



Application for Works Approval

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

Works Approval Number	W6687/2022/1
Applicant	LRL (AUST) Pty Ltd
ACN	118 153 825
File number	DER2022/000121
Premises	Kathleen Valley Lithium-Tantalum Project Mining tenements M36/265, M36/459, M36/460, M36/696, G36/52, L36/255, L36/256 As defined by the premises maps attached to the issued works approval
Date of report	28 September 2022
Decision	Granted

**A/MANAGER, RESOURCE INDUSTRIES
INDUSTRY REGULATION**

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 W6687/2022/1 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 15 March 2022, LRL (AUST) Pty Ltd (LRL, the applicant) submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act). The proposed project area is located approximately 45 kilometres (km) north-west of Leinster in the Northern Goldfields region. The project is a greenfields development, and as such, there are no pre-existing Part V instruments held for the project.

The application is for construction and time limited operations for:

- a processing plant for spodumene ore to produce spodumene and tantalum concentrates. Ore is proposed for processing at a rate of 4 Million tonnes per annum (Mtpa);
- an above ground paddock style tailings storage facility (TSF) with two cells (TSF1). Tailings are proposed to be discharged at annual rate ranging from 0.86 to 1.4 Mtpa;
- a paste plant for underground stope fill;
- an electric power generation facility with 32 Mega Watts (MW) generation capacity;
- two wastewater treatment plants (WWTP) with treatment capacities of 170 kilolitres (kL) and 60kL per day; and
- a class II putrescible landfill facility for disposal of 2,270 tonnes of putrescible and inert waste per year.

Proposed infrastructure locations are shown in Figure 1 below.

The premises relates to the categories and assessed design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in works approval W6687/2022/1. The infrastructure and equipment relating to the premises category and any associated activities which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020) are outlined in works approval W6687/2022/1.

DWER has also received an application for a 5C groundwater licence (046582) under the *Rights in Water and Irrigation Act 1914* which is currently under assessment.

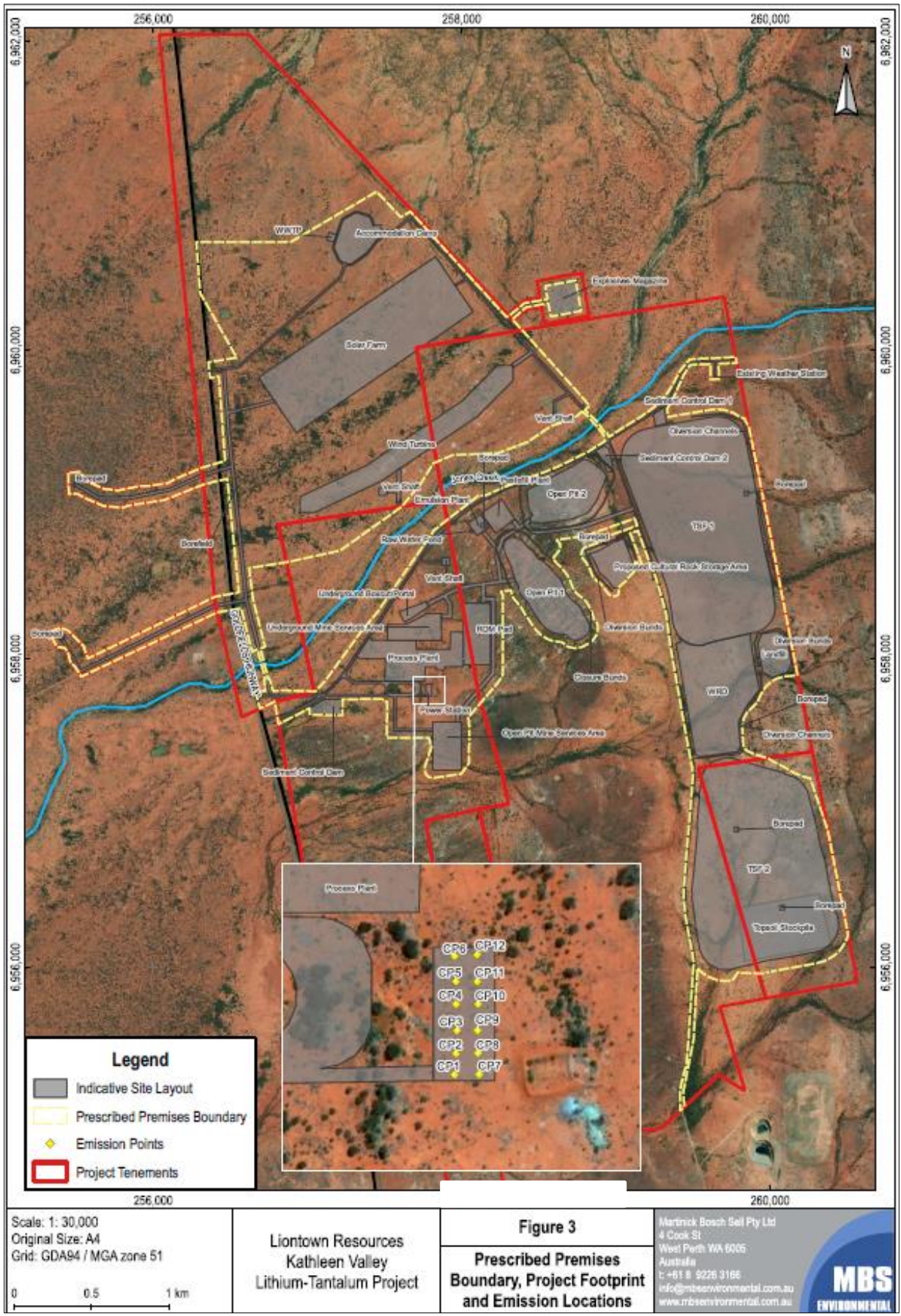


Figure 1 Prescribed premises and proposed infrastructure

2.2.1 Processing Plant (Category 5)

The processing plant will process spodumene ore at a rate of 4 Mtpa. The plant will operate 24 hours a day to crush, wash and separate ore and waste materials. The proposed processing plant operations are summarised in Appendix 1.

Process reagents will be stored adjacent to the processing plant within tanks or silo's in bunded facilities. Reagents will include soda ash, caustic soda, sodium silicate, frother, dewatering aid, coagulant, flocculant and anti-foam reagent. Chemical (and any hydrocarbons or fuels) transport and storage will be managed according to a Dangerous Goods Licence under the *Dangerous Goods Safety Act 2004*.

A process water tank will be installed adjacent to the processing plant with a storage capacity sufficient for plant operations. The process water tank will be supplied from the process thickener overflow and decant return and topped up with raw water as required.

Raw water will be stored in two interconnected tanks, which will contain water from the proposed borefield (the 5C groundwater licence is currently under assessment by DWER). Water will be pumped from the tanks to a water treatment plant if required for removal of any deleterious salts prior to use in reagent mixing or flotation.

2.2.2 Tailings Storage Facility (Category 5)

The proposed tailings storage facility will be an above ground paddock style facility (TSF 1) with two cells (A & B), proposed for an eventual total capacity of 14.72 Mt tailings. Tailings discharge is proposed at an annual rate ranging from 0.86 to 1.4Mtpa. The facility, including the basin area, will have a footprint of approximately 102.7 hectares (ha). The starter embankments for cells one and two will be constructed initially, and stages 2 – 5 will be constructed at the same time approximately 3 years after tailings deposition commences (Table 1). This works approval authorises the construction of the starter embankments for cells 1 and 2 and stages 2-5. For further detail on TSF construction, seepage management, tailings characterisation and DWER regulatory controls see section 3.3.

Table 1 Proposed TSF storage capacity and embankment/crest height

Stage	Cell	Embankment height (m)	Crest height (m RL)	Est. storage capacity (Mt)
1A	1	10.0	519	1.85
1B	2	7.5	520	0.97
2	1 & 2	3.0	523.0	1.87
3	1 & 2	3.9	526.9	2.93
4	1 & 2	4.0	530.9	3.23
5	1 & 2	4.1	535.0	3.88

A second facility (third cell) is also planned for construction approximately 12 years after project commencement and will not be included as part of this approval.

2.2.3 Paste Plant (Category 5)

Two paste plants are proposed for construction to provide material for underground fill. Construction will be staged, with the first paste plant to be constructed at project commencement. As the second paste plant is proposed for construction five years after

operations commence, DWER has determined it will not be included as part of this approval.

2.2.4 Electric Power Generation (Category 52)

LRL proposes to construct a 27 MW Liquid Natural Gas (LNG) (gas) electric power plant¹, and a 5MW diesel backup power plant, housed in a purpose-built facility. Gas and diesel generator exhaust will be directed to individual stacks within the prescribed premises boundary. Emission points are shown in Figure 1 and coordinates are listed in works approval W6687/2022/1. Estimated emissions from the gas and diesel power plant are based on stacks of 8 meters (m) in height, gas flow of 98,170kg/hr, CO₂ emissions at 100% loading and 5% O₂. Estimated emission components are shown in Table 2 and Table 3.

Table 2 Power plant estimated emissions

Emission component	Gas emissions flow (kg/hr)
Total unburned hydrocarbons	109.5
NOx (oxides of nitrogen as NO ₂)	36.5
Carbon monoxide	76.5
Particulate matter	0.5
Sulfur dioxide	1.5

Table 3 Diesel power plant emissions

	Continuous power 100% ¹		Continuous power 75%		Continuous power 50%	
Emission	Fuel burn (l/hr)	Emissions flow (kg/hr)	Fuel burn (l/hr)	Emissions flow (kg/hr)	Fuel burn (l/hr)	Emissions flow (kg/hr)
CO ₂	242	653	222	599	157	148
Methane		0.93		0.85		0.61
NOx		1.9		1.7		1.2

1. 100% is based on full reliance on diesel power a with no contributions from renewable power infrastructure.

The applicant notes that these estimated emissions are based on use of 6 Jenbacher J624 gas and 5 Cummins KTA50 diesel generators.

2.2.5 Wastewater Treatment Plants (Category 54)

LRL proposes construction and operation of two wastewater treatment plants:

- The primary WWTP near the accommodation village will process 170kL per day (based

¹ The power plant will be part of a hybrid renewable (solar/wind) microgrid. Power infrastructure is proposed to be provided by a third party under a build own and operate style contract. The microgrid will comprise four wind turbines, solar farm and battery system in addition to the proposed LNG gas powerplant.

on 510 persons, 300 L/pp/day + miscellaneous production). The treatment plant has been sized to include a planned camp upgrade to 510 persons after 4 years of operation.

- A secondary smaller WWTP near the process plant to process 60kL per day (based on 598 persons, 70L/pp/day + miscellaneous production, sized for peak construction staffing).

Both plants will use containerised Moving Bed Bioreactor (MBBR) technology with external process and storage tanks². A small quantity of chemicals will be stored in a bunded area adjacent to the wastewater treatment plants.

Wastewater from the accommodation village plant is proposed to be treated to “Medium” exposure risk level, in accordance with Department of Health (DoH) non-potable use criteria, suitable for industrial use (with potential for human exposure) and dust suppression. Wastewater from the Processing Plant is also proposed to be treated to “Medium” standards but with less conservative values for nitrogen and phosphorous. Water quality specification shown in Table 4 below. WWTP solids/activated sludge will be processed offsite by a third party.

Treated effluent from the accommodation village WWTP will either be pumped to the Process Plant tails hopper where it will ultimately be disposed of within the TSF or it will be pumped to holding tanks where it will be used for limited construction purposes (dust suppression, condition of materials for foundation or TSF embankments). Treated effluent from the process plant WWTP will be pumped to a holding tank where it will be regularly removed from site by a licenced contractor for offsite disposal prior to the TSF be constructed and commissioned. Once commissioned, treated wastewater will be disposed of within the TSF.

Table 4 Proposed WWTP water quality specification

Parameter	Unit	Influent	Accommodation village discharge	Process plant WWTP discharge
Hydraulics	kL/d	120	120	120
Biological oxygen demand (BOD)	mg/L	150 – 350	<20	<20
Total suspended solids (TSS)	mg/L	150 – 350	<30	<30
Total Nitrogen	mg/L	50 – 70	<20	<30
Total Phosphorus	mg/L	10 – 30	<2	<8
<i>E.coli</i>	Cfu/100mL	-	<10	<10
pH	pH units	6.5 – 8.5	6.5 -8.5	-
Chlorine residual	mg/L	-	0.5-2.0	-

² The MBBR system will comprise two anoxic and two aerobic tanks. The biologically treated sewage overflows to the clarifier where excess biomass settles and is circulated to the sludge tank. The treated water then exits through the overflow of the clarifier and is collected in the chlorine tank after being disinfected with sodium hypochlorite. The disinfected product is filtered by means of sand-filtration prior to release.

2.2.6 Putrescible Landfill (Category 89)

LRL proposed construction and operation of a class II putrescible landfill facility with a footprint of 5 ha and a total capacity of 2,270 tonnes per year including:

- 270 tonnes per year domestic putrescible waste (based on 500 personnel producing 540 kg of waste each per year); and
- 2,000 tonnes per year inert waste, including packaging and scrap materials not able to be recycled including scrap metals, timber, cabling, packaging of materials used in construction activities.

