mobile crushing and screening will be required for the development of roads and hardstand areas in the initial stages of premises construction although additional crushing and screening may be required ongoing.

Road base and foundation/hardstand materials will be sourced from a local borrow pit using a 30 tonne excavator to feed a mobile jaw crusher capable of crushing material at a rate of 700 tonnes per hour (t/hour). Crushed rock will then be conveyed to a mobile screen to separate the crushed rock into three products used in road construction:

- base course (approximately 69,000 m^3);
- sub-base course (approximately 79,920 m^3); and
- subgrade improvement material (as required).

The screening plant is expected to have a maximum throughput rate of 600 t/hour, which will likely dictate the overall crushing and screening throughput rate of the facility.

Stockpiled material will be limited to 5 m in height. During premises construction the turnover of stockpiles is expected to be such that erosion controls will be difficult to practicably implement. However, during ongoing operations stockpiles may remain static for extended periods, at which point tarpaulins or chemical dust suppressant will be applied to prevent dust.

Stockpiled screened material will be collected by front end loader for transport to the construction area via dump truck (40 tonne payload). Alternatively the mobile plant will be located around the premises in closer proximity to construction sites, depending on the suitability of the location for a borrow pit and access tracks. Each crushing and screening location will require the development of a hardstand area for stockpiling and vehicle movement.

2.2.4 Electric power generation

The WMP will primarily be powered through renewable energy sources during operations. However, there is a requirement for instantaneous load or emergency/standby power from diesel generated power. The electricity generation plant will consist of an engine hall (semi-enclosed building with roof) housing between 12 and 25 diesel-fueled gensets, each of a capacity between 2 megawatt equivalent (MWe) and 4.2 MWe, totaling a capacity of 56 MWe.

Storage of up to 3 million litres (ML) of diesel will be required to supply the gensets will be stored in bunded, above ground storage tanks (refer to section 2.2.7). Generator exhaust gases will be directed to a stack located on each genset (12 to 25 in total). Equivalent emission rates for the overall power generation circuit are presented in Table 1.

Table 1: Total estimated emission rates from power generation during normal operations

Equipment	Parameter	Estimated emission rate (g/s)	Emission rate (tonnes per annum)
Diesel genset units (56 MWe)	Carbon monoxide	46.0	1462.8
	Flouride compounds	0	0
	Nitrous oxides (NOx)	110.4	3496
	$PM_{2.5}$	5.75	186.3
	PM_{10}	5.98	190.9
	Polycyclic aromatic hydrocarbons (PAH)	0	0
	Sulfur dioxide	0.069	2.185
	Total volatile organic compounds (VOCs)	4.6	167.9

The building and genset foundations will be constructed of concrete with the building floor area drained to a 600 mm wide culvert running the full length of the building. The building has been

designed to ensure all hydrocarbon spills and contaminated water is contained within the building area and directed through to a spill containment pit. Uncontaminated stormwater, including floodwater will be diverted around the building with concrete foundations built to at least 100 mm above ground level.

Commissioning of the power generation plant will be over 26 weeks.

2.2.5 Wastewater treatment plant

The applicant proposes to install a 'Passive' wastewater treatment plant (WWTP) to treat all wastewater for reuse as grey water. The treatment system consists of underground primary treatment (anaerobic digestion) tanks prior to discharge to grass and soil filter beds sitting over a low permeability-lined basin, designed to prevent seepage to groundwater. While some water and nutrients will be taken up by vegetation and soil, seepage is collected in a drainage channel that feeds to the tertiary (UV, ozone and chlorination) treatment system before being pumped to storage tanks for later reuse (Figure 3). There remains the potential for irrigation of treated wastewater to an irrigation field from the Passive WWTP, although the applicant has expressed preference for reuse.

However, due to the remote location of the premises, the applicant has proposed to install a backup temporary two-unit sequence batch reactor (SBR unit) and membrane bioreactor (MBR) WWTP to service the wastewater requirements of the initial construction workforce, which may reach approximately 1,100 personnel.

During the WMP construction phase the WWTP will have an initial capacity of around 100 m^3/day (operating with the SBR only) and up to 275 m^3/day when operating at full capacity (SBR plus MBR). Following peak construction and leading into operation of the WMP, the primary wastewater treatment infrastructure will be required to service approximately 400 personnel.

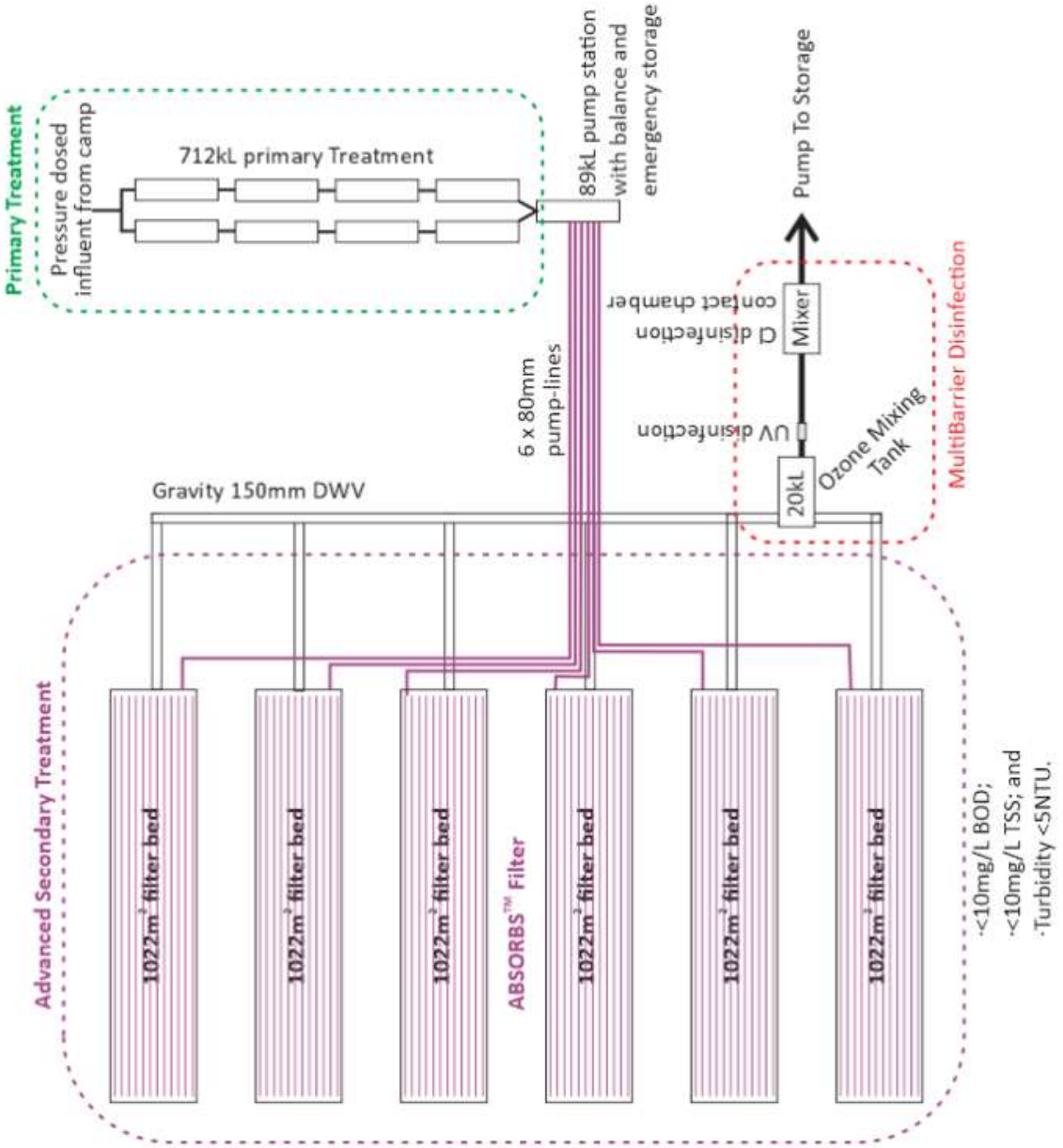

Figure 3: Passive WWTP layout

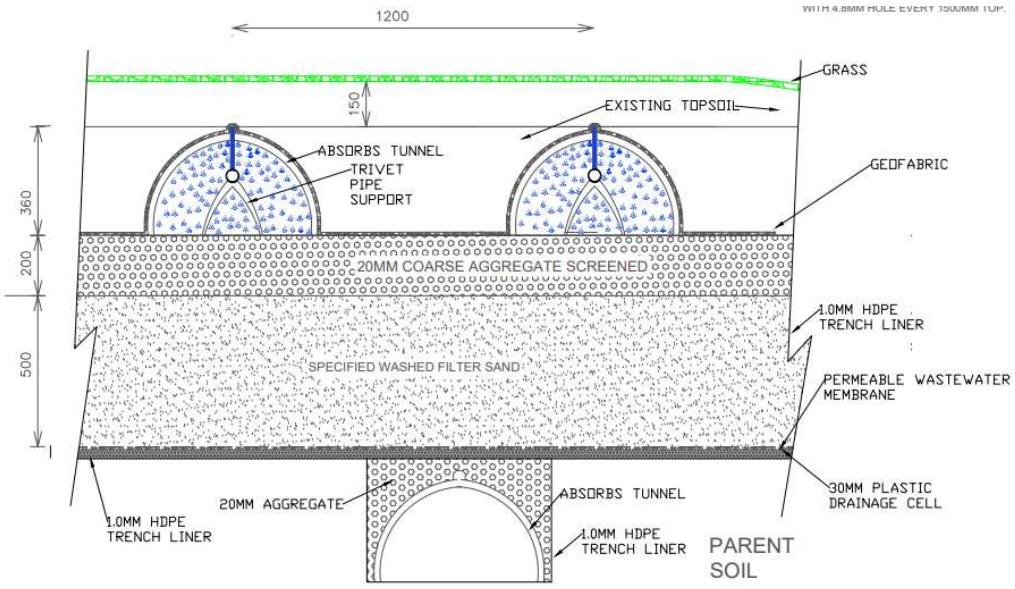

Figure 4: Cross-section layout of filter bed (secondary) treatment system of the Passive WWTP

SBR and MBR (temporary plants)

In the event that the Passive WWTP cannot be installed prior ot the construction workforce arriving, two units of SBR would be installed adjacent to an MBR unit. The SBR reactor basin is filled from the balance tanks. Once the basin is full, the reaction phase commences which is a combination of anoxic and aerobic phases to achieve high levels of biological oxygen demand (BOD) and nitrogen removal. Following anaerobic digestion, mixed liquor is aerated using fixed or floating mechanical pumps, or by transferring air into fine bubble diffusers fixed to the floor of the tank.

Suspended solids are then allowed to settle and the treated wastewater is separated from the sludge for final irrigation. Sludge and treated wastewater will be stored in separate tanks prior to removal/discharge.

The MBR plant removes foreign objects prior to treatment via an inlet screen. Similar anaerobic and aerobic processes occur in the MBR compared to the SBR to promote nitrification and BOD removal. However, in the MBR unit liquor from the aerobic chamber is recycled back to the anoxic tank to complete the denitrification reaction. Treated wastewater is then filtered via the membranes and pumped to treated effluent tank where it is dosed with sodium hypchlorite for bacterial removal.

Treatment

Treated effluent quality at all WWTP systems is expected to meet the target outputs specified in the *Australian Guidelines for Sewerage Systems – Effluent Management 1997* (ANZECC/ARMCANZ,1997) following secondary treatment. Table 2 details the target effluent quality from the temporary SBR and MBR systems.

Table 2: Influent and effluent quality at temporary wastewater treatment facilities

Parameter	**SBR**		**MBR**	
	Influent	**Effluent**	**Influent**	**Effluent**
Hydraulic capacity (kL/d)	100	100	225	225
Biological Oxygen Demand, BOD	350	<20	350	<10

(mg/L)				
Total Suspended Solids, TSS (mg/L)	350	<30	350	<10
Total Nitrogen (mg/L)	60	<30	60	<30
Total Phosphorus (mg/L)	14	<8	14	<8
pH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
Fats, oils, grease (mg/L)	50	<5	50	<5
E. Coli (cfu/100 mL)	N/A	<1,000	N/A	<1
Residual Chlorine (mg/L)	N/A	0.2-2.0	N/A	0.2-2.0
Turbidity (NTU)	-	-	N/A	<2 (95%) <5 (Max)

Wastewater treatment at the Passive WWTP is designed to meet the Department of Health (DoH) *Guidelines for the Non-Potable Uses of Recycled Water in WA* (DoH, 2011). Table 3 demonstrates that the treatment quality will meet DoH Guidelines and ANZECC/ARMCANZ secondary treatment standards.

Table 3: Influent and effluent quality at Passive WWTP

Parameter	**Wastewater quality**			**Treatment standards[1]**
	Influent	**Effluent to secondary treatment (closed system)**	**Effluent from tertiary treatment (for reuse)**	
Hydraulic capacity (kL/d)	275	275	275	N/A
Biological Oxygen Demand, BOD (mg/L)	300	10	1	<10
Total Suspended Solids, TSS (mg/L)	600	9	2	<10
Total Nitrogen (mg/L)	50	3	2	30-55
Total Phosphorus (mg/L)	15	11	8	6-14
pH	6.0-9.0	6.5-8	6.5-8	6.5-8.5
Fats, oils, grease (mg/L)	100	1	0.5	<10
E. Coli (cfu/100 mL)	$10^4 – 10^{10}$	$10^{7.5} – 10^{9.5}$	<1	<1
Residual Chlorine (mg/L)	N/A	N/A	0.5	0.2-2.0
Turbidity (NTU)	High	250	1	<2 (95%) <5 (Max)

Note 1: Refers to the most conservative wastewater output standard for either ‘High’ exposure risk level

wastewater reuse purposes (Department of Health, 2011), or typical effluent quality following secondary wastewater treatment (ANZECC/ARMCANZ, 1997)

Based on the treated wastewater quality detailed in Table 3, water will be able to be reused for the following potential purposes onsite:

- Dust suppression
- Process water
- Grey water reuse
- Irrigation of plantings
- Bioremediation pad irrigation

The above wastewater uses are classed as 'High' exposure risk level, based on the potential for human contact as defined in DoH Guidelines (2011).

Irrigation and disposal of solids

Where treated wastewater is not found suitable for reuse in the WMP processing facility, it will be irrigated to a 50 hectare irrigation area located adjacent to the WWTP.

Soils at the proposed project are red sands with no nearby watercourses and are classified as risk category B (WQPN 22). A review of the soils at the project and vulnerability to eutrophication for soils of this risk category indicates that the maximum allowable nitrogen (N) and phosphorus (P) loads are 180 kg/ha/year and 20 kg/ha/year, respectively.

Sludge will be stored in a tank where it is dosed with a coagulating agent and later transferred to the sludge dewatering unit, which consists of an in-line screw filter press to remove excess water. Drained water will then be captured and returned to the MBR unit for further treatment.

Commissioning

Each WWTP will be commissioned to ensure all connections are sealed, pumps and high level alarms are functioning satisfactorily. Wastewater feed will be gradually increased until steady-state design volumes are reached. The commissioning period for the WWTP units and irrigation field is expected to take up to 12 weeks.

Biosolids/sludge produced from WWTP equipment will be drained and directed to the landfill.

Key finding: Exposure standards for the protection of human health are more conservative than standards typically applied through Part V regulation for irrigation of treated wastewater to land. Table 3 demonstrates that the quality of treated effluent from the Passive WWTP will meet, or be to higher quality than the SBR and MBR treatment facilities, which are designed for the protection of environmental values.

All reuse of treated wastewater will be regulated by the DoH to ensure health exposure standards are met.

2.2.6 Waste storage and disposal

Waste at the premises will be either disposed onsite at a Class II landfill or sent offsite for recycling or disposal. The landfill will consist of a series of trenches approximately 150 m in length and 6 m width in a designated area (fenced) of approximately 300 x 200 m. Waste will be progressively deposited and compacted in each landfill trench with overburden deposited over the waste on a minimum weekly basis.

The landfill will be surrounded by a surface water diversion drain and bunding to direct surface water flows around the facility in the event of an overland flow rainfall event.

Some wastes will also be stored at the premises' waste transfer facility (WTF) prior to either

landfilling onsite or offsite removal (refer to Table 4).

Table 4: Waste storage and disposal

Waste type	Amount	Proposed management
Landfill[1]		
Clean fill	Unspecified	Used to cap landfill waste.
General waste (Inert Waste and Putrescible Waste, including xanthate packaging)	404 tonnes per annum (tpa)	Residual waste mobile garbage bins to be collected by the waste services contractor or village services contractor and contents disposed to site landfill. Capped weekly and at closure.
Village waste (Inert Waste and Putrescible Waste)	82 tpa	
Timber (Putrescible waste)	195 tpa	Capped weekly and at closure.
Special Wastes Type 2 (biomedical wastes that do not require incineration)	Unspecified	Capped weekly and at closure.
Inert Waste Type 2 (industrial and commercial) including miscellaneous construction wastes, HDPE pipe and plastics, rubbers e.g. conveyor belt material.	500 tpa	Capped weekly and at closure.
Inert Waste Type 3 (biosolids/sludge from the WWTP)	45 tpa	Capped weekly and at closure.
Special Waste Type 1 and Type 3	0 tpa	Asbestos and PFAS not to be used on site. As a new site these wastes are not anticipated to be encountered.
Waste storage		
Inert Waste Type 1 e.g. concrete and other construction wastes, non-recyclable plastics	500 tpa	Stored at the WTF. Disposal of some plastics and excess concrete to landfill.
Special Wastes Type 2 – biomedical wastes	Unspecified	Non-sharps stored at the WTF and taken to an incineration drum at the Emergency Response Team Training Ground for disposal. Sharps disposed offsite.
Hydrocarbon wastes (oil, grease and other hydrocarbon waste)	Approximately 39,100 tpa	Collected in IBC's or sealed steel 205L drums and located throughout site in bunded locations, including the WTF and bioremediation pad. Transported by a licensed waste services contractor for offsite disposal.
Recyclables	Glass – 96 IBCs	Stored at the WTF

	Cans – 7 bales Cardboard – 217 bales Steel and scrap metals – 975 tonnes Polystyrene boxes – 11 pallets Shrink wrap – 20 IBCs	Transported by a waste services contractor for offsite recycling.
Wood e.g. scrap pallets	195 tpa	Waste services contractor to consolidate for either reuse by themselves to transports commodities off site. Relocated to the Emergency Response Team burn pit with some wood to be disposed at the site landfill. No copper-chrome-arsenate treated wood products will be burnt on-site.
Tyre storage		
Tyres (as defined under Part 6 of the EP Regulations)	Up to 500 tyres stored on site at any time	Light and heavy vehicle tyres to be consolidated for periodic transport to an off-site recycling facility, use around site or disposal at the waste rock dumps.