Recyclable materials such as metals, rubber, plastic paper, glass and fabric products will be segregated from other waste.

The landfill design will be a moving trench with a proposed maximum open excavation of 30 m long by 4 m wide and up to 4 m deep. The base of the landfill will be maintained at least 5 m from groundwater level.

2.3 Other relevant approvals

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

A mining proposal for the activities was submitted to the Department of Mines, Industry Regulation and Safety (DMIRS) on 25 February 2022 and has not yet been approved. DWER notes that the applicant is required to meet all obligations under the *Mining Act 1978* (noting tailings storage facility design and stability) and *Work Health and Safety Act 2020* (noting radiation management). DWER notes that should alterations in tailings storage facility design be required under the mining proposal, which have not been assessed under this approval, LRL would be required to apply for a works approval amendment.

Clearing permit 9591-1 to clear up to 348.2 hectares of native vegetation was granted on 15 July 2022.

2.3.2 Radiological Council of WA

DWER sought advice from the Radiological Council regarding naturally occurring radioactive material (NORM) which may be present within tailings. Specifically DWER requested confirmation on whether a radiation management plan would be required for tailings management. The Radiological Council responded on 5 August 2022 that, from the tailings characterisation information provided by the applicant, the tailings would not be considered radioactive under the *Radiation Safety Act 1975* and would consequently not require a radiation management plan.

The Radiological Council indicated DMIRS also has requirements with respect to NORM under the legislation that it administers which may still require consideration of a radiation management plan for the spodumene/lithium operation.

2.3.3 Aboriginal Heritage

The proposed premises overlaps with fourteen registered sites, and six lodged sites, under the *Aboriginal Heritage Act 1972*. DWER notes that the *Aboriginal Cultural Heritage Act 2021* (ACH Act) has recently come into effect (18 June 2022). The Department of Planning Lands and Heritage (DPLH) has advised that a transitional phase will be in place until 1 July 2023, during which time the *Aboriginal Heritage Act 1972* will remain in force to allow proponents to continue

to seek section 18 consent for any activity that will impact Aboriginal sites³. DPLH has confirmed (DWER reference DWERDT640558) that LRL have submitted a notice under section 18, for which the Minister for Aboriginal Affairs granted consent on 30 May 2022.

The premises is partly covered by the Tijwarl Determined Native Title Claim (WC11/7). DWER requested comment from the Tijwarl Aboriginal Corporation (Tijwarl AC) regarding the proposed activities. A response was received from the Tijwarl AC on 15 July 2022 confirming that LRL had engaged with Tijwarl AC prior to lodging the works approval application and that a comprehensive native title agreement had been signed on 17 November 2021. In their response they indicated that “Tijwarl does not currently hold any objection to the works approval the subject of this correspondence”.

3. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk Assessments* (DWER 2020).

To establish a risk event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

3.1 Source-pathways and receptors

3.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction and time limited operations which have been considered in this decision report are detailed in Table 5 below. Table 5 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary. Noise emissions associated with construction, and odour emissions from landfill activities, have been discounted from the risk assessment as there are no nearby sensitive human receptors.

Table 5: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Construction of: <ul style="list-style-type: none"> Processing plant Tailings storage facility Paste Plants Electric power station 	Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and PEC vegetation complex	<ul style="list-style-type: none"> Use of water cart on exposed areas Use of fixed sprays as required Use of water cart or fixed sprays for the ROM pad Sprays fitted to the tipping area of the crusher

³ Any section 18 consents applied for and granted during this period will be limited to 5 years and will be subject to additional protection mechanisms, including the requirement to report new information about the existence or the characteristics of Aboriginal cultural heritage.

Emission	Sources	Potential pathways	Proposed controls
	<ul style="list-style-type: none"> • WWTP • Putrescible landfill Vehicle movements and earthworks		
Commissioning			
Spills/leaks of process water contaminated with environmentally hazardous materials (metalloids, processing plant reagents)	Commissioning of ore processing plant and associated pipelines	Direct discharge to land causing vegetation poor health/death for adjacent priority flora and PEC vegetation complex	<ul style="list-style-type: none"> • Pre-commissioning (static checks to ensure unpowered equipment has been installed to specification) • Dry commissioning (tests of empty equipment without addition of ore or water) • Wet commissioning – comprising tests of equipment and facilities with ore and process fluids where relevant. • Pipelines will be fitted with flow and leak detection sensors monitored in real time for the centrally located control room. • Surface water management infrastructure will be constructed prior to ore commissioning commencing.
Time limited operations			
Processing plant			
Spills/leaks of process water contaminated with environmentally hazardous materials (metalloids, processing plant reagents) Contaminated surface water run-off	Operation of the processing plant and associated pipelines	Direct discharge to land causing vegetation poor health/death for adjacent priority flora and PEC vegetation complex	<ul style="list-style-type: none"> • Ore processing activities will be conducted within bunded areas draining to sumps with recovery pumps. • Diversion bunds constructed to separate clean water from potentially contaminated water • Regular inspection of infrastructure, pipelines • Flow sensors would be fitted along pipelines to allow detection of loss of contents. • All chemical reagents will be stored within tanks or silos in appropriately bunded facilities whereby 110% of the largest vessel is contained and 25% of

Emission	Sources	Potential pathways	Proposed controls
			<p>the total volume</p> <ul style="list-style-type: none"> • Minor spills to be cleaned up immediately and reported through the incident report procedure • Process water stored in a 720m³ tank with high level alarms
Dust		Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and PEC vegetation complex	<ul style="list-style-type: none"> • Use of water cart on ROM pad • Use of fixed sprays as required • Crushing and screening activities restricted during high winds if dust can not be adequately controlled • Spilled ore and materials outside of the ore processing areas regularly cleaned up • Spodumene concentrate loaded into trucks within an enclosed shed • Tantalum concentrate placed in bags with an enclosed area
Tailings Storage Facility			
Tailings and contaminated water (metalloids)	Discharge and storage of tailings into the TSF	Seepage through base and embankments to soil and groundwater causing vegetation poor health/death and groundwater contamination (adjacent priority flora and PEC vegetation complex)	<p>Controls</p> <ul style="list-style-type: none"> • Where in-situ materials are unsuitable for subgrade a 200mm thick layer of imported fine grained compacted material will be placed as the HDPE subgrade; • 1.5mm HDPE geomembrane liner: <ul style="list-style-type: none"> ○ Heat welded seams ○ Carbon black content 2 – 3% ○ Leak tested ○ Quality control testing undertaken by the contractor and quality control certificates provided • Upstream cut-off trench and toe drain; • Basin underdrainage system and underdrainage collection sump; • Slotted concrete decant tower at the centre of each cell, with decant return pipeline. Decant recycled to the process plant;

Emission	Sources	Potential pathways	Proposed controls
			<ul style="list-style-type: none"> • Sub-aerial deposition using bank spigots to maintain the supernatant pond near the decant tower; <p>Monitoring</p> <ul style="list-style-type: none"> • Installation of 3 “monitoring stations” to the west the TSF1 tailings storage facility, each with two groundwater bores, one shallow and one deep (i.e. 6 wells in total); • No upgradient bores are proposed due to exclusion zones associated with cultural heritage requirements; and • Installation of 14 piezometers within the TSF embankments.
		Overtopping of TSF and direct discharge to land causing poor vegetation health/death to adjacent priority flora and PEC vegetation complex	<ul style="list-style-type: none"> • Total freeboard allowance after a 1% Annual Exceedance Probability (AEP) 72 hour rainfall event to be minimum 500mm. • Operation freeboard (for solids – distance between the perimeter embankment and the solid tailings beach) to be minimum 300mm. • Beach freeboard (height between pond level and exposed tailings beach extent) to be minimum 200mm.
		Pipeline leak/rupture and direct discharge to land causing vegetation poor health/death	<ul style="list-style-type: none"> • Pipelines will incorporate isolation valves at appropriate intervals and period visual inspections undertaken once per 12 hour shift • Tailings and return water pipelines to be fitted with flow and leak detection sensors • Scour pits or sumps to be constructed along the length of the above-ground pipeline corridors to ensure leaks or spillages are contained with bunded areas • Pipelines to be installed with instrumentation consisting of electromagnetic flow meters and pressure transmitter installed downstream of pump station and upstream TSF discharge providing constant monitoring of

Emission	Sources	Potential pathways	Proposed controls
			<p>operation parameters of the tailings pipeline, and to provide shutdown of the system in the event of pipeline failure</p>
		Contaminated surface water run-off	<ul style="list-style-type: none"> • Diversion of rainfall runoff from catchment areas around site infrastructure to discharge off site downstream of the project. The proposed diversion will direct runoff from three catchments to the North and into Jones Creek after having passed through a Sediment Control Dam (SCD). • SCDs will be constructed in the downstream reaches of catchments impacted by site infrastructure. The stored water will be monitored to confirm suitability for discharge to the environment downstream of the project site. • Precipitation onto each facility will be contained within the appropriate freeboard allowances. • Surface water run-off collected at the downstream toe of the TSF1 embankments to prevent ponding and/or erosion. <p>Monitoring</p> <ul style="list-style-type: none"> • Surface water monitoring of sediment control dams SCD01 and SCD02. Water quality will be monitored monthly (anticipating that dams will remain empty in most months given the climatic conditions and dam catchment sizes). • Monitoring will also occur when the dams are overflowing. Monitoring will comprise pH, EC and total suspended solids. Consideration will be given to a more comprehensive monitoring suite if results indicate elevated salinity.
Paste plants			
Mixed tailings/cement paste	Accidental spill/containment loss from paste fill	Overland flow causing contamination of	<ul style="list-style-type: none"> • Paste plant activities will be conducted within bunded areas draining to sumps with recovery pumps.

Emission	Sources	Potential pathways	Proposed controls
	plant	nearby creek lines	
Electric power generation			
Emissions to air – NOx, carbon monoxide, unburned hydrocarbons	LNG power station operation	Air/windborne pathway causing impacts amenity	<ul style="list-style-type: none"> • LRL have stated that “Standard monitoring will be conducted.” • Factory trained personnel will tune the gas engines by sampling exhaust emissions to ensure the specified NOx values are achieved. • Trained personnel will check, and tune exhaust NOx values on completion and construction of the plant, every 2,000 running hours to ensure engine performance is maintained. Sampling will be from exhaust sampling points built into each stack. Typically sampling connections are installed in the muffler discharge pipe.” • Distribution transformers will be fully sealed and installed in a concrete bund.
Contaminated stormwater (hydrocarbons)		Overland flow causing contamination of nearby creeklines	<ul style="list-style-type: none"> • Building pad will be a 100mm concrete foundation to prevent ingress of stormwater • Building and genset foundations constructed of concrete with the building floor drained to a 600mm wide culvert running the full length of the building • Building designed so that hydrocarbon spills and contaminated stormwater are directed through to a spill containment pit
Wastewater Treatment Plants			
Sewage, partially treated sewage, wastewater	Containment loss from WWTP and associated pipelines	Overland flow causing contamination of nearby creek lines Infiltration through soil to groundwater causing contamination of groundwater	<ul style="list-style-type: none"> • The balance tanks will be fitted with low level and high level alarms to commence and cease pumping and a ‘high high level’ alarm which activates a visual and sound alarm for abnormally high levels in the tank for immediate action. • The WWTPs will have contingency storage for up to two days of normal flow if discharge is

Emission	Sources	Potential pathways	Proposed controls
			suspended.
Treated wastewater	Discharge of wastewater to the tailings storage facility	Seepage through base and embankments of the tailings storage facility, causing contamination of groundwater	<ul style="list-style-type: none"> Treated to quality criteria outlined in section 2.2.5 <p>MBS (2022) states that treated effluent will comprise less than 5% of the overall volume of waste disposed of within the TSF and the TSF will be HDPE-lined.</p>
	Use of treated wastewater from the Accommodation Village WWTP for dust suppression and for construction purposes	Direct discharge to land	<ul style="list-style-type: none"> Treated to “Medium” risk standards for DoH non-potable use category applications. See quality criteria outlined in section 2.2.5.
Treatment chemicals	Storage of WWTP treatment chemicals – containment loss	<p>Direct discharge to land causing contamination of nearby ephemeral creeklines</p> <p>Infiltration through soil to groundwater causing contamination of groundwater</p>	<ul style="list-style-type: none"> Chemicals to be stored in a bunded area Spill kits to be kept at the premises
Putrescible Landfill			
Dust	Operation of a category 89 landfill	Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and PEC vegetation complex	<ul style="list-style-type: none"> Use of water cart on exposed areas
Windblown waste		Air/windborne pathway causing impacts to health	<ul style="list-style-type: none"> Weekly covering and compaction of waste Fence around whole perimeter of

Emission	Sources	Potential pathways	Proposed controls
		and amenity	landfill <ul style="list-style-type: none"> Waste that is blown outside the landfill will be returned to the tipping area at least once every month
		Fauna access/scavenging	<ul style="list-style-type: none"> Fence around whole perimeter of landfill Gates to be kept closed, other than when waste is being deposited
Leachate		Seepage through base and embankments to soil and groundwater causing vegetation poor health/death and groundwater contamination	<ul style="list-style-type: none"> The base of the landfill will be maintained at least 5 m from groundwater level. No lining of the landfill is proposed Groundwater depth in the vicinity of the landfill was recorded at 14.81 meters below ground level (mbgl) for bore WSTB006 in November 2019.
Contaminated surface water		Surface water run off causing contamination of nearby ephemeral creek lines	<ul style="list-style-type: none"> Located away from ephemeral creeks and areas of associated flooding Weekly covering and compaction of waste

3.1.2 Receptors

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

Table 6 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)). The nearest town of Leinster is approximately 60 km south-east of the premises.

Table 6: Sensitive human and environmental receptors and distance from prescribed activity

Environmental receptors	Distance from prescribed activity
<u>Groundwater</u> Goldfields Groundwater Area- <i>Rights in Water Irrigation Act 1914</i>	<u>Groundwater depth:</u> Groundwater levels were measured at approximately 8 – 12m below ground level within the area of the proposed tailings storage facility footprint (AQ2, 2019). A number of other hydrogeological studies have taken place across the site, whereby 35 monitoring and production bores have been

	<p>advanced at the premises. Four wells recorded depths 5-10mbgl (shallowest 5.55mbgl), fifteen wells with groundwater depths between 10-15mbgl, fifteen wells between 15 – 20mbgl, thirteen wells between 15 -25mbgl. Only three wells returned groundwater depths >25mbgl (H2, 2022).</p> <p>Groundwater flow at site is predicted to flow east to west at a relatively steep groundwater gradient for the Goldfields (AQ2, 2019).</p> <p><u>Groundwater quality</u></p> <p>Groundwater quality at Kathleen Valley is fresh (total dissolved solids concentrations (TDS) of 590 to 810 mg/L), alkaline (pH 8.0 to 8.6) and with no significant concentrations of dissolved metals (AQ2, 2019).</p> <p>Groundwater quality is further discussed in section 3.3.2.</p> <p><u>Nearby groundwater users</u></p> <p>There are several active mine sites using groundwater surrounding site. H2 (2022) indicates the closest significant borefield is ~6km from the site.</p> <p>There are also multiple pastoral stations (with watering sites for cattle) surrounding the project area. H2 (2022) indicates that there is likely to be low connectivity between groundwater sourced by LRL and adjacent pastoral stations due to the fractured rock aquifer underlying the site.</p>
<p><u>Priority Ecological Community (PEC)</u></p> <p>Priority 1⁴ – Violet Range (Perseverance Greenstone Belt) vegetation complexes (banded ironstone formation)</p> <p>Figure 3 – Appendix 2</p>	<p>Within prescribed premises boundary</p>
<p><u>Threatened fauna</u></p> <p><i>Kwonkan moriartii</i> – Moriarty’s trapdoor spider</p>	<p>Within prescribed premises boundary (adjacent to south-west boundary)</p>
<p><u>Priority 4⁵ flora</u></p> <p>Multiple occurrences of <i>hemigenia exilis</i> and <i>Grevillea inconspicua</i></p>	<p>Within prescribed premises boundary</p>

⁴ Priority one communities are “Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. active mineral leases)”. (DEC, 2003)

⁵ Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. (DBCA, 2019)

Figure 4– Appendix 2	
<p><u>Hydrography WA – surface water lines</u></p> <p>Jones Creek and associated aquatic organisms and hyporheic fauna</p> <p>Ephemeral creek lines</p> <p>Figure 5– Appendix 2</p>	<p>Within prescribed premises boundary, approximately 150m north of proposed TSF1</p> <p>The Project falls within the surface water sub-catchment of Jones Creek, which extends about 14 km to the northeast and 8 km to the east of proposed infrastructure. It flows to the south-west into the Albion Downs valley and eventually to Lake Miranda. The expected flow frequency of Jones Creek is slightly more than once per year with flow duration of several hours. Continuous flow between 48 and 72 hours has a frequency of about 1:100 years (AQ2, 2018).</p> <p>Several smaller drainage lines are present throughout the project area. All creeks are ephemeral in nature, only flowing briefly immediately following significant rainfall events (MBS Environmental, 2022).</p>
<p><u>Subterranean fauna</u></p>	<p>A subterranean fauna survey was conducted for the project area by Invertebrate Solutions on 26 November 2021. No stygofauna were identified during the survey. Invertebrate solutions indicate that there is a low likelihood of stygofauna being present within the project area. They indicated further investigation would be warranted for significant dewatering for potential impacts to the Carey Paleochannel and associated aquifer 10km to the south west of the project area.</p>

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 3.1. 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 3.1), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 7.

Works approval W6687/2022/1 that accompanies this decision report authorises construction and time-limited operations. The conditions in the issued works approval, as outlined in Table 7 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 7: Risk assessment of potential emissions and discharges from the premises during construction, commissioning and operation

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
Construction								
<ul style="list-style-type: none"> Construction of: <ul style="list-style-type: none"> Processing plant Tailings storage facility Paste Plants Electric power station WWTP Putrescible landfill Vehicle movements and earthworks 	Dust	Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and PEC vegetation complex	Adjacent priority flora and PEC vegetation complex Adjacent threatened fauna	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Conditions 1 – dust management	Applicant proposed dust suppression with water cart has been included within the works approval as a regulatory control.
Commissioning								
Commissioning of ore processing plant and associated pipelines	Spills/leaks of process water contaminated with environmentally hazardous materials (metalloids, processing plant reagents) Contaminated surface water run-off	Direct discharge to land causing vegetation poor health/death for adjacent priority flora and PEC vegetation complex	Adjacent priority flora and PEC vegetation complex Adjacent threatened fauna Ephemeral creek lines	Refer to Section 3.1	C = Moderate L = Possible Medium Risk	N	<u>Condition 15 - commissioning requirements</u>	The applicant proposed controls for environmental commissioning, for spill/leak and contaminated surface water management have been included within the works approval as regulatory controls. <u>DWER controls</u> Whilst the applicant has generally indicated that equipment and pipelines will be "tested", DWER has conditioned further detail requiring testing of bunds, sumps, pipelines, process control alarms, flow metres and pressure metres to mitigate risks of spills or containment loss from the process plant.
	Dust	Air/windborne pathway causing poor vegetation	Adjacent priority flora and PEC	Refer to Section 3.1	C = Minor L = Unlikely	Y	Conditions 1 – dust management	Applicant proposed dust suppression with water cart has been included within the

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
		health/death for adjacent priority flora and PEC vegetation complex	vegetation complex Adjacent threatened fauna		Medium Risk			works approval as a regulatory control.
Operation (including time-limited-operations operations)								
Processing plant								
Operation of the processing plant	Spills/leaks of process water contaminated with environmentally hazardous materials (metalloids, processing plant reagents) Contaminated surface water run-off	Direct discharge to land causing vegetation poor health/death for adjacent priority flora, fauna and PEC vegetation complex. Contamination of ephemeral creeklines	Adjacent priority flora and PEC vegetation complex Adjacent threatened fauna Ephemeral creek lines	Refer to Section 3.1	C = Moderate L = Possible Medium Risk	Y	Condition 4 – construction requirements Condition 21 – operational requirements	The applicant proposed controls for spill/leak and contaminated surface water management are considered sufficient and have been included within the works approval as regulatory controls.
	Dust	Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and PEC vegetation complex	Adjacent priority flora and PEC vegetation complex Adjacent threatened fauna	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 4 – construction requirements – water sprays fitted at ROM bins and transfer points in the crushing circuit	The applicant controls for dust management are considered sufficient and have been included within the works approval as regulatory controls
Tailings Storage Facility								
Discharge and storage of tailings into the TSF	Tailings and contaminated water (metalloids)	Seepage through base and embankments to soil and groundwater causing vegetation poor health/death and groundwater	Adjacent priority flora and PEC vegetation complex RIWI Groundwater	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	N	Refer to section 3.3	Refer to Section 3.3

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
		contamination (adjacent priority flora and PEC vegetation complex)	area					
		Seepage through base and embankments causing impacts to nearby ephemeral creeklines	Ephemeral creek lines (Jones Creek)		C = Moderate L = Unlikely Medium Risk	Y	N/A	DWER has assessed risk to nearby Jones Creek and associated aquatic and hyporheic fauna as "Medium" risk. Impacts are, however, unlikely during the 6 months of time limited operations permitted by the works approval. Flow of the creek may also not occur during this time. DWER notes that potential risks to Jones Creek should be further considered and assessed for the licence application Refer to Section 3.3 for further detail.
		Overtopping of TSF and direct discharge to land causing poor vegetation health/death to adjacent priority flora and PEC vegetation complex	Adjacent priority flora and PEC vegetation complex Adjacent threatened fauna		C = Moderate L = Unlikely Medium Risk	Y	Condition 2 – construction requirements – freeboard Condition 21 – operational requirements, freeboard and inspections	Applicant proposed total freeboard has been placed on the works approval as a regulatory control. Applicant proposed 12 hourly visual inspections have been placed on the works approval as a regulatory control.
		Pipeline leak/rupture and direct discharge to land causing vegetation poor health/death	Adjacent priority flora and PEC vegetation complex Adjacent threatened fauna Ephemeral creek lines		C = Moderate L = Possible Medium Risk	N	<u>Condition 2 – construction requirements</u> Condition 21 – operational requirements	Applicant proposed controls for pipeline construction and operation have been placed on the works approval as regulatory controls. The applicant has proposed visual inspection of pipelines every 12 hours has been placed on the works approval as a regulatory control. <u>DWER control</u> Due to nearby PEC and sensitive flora, additional detail has been included within pipeline controls, requiring that the containment for a pipeline spill or breach be of sufficient capacity to contain a volume equal to the time between routine

Risk events					Risk rating ¹	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls	C = consequence L = likelihood			
								inspections.
		Contaminated surface water run-off	Ephemeral creek lines		C = Moderate L = Unlikely Medium Risk	Y	Condition 2 – construction requirements	The applicant proposed controls for stormwater diversion/run-off are considered sufficient and have been included within the works approval as regulatory controls.
Paste plant								
Accidental spill/containment loss from paste fill plant	Mixed tailings/cement paste	Overland flow causing contamination of nearby creek lines	Ephemeral creek lines	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 4 – construction requirements – bunding and sumps	The applicant proposed controls for paste plant containment loss are considered sufficient and have been included within the works approval as regulatory controls.
Electric power generation								
LNG/diesel power station operation	Emissions to air – NOx, carbon monoxide, unburned hydrocarbons	Air/windborne pathway impacting amenity	No receptors	N/A	N/A	N/A	Condition 22 – authorised emissions Condition 28 – monitoring during time limited operations	The applicant has indicated it will test for NOx to determine power station performance. DWER has therefore placed a single monitoring event for NOx during time limited operations to verify expected power station operation.
	Contaminated stormwater (hydrocarbons)	Overland flow causing contamination of nearby creeklines	Ephemeral creek lines	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 4 – construction requirements - bunding	The applicant proposed controls are considered sufficient and have been included within the works approval as a regulatory control.
Wastewater Treatment Plants								
Containment loss from WWTP and associated pipelines	Sewage, partially treated sewage, wastewater	Direct discharge to land causing contamination of nearby ephemeral creeklines Infiltration through soil to groundwater causing contamination of groundwater	RIWI Groundwater area Ephemeral creek lines	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 4 – construction and minimum performance requirements	The applicant proposed controls, including tank alarms, treatment quality criteria and storage contingency have been included within the works approval as regulatory controls.