Note 1: Landfill waste types as defined in the DWER (2019) *Landfill Waste Classification and Waste Definitions*

2.2.7 Chemical storage

At any given time the chemicals described in Table 5 may be stored at the premises.

Table 5: Chemical storage – types and volumes

Chemical	Volume in aggregate (m^3)	Description
Reagents	995	Storage area for minerals processing reagents, including: • frother – 40 m^3 tank • chelating agent (triethylenetetramine – TETA) – 40 m^3 tank under nitrogen blanket • depressant (sodium sulphite) – 100 m^3 tank • collectors (xanthate compounds) - 120 m^3 tank; 30 m^3 tank • Quicklime – 480 tonne silo; 100 m^3 tank • Finnfix 300 - 100 m^3 tank • magnesium oxide depressant; and • flocculant – 85 m^3 tank.
Fuel and other hydrocarbons for vehicles	3,020	• 1 x vertical bulk diesel tank and associated distribution and refilling infrastructure, with a total capacity of 3 ML. • 2 x 10,000 L intermediate storage tanks and vehicle

		filling infrastructure.
Fuels and other hydrocarbons for power generation	1,000	Storage sufficient for 15 days utilisation, and consisting of 5 x self-bunded bullet-style bulk diesel tanks and associated distribution and refilling infrastructure, with a total capacity of 1 ML
Waste hydrocarbon storage	200	1 x bunded above ground storage tank and associated transfer infrastructure, with a total capacity of 0.2 ML
Total	***5,215***	

Each of the fuel (diesel) storage areas will contain access point for fuel deliveries and be capable of accepting a triple tanker with the following controls for spill management:

- Skid mounted diesel unloading pumps;
- Emergency stops controls stations;
- Bunded concrete containment areas graded to a low point with collection sumps to contain the spillage/leakage for later removal;
- Buried pipelines where appropriate to avoid damage from vehicles.

Bulk fuel storage will consist of a combination of either multiple units of:

- single skinned in-situ weld/bolted tanks placed within suitable sized and constructed bunds. Each tank would be contained in a single bunded area; or
- double skinned, self-bunded fuel bullet tanks.

Waste oil would be stored in a suitably bunded aboveground storage tank located within a covered WTF, pending removal from site for reuse/recycling. All spilt and collected hydrocarbons from sumps will report to an oily water separator where treated water will be directed to the process water pond.

All chemicals and hydrocarbon storage areas, including waste oil storage infrastructure, will be constructed in accordance with *Australian Standard (AS) 1940: The storage and handling of flammable and combustible liquids* and tank storage constructed in accordance with *AS1692: Steel tanks for flammable and combustible liquids*. Tanks will be equipped with leak detection and alarms as well as fuel metering and level monitoring with remote display.

2.3 Legislative context and other approvals

Table 6: Relevant approvals

Legislation	Approval
Part IV of the EP Act Ministerial Statement 1188 (MS1188)	Conditions for the construction and operation of a copper and nickel mine, processing facility and supporting infrastructure. Refer to section 2.3.1.
Mining Act 1978 (WA)	Miscellaneous Licences listed on the cover page to this Decision Report are yet to be granted by Department of Mining, Industry Regulation and Safety (DMIRS). These licences allow the applicant to have the WMP applied for and assessed via mining proposal. Decisions on the mining proposal for the WMP is yet to be approved. The applicant may be subject to conditions as part of approval of the mining proposal, in accordance with the *Mining Act 1978*.

Environmental Protection (Clearing of Native Vegetation) Regulations 2004	Clearing of up to 3,830 ha of native vegetation within a Development Envelope of 20,852 ha assessed and authorised under Part IV Ministerial Statement 1188.
Environment Protection and Biodiversity Conservation Act 1999 (Cth)	N/A – No Threatened flora, as listed under the Environment Protection and Biodiversity Conservation Act (EPBC Act) or the Biodiversity Conservation Act (BC Act) were recorded.

2.3.1 Part IV of the EP Act

The WMP proposal was referred to the EPA in October 2020 under section 38 of the EP Act. In March 2021, the EPA decided to assess the proposal and set the level of assessment at Referral Information with updated referral document and additional information required, with a 4 week public review period.

The EPA advertised the level of assessment for the proposal for public comment in January 2021. Following review the EPA endorsed draft Ministerial conditions on 16 December 2021 for the Minister for Environment's consideration.

The EPA assessed the risks of the proposal associated with the environmental factors below:

- Greenhouse Gas Emissions
- Social Surroundings
- Flora and Vegetation
- Terrestrial Fauna
- Inland Waters

Consideration of inland waters includes the assessment of risks associated with groundwater drawdown, including the potential for impacts to native vegetation and subterranean species. A key conclusion of the EPA's assessment in relation to groundwater impacts, and relevant to this Decision Report, is the acknowledgement that impacts to groundwater from tailings discharge can be managed under Part V works approval and licence.

Relevant to Part V assessment, conditions of MS1188 include the authorisation of:

- no more than 3,830 ha of native vegetation within a development envelope of 20,852 ha to be cleared;
- abstraction of up to 7.5 GL/a of groundwater from the Borefield and through mine pit dewatering;
- disposal of up to 315 Mt of tailings into a TSF and/or Nebo pit void; and
- power supply of up to 60 MW of fossil fuel generated electricity.

Key finding: In accordance with section 54(4) of the EP Act and the Department's *Guidance Statement: Setting Conditions*, conditions of the works approval will not be contrary to or unnecessarily duplicate requirements of the Ministerial Statement.

Based on conditions applied through MS1188, the delegated officer has determined not to unnecessarily duplicate the requirements of MS1188, or reassess the following Environmental Factors already assessed through EPA Assessment 1720:

- Greenhouse gas emissions.
- Terrestrial fauna, with the exception of potential impacts from dust, noise and vibration.
- Flora and vegetation, with the exception of potential impacts from dust and changes

to surface water quality and/or groundwater regimes that potentially result from TSF seepage.

- Groundwater protection not including groundwater impacts from TSF seepage.

The delegated officer has determined that conditions of the works approval relating to tailings waste management and air emissions are uninhibited by the EPA's assessment and conditions of the Ministerial Statement. There exists opportunity for conditions of the works approval to support the EPA's assessment and Ministerial Statement conditions for the protection of flora, fauna and groundwater values.

2.3.2 Mining Proposal

The DMIRS have advised that issues relating to the potential for acid mine drainage (AMD), management of waste material, and the stability and rehabilitation of waste rock dumps, pit and tailings storage facilities (TSF) will be regulated throughout the life of the project and considered as a part of the final closure plan under the *Mining Act 1978* (the Mining Act) for the WMP (DMIRS, 2021).

Geotechnical design and stability of the TSFs has been considered as satisfactory through the DMIRS assessment of the Project's mining proposal.

2.4 Exclusions to this assessment

The following matters are out of the scope of this assessment and have not been considered within the technical risk assessment detailed in this report:

- abstraction of groundwater – the applicant intends to utilise all abstracted groundwater through the processing plant and for dust suppression, with no discharges to the environment proposed. Impacts to groundwater dependent ecosystems from abstraction is managed under Part IV of the EP Act (refer to section 2.3.1);
- heritage – managed under Part IV of the EP Act (refer to section 2.3.1);
- preparatory works unrelated to the prescribed activity, such as clearing, levelling and construction of access roads, carparks, laydown areas, office buildings, workshops, warehouse/storage, and construction of hardstands for use in construction works. Note that crushing and screening activities that support these construction activities remain within scope of this assessment;
- reuse of wastewater from the Passive WWTP, which is regulated by the Department of Health (refer to section 2.2.5)
- vehicle movements on public roads;
- tailings lifts beyond the initial starter embankment authorised through the works approval. Upstream embankment lifts will need to be assessed and authorised under future licence amendment, as required; or
- disposal of tailings to other locations, for example in-pit disposal to the Nebo pit void.

The works approval is related to the prescribed activities specified on the works approval only and does not offer the defence to offence provisions in the EP Act (see s.74, 74A and 74B) relating to emissions or environmental impacts arising from non-prescribed activities, including those listed above.

As the application is related to a proposal that has been referred to the EPA under section 38 of the EP Act, in accordance with section 54(4) of the EP Act the delegated officer must not make a decision on the application that is contrary to, or otherwise in accordance with, an implementation agreement or decision.

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.

Emission and discharge management measures/controls are described in sections 2.2.1 to 2.2.7 inclusive.

3.1 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 exposure risks and prevention strategies, and is provided for under other state legislation.