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
Discharge of wastewater to the TSF	Treated wastewater	Seepage through base and embankments of the TSF, causing contamination of groundwater	RIWI Groundwater area	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	N	<p><u>Condition 4 – construction and minimum performance requirements</u></p> <p><u>Condition 27 – water balance monitoring</u></p>	<p>To ensure the quality of wastewater being discharged to the tailings storage facility is acceptable, the applicant proposed treatment performance criteria have been included within works approval as a regulatory control.</p> <p><u>DWER control</u></p> <p>The applicant has indicated that treated wastewater shall represent no greater than 5% of the total volume of materials deposited into the tailings storage facility.</p> <p>DWER has therefore additionally included a requirement for a volumetric flow metre to monitor volumes of outgoing treated wastewater to monitor how much wastewater will be deposited in the tailings storage facility.</p> <p><u>Approval under the Mining Act 1972</u></p> <p>DWER notes, that whilst it regulates emissions (i.e seepage of treated wastewater from the tailings storage facility), LRL is required to gain approval for this activity under the <i>Mining Act 1972</i>, as discharge of treated wastewater to the TSF may have TSF stability, design and life of mine implications.</p>
		Discharge of treated wastewater to land for dust suppression and construction purposes	<p>Adjacent priority flora and PEC vegetation complex</p> <p>Adjacent threatened fauna</p> <p>Ephemeral creek lines</p>	Refer to Section 3.1	C = Minor L = Possible Medium Risk	N	<p>Condition 4 – construction and minimum performance requirements</p> <p><u>Condition 31 – WWTP monitoring requirements</u></p>	<p>The applicant proposed controls have been placed on the works approval as regulatory controls (to treat wastewater to “Medium” risk Department of Health standards prior to reuse for dust suppression or construction purposes).</p> <p><u>DWER controls:</u></p> <p>To determine suitability of treated wastewater for dust suppression and construction purposes, DWER has conditioned a single monitoring event during time limited operations to verify treatment performance of the Accommodation Village</p>

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
								WWTP.
Storage of WWTP treatment chemicals – containment loss	Treatment chemicals	Direct discharge to land causing contamination of nearby ephemeral creeklines Infiltration through soil to groundwater causing contamination of groundwater	Adjacent priority flora and PEC vegetation complex RIWI Groundwater area Ephemeral creek lines	Refer to Section 3.1	C = Minor L = Possible Medium Risk	Y	Condition 4 – construction requirements (chemical storage/bunding)	The applicant proposed controls are considered sufficient and have been included within the works approval as a regulatory control.
Putrescible Landfill								
Operation of a category 89 landfill	Dust	Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and PEC vegetation complex	Adjacent priority flora and PEC vegetation complex	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Conditions 1 – dust management	Applicant proposed dust suppression with water cart has been included within the works approval as a regulatory control.
	Windblown waste	Air/windborne pathway causing poor vegetation health/death	Adjacent priority flora and PEC vegetation complex	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 21 – time limited operations – compaction and covering	The applicant proposed controls for preventing windblown waste are considered acceptable and have been included within the works approval as regulatory controls.
		Fauna access/scavenging	Native and threatened fauna	Refer to Section 3.1	C = Moderate L = Possible Medium Risk	Y	Condition 4 – construction requirements – perimeter fence	The applicant proposed control for restricting fauna access with a perimeter fence is considered acceptable and has been included within the works approval as a regulatory control.
	Leachate	Seepage through base and embankments to soil and groundwater causing vegetation poor health/death and groundwater	Adjacent priority flora and PEC vegetation complex RIWI Groundwater	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 4 – construction requirements Condition 6 – groundwater monitoring associated with putrescible	DWER has placed the applicant proposed landfill construction, including maintaining a minimum distance above groundwater, on the works approval as regulatory controls. To ensure the 5 m buffer between the landfill base and groundwater level can be achieved a requirement has been added to the works

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
		contamination	area				landfill	approval for the applicant to test depth to groundwater in the vicinity of the landfill prior to construction. The proponent should test depth to groundwater in the vicinity of the landfill prior to construction to ensure that it can meet the 5m separation distance from the base of landfill to groundwater.
	Contaminated surface water	Surface water run off causing contamination of nearby ephemeral creek lines	Ephemeral creek lines	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 4 – location of landfill	DWER has placed the applicant proposed landfill construction, including locating the landfill away from creeklines, on the works approval as regulatory controls.

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

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

3.3 Detailed risk assessment – impacts of tailings storage facility seepage on adjacent vegetation and creek lines

3.3.1 Source

Tailings Characterisation

A tailings characterisation report by MBS Environmental (2021) was provided in the application whereby a representative tailings sample was prepared using 39 samples of pegmatite ore collected from 18 drill holes. The bulk sample was then subjected to processing conditions reflective of the proposed process plant operation.

Tailings were found to be enriched in beryllium, bismuth, caesium, lithium, rubidium, rhenium, tin, tantalum, tellurium and thallium. Samples were found to have low sulfur content, were strongly basic in solution and classified as non-acid forming.

Samples underwent both water leachate tests (simulating short term leaching by rainwater over a period of several years) and kinetic leachate tests (simulating whether elements have the potential to enter solution following oxidation of tailings). Water leachates were found to be alkaline, non-saline and with low concentrations of major ions, metals and metalloids (Appendix 3 - Water Leachate Test). Under highly oxidizing conditions, tailings leachates are likely to be neutral, non-saline and contain low concentrations of fluoride, major ions, metals and metalloids (Appendix 3 – Kinetic Leachate test).

Under different pH conditions⁶, exceedances of non-potable ground water use criteria (DWER, NPUG) and ANZECC livestock drinking water criteria were found only for extreme pH values 2.2 or 13.1.

Supernatant collected from the tailings sample was circum-neutral to slightly alkaline but had salinity and concentrations of major ions, and soluble alkalinity levels that were an order of magnitude higher than those in the leachate tests (Appendix 3 – Supernatant). MBS (2021) attributed this to differences in dilutions between the measurements.

MBS (2021) found that overall, the tailings samples were “relatively benign” and the risk of tailings producing environmentally hazardous leachates to be “very low”.

Naturally Occurring Radioactive Material

Tailings were found to be enriched in rubidium, considered a naturally occurring radioactive material (NORM). Rubidium (Rb-87) was found to occur at concentrations of 3,400mg/kg with an activity concentration of 3.026 Bq/g. MBS (2021) indicated these levels are low enough as to not to require a radiation safety management plan.

The Radiological Council confirmed, from the tailings characterisation information provided, the tailings would not be considered radioactive under the *Radiation Safety Act 1975* and would consequently not require a radiation management plan (see section 2.3.2).

Estimated Seepage

Knight Piesold (2022) seepage modelling indicates that an intact HDPE liner will retain water within the TSF basin and the embankment and near surface ground will be unsaturated. If the integrity of the proposed HDPE liner is ensured, the seepage is estimated to be “very low”, from 5 – 25m³/day. Model assumptions include the following:

⁶ Leaching Environmental Assessment Framework (LEAF) tests method 1313 and 1314 were conducted on tailings for testing under different pH conditions

- 1.5 mm HDPE geomembrane liner;
- Fine grained HDPE Liner Subgrade and compacted soil liner;
- Tailings will be 55% solids by weight;
- Freeboard of 1 m;
- Takes into account the possibility of a blocked underdrainage system
- Groundwater level at 8 m bgl.

3.3.2 Pathway

Hydrogeology

The ground conditions underlying the proposed TSF area comprise a thin layer of silty/clayey soil to an average depth of 280mm, underlain by hardpan (a thin layer of weathered rock like material) underlain by igneous rock. The permeability of the rock within the proposed footprint of the TSF was found to be moderate with the average permeability being approximately 1×10^{-6} m/s.

Groundwater levels were measured at approximately 8 – 12m below ground level within the area of the proposed tailings storage facility footprint (AQ2, 2019). Groundwater flow on-site is predicted to be towards the west with a steep groundwater gradient. Knight Piesold (2020) indicates the majority of groundwater in the area is hosted in discrete geological structural features with associated limited storage. Preferential pathways for groundwater flow exist in the form of faults and fractures.

Baseline Groundwater Information

H2 (2022) indicates groundwater quality at Kathleen Valley is mostly fresh (total dissolved solids concentrations (TDS) of 590 to 810 mg/L), alkaline (pH 8.0 to 8.6) and with no significant concentrations of dissolved metals (AQ2, 2019). This is also reflected in groundwater data collected from five monitoring bores installed by Knight Piesold (2020) included in Appendix 4.

Baseline Surface water information

The Project falls within the surface water sub-catchment of Jones Creek, which extends about 14 km to the northeast and 8 km to the east of proposed infrastructure. It flows to the south west into the Albion Downs valley and eventually to Lake Miranda. The expected flow frequency of Jones Creek is slightly more than once per year with flow duration of several hours. Continuous flow between 48 and 72 hours has a frequency of about 1:100 years (AQ2, 2018).

Several smaller drainage lines are present throughout the project area. All creeks are stated by the applicant to be ephemeral in nature, generally flowing immediately following significant rainfall events.

3.3.3 Proposed seepage management and monitoring

The applicant is proposing the following controls to manage seepage from the TSF:

- Where in-situ materials are unsuitable for subgrade a 200mm thick layer of imported fine grained compacted material will be placed as the HDPE subgrade;
- 1.5mm HDPE geomembrane liner:
 - Heat welded seams
 - Carbon black content 2 – 3%
 - Leak tested
 - Quality control testing undertaken by the contractor and quality control certificates provided

- Upstream cut-off trench and toe drain;
- Basin underdrainage system and underdrainage collection sump. Water collected either pumped to the supernatant pond or process plant;
- Slotted concrete decant tower at the centre of each cell, with decant return pipeline. Decant recycled to the process plant;
- Sub-aerial deposition using bank spigots to maintain the supernatant pond near the decant tower;
- Sealing of boreholes drilled within the TSF footprint to prevent development of preferential pathways for seepage;

The following monitoring program is proposed, for the requirements and frequency listed in Table 8:

- Installation of 3 “monitoring stations” to the west the TSF1 tailings storage facility, each with two groundwater bores (i.e. 6 wells in total), one extending to a depth of approximately 5m bgl and the other extending to the groundwater table (anticipated to be approximately 10 to 15m bgl). The shallow bore is intended to detect any seepage from the TSF flowing within the surface sediments, whilst the deep bore is designed to monitor groundwater level and chemistry;
- No upgradient bores are proposed due to exclusion zones associated with cultural heritage requirements; and
- Installation of 14 piezometers within the TSF embankments.

Table 8 Proposed monitoring

Monitoring type	Proposed monitoring requirement	Proposed frequency
Groundwater monitoring bores	Water level	Monthly
	Water quality – basic – analytes not specified	Monthly
	Water quality – comprehensive – pH, EC, TDS, hardness, alkalinity, Ca, Mg, Na, K, NH ₄ , PO ₄ , CO ₃ , HCO ₃ , Cl, SO ₄ , NO ₃ , SiO ₂ , Al, Fe, Mn, Li, Rb, Tl and U	Quarterly
Piezometer	Water level (phreatic surface)	Weekly

3.3.4 DWER assessment and regulatory controls

The closest receptors which may be sensitive to impacts from seepage are the adjacent PEC and priority flora. As the PEC and priority flora are directly adjacent to the TSF, the consequence rating for impacts from seepage are considered “Moderate”. Groundwater in the vicinity of the TSF is shallow (~8 m bgl within the vicinity of the TSF), however as the modelled seepage from the TSF is relatively minimal (as the TSF will be HDPE lined), the likelihood is considered as “Unlikely”. The Delegated Officer therefore considers the overall risk rating impacts of seepage to adjacent the adjacent PEC and priority flora to be “Medium”.

Risk of seepage impacts to aquatic and hyporheic fauna within Jone’s Creek is considered “moderate”. As Jone’s Creek is in close proximity to the TSF1, being only 150m north, the likelihood for impacts to the creekline are considered “possible”, giving an overall “Medium” risk rating.

Given risk ratings for seepage to nearby receptors, the following DWER regulatory controls will consequently be placed on the works approval.

Table 9: DWER regulatory controls (seepage)

Condition/control	Justification
<p><u>Tailings storage facility construction requirements</u></p> <p>Condition 2 – construction</p> <p>Condition 3 – construction of additional embankment lifts</p> <p>Condition 8 – critical containment infrastructure reporting – liner QA/QC</p>	<p>Applicant proposed construction specifications to prevent seepage have been placed on the works approval as regulatory controls.</p> <p>Additionally, as the modelled low rate of seepage is almost entirely dependent on the HDPE liner integrity, DWER has also conditioned a number of requirements for the HDPE liner using guidance from DWER’s Water Quality Protection Note 26 – “Liners for containing pollutants, using synthetic membranes”. A third party quality control/quality assurance certificate regarding the HDPE liner has also been conditioned.</p>
<p><u>Water balance:</u></p> <p>Condition 27 – water balance</p>	<p>While an estimated water balance has been provided, the low seepage (5-25m³/day) calculated is likely to be approximate only. To verify expected seepage, DWER has placed a requirement for monitoring monthly water balance during time limited operations has been placed on the works approval.</p>
<p><u>Time limited operations – starter embankments</u></p> <p>Condition 21 – time limited operations</p>	<p>The applicant requested, in response to the first draft, to be allowed to construct stages 2 – 5 under the works approval (see Appendix 5). Time limited operations, allowing deposition of tailings, will commence following completion of the <u>starter embankments</u> for a duration of 180 days. As stages 2 – 5 will take place 2.5-3 years following initial deposition, this will fall outside of time limited operations as authorised by the works approval. Consequently, whilst the works approval will authorise construction of additional stages (with submission of compliance documentation required), LRL will be required to submit a licence amendment application (assuming a licence will be in place for the operation), to allow operation of the additional stages.</p> <p>Seepage impacts and the management of the TSF will be reassessed during each licence amendment to ensure the TSF is being managed appropriately</p>
<p><u>Tailings:</u></p> <p>Condition 22 – authorised emissions</p>	<p>Tailings from other ore sources may present additional risk associated with contaminants of concern which have not been considered or risk assessed within this approval. These may present additional contaminants of concern being present within facility seepage.</p> <p>Only tailings from the Kathleen Valley Project are therefore permitted to be deposited into the TSF1 during time limited operations. To deposit tailings from other ore sources, a works approval amendment would be required.</p>
<p><u>Infrastructure and equipment requirements during time limited operations</u></p> <p>Condition 21</p>	<p>Applicant proposed operational specifications to prevent seepage have been placed on the works approval as regulatory controls.</p>
<p><u>Groundwater monitoring</u></p> <p>Condition 2 – piezometer</p>	<p>To monitor potential impacts from seepage, the applicant proposes to install three pairs of groundwater monitoring bores to the west of TSF1 (and a fourth pair south-west of proposed TSF2 – to be</p>

<p>installation</p> <p>Condition 5 - groundwater monitoring well construction</p> <p>Conditions 6, 23 – 26– groundwater monitoring, limits and reporting</p>	<p>constructed at a later time and not considered within the scope of this approval). Baseline and on-going operational groundwater information are proposed to be collected. DWER has therefore conditioned installation of these monitoring bores, baseline monitoring and monitoring during and at the end of time limited operations.</p> <p>In addition to the applicant proposed analytes, DWER has conditioned baseline and on-going monitoring requirements for analytes based on leachate and tailings composition as provided in the tailings characterisation report. Analytes for on-going monitoring, post time limited operations, will be reviewed again at the time of the licence application.</p> <p>Additionally, to protect adjacent PEC and priority flora, DWER has placed a standing water level limit of 4m bgl on the works approval. A trigger for management action at 6m bgl has also been conditioned.</p> <p>The applicant also proposes installation of fourteen piezometers to give an early warning for seepage (and for assessment of stability etc). Installation and monitoring of piezometers has been placed on the works approval as a regulatory control.</p>
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DWER has assessed risk to nearby Jones Creek and associated aquatic and hyporheic fauna as “Medium” risk, however impacts are unlikely during the 6 months of time limited operations permitted by the works approval. Flow of the creek may also not occur during this time. DWER notes that potential risks to Jones Creek should be further considered and assessed for the licence application.

4. Consultation

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

Table 10: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 27 June 2022	None received	N/A
Shire of Leonora advised of proposal on 27 June 2022	None received	N/A
Department of Mines, Industry Regulation and Safety (DMIRS) advised of proposal 27 June 2022	DMIRS advised on 17 August 2022 that a mining proposal was under assessment but had not yet been approved under the <i>Mining Act 1972</i> . DMIRS indicated that radiation management with respect to site operation was also being assessed.	Should there be any significant alterations to TSF design or proposed activities as required by the mining proposal, LRL will be required to submit a works approval amendment so that the approval under the <i>EP Act</i> are consistent with those under the <i>Mining Act 1972</i> .
Department of Planning, Lands and Heritage advised of proposal on 27 June	DPLH confirmed on 4 August 2022 (DWER reference DWERDT640558) that LRL have submitted a notice under section 18, for which the Minister for Aboriginal Affairs	N/A

2022	granted consent on 30 May 2022.	
Tijwarl Aboriginal Corporation advised of proposal on 27 June 2022	A response was received from the Tijwarl AC on 15 July 2022 confirming that LRL had engaged with Tijwarl AC prior to lodgement of the works approval and that a comprehensive native title agreement had been signed on 17 November 2021. In their response they indicated that “Tijwarl does not currently hold any objection to the works approval the subject of this correspondence”	N/A
Radiological Council advised of proposal on 12 July 2022	The Radiological Council responded on 5 August 2022 that, from the tailings characterisation information provided by the applicant, the tailings would not be considered radioactive under the Radiation Safety Act and would consequently not require a radiation management plan. The Radiological Council indicated DMIRS also has requirements with respect to NORM under the legislation that it administers which may still require consideration of a radiation management plan for the spodumene/lithium operation.	N/A
Applicant was provided with the first draft on 25 August 2022	The applicant provided comments to the first draft on 5 September 2022. See Appendix 5 for a summary of comments received.	See Appendix 5 for DWER responses to the comments received.
Applicant was provided with the second draft on 20 September 2022	The applicant responded with no comments on the second draft and requested the instrument to be granted.	Noted.

5. Conclusion

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

DWER notes that LRL will be also required to meet obligations under the *Mining Act 1972* and that a mining proposal, at the time of writing, had not yet been approved. Should there be any alterations to TSF design or proposed activities required under the *Mining Act 1972*, LRL may be required to submit a works approval amendment.

References

1. AQ2, 2018. *Scoping Study – Water Management. Kathleen Valley Lithium Deposit*
2. AQ2, 2019. *Water Management Study, as Input to the Kathleen Valley Lithium Deposit, Pre-Feasibility Study*
3. Department of Biodiversity, Conservation and Attractions, 2019. *Conservation Codes for Western Australian Flora and Fauna*
4. Department of Environment and Conservation (DEC formerly), 2003. *Definitions, categories and criteria for threatened and priority ecological communities*
5. Department of Environment and Conservation (DEC formerly), 2009, *Native Vegetation Condition Assessment and Monitoring Manual for Western Australia*
6. Department of Environment Regulation (DER formerly) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
7. Department of Planning Lands and Heritage, response to request for advice, DWER reference DWERDT640558.
8. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
9. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
10. H2, 2022. *H2 Hydrogeological Assessment – Kathleen Valley Lithium-Tantalum Project*
11. Invertebrate Solutions, 2022. *Pilot Survey and Desktop Assessment of Subterranean Fauna for the Kathleen Valley Lithium and Tantalum Project, Western Australia*
12. Knight Piesold Consulting, 2020. *Kathleen Valley – Monitoring Bore Completion and Aquifer Testing Report*.
13. Knight Piesold Consulting, 2022. *Tailings Storage and Associated Infrastructure Design Report*
14. MBS Environmental, 2021. *Kathleen Valley Lithium-Tantalum Project Spodumene Concentrator Tailings Geochemical Characterisation*

Appendix 1: Process plant operation

The Processing Plant will include the following operations to produce spodumene concentrate as summarised in Table 11 and Figure 2 below.

Table 11 Process plant operation

Stage	Description summary
Feed preparation	Two-stage ore crushing, whereby primary crushed ore will be discharged to the secondary crusher which will operate as an open circuit. Excess ore from the secondary crusher will overflow for deposition into a stockpile.
Ore grinding	Ore from the secondary crusher will be transferred for grinding in a Semi Autogenous Grinding (SAG) mill.
Magnetic separation	Cyclone overflow from the SAG mill will feed into two Low Intensity Magnet Separators (LIMS) for removal of any ferrous materials before transfer to the Wet High Magnetic Separators (WHIMS)
Tantalum recovery	The combined LIMS/WHIMS magnetic streams will be processed through a tantalum recovery circuit via gravity separation. The dried tantalum concentrate will initially discharge into a bin ahead of loading into bulk bags. Tantalum concentrate will be stored in bulk bags in dedicated shipping containers adjacent to the reagents shed.
Desliming and caustic conditioning	The combined LIMS/WHIMS non-magnetic stream will be pumped to a deslime feed tank from which it will then overflow into caustic scrubbing tank. The cyclone underflow will be dosed with caustic soda and agitated. Any overflows will be fed to the process tailings thickener for water recovery.
Flotation	Involves three-stage flotation, including a roughing stage followed by two stages of cleaning to produce an upgraded spodumene concentrate and barren tailings stream;
Concentrate thickening and filtration	The final spodumene concentrate will be pumped to a concentrate thickener prior to filtration. The feed will be mixed with a flocculant and coagulant prior to discharge into the thickener.
Concentration storage	Spodumene concentrate (nominal moisture 8 – 10%) will be conveyed to a radial stacker, stacking into the covered concentrate storage shed. The storage shed will have a maximum capacity of 15,600 tonnes.
Tails thickening and disposal	Approximately 50% of the tailings will be pumped to the tailings storage facility and 50% to the paste plant.