Table 7 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 7: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	**Distance from prescribed activity**
Closest residential receptor	The nearest residential receptor lives in the community of Jameson (Mantamaru), approximately 26 km north of proposed prescribed activities.
Groundwater bores	The premises is not located within any public drinking water source area (PDWSA). The nearest groundwater abstraction bore located approximately 29km north of proposed prescribed activities.
Environmental receptors	**Distance from prescribed activity**
Surface waters	There are no ephemeral surface waters within 500m of prescribed premises activities.
Groundwater	Depth to groundwater ranges between 2.7 and 14.5 metres below ground level (mbgl) sitting at a site-wide average water level of 6.5 mbgl (approximately 4.85 mbgl near to the TSF). Groundwater has a steady gradient of approximately 0.1% running north to south across the TSF. Salinity ranges from marginal to brackish (920 to 4,500 mg/L total dissolved solids (TDS)) and is variable across the project area. Slightly alkaline pH (7.5 – 8.5)

Groundwater dependent receptors	Stygofauna are present within the shallow Kadgo palaeochannel sediments and the basement gabbro strata (Babel pit area). This paleodrainage system is within the area of impact of TSF seepage.
Native vegetation	No TECs, or PECs were identified within 100km of the premises. No Threatened flora as listed under the *Environment Protection and Biodiversity Conservation Act, 1999* (Cth) or *Biodiversity Conservation Act, 2016* (WA) were recorded. Vegetation associations, including terrestrial groundwater dependent ecosystems (GDEs), are considered to be widespread and well represented in the region.
Terrestrial fauna	Eleven fauna habitats were identified during fauna surveys. Fifteen species of significant fauna were identified across the survey area, including: • One vulnerable species under the BC Act and EPBC Act (great desert skink) • six species listed under the EPBC Act were listed as Marine of which one is also listed as Migratory under the BC Act and EPBC Act • three Specially Protected (Priority 4) species under the BC Act • a single locally significant species, not listed under the BC Act or EPBC Act • four species observed that represent range extensions (however not listed under EPBC or BC Act): No Threatened flora, as listed under the EPBC or BC Acts were recorded. However, the night parrot, listed as endangered and critically endangered under the EPBC Act and BC Act respectively, was identified as potentially occurring within the project extent.

3.1.1 Native vegetation

Impacts to vegetation from site development and ongoing mining activities associated with groundwater abstraction and waste rock dumps are assessed under Part IV. However, impacts to native vegetation from seepage at the TSF were considered through the Part IV assessment as being best regulated under a Part V works approval and licence.

Shallow rooted understorey species where roots are within the upper 1 to 2 m of the soil profile comprise the dominant flora taxa within the TSF footprint and immediate surrounds. There exist a small patch of deeper-rooted groundwater dependent vegetation to the south-east of the TSF that could be susceptible to longer term changes to water quality.

There is generally shallow depth to groundwater throughput the Premises and impacts are likely to depend on the root system interaction with groundwater between each species.

3.1.2 Groundwater characteristics and pathways

Much of the project area is underlain by a palaeochannel that has been carved into crystalline bedrock. The Kadgo palaeochannel contains sediments of Tertiary age that form two distinct aquifers: an upper unconfined to semi-confined aquifer comprising fine sands and silts that is 36-86 metres thick (the Garford Formation); and a deeper sandy confined aquifer that is 10 to 20 metres thick (the Pidinga Formation). These two aquifers are separated by a 10-20-metre-thick clayey aquitard that limits the degree to which they are hydraulically interconnected.

The shallow paleochannel aquifer is known to contain stygofauna, and these organisms are considered to be the most sensitive environmental receptors to changes in the groundwater regime that would be caused by mining activities at the site.

Dewatering will be required to allow mining to take place in the two pits (the Babel and Nebo pits) that will be developed at the mine site and in close proximity to the TSF. The degree to which pumping from basement rocks in these pits will affect water levels in the palaeochannel aquifers will depend on:

- the extent to which excavation of the mine pits will develop a direct hydraulic connection between the sediments and pumping from bedrock in the pits;
- the rate and extent to which leakage of water would take place through clayey regolith between the base of the palaeochannel and the bedrock aquifer; and
- the rate and extent to which leakage of water would take place through the aquitard that separates the two palaeochannel aquifers.

3.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and takes into account potential source-pathway and receptor linkages as identified in Section **Error! Reference source not found.**. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Section **Error! Reference source not found.**), 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 8.

Works approval W6579/2021/1 that accompanies this decision report authorises construction, commissioning and time-limited operations. The conditions in the issued works approval, as outlined in Table 8 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 8: Risk assessment of potential emissions and discharges from the premises during construction, commissioning and operation

Risk Event					Risk rating C = consequence L = likelihood	Reasoning	Regulatory conditions
Source/Activities	**Potential emissions**	**Potential pathways and impact**	**Receptors**	**Applicant controls**			
Site preparation and clearing of native vegetation. Construction of the processing plant, tailings facility, stockyard, landfill and other ancillary infrastructure. Civil excavation, earthworks, vehicle movements on unsealed roads.	Dust	Air/windborne pathway to adjacent environmental receptors that may experience smothering. No pathway to residential receptors. Air/windborne pathway to cultural heritage sites resulting in amenity impacts.	Nearest residential receptors approximately 26 km to the north. Visitors to cultural heritage sites approximately 3.5 km north of the airstrip and WWTP. Adjacent vegetation associations.	Dust would be managed by watering exposed areas with a water cart or with fixed sprays as required.	Minimal offsite impacts at a local scale (**Minor**) Risk event may only occur in exceptional circumstances (**Rare**) ***Low risk***	No nearby sensitive receptors noting that impacts to visitor amenity at nearby heritage sites are regulated through Part IV Ministerial conditions. Nearby vegetation expected to be resilient to the levels of dust generated by earthworks associated with the construction of the WMP processing plant. Nearby vegetation expected to be well represented in the region.	No conditions for the management of dust during construction. Applicant will be required to construct infrastructure as specified in the application for the purpose of managing dust impacts during commissioning and operation.
	Noise	No pathway to residential receptors. Air/windborne pathway to cultural heritage sites resulting in amenity impacts.	Nearest residential receptors approximately 26 km to the north. Visitors to cultural heritage sites approximately 3.5 km north of the airstrip and WWTP.	N/A	Specific Consequence Criteria met (**Slight**) In exceptional circumstances (**Rare**) ***Low risk***	No nearby sensitive receptors noting that impacts to visitor amenity at nearby heritage sites are regulated through Part IV Ministerial conditions. Noise associated with the construction of the WMP processing plant are expected to be inaudible from approximately 10 km away.	No conditions for the management of noise during construction.
	Erosion and sedimentation from surface water runoff	Overland runoff from site, causing adverse health impacts to downgradient native vegetation and local ecosystems	Adjacent vegetation associations.	Uncontaminated stormwater diverted away from operational areas to natural downstream drainage.	Minimal off-site impacts on local scale (**Minor**) Not likely to occur in most circumstances (**Unlikely**) ***Low risk***	The delegated officer has determined that applicant controls provide a suitable level of control to minimise erosion and contamination of stormwater flows when present. In addition, the assessment of native vegetation under Part IV regulation focuses on impacts from groundwater abstraction and drawdown. Therefore the regulation of surface water flows is unrestricted under Part V works approval and licence. Nearby vegetation expected to be well represented in the region.	Consistent with commitments made by the applicant.
Commissioning and time limited/ full operations							
Commissioning of ore processing plant including primary/secondary crushing. Crushing and screening activities utilising mobile infrastructure. Vehicle movements on unsealed roads. Wind erosion from	Dust	Air/windborne pathway to adjacent environmental receptors that may experience smothering. No pathway to residential receptors. Air/windborne pathway to cultural heritage sites resulting in amenity	Nearest residential receptors approximately 26 km to the north. Cultural heritage sites located greater than 5 km from key dust sources during operations. Some crushing and screening operations may be within 5 km periodically. Adjacent vegetation associations.	Dust from primary and secondary crushers captured by a dust collector capable of filtering dust down to 50 mg/Nm^3 when under ore flow rate of 38,200 m^3/hour. Dust from filters removed by jet pulse (air) and deposited on to the crusher discharge conveyor. Vertical mill rollers to operate under negative pressure with air vented to a stack via baghouse. Dust monitoring at the stack to ensure integrity of the bag filter. Conveyors to be enclosed with the exception of the exit conveyor to the vertical mill rollers, which will be equipped with spray bars.	Minimal offsite impacts at a local scale (**Minor**) Risk event is not likely to occur in most circumstances (**Unlikely**) ***Low risk***	No reasonable pathway to residential receptors due to distance. Impacts to visitor amenity at nearby heritage sites are regulated through Part IV Ministerial conditions. Nearby vegetation expected to be resilient to the levels of dust generated by crushing/screening facilities resulting in minimal localised impacts. Impacted vegetation expected to be well represented in the region. The delegated officer considers that the WMP plant design and the proposed siting controls for the mobile crushing and screening equipment appropriately manages risks associated with dust.	Consistent with commitments made by the applicant.