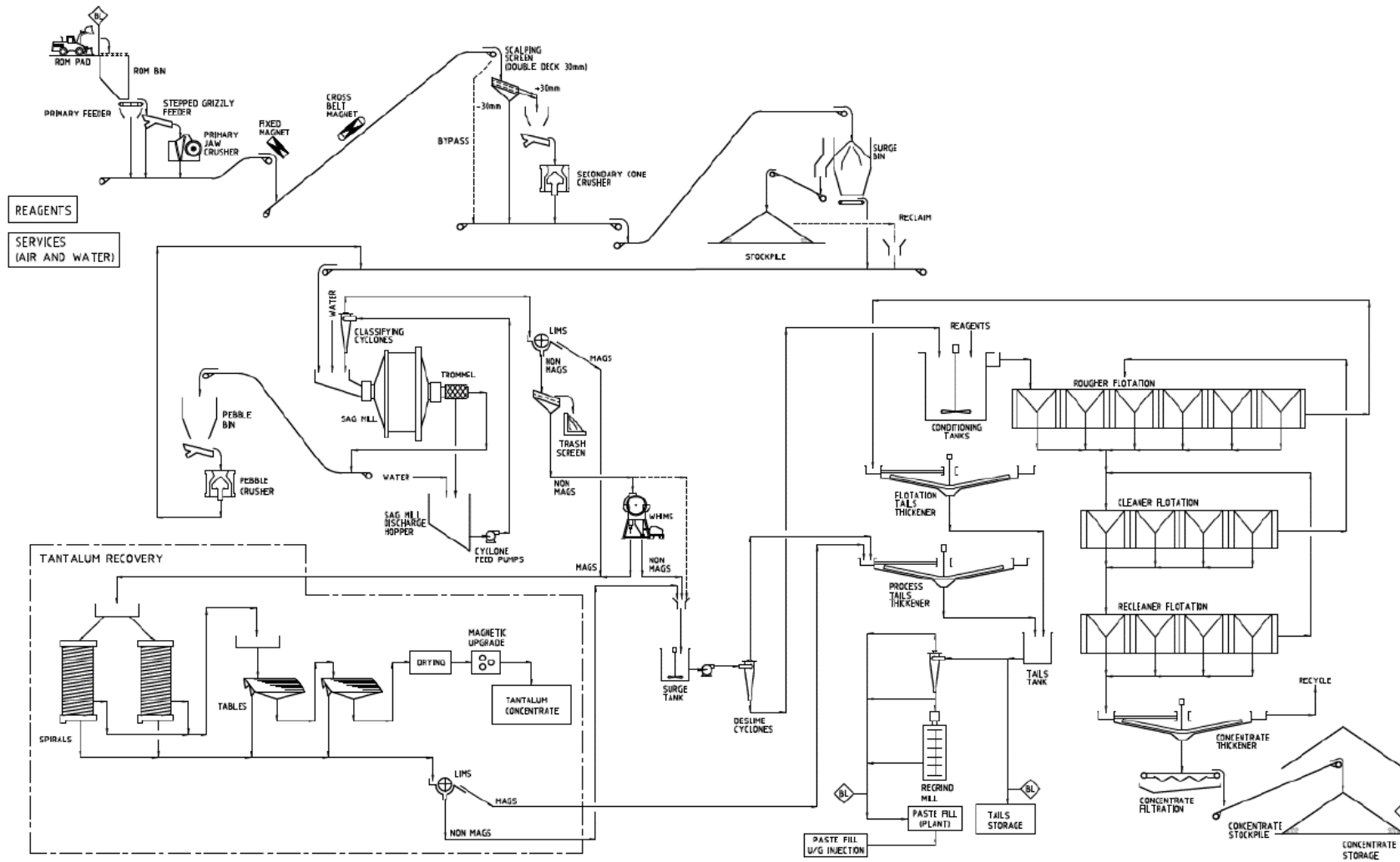


Figure 2 Process plant operation

Appendix 2: Receptor Figures

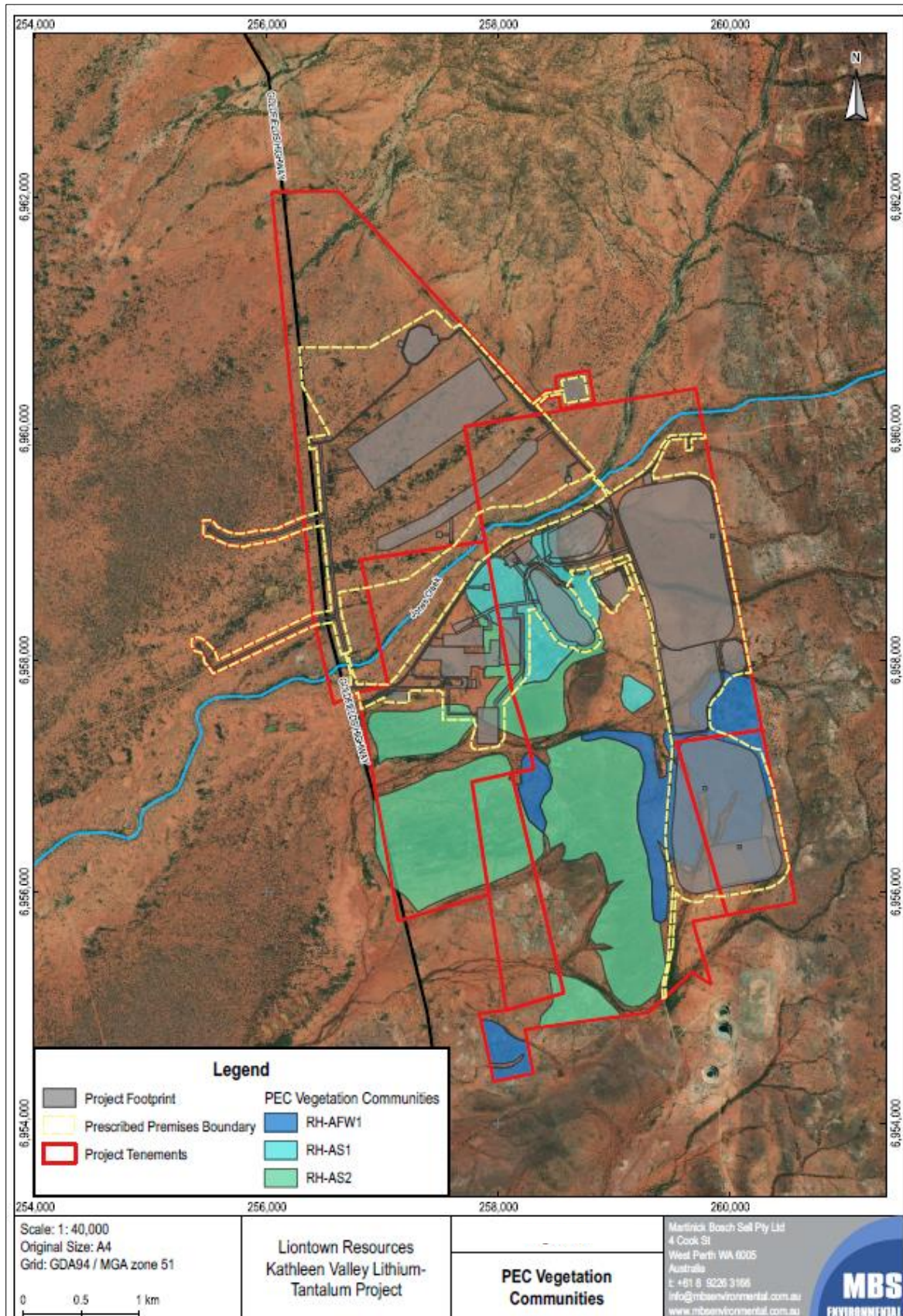


Figure 3 Priority Ecological Communities - Vegetation Complexes

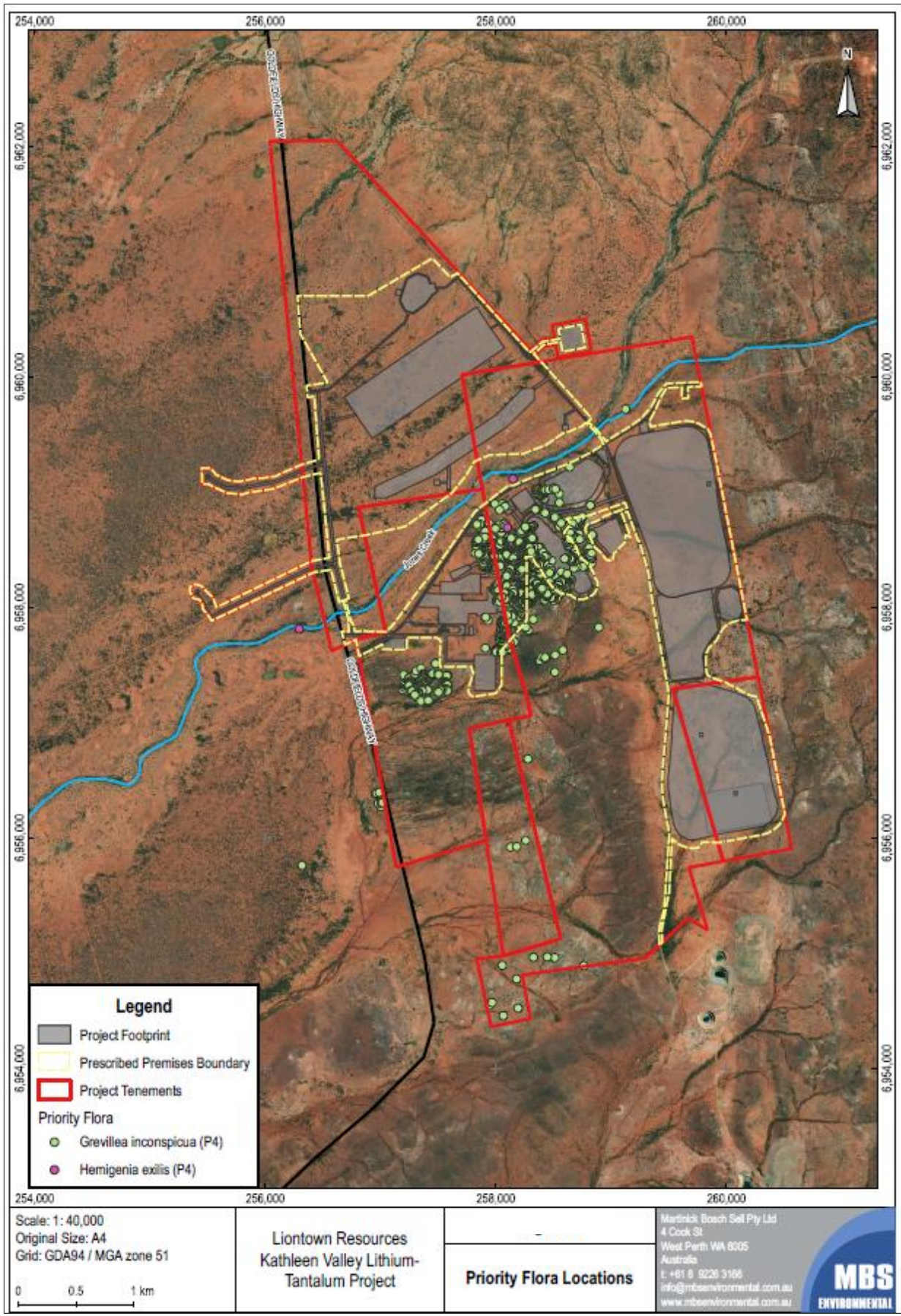


Figure 4 Priority Flora Locations

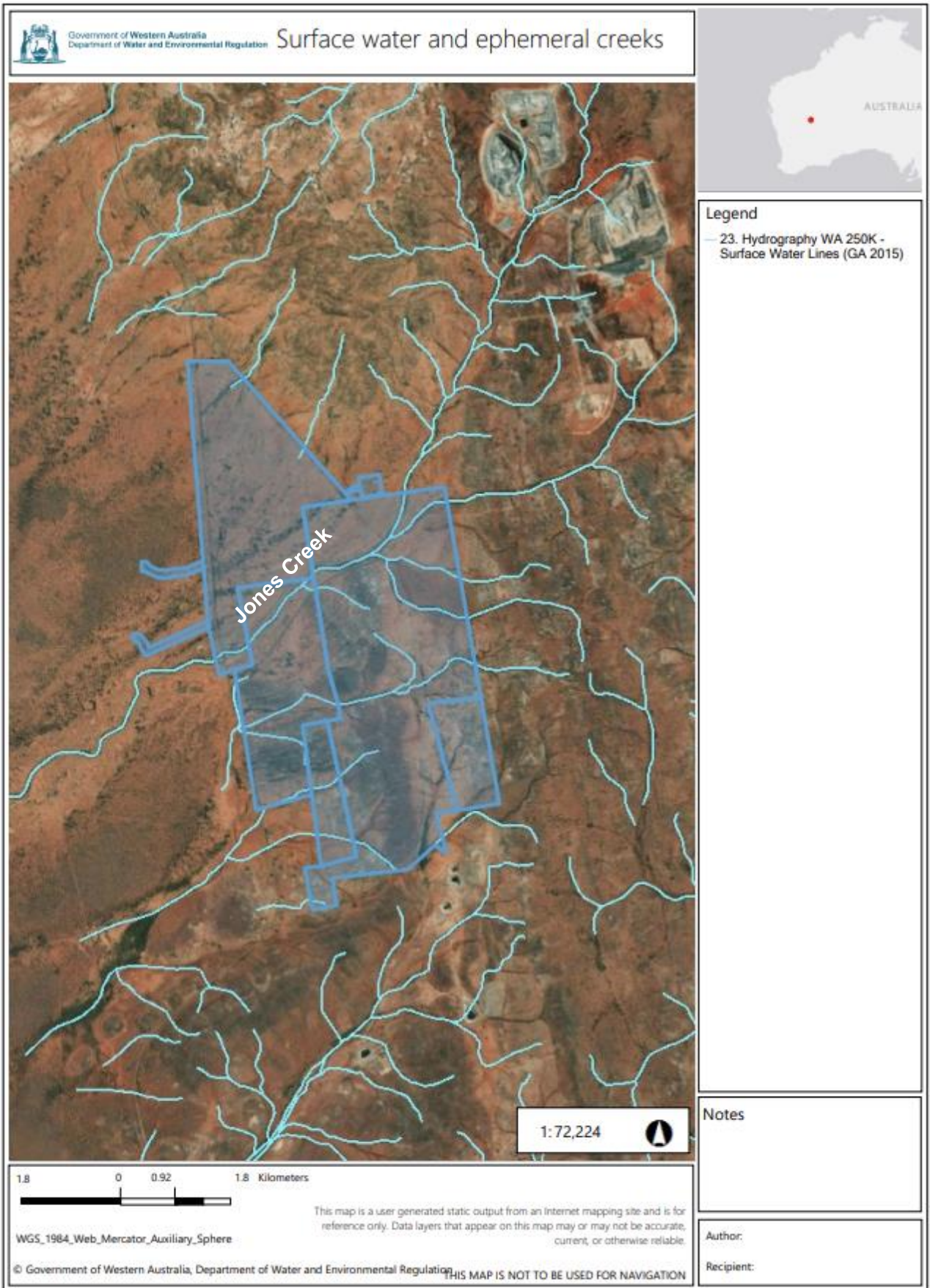


Figure 5 Surface Water and Ephemeral Creeks

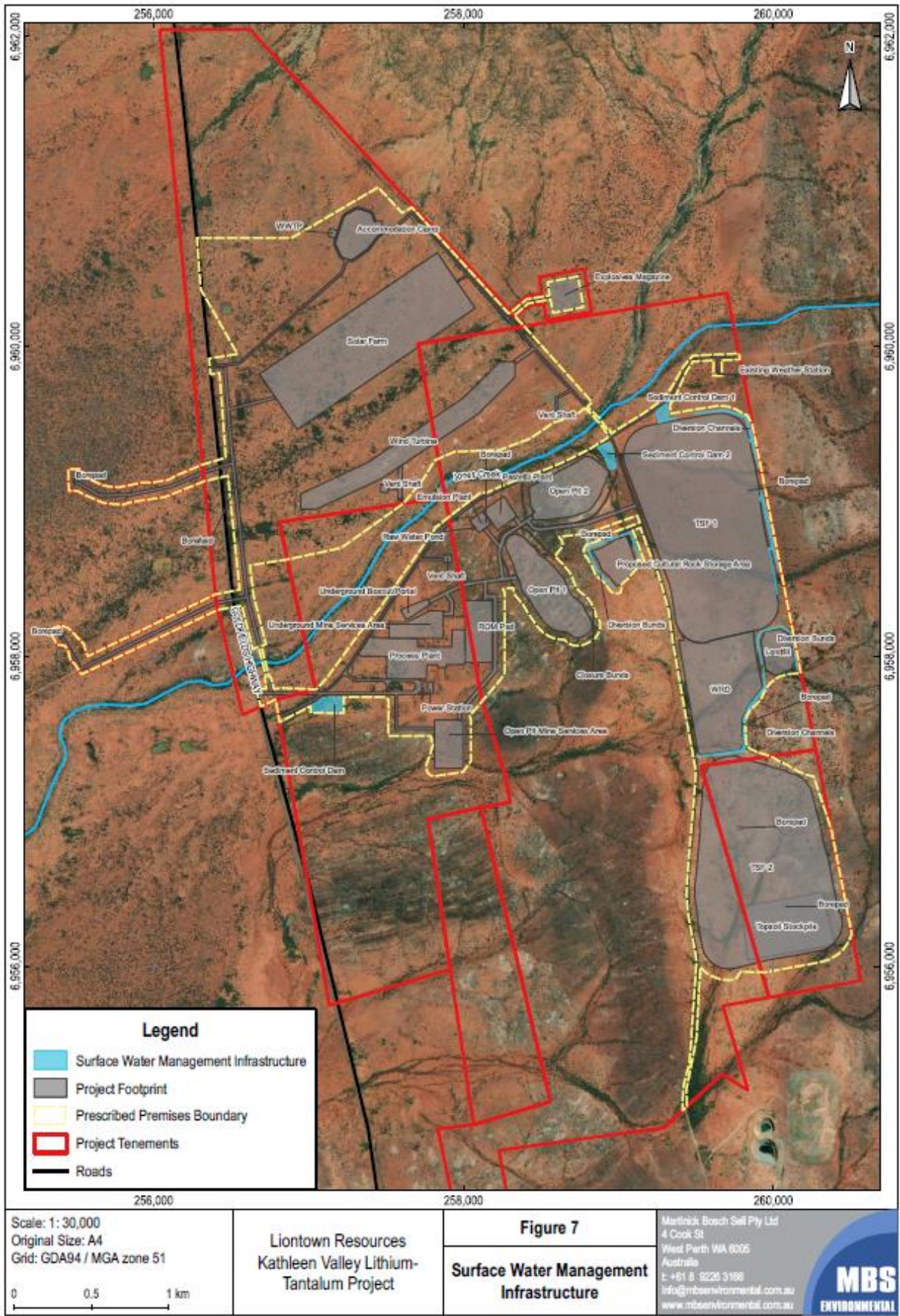


Figure 6 Surface Water Management Infrastructure

Appendix 3: Leachate tests

Water Leachate test

Sample ID	pH	EC	TDS	Ca	K	Mg	Na	Sulfate	Fluoride	Chloride	
		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	9.60	46	29	4	0.7	<0.5	2	<1	0.1	2	<5
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	6,250	4,000	1,000	N/G	No limit	N/G	1,000	2	N/G	N/G
NPUG (DER 2014)	N/G	N/G	N/G	N/G	N/G	N/G	N/G	1,000.00	15.00	250.00	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G

Sample ID	Alkalinity (mg CaCO ₃ /L)		
	HCO ₃ ⁻	CO ₃ ²⁻	Total
A218198 Combined Tailings	24	12	36
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G
NPUG (DER 2014)	N/G	N/G	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G

Sample ID	pH	Ag	Al	As	B	Ba	Be	Bi	Cd	Ce	Co	Cr
	SU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	9.6	<0.001	0.7	0.002	<0.02	0.002	<0.0005	0.001	<0.0001	<0.001	<0.001	0.001
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	N/G	5	0.5	5	N/G	N/G	N/G	0.01	N/G	1	1
NPUG (DER 2014)	N/G	1	0.2	0.1	40	20	0.6	N/G	0.02	N/G	N/G	0.5
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	0.00005	0.055	0.013	0.37	N/G	N/G	N/G	0.0002	N/G	0.0014	0.0033

Sample ID	Cs	Cu	Fe	Ga	Ge	Hf	Hg	In	La	Li	Mn	Mo
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	<0.001	0.003	<0.01	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.0005	0.05	<0.005	0.002
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	1	No limit	N/G	N/G	N/G	0.002	N/G	N/G	N/G	N/G	0.15
NPUG (DER 2014)	N/G	20	0.3	N/G	N/G	N/G	0.01	N/G	N/G	N/G	5	0.5
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	0.0014	0.3	N/G	N/G	N/G	0.0006	N/G	N/G	N/G	1.9	0.034

Sample ID	Ni	Nb	Phosphate	Pb	Rb	Re	S	Sb	Sc	Se	Sn	Sr
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	<0.001	<0.0001	<0.5	<0.001	0.04	<0.001	<0.5	<0.001	<0.001	<0.001	<0.001	0.01
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	1	N/G	N/G	0.1	N/G	N/G	333	N/G	N/G	0.02	N/G	N/G
NPUG (DER 2014)	0.2	N/G	N/G	0.1	N/G	N/G	333	0.03	N/G	0.1	N/G	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	0.011	N/G	Refer to guideline	0.0034	N/G	N/G	N/G	0.009	N/G	0.011	N/G	N/G

Sample ID	Ta	Te	Th	Tl	Ti	U	V	W	Y	Zn	Zr
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	<0.001	<0.001	<0.0005	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.01
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G	N/G	N/G	0.2	N/G	N/G	N/G	20	N/G
NPUG (DER 2014)	N/G	N/G	N/G	N/G	N/G	0.17	N/G	N/G	N/G	3	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G	0.00003	N/G	0.0005	0.006	N/G	N/G	0.008	N/G

Kinetic Leachate test

Sample ID	pH	EC	TDS	Ca	K	Mg	Na	Sulfate	Fluoride	Chloride	
		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	6.4	110	70	3.2	13	<2.5	20	N.D	N.D	N.D	N.D
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	6,250	4,000	1,000	N/G	No limit	N/G	1,000	2	N/G	N/G
NPUG (DER 2014)	N/G	N/G	N/G	N/G	N/G	N/G	N/G	1,000	15	250	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G

Sample ID	pH	Ag	Al	As	B	Ba	Be	Bi	Cd	Ce	Co	Cr
	SU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	6.4	<0.001	0.2	0.003	0.06	0.001	0.001	<0.001	<0.0001	<0.001	<0.001	0.046
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	N/G	5	0.5	5	N/G	N/G	N/G	0.01	N/G	1	1
NPUG (DER 2014)	N/G	1	0.2	0.1	40	20	0.6	N/G	0.02	N/G	N/G	0.5
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	0.00005	0.055	0.013	0.37	N/G	N/G	N/G	0.0002	N/G	0.0014	0.0033

Sample ID	Cs	Cu	Fe	Ga	Ge	Hf	Hg	In	La	Li	Mn	Mo
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	0.01	0.002	0.02	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	0.27	0.07	0.001
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	1	No limit	N/G	N/G	N/G	0.002	N/G	N/G	N/G	N/G	0.15
NPUG (DER 2014)	N/G	20	0.3	N/G	N/G	N/G	0.01	N/G	N/G	N/G	5	0.5
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	0.0014	0.3	N/G	N/G	N/G	0.0006	N/G	N/G	N/G	1.9	0.034

Sample ID	Ni	Nb	Phosphate	Pb	Rb	Re	S	Sb	Sc	Se	Sn	Sr
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	0.01	0.01	1.0	<0.001	0.51	<0.001	<2.5	<0.001	<0.001	<0.001	<0.001	0.01
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	1	N/G	N/G	0.1	N/G	N/G	333	N/G	N/G	0.02	N/G	N/G
NPUG (DER 2014)	0.2	N/G	N/G	0.1	N/G	N/G	333	0.03	N/G	0.1	N/G	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	0.011	N/G	Refer to guideline	0.0034	N/G	N/G	N/G	0.009	N/G	0.011	N/G	N/G

Sample ID	Ta	Te	Th	Tl	Ti	U	V	W	Y	Zn	Zr
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	0.02	<0.001	<0.0005	0.001	0.005	0.016	<0.001	<0.001	<0.001	0.01	<0.01
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G	N/G	N/G	0.2	N/G	N/G	N/G	20	N/G
NPUG (DER 2014)	N/G	N/G	N/G	N/G	N/G	0.17	N/G	N/G	N/G	3	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G	0.00003	N/G	0.0005	0.006	N/G	N/G	0.008	N/G

Supernatant

Sample ID	pH	EC	TDS	Ca	K	Mg	Na	Sulfate	Fluoride	Chloride	
		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings - Supernatant	7.6	1,300	832	21	16	0.5	200	36	1	220	<5
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	6,250	4,000	1,000	N/G	No limit	N/G	1,000	2	N/G	N/G
NPUG (DER 2014)	N/G	N/G	N/G	N/G	N/G	N/G	N/G	1,000	15	250	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G

Sample ID	Alkalinity (mg CaCO ₃ /L)		
	HCO ₃ ⁻	CO ₃ ²⁻	Total
A218198 Combined Tailings - Supernatant	370	<5	370
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G
NPUG (DER 2014)	N/G	N/G	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G

Sample ID	pH	Ag	Al	As	B	Ba	Be	Bi	Cd	Ce	Co	Cr
	SU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings - Supernatant	7.6	<0.001	0.9	0.01	0.08	0.1	0.1	0.001	<0.0001	<0.001	<0.001	0.06
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	N/G	5	0.5	5	N/G	N/G	N/G	0.01	N/G	1	1
NPUG (DER 2014)	N/G	1	0.2	0.1	40	20	0.6	N/G	0.02	N/G	N/G	0.5
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	0.00005	0.055	0.013	0.37	N/G	N/G	N/G	0.0002	N/G	0.0014	0.0033

Sample ID	Cs	Cu	Fe	Ga	Ge	Hf	Hg	La	Li	Mn	Mo	Ni
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings - Supernatant	0.01	0.004	0.63	<0.001	<0.001	<0.001	<0.00005	<0.001	1.0	0.3	0.10	0.01
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	1	No limit	N/G	N/G	N/G	0.002	N/G	N/G	N/G	0.15	1
NPUG (DER 2014)	N/G	20	0.3	N/G	N/G	N/G	0.01	N/G	N/G	5	0.5	0.2
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	0.0014	0.3	N/G	N/G	N/G	0.0006	N/G	N/G	1.9	0.034	0.011

Sample ID	Nb	Phosphate	Pb	Rb	Sb	Sc	Se	Sn	Sr	Ta	Te	Th
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings - Supernatant	0.001	<0.05	0.01	0.5	0.01	<0.001	<0.001	0.001	0.15	<0.002	<0.001	0.001
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	0.1	N/G	N/G	N/G	0.02	N/G	N/G	N/G	N/G	N/G
NPUG (DER 2014)	N/G	N/G	0.1	N/G	0.03	N/G	0.1	N/G	N/G	N/G	N/G	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	Refer to guideline	0.0034	N/G	0.009	N/G	0.011	N/G	N/G	N/G	N/G	N/G

Sample ID	Tl	Ti	U	V	W	Y	Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings - Supernatant	0.001	<0.001	0.26	<0.001	0.01	<0.001	0.01
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	0.2	N/G	N/G	N/G	20
NPUG (DER 2014)	N/G	N/G	0.17	N/G	N/G	N/G	3
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	0.00003	N/G	0.0005	0.006	N/G	N/G	0.008

Appendix 4: Baseline Groundwater Information

		Monitoring Bore				
Parameter	Unit	WSTB004	WSTB006	WSTB008	WSTB009	WSTB010
Date		14/11/2019	19/11/2019	24/11/2019	26/11/2019	27/11/2019
In-situ pH	pH Unit	n/a	n/a	n/a	8.5	8.6
In-situ EC	µS/cm	n/a	n/a	1187	1150	1050
Lab pH	pH Unit	7.9	8.6	8.2	8.2	8.3
Lab EC	µS/cm	2000	1400	1500	1300	1400
Total Dissolved Solids	mg/L	1200	830	1200	810	4000
Calcium	mg/L	130	14	43	59	27
Magnesium	mg/L	22	22	19	42	24
Sodium	mg/L	230	210	180	110	170
Silicon	mg/L	10	17	5.9	21	2.8
Potassium	mg/L	5.6	43	49	11	39
Chloride	mg/L	470	190	240	190	210
Total Hardness by Calculation	mg/L	420	130	190	320	160
Sulfate as SO ₄ 2-	mg/L	220	130	140	120	120
Carbonate Alkalinity as CaCO ₃	mg/L	<5	13	<5	<5	<5
Bicarbonate Alkalinity as CaCO ₃	mg/L	94	290	160	170	160
Hydroxide Alkalinity as OH	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	77	260	130	140	130
Iron (dissolved)	mg/L	7	<5	6	<5	9
Aluminium (dissolved)	µg/L	11	12	46	7	35
Arsenic (dissolved)	µg/L	<1	26	4	12	4
Cadmium (dissolved)	µg/L	<0.1	<0.1	0.3	<0.1	0.2
Mercury (dissolved)	µg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Manganese (dissolved)	µg/L	160	10	67	190	32
Ammonia, NH ₃	mg/L	0.1	0.05	<0.01	0.3	5.7
Nitrite, NO ₂ as NO ₂	mg/L	<0.2	<0.2	0.2	0.6	3.2
Nitrate, NO ₃ as NO ₃	mg/L	9.5	68	130	150	140
Total Kjeldahl Nitrogen	mg/L	0.71	0.50	1.3	0.62	11
Total Phosphorus (Kjeldahl Digestion) as P	mg/L	0.09	0.98	3.8	0.07	27