cleared areas.		impacts.		Rejects from the vertical roller mills to be discharged to the rejects feeder and conveyed to a closed bin. Mobile crushing and screening plant equipped with sprays and operated remotely from identified priority flora species.		Design features for the management of dust will be required to be installed/built during the construction phase. Ongoing maintenance requirements will be conditioned for time limited operations.	
	Noise	No pathway to residential receptors. Air/windborne pathway to cultural heritage sites resulting in amenity impacts.	Nearest residential receptors approximately 26 km to the north. Cultural heritage sites located greater than 5 km from key noise sources during operations. Some crushing and screening operations may be within 5 km periodically.	Crushing and screening activities will be conducted in daylight hours only.	Specific Consequence Criteria met (**Slight**) Risk event may only occur in exceptional circumstances (**Rare**) ***Low risk***	No nearby sensitive receptors. Assigned levels expected to be met at both residential and cultural heritage locations. The management of impacts to amenity at heritage visitation sites forms part of the project's Cultural Heritage Management Plan, which forms part of requirements under Ministerial Statement.	No conditions for the management of noise during commissioning or operations.
Commissioning and time limited operation of ore processing plant. Time limited operations of the power generation and chemical storage facilities. Hazardous materials, waste and hydrocarbon storage.	Genset stack emissions during commissioning and testing, and subsequent full operations	No pathway to residential receptors or cultural heritage sites.	Nearest residential receptors approximately 26 km to the north. Cultural heritage sites located greater than 5 km away.	Equipment designed to meet the stack emission rates specified in Table 1.	Specific Consequence Criteria met (**Slight**) Risk event may only occur in exceptional circumstances (**Rare**) ***Low risk***	No reasonable pathway to residential receptors or cultural heritage locations due to distance. Impacts to visitor amenity at nearby heritage sites will be managed through Part IV Ministerial conditions. The delegated officer considers that the implementation of emission specifications on the works approval are not required due to the distance to receptors.	Consistent with commitments made by the applicant. Design controls to be implemented during construction and emission testing during commissioning to determine equipment effectiveness.
	Odour from the storage and use of processing chemicals (e.g. sodium ethyl xanthate) and hydrocarbons.	No pathway to residential receptors or cultural heritage sites.	Nearest residential receptors approximately 26 km to the north. Cultural heritage sites located greater than 5 km away.	Hydrocarbon and chemical storage tanks are vented to maintain atmospheric pressure within the tank. Applicant has proposed no further controls.	Minimal impact to amenity (**Slight**) Risk event may only occur in exceptional circumstances (**Rare**) ***Low risk***	No reasonable pathway to residential receptors or cultural heritage locations due to distance. The delegated officer has determined that controls are not required to further reduce risk.	No conditions for the management of odour during commissioning or operations.
	Spills and leaks of hazardous materials and hydrocarbons	Overland runoff from site, causing adverse health impacts to downgradient native vegetation and local ecosystems. Seepage /infiltration causing groundwater contamination.	Adjacent vegetation associations. Toxilogical impacts to groundwater dependent ecosystems. Depth to groundwater approximately within 6.5 mbgl. No human groundwater users in the area.	All liquid chemical reagents would be stored within tanks or silos in appropriately bunded facilities whereby 110% of the largest vessel and 25% of the total volume is contained according to Australian Standards. Packaged reagents will be stored within a shed on a concrete floor with drainage to a sump for leak collection. Refuelling and fuel delivery inlets located on concrete or HDPE-lined pads to contain any drips or spills and draining to a sump to allow removal of collected material. WTF designed with a concrete foundation graded to a sump to allow the collection of surface water run-off and spilled material.	Mid-level onsite impacts, low-level offsite impacts (**Moderate**) Risk event may only occur in exceptional circumstances (**Rare**) ***Medium risk***	The delegated officer has determined that as proposed controls are critical for maintaining an acceptable level of risk, they will be imposed on the works approval.	Consistent with applicant commitments. Design controls to be implemented during construction.
	Erosion and contaminated surface water runoff from operational areas	Overland runoff from site, causing adverse health impacts to downgradient native vegetation and local ecosystems.	Adjacent vegetation associations.	Surface water will be redirected around operational areas. Drainage infrastructure and/or surface water diversions would be constructed to ensure natural flow paths are maintained where possible. TSF embankment walls rock-armoured or covered with binding agents to prevent erosion. Regular covering and compaction of landfill material.	Minimal offsite impacts at a local scale (**Minor**) Risk event may only occur in exceptional circumstances (**Rare**) ***Low risk***	To minimise the potential for impacts, the applicant proposes to install drainage infrastructure on the site to divert uncontaminated surface water runoff away from construction and operational areas, in a manner that prevents increased rates of sedimentation and erosion. Proposed activities are located away from defined waterways and stormwater flows and topography is gently undulating, minimising the stormwater velocities even during high rainfall events. Surface water flow/sheet flows are only expected during and	Consistent with applicant commitments. Design controls to be implemented during construction. Requirement to install a rumble strip at the exit point of the concentrate storage shed to further remove material from trucks prior to departure.

				Covered WTF and concentrate storage areas to prevent interaction with rain. Exit road from the concentrate storage shed to be concreted and regularly cleaned to prevent tracking of concentrate materials. Shed doors will be closed at all times other than when trucks are entering and leaving the shed to minimise the potential for fugitive emissions of concentrate, which may contaminate surface waters.		after short intense storm events. The delegated officer has determined that risk can be acceptably managed based on proposed controls being implemented. To further avoid tracking of concentrate materials from the concentrate storage shed, the minor additional controls have been applied.	
Transport of tailings and process water during commissioning and time limited operations.	Tailings and process water containing metals, metalloids and residual flocculants seeping to groundwater.	Seepage /infiltration through subsurface causing groundwater contamination and mounding.	Toxilogical impacts to groundwater dependent ecosystems. Intrusion of groundwater to the root zone of shallow-rooted vegetation. Depth to groundwater approximately within 5 mbgl at the TSF. No human groundwater users in the area.	HDPE-lined process water pond with leak detection. TSF constructed over a natural calcrete base with low permeability starter embankments connected. TSF supernatant water and seepage water recovered from underdrainage and toe drains returned to process water ponds. Tailings thickened to achieve a solids density of 60-65%.	Refer to section 3.3 for detailed risk assessment.	Consideration under Part IV assessment given only to the impacts of groundwater drawdown on dependent ecosystems. Seepage from process water ponds and TSF can be assessed and regulated under Part V.	Consistent with applicant commitments. Design controls to be implemented during construction with detailed design requirements specified.
	Overtopping of TSF or process water pond.	Overland runoff causing adverse health impacts to downgradient native vegetation and local ecosystems.	Localised contamination and/or sedimentation impacts to soil and vegetation.	Process water pond fitted with level indicators to prevent overtopping. Freeboard maintained at the TSF to avoid discharge following a 72-hour, 1 in 100 year rainfall event (550 mm). TSF supernatant pond minimised to reduce seepage and maintain capacity within the dam.	Mid-level onsite impacts (**Moderate**) Risk event may only occur in exceptional circumstances (**Rare**) ***Medium risk***	As the proposed controls are critical for maintaining an acceptable level of risk, they will be imposed on the works approval.	Consistent with applicant commitments. Design controls to be implemented during construction. Freeboard limits applied for time limited operations. TSF freeboard applied to prevent overtopping under worst case scenarios.
	Discharge to land of tailings or seepage/ supernatant return water.	Overland runoff from pipeline leak or rupture, causing adverse health impacts to downgradient native vegetation and local ecosystems.	Localised contamination and/or sedimentation impacts to soil and vegetation.	Tailings pipeline to be installed within a dedicated pipeline corridor (bunded trench) that drains any spillage to a sump. Pipeline fitted with leak detection capable of remote operator shutdown. Regular pipeline inspections.	Mid-level onsite impacts (**Moderate**) Risk event may only occur in exceptional circumstances (**Rare**) ***Medium risk***	As the proposed controls are critical for maintaining an acceptable level of risk, they will be imposed on the works approval. During commissioning leak detection may falsely identify a low pressure as being associated with a leak. The automated detection system may be switched off during this period while flow is stabilised. However, additional pipeline inspections will be required at this time to minimise the risk of a spillage escaping the bunded trench.	Consistent with applicant commitments. Additional visual inspection of pipeline integrity/ tailings containment required.
Landfill operation and tyre storage	Leachate seeping into groundwater.	Leachate generated by waste material seeping to groundwater resulting in contamination.	Depth to groundwater approximately within 6.5 mbgl. No groundwater users in the area.	Directing rainfall run-off directed around the facility and regularly covering waste. Controls represented in Table 4.	Low level offsite impacts at a local scale (**Moderate**) The risk event could occur at some time (**Possible**) **Medium risk**	Domestic (putrescible and non-putrescible) and non-recyclable waste produced at the accommodation village, processing plant, workshops, offices, kitchen and medical clinic will be disposed of into this landfill facility, together with biosolids produced from the WWTP sludge dewatering facility. The delegated officer considers that the nature, volume and management of waste at the landfill presents an acceptable level of risk to the environment.	Waste criteria will be specified on the works approval, consistent with applicant commitments.
	Dust generated through earthmoving and vehicle movement during waste deposition and	Air/windborne pathway to adjacent environmental receptors that may experience smothering.	Adjacent vegetation associations. Nearest residential receptors approximately 26 km to the north. Cultural heritage sites	No controls proposed.	Specific Consequence Criteria met (**Slight**) Risk event may only occur in exceptional circumstances (**Rare**)	No reasonable pathway to residential receptors or cultural heritage sites due to distance and low levels of short term dust generated at the landfill. Nearby vegetation expected to be resilient to the levels of dust generated by intermittent landfilling activities, which are likely to only result in minimal	No conditions for the management of dust during landfill operations. Water cart availability will be required for the construction of trenches.

	capping.	No pathway to residential receptors or cultural heritage sites.	located approximately 3 km to the east.		***Low risk***	localised impacts. Impacted vegetation expected to be well represented in the region.	
	Odour from putrescible wastes and xanthate flocculant packaging Flyaway litter	No pathway to residential receptors or cultural heritage sites. Air/windborne pathway to nearby fauna.	Attracting native fauna to landfilling activities, which may result in strike incidents. Nearest residential receptors approximately 26 km to the north. Cultural heritage sites located approximately 3 km to the east.	Minimising the active disposal face and applying daily and interim covers. Installing a perimeter fence to prevent fauna interactions and flyaway litter. Maximum height of waste will not be within 500mm below the tip of the trench.	Minimal offsite impacts at a local scale (**Minor**) Risk event may only occur in exceptional circumstances (**Rare**) ***Low risk***	The delegated officer notes that proposed capping frequencies exceed the requirements of the *Environmental Protection (Rural Landfill) Regulations 2002* for a 1,000tpa landfill. Applicant-proposed controls reduce risks to acceptable levels.	Consistent with requirements of the *Environmental Protection (Rural Landfill) Regulations 2002* for a 1,000tpa landfill, and applicant commitments. No further regulatory controls required.
	Particulate and noxious emissions from tyre or landfill fire	No pathway to residential receptors or cultural heritage sites. Amenity impacts at cultural heritage sites. Air/windborne pathway to nearby fauna.	Nearby terrestrial fauna. Fires may be visible from cultural heritage sites located approximately 3 km to the east.	Tyre storage area capable of storing up to 500 tyres in compliance with AS 1940 in an area not accessible by public. Tyres disposed on site in batches separated by soil and not consisting more than 1,000 whole tyres. Landfill fenced to prevent public access.	Risk event may only occur in exceptional circumstances (**Rare**)	The delegated officer notes that landfill fencing and proposed capping frequencies reduce the risk of fires at the landfill. In addition, tyre disposal is consistent with Part 6, regulation 14(2) of the EP Regulations.	Consistent with applicant commitments. No further regulatory controls required.
WWTP	Wastewater	Overland flow or discharge of untreated or partially treated wastewater causing ecosystem disturbance or impacting groundwater quality.	Adjacent vegetation associations. Depth to groundwater approximately within 6.5 mbgl. No groundwater users in the area. No nearby surface waters.	Wastewater and sludge will be stored and treated in tanks fitted with high level alarms to avoid discharge. The WWTPs would have contingency storage for up to two days of normal flow if discharge is suspended. The application of effluent will be controlled to prevent pooling and surface water run-off.	Minimal offsite impacts at a local scale (**Minor**) Risk event may only occur in exceptional circumstances (**Rare**) ***Low risk***	Based on the applicant's proposed controls, the risk of untreated or partially treated wastewater being discharged to the environment is low. The low potential for surface water in the local area further reduces the risk of impacts.	Consistent with applicant commitments. No further regulatory controls required.
	Treated wastewater irrigation	Infiltration of nutrient rich (treated) wastewater impacting groundwater quality and/or proliferation of invasive species.	Adjacent vegetation associations. Depth to groundwater approximately within 6.5 mbgl. No groundwater users in the area.	Wastewater will be treated to quality outlined in Tables 2 and 3. The irrigation sprayfield is adequately sized to absorb nutrient loads from the treatment plant. Nitrogen and phosphorus application to the sprayfield will be below the maximum application rate for Risk Category D listed in *Water Quality Protection Note 22: Irrigation with Nutrient-rich Wastewater* (DoW 2008). The application of effluent will be controlled to prevent pooling and infiltration beyond the receiving vegetation.	Low level offsite impacts at a local scale (**Moderate**) Risk event is not likely to occur in most circumstances (**Unlikely**) **Medium risk**	The delegated officer notes that there are no groundwater users in the area and there are very high evaporation rates, reducing the likelihood of impacts. Groundwater dependent ecosystems (stygofauna and deep-rooted vegetation) are not expected to be adversely affected.	Consistent with applicant commitments. Ongoing monitoring of WWTP outputs will be required to ensure risk is maintained.
	Odour	No pathway to residential receptors or cultural heritage sites.	Nearest residential receptors approximately 26 km to the north. Nearest cultural heritage site located approximately 3.5 km away.	No controls proposed.	Minimal onsite impacts at a local scale (**Slight**) Risk event may only occur in exceptional circumstances (**Rare**) ***Low risk***	No reasonable pathway to residential receptors or visitors to cultural heritage sites due to distance. Odours from the WWTP when operating are expected to be highly localised.	No conditions for the management of odour during WWTP operation.

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

3.3 Detailed risk assessment for tailings disposal

3.3.1 Description of risk event – tailings disposal and seepage

Drainage from a TSF has the potential to cause the formation of a perched aquifer and local groundwater mounding, even under conditions where the regional water table is falling due to the effects of pit dewatering.

Large changes in the water table elevation, or of groundwater quality due to mining, could adversely affect vegetation in close proximity to the TSF, and impact groundwater dependent invertebrates downstream of groundwater flows from the TSF.

The most sensitive environmental receptors for contaminants from the TSF are likely to be the stygofauna communities in the shallow aquifer in the Kadgo palaeochannel, particularly in the area to the south of the Babel and Nebo pits. Although these pits are expected to act as groundwater sinks, seepage from the TSF is likely to flow laterally in all directions and follow the underlying palaeochannel that flows to the south.

Fluctuations in groundwater levels could also impact non-groundwater dependent vegetation in the surrounding area to the TSF in the event that groundwater rises into the root zone.

3.3.2 Identification and general characterisation of emission

Tailings have been characterised as potentially acid forming (PAF) using static testing methods although kinetic leaching trials demonstrated tailings to be unlikely to generate acidic seepage (Oz Minerals, 2021). After 12 months, leachate from all three samples remained moderately alkaline and similar to existing groundwater pH levels. Similarly, tailings were found to be fresh to slightly brackish much like current groundwater quality. Primary elements of potential concern within tailings seepage are copper and nickel.

Overall, the kinetic leachate data indicates that risks of generating neutral metalliferous drainage are increased if the tailings are stored under saturated conditions (under a head of water), particularly if periodic loss of full saturation occurs (Oz Minerals, 2021).

Although pyrrhotite oxidation does not produce as much acidity as pyrite oxidation, it produces large amounts of iron oxyhydroxide minerals that can form cemented layers within a TSF. Experience at similar sites with nickel-rich tailings suggests that hardpan layers first form near the top of the TSF, and then progressively expand in a downward direction through the TSF. In the short-term this is beneficial as the iron hardpan layer initially forms a barrier that limits the diffusion of oxygen into the system and reduces the rate of sulfide oxidation. However, this may offer only short-term reprieve, as metals that are initially adsorbed near the base of the TSF are later released by the advancing acidification front. That is, metals may not be released from the TSF for many decades after the TSF is closed.

3.3.3 Description of potential adverse impact from the emission

Changes to groundwater quality as a result of seepage from the proposed TSF may increase the toxicity to existing stygofauna.

Rising groundwater may intercept the root zone of native vegetation and potentially impact upon survival rates. The dominant flora taxa within the TSF footprint are shallow rooted understorey species where roots are within the upper 1 to 2 m of the soil profile (Oz Minerals, 2021).

3.3.4 Criteria for assessment

In the absence of criteria derived from toxicity testing of specific chemical constituents on stygofauna, the default water quality criteria that are provided in the 2018 Australian and New Zealand guidelines (ANZG) are used. Stygofauna in the area are closely related to macroinvertebrate species that inhabit surface water bodies, and they are likely to have a similar

physiological response to many toxicants as surface water species.

The ANZG criterion for copper is low and not likely to be representative of the natural background concentrations. There also exist naturally elevated concentrations of vanadium in the local groundwater. Table 9 presents the groundwater assessment criteria and indicative baseline groundwater quality at the TSF, noting that baseline data is based on single sample events at monitoring locations in the general location of the proposed TSF.