Appendix 5: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of applicant's comment	Department's response
Prescribed Premises Category 5 Condition 2	<ul style="list-style-type: none"> In response to the draft approval, the applicant has requested a change in assessed Production/Design Capacity from 2.5Mtpa to 4Mtpa. The applicant requests DWER approve all five stages of TSF construction (to crest height 535 m RL) total TSF capacity to full final volume of 14.72Mt. LRL notes that whilst the overall design of TSF1 is unchanged, the staged construction of TSF1 as described in the TSF Design Report will no longer be adopted. Stages 2 – 5 will be constructed at the same time, approximately 3 years after tailings deposition commencement. LRL has confirmed there will be no changes to TSF design. 	<p>Accepted. As documents circulated for public and stakeholder comment included all stages, further consultation will not be required.</p> <p>Time limited operations, allowing deposition of tailings, will commence following completion of the starter embankments for a duration of 180 days. As stages 2 - 5 will take place 3 years following initial deposition, this will fall outside of time limited operations as authorised by the works approval. Consequently, whilst the works approval will authorise construction of additional stages (with submission of compliance documentation required), LRL will be required to submit a licence amendment application (assuming a licence will be in place for the operation), to allow <u>operation</u> of the additional stages.</p>
Schedule 1, Figures 4, 5, 6, 8 and 9	<ul style="list-style-type: none"> Request update to capture construction of all TSF design stages. 	
Prescribed Premises Category 52	<ul style="list-style-type: none"> Change assessed Production/Design Capacity from 21 to 32 MW. Modifications to the initial submitted power station design have been proposed in response to the draft approval. 	Modification to the production/design capacity of the power station does not significantly alter the risk associated with the activity. DWER has amended category 52 throughput to 32 MW.
Condition 1(b)	<ul style="list-style-type: none"> Request removal of speed limit as "dust emissions can be effectively managed by means other than limiting speed" 	As the applicant also proposes to use a water cart to manage generation of dust at the premises, the speed limit will be removed.
Condition 2	<ul style="list-style-type: none"> Request modification of footprint from 100ha to 102.7ha. Request to change the wording to pipeline to be installed with instrumentation consisting of electromagnetic flow meters and pressure transmitter installed downstream of pump station and upstream TSF discharge providing constant monitoring of operation parameters of the tailings pipeline, and to provide shutdown of the system in the event of pipeline failure. This will allow for change in methods of achieving the required DWER outcome given tendering processes for completion of TSF work and supply of required equipment is ongoing. DWER will be provided with details of what monitoring system is actually fitted as part of the CCI report. 	<ul style="list-style-type: none"> Adjustment to footprint specification has been amended to 102.7. Applicant modified proposed control is considered sufficient to mitigate risk and has been included on the works approval as a regulatory control.

Condition	Summary of applicant's comment	Department's response
Condition 3 Item 1	<ul style="list-style-type: none"> Item 1(a) Request to insert Grinding and Milling Circuit as this has been left out Item 1(b) Request word change for clarity: modify "layout of concentrator infrastructure" to "layout of processing infrastructure" Item 1(e) Request modification of wording for item so that the concrete pad with bunding be used only for areas where liquids are to be stored, used or contained. Item 1(g) Request modification of wording to reflect that only liquid reagents are required to be stored within bunded areas. Solid or gaseous reagents do not require storage within a bunded area. 	<ul style="list-style-type: none"> Item 1(a) Grinding and Milling Circuit was omitted by administrative error and has been included within the condition. Item 1(b) wording has been modified to reflecting processing infrastructure, not that the layout will be required as per Figure 2 of Schedule 1. Item 1(e) wording has been modified, as key environmental risks are associated with liquid containment loss to the environment. Item 1(g) wording has been modified.
Condition 3 and Condition 22	<ul style="list-style-type: none"> Request modification of power station specifications – replace 12 reciprocating engines with 6 reciprocating gas engines and 5 reciprocating diesel engines (11 in total). 	<ul style="list-style-type: none"> DWER considers that modification to the power plant specifications does not significantly alter the risk associated with the activity. DWER has amended the conditions and the Schedule.
Schedule 2	<ul style="list-style-type: none"> Request update to power plant stack coordinates to replace current coordinates. 	
Condition 3, item 3 (f)	<ul style="list-style-type: none"> Item 3(f) Request modification to reflect three 350kL LNG tanks. Remove requirement for the LNG tanks to be stored in bunded area as they store gas, not liquid. Suggestion for inclusion of diesel tanks for storage and bunding. 	<ul style="list-style-type: none"> Item 3(f) has been modified to include three 350kL LNG gas tanks and has been revised to indicate that storage must be managed in accordance with manufacturers specifications. Another item 3(g) has been included for management of diesel tanks for storage and bunding
Modification to WWTP specifications and proposed additional use of treated wastewater.	<ul style="list-style-type: none"> The Accommodation Village WWTP will have a polishing plant fitted to allow final effluent water quality to meet High quality or Class A criteria. This change has been made to allow use of treated effluent for construction purposes (road dust suppression and foundation conditioning) recognising the importance of re-use of resources in an area where water is limited in availability. Liontown will submit applications to the Shire of Leonora and Department of Health by 5 September 2022 for licencing of both proposed plants noting a Recycled Water Management Plan will also be submitted to seek authorisation for both disposal of WWTP effluent into the TSF and use for limited construction purposes. 	<p>As proposed by the applicant, modified criteria for the Accommodation Village WWTP have been placed on the works approval. The applicant will be required to meet this criteria before treated wastewater will be allowed to be used for dust suppression or limited construction purposes. DWER notes that the supporting document provided for the given criteria do not list "Class A" or "Class C" criteria but rather give risk categories. The criteria which LRL have suggested would fall within "Medium" risk categories Department of Health criteria for non-potable use.</p>

Condition	Summary of applicant's comment	Department's response
Condition 3	<ul style="list-style-type: none"> Request to update the treated wastewater quality specifications for the Accommodation Village WWTP – adjustment from “Class C” criteria to “Class A” criteria, according to Department of Health 	
Condition 22	<ul style="list-style-type: none"> Amend authorised emissions condition to allow reuse of treated wastewater from the Accommodation Village WWTP for construction purposes. 	
Condition 5 and 23	<p>LRL request removal of:</p> <ul style="list-style-type: none"> Acrylamide. Not used within the processing. No known source for this to be present to warrant monitoring. Arsenic III and Arsenic V. Tails characterisation found very low levels of Arsenic. Suggest monitoring of Total Arsenic and then speciation monitoring if results are above the 13 ug/L ANZEC freshwater level. Chromium III and VI. No leachable Chromium was detected in tailings characterisation work. Suggest analysis for total Cr with speciation if levels are more than 5 ug/L. Fluoride. Levels of soluble fluoride in the tailings leachate were very found to be low (0.07 mg/L). Tails are NAF so no reason for acidic conditions which may result in release of Fluoride. Nitrite – Liontown proposed monitoring of NH4 which hasn't been included. Monitoring of NH4 would still allow determination of whether tails are anaerobic which could result in increased metal mobilisation. Suggest remove Nitrite and include NH4. Rhenium. No source or reason for need to monitor this. Noted by chemists as non-routine element for monitoring and standards are not readily available for analysis in WA laboratories. 	<p>DWER has reviewed the analytes with respect comments provided by LRL and has modified suite of elements required for monitoring accordingly. Arsenic and chromium have been flagged for speciation at the thresholds proposed by the applicant. Note that analytes for on-going monitoring will be reviewed again at the time of the licence application.</p>
Conditions 12 -15 Table 5 and 6 Item 3	<p>The applicant has requested removal of commissioning requirements for the power station including monitoring to demonstrate that it can perform according to design specifications. The applicant indicates that the equipment will be tuned according to NOx emissions and that “if power station generators are tuned for NOx emissions, other parameters will be as per the manufacturers stated emission values.</p>	<p>Due to the low risk setting of the site (no nearby sensitive off-site human receptors), DWER has removed commissioning requirements for the power station. DWER has however, included a single monitoring event requirement for NOx emissions (proposed for monitoring by the applicant) during time limited operations so that the applicant can demonstrate the power station performs according to design specifications.</p>

Condition	Summary of applicant's comment	Department's response
Schedule 1, Figure 1	The figure does not contain the prescribed premises boundary – rather the tenements. Figure 2 includes the premises boundary.	Figure captions have been updated accordingly.

Appendix 6: Application validation summary

SECTION 1: APPLICATION SUMMARY				
Application type				
Works approval	<input checked="" type="checkbox"/>			
Licence	<input type="checkbox"/>	Relevant works approval number:		None <input type="checkbox"/>
		Has the works approval been complied with?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Has time limited operations under the works approval demonstrated acceptable operations?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	
		Environmental Compliance Report / Critical Containment Infrastructure Report submitted?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Date Report received:		
Renewal	<input type="checkbox"/>	Current licence number:		
Amendment to works approval	<input type="checkbox"/>	Current works approval number:		
Amendment to licence	<input type="checkbox"/>	Current licence number:		
		Relevant works approval number:	N/A	<input type="checkbox"/>
Registration	<input type="checkbox"/>	Current works approval number:	None	<input type="checkbox"/>
Date application received	15/03/2022			
Applicant and Premises details				
Applicant name/s (full legal name/s)	LRL (Aust) Pty Ltd (118 153 825)			
Premises name	Liontown – Kathleen Valley Lithium Project			
Premises location	M36/265, M36/459, M36/460, M36/696, G36/52, L36/255, L36/256			
Local Government Authority	Shire of Leonora			
Application documents				
HPCM file reference number:	DER2022/000121			
Key application documents (additional to application form):	<i>Attachment 1A Proof of occupier status</i> <i>Attachment 1B ASIC search</i> <i>Attachment 2A KV PPB Vertices</i> <i>Attachment 2 Figures</i> <i>Attachment 3A Commissioning Plan Final</i> <i>Attachment 3B Works Approval Application 3B Proposed Activities</i> <i>Attachment 5 Approvals</i> <i>Attachment 6A Emissions and Discharges Final</i> <i>Attachment 7 Siting</i> <i>Attachment 9 W Approval Fee Calculation</i> <i>Attachment 9 Costs</i>			

Scope of application/assessment		
Summary of proposed activities or changes to existing operations.	<p>Works approval Construction of:</p> <p>Two small open pits mines located south of Jones Creek</p> <p>Processing plant including supporting activities such as Process Water Pond, Run of Mine Pad and low-grade ore stockpiles. Ore will be processed at 2.5 Mtpa initially with an increase to 4 Mtpa in 2029.</p> <p>Two tailings storage facilities consisting of three cells with the second facility (third cell) being constructed above 12 years after Project commencement.</p> <p>One temporary waste rock dump.</p> <p>A borefield and water conveyance infrastructure.</p> <p>An integrated energy facility comprised of a natural gas power plant, solar farm and wind turbines to provide power for the project.</p> <p>On site accommodation village located north of Jones Creek and the mining ore processing facilities.</p> <p>Roads including connect from the Goldfields Highway and internal roads and tracks.</p> <p>Supporting infrastructure such as laydown areas, workshops, on-site offices, power transmission lines, a water treatment plant, landfill magazine, surface water management infrastructure and topsoil stockpiles.</p>	
Category number/s (activities that cause the premises to become prescribed premises)		
Table 1: Prescribed premises categories		
Prescribed premises category and description	Proposed production or design capacity	Proposed changes to the production or design capacity (amendments only)
<i>Category 5: Processing or beneficiation of metallic or non-metallic ore</i>	2.5 Mtpa initially 4.0 Mtpa after 4 years	N/A
<i>Category 52 Electric power generation</i>	21 MW/a	
<i>Category 54 sewage facility</i>	WWTP 1 -170 kL/day WWTP 2 – 60 kL/day	
<i>Category 89 putrescible landfill</i>	2,270 t / year	
Legislative context and other approvals		
Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Referral decision No: Managed under Part V <input type="checkbox"/> Assessed under Part IV <input checked="" type="checkbox"/>

Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Ministerial statement No: EPA Report No:
Has the proposal been referred and/or assessed under the EPBC Act?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Reference No:
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Certificate of title <input type="checkbox"/> General lease <input type="checkbox"/> Expiry: Mining lease / tenement <input checked="" type="checkbox"/> Expiry: M 36/460 expiry 03/05/2041 M36/459 expiry 03/05/2041 M36/265 expiry 27/06/2035 M36/696 expiry 24/06/2043 G36/52, L36/255, L36/256 Other evidence <input type="checkbox"/> Expiry:
Has the applicant obtained all relevant planning approvals?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	Approval: Expiry date: If N/A explain why?
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	CPS No: CPS9591/1
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Application reference No: N/A Licence/permit No: N/A
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Application reference No: Licence/permit No:
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Name: N/A Type: Has Regulatory Services (Water) been consulted? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Regional office: Swan Avon / Mid-West Gascoyne / Kwinana Peel / North West / South West / Goldfields / South Coast

<p>Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	<p>Name: N/A Priority: N/A Are the proposed activities/ landuse compatible with the PDWSA (refer to WQPN 25)? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/></p>
<p>Is the Premises subject to any other Acts or subsidiary regulations (e.g. <i>Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx</i>)</p>	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	<p><i>Environmental Protection (Noise) Regulations 1997</i> <i>Mining Act 1978</i></p>
<p>Is the Premises within an Environmental Protection Policy (EPP) Area?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	<p>N/A</p>
<p>Is the Premises subject to any EPP requirements?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	<p>N/A</p>
<p>Is the Premises a known or suspected contaminated site under the <i>Contaminated Sites Act 2003</i>?</p>	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	<p>Classification: Report not substantiated Date of classification: N/A</p>