Table 9: Indicative baseline groundwater quality and criteria for assessment of impacts at the TSF (Source: CDM Smith, 2020; ANZG, 2018)

Chemical parameter	Indicative baseline groundwater quality at the TSF	Comparison against ANZG concentration limit (mg/L)
Monitoring bore WMPS12 sampled 27 June 2018		
Standing water level (mbgl)	4.85	N/A
pH	8.2	
EC (µS/cm)	1,000	
Alkalinity (mg/L)	180	
Bicarbonate (mg/L)	220	
Calcium (mg/L)	34	
Carbonate (mg/L)	<1	
Chloride (mg/L)	120	
Magnesium (mg/L)	21	
Nitrate (mg/L)	87	
Potassium (mg/L)	20	
Sodium (mg/L)	120	
Sulfate (mg/L)	69	
Monitoring bore WMPW04 sampled 3 November 2018		
pH	7.9	N/A
EC (µS/cm)	940	N/A
Alkalinity (mg/L)	170	N/A
Aluminium (mg/L)	<0.005	0.055
Arsenic (mg/L)	<0.001	0.013
Antimony (mg/L)	Not monitored	0.009
Bicarbonate (mg/L)	210	N/A
Cadmium (mg/L)	<0.0001	0.002[1]
Chromium (mg/L)	0.002	0.120[1]
Copper (mg/L)	<0.001	0.0013
Nickel (mg/L)	<0.002	0.110[1]
Nitrate (mg/L)	79	N/A
Potassium (mg/L)	33	N/A
Selenium (mg/L)	<0.001	0.011
Sulfate (mg/L)	68	N/A
Vanadium (mg/L)	**0.011**	0.006
Zinc (mg/L)	0.027	0.080[1]

Note 1: Hardness corrected value, refer to Warne et. al., 2018

Groundwater monitoring data provided in Table 9 references that collected from bores at different locations but are considered generally representative of groundwater in the proximity

of the TSF. The delegated officer generally considers groundwater sampled at bore WMPS12 to be most representative of that at the proposed TSF. However, chemical parameters monitored at WMPW04 are more extensive and also considered representative of background levels of local groundwater.

Due to the high natural (baseline) concentrations of copper and vanadium in groundwater assessment against ANZG criteria may not be appropriate. Therefore upper tolerance limits at a 95% level of confidence are likely to be more appropriate for these parameters to protect local environmental receptors.

3.3.5 Applicant controls

Seepage modelling provided by the applicant indicates that groundwater mounding could cause the water table to reach the ground surface near the toe of the TSF if the facility was constructed without an effective underdrain system. The drains are designed to result in unsaturated conditions at the embankment and will have their ongoing effectiveness monitored by vibrating wire piezometers (Golder Associates, 2021). Seepage modelling information provided assumes a minimum starter embankment will be compacted to achieve a dry density greater than 95% standard maximum dry density to achieve a permeability of 1 x 10^{8} m/s (Golder, 2021).

The applicant will actively limit the size of supernatant water to ensure that ponding does not exceed 5% of the tailings beach area during normal operations (Oz Minerals, 2022a). This will be achieved through the operation of a floating turret connected to a pump located on the decant access causeway. The pump will have a minimum capacity of 60L/s and be capable of abstracting supernatant water to a minimum depth of 250 mm (Golder, 2021; Oz Minerals, 2022a). All recovered supernatant water will report directly to the process plant (Oz Minerals, 2022).

Seepage will also be controlled/mitigated through the effects of tailings consolidation over time. Tailings properties indicate a decreasing permeability to an estimated 2.5 x 10^{-6} and up to 3 x 10^{-7} m/s after 12 months based on laboratory results. The process of expediting tailings consolidation is achieved in part through tailings thickening, which also serves to reduce the amount of water available for seepage. During normal operations, the applicant has targeted a 60% (w/w%) tailings dry density, increasing to 65% after year 1 of operations (Golder, 2021; Oz Minerals, 2022a).

Aeolian sand typically encountered in the area is highly erodible and permeable, creating a direct pathway to groundwater. To reduce the risk of lateral movement at the perimeter of the TSF, beneath embankment walls, the applicant's design report identified the critical controls to remove loose, unstable soils to a depth of two metres and rip and recompact fractured and/or brecciated hardpan calcrete encountered in the footprint of the perimeter embankments during construction (Golder, 2021). High moisture within embankment walls also has the potential to increase the risk of embankment failure. The applicant has committed to implementing vibrating wire piezometers to monitor embankment wall performance and allow early identification of seepage.

TSF Groundwater Monitoring and Contingency Plan

The applicant proposes to conduct groundwater monitoring on a quarterly basis at six TSF groundwater monitoring bores surrounding and downstream of the TSF:

- Four are to be within 20 m of the final toe of the TSF – TSF1 to TSF4
- Two are to be located in the potential flow path towards receptors:
    - Kadgo Paleochannel – TSF5
    - predicted flow path from particle tracking during Babel drawdown and post-closure – TSF6.

A final background bore close to the prescribed premises boundary in the Garford Formation

(Kadgo Paleochannel, WMPW06 used in baseline data collation).

In response to potential horizontal and/or lateral seepage from the TSF, the applicant has prepared a TSF Groundwater Monitoring and Contingency Plan (Oz Minerals, 2022), which presents the following management response actions in response to the threshold criteria detailed in Table 10:

- construction of an interception trench upstream of embankments (outside the TSF footprint);
- installation of groundwater abstraction bores, to the eastern TSF cell to reduce risk of groundwater mounding;
- treatment of the supernatant pond locations to reduce the hydraulic conductivity of the supernatant decant pond location and therefore reduce infiltration of process water into the TSF. This may include compaction of the tailings in the decant pond location with or without addition of bentonite or spraying of sealant in the decant pond location;
- construct stormwater drainage channels to direct stormwater flows away from the toe of the TSF perimeter embankments; and/or
- armour the lower portions of the TSF embankment slope.

Trigger criteria provided in Table 10 is linked to additional monitoring and investigation of potential seepage under the TSF Groundwater Monitoring and Contingency Plan. However, this does not constitute a seepage control or management. Similarly, the construction of stormwater drainage channels to divert stormwater away from TSF embankments and rock armouring of embankments do not address the risk of seepage flowing to groundwater.

The applicant has proposed that these management responses be triggered by criteria against groundwater monitoring at bores that intercept the Garford Aquifer downstream of the TSF. The delegated officer has taken this to be in reference to the monitoring bores located to the south of the TSF and along the Kadgo palaeochannel (as depicted in Figure 9 of the Works Approval). Groundwater quality management trigger values have been established using ANZECC default trigger values, 95th percentile of background water quality (threshold values), and statistically significant upper tolerance limits for specific chemical constituents e.g. copper and vanadium, which are in natural concentrations greater than ANZG (Table 10).

Table 10: Trigger values of Garford Aquifer water quality

Parameter	Units	Trigger	Threshold
Standing water level	mbgl	3	2
pH[1]	-	7.5-8.1	7-8.5
Electrical Conductivity, EC	µS/cm	3,000	4,500
Total Dissolved Solids, TDS	mg/L	1,900	2,850
SO_4	mg/L	270	405
Cu	µg/L	2	3
Ni	µg/L	8.8	11
F	mg/L	1.5	2
Cl, K, Ca, Mg, Na	mg/L	N/A	N/A
HCO_3	mg/L	<194	<180
Ag	µg/L	0.05	0.06
Al	µg/L	44	55
As	µg/L	11	13
Ba	µg/L	50	54
Cd	µg/L	0.16	2

Co	µg/L	1.1	1.4
Cr	µg/L	2.6	3.3
Fe	µg/L	N/A	N/A
Mn	µg/L	1,520	1,900
Mo	µg/L	27	34
Pb	µg/L	2.7	3.4
Se	µg/L	8.8	11
Tl	µg/L	0.8	2
U	µg/L	5.4	7.3
V	µg/L	32	34
Zn	µg/L	29	49
NO_3	mg/L	119	130
NH_4	mg/L	0.11	1.5
Total N	mg/L	30	31

3.3.6 Key findings

Key finding: The modelled average seepage flow through the base of the TSF is approximately 0.94GL/y, if underdrainage is working properly. Therefore the delegated officer has found that the high solids content of tailings, low permeability of the embankment walls and the ongoing removal of supernatant water, remain critical controls for the management of seepage.

There remains a risk that the TSF underdrainage system could become progressively clogged with finer materials (iron oxides) due to the mineralogical characteristics of tailings materials. This in turn could lead to seepage moving laterally in all directions around the TSF, potentially resulting in groundwater mounding and localised impacts on vegetation.

For the purpose of the assessment of seepage risks the delegated officer has determined baseline using the nearest monitoring bores as representative indicators of local groundwater quality (Table 9).

Drawdown of groundwater from the Babel pit is expected to mitigate the risk of groundwater mounding. However, this presents a risk to the environment in the event of dewatering discharge, as localised groundwater becomes contaminated with seepage material.

Key determination: Part IV of the EP Act manages impacts to vegetation from groundwater abstraction and drawdown. The assessment of risks associated with groundwater mounding at the TSF under Part V of the EP Act is uninhibited by Part IV assessment and approvals.

In its review of groundwater mounding risks, the delegated officer identified that groundwater abstraction in the vicinity of the Babel Pit may result in TSF seepage entering the drawdown cone. Risks associated with the discharge of groundwater from nearby abstraction bores to the environment have not been assessed in this Decision Report. All abstracted groundwater must be utilised in the processing plant or for dust suppression.

Groundwater abstraction bores must be separate to monitoring bores where compliance is measured.

3.3.7 Consequence

Groundwater quality and mounding impacts due to seepage would most likely be confined to an area near the TSF, and contaminated groundwater would mostly discharge to the mine pits. There is no dewatering discharge proposed.

If significant groundwater contamination or mounding from seepage occurs, then the delegated officer has determined that mid-level impacts to stygofauna and native vegetation in the local (on-site) environment may occur. Therefore, the delegated officer considers the consequence to be **Moderate**.

3.3.8 Likelihood of Risk Event

The delegated officer has determined that groundwater quality changes or mounding impacting receptors could occur at some time during operation of the TSF. Therefore, the delegated officer considers the likelihood of tailings seepage and groundwater mounding impacting environmental receptors to be **Possible**.

3.3.9 Overall rating of tailings disposal and seepage

The delegated officer has compared the consequence and likelihood ratings described above with the risk rating matrix in DWER's *Guidance Statement: Risk Assessments* and determined that the overall rating for the risk of seepage impacting native vegetation and stygofauna surrounding the TSF by altering water quality and standing water levels is ***Medium***. Therefore additional controls are justified.

4. Consultation

Table 11 provides a summary of the consultation undertaken by the department.

Table 11: Consultation

Consultation method	Comments received	Department response
Application advertised in the West Australian and on the department's website on 20 September 2021.	None received.	N/A
Comment on proposal invited to Shire of Ngaanyatjarraku and the Ngaanyatjarra Council on 17 September 2021.	None received.	N/A
Request for advice sent to the Department of Mines, Industry Regulation and Safety (DMIRS) on 17 September 2021.	DMIRS' Geotechnical Inspectors have advised that the integrity of the TSF will be maintained. Oz Minerals is waiting on tenement approval from DMIRS for miscellaneous licence areas L69/56 and L69/57.	Following DMIRS advice DWER is satisfied that the integrity of the TSF will be maintained and the risk to nearby environmental receptors from dam collapse does not need to be further considered/risk assessed. DWER notes that the applicant cannot commence works until tenure is granted and a mining proposal is approved by DMIRS. The prescribed premise activities will be undertaken on the approved tenement M69/149. The issuing of this works approval does not contradict, and is independent of approvals under the *Mining Act 1978*.

Applicant was provided with draft documents on 23 May 2022 and 26 June 2022.	Refer to Appendix 1	Refer to Appendix 1

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.

Applicant controls have been implemented where necessary to address risk. These controls are described in Table 8 and section 3.3.5 of this Decision Report. In addition to the original proposed controls within the Application, further information has been provided during DWER's assessment for implementation of the TSF Groundwater Monitoring and Contingency Plan. However, the delegated officer notes that the document may not be suitable for operator use as trigger/threshold values are difficult to find within the document and the required management response is uncertain.

Identified controls within the Contingency Plan have been transferred to the Works Approval as conditions and where necessary, further clarified to better align with DWER's *Guidance Statement: Setting Conditions*, which requires conditions to be clear and enforceable to be valid.

The Contingency Plan requires management action to be taken when standing water levels rise to within 2 mbgl. Vegetation in close proximity to the TSF have a root zone within this range, indicating that impacts beyond the TSF footprint may arise with the slow management response. Therefore conditions of the works approval trigger the following management actions within three months where standing water levels rise to within 4 mbgl:

1. install and operate groundwater abstraction bores for the purpose of reducing risk of groundwater mounding; and
2. construct an interception trench upstream of embankments (along the outer embankment/s); and/or
3. treat the supernatant pond locations with chemicals or clay to reduce the hydraulic conductivity of the supernatant decant pond; and/or
4. other method as agreed with the CEO for the purpose of minimising impacts from seepage.

The intent of the above management actions is for an abstraction bore/s to be installed and operated at/in close proximity to the TSF (source), in addition to one or more of controls 2 to 4 listed above. The purpose of this condition is to address the source of seepage in a timely manner, but also to allow flexibility in the applicant's approach to managing seepage depending on the nature of the trigger exceedance. The same management response is required in the event that water quality trigger values are exceeded at downstream monitoring bores. Trigger values are consistent with those proposed through the Contingency Plan.

To avoid impacts to vegetation and ensure that seepage is being adequately managed for the protection of groundwater values beyond the premises, standing water levels at bores adjacent to the TSF must not rise above 2 mbgl (limit). The delegated officer does not support the use of abstraction bores for the purpose of monitoring standing water levels ongoing, and the conversion of monitoring bores to abstraction bores is not permitted under the works approval.

To further address the risk of, groundwater contamination, mounding and impacts to stygofauna and surrounding vegetation to the TSF and process water pond, the following additional conditions have been applied:

- Detailed specifications on the liner properties and installation requirements for the process water pond.

- No discharge of dewater from within the TSF drawdown area to the environment is permitted for reasons identified in section 3.3.6. The applicant has not applied for approval to discharge abstracted groundwater to the environment.
- Under drainage infrastructure must be installed within filter compatible zones of gravel and sand to minimise the potential for clogging during operation.
- Ongoing monitoring is carried out of the elevation of the phreatic surface within the TSF using vibrating wire piezometers in embankment walls.
- Compliance bores to be constructed in the shallow aquifer to the south of the main mining area to ensure that groundwater contamination from the TSF does not cause adverse impacts on stygofauna communities in along the Kadgo palaeochannel, beyond the mining footprint.
- Shallow and deep nested bores to be constructed near to the TSF (compliance bores near to the source of seepage), and monitoring bores located up and down hydrogeological gradient (pathway, receptor and background bores).
- Additional geochemical test-work is conducted during the life of the mining operation to better characterise the potential for metals, especially nickel, and metalloids to be leached from mine waste materials at the site after a prolonged period of time.

The delegated officer will give consideration to implementing groundwater reporting requirements on exceedances of trigger values near the mine site under a licence. Trigger values are consistent with using ANZG criteria and or statistically significant upper tolerance limits (UTLs) from baseline data - criteria to match Table 9. Exceedances of these values trigger a management response and will require reporting to DWER demonstrating an investigation into the source of groundwater quality degradation, and to determine whether it is likely to cause significant adverse environmental impacts.

ANZG water quality criteria have not been applied to monitoring bores in the vicinity of the main mining area, as groundwater quality in this part of the mine site are expected to be disturbed due to the effects of mining. The purpose of trigger management based on groundwater quality is to ensure that impacts from TSF seepage remain at acceptable levels beyond the mining footprint.

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

Condition	Summary of applicant's comment	Department's response
General	Minor administrative errors identified.	Noted. Necessary amendments made.
Works approval duration	Request for 26 year works approval duration.	Noted. The works approval duration has not been extended from the standard 5 years to 26 years as the scope of the instrument relates only to the construction, commissioning and time limited operations of the premises. Due to the extensive and staged works required, the delegated officer has determined an 8 year approval is acceptable. The completion of the 180 day time limited operations would also signify the expiration of the works approval, which may occur before the listed expiry date. An extension to this timeframe would require an amendment to the works approval.
Critical containment infrastructure design and construction requirements – Tailings storage facility	It is the TSF designer's recommendation that an embankment permeability of 1 x 10^{-8} m/s is unreasonably low, and that 1 x 10^{-7} m/s would be more reasonable.	Noted. Reduced embankment permeability is accepted although additional control for the prevention of outer embankment erosion has been applied. The applicant will be required to rock armour the lower portions of the western TSF walls to avoid erosion during high rainfall events. This is consistent with the TSF design report and is considered by the delegated officer to be a critical control where embankment walls are of lower permeability, having greater potential to erode.
Time limited operations requirements and emission limits – solid waste storage and transfer	Request change to requirement to store all solid wastes undercover. All solid wastes will be stored within bunded storage areas but only wastes within the solid waste transfer area and the hydrocarbon waste transfer area will be covered.	Accepted.
Monitoring during Time Limited Operations – Representative tailings samples	Applicant request to change reporting timeframes from 60 days after sample collection, to within 7 days of receiving laboratory reports. The reason for the request is to avoid potential delays in receiving monitoring results that are beyond the control of the Applicant.	Accepted.

Condition	Summary of applicant's comment	Department's response
Monitoring during Time Limited Operations – Groundwater trigger value actions	The applicant provided some alternative contingency measures in the event that seepage from the TSF results in trigger criteria being exceeded. This includes the compaction of the tailings surface where ponding occurs and the installation of an abstraction bore within the TSF.	Noted. There is the potential that compaction of tailings would result in larger ponding on the surface of the TSF and potentially drive entrained water within the TSF into groundwater, exacerbating seepage issues. It is possible that greater abstraction rates through the existing (proposed) decant tower, installation of groundwater abstraction bores, and further thickening tailings would be a suitable alternative to compacting tailings within the TSF. There exists a clause in the final condition that Oz Minerals may take other measures in the event that trigger criteria is exceeded and the CEO agrees to the response plan.
Wastewater treatment conditions	Applicant requested that authorisation for a Passive WWTP be issued (refer to section 2.2.5)	Accepted, noting that the treated effluent from the Passive WWTP is of a higher quality than the original proposed SBR and MBR WWTP units. Further that treated wastewater reuse is regulated through the DoH. The delegated officer has determined based on expected treatment quality provided by the applicant, DoH requirements will be achieved. Where the Passive WWTP cannot meet DoH requirements, irrigation to land is authorised through the works approval provided that treatment quality meets existing requirements specified in the draft works approval.
	In response to the revised draft presented to the applicant on 27 June 2022, with updates to the WWTP, the following comments were made: • Request to amend the authorised production capacity from 325m^3/day to 600m^3/day, to allow for the simultaneous operation of the Passive WWTP and SBR/MBR WWTPs. • Minor changes to the authorised bulk diesel storage and refilling infrastructure.	Noting that the irrigation field is designed to accept treated wastewater from the SBR/MBR plants, and that treated wastewater from the Passive WWTP will be treated to a quality for reuse, the revised throughput is accepted. Changes to authorised bulk storage accepted.