Decision Report

Application for Works Approval

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number	W6251/2019/1
Applicant	Iluka Resources Limited
ACN	008 675 018
File Number	DER2019/000302
Premises	Eneabba Mineral Sands Mine Brand Highway ENEABBA WA 6518 Legal description – Part of tenement ML267SA
Date of Report	01 August 2019
Status of Report	Final

Overview of premises

Classification of premises

The Eneabba Mineral Sands Mine (Premises) is an existing heavy mineral sands mine located near Eneabba, approximately 150 km south of Geraldton. It has been in operation since 1974 and is subject to the *Mineral Sands (Eneabba) State Agreement Act 1975* (State Agreement).

Poor market conditions led to the idling of mining and processing at the site in April 2013. Rehabilitation activities have been predominant since this time, including rehabilitation earthworks, landform restoration, revegetation, infrastructure deconstruction and demolition. The site retains an active Part V licence L5646/1994/10 under the following Prescribed Premises category:

Classification of Premises	Description	Premises design capacity
Category 8	Mineral sands mining or processing: premises on which mineral sands ore is mined, screened, separated or otherwise processed.	18,600,000 tonnes per annual period

This application relates to a proposal to construct and operate a standalone mineral sands recovery plant, for the purpose of producing a mineral sands concentrate from re-mining an area of tailings at the Premises. An application for works approval was submitted by the Applicant under Division 3 Part V of the EP Act on 15 May 2019 (the Application).

Description of proposed activity

The Applicant proposes to re-process tailings material currently stored within the 'Eneabba Monazite Pit' (EMP), a large open pit on the Premises where tailings from the Narngulu Mineral Separation Plant (MSP) and historical operations at Eneabba have been deposited. The tailings material comprises a mixture of ilmenite, staurolite, aluminosilicates, zircon and the rare earth bearing mineral 'monazite', a naturally-occurring radioactive material (NORM). It is proposed to construct a small mineral sands recovery plant adjacent to the EMP, consisting of a conveyor, a mobile screening unit and de-sliming cyclones.

The project is proposed to be developed in two phases – Phase 1 focuses on the production of a 'mineral sands concentrate' with approximately 21.5 % monazite, 23% zircon, 32% ilmenite and 1% rutile. The scope of this Application relates to Phase 1 only.

Phase 2 will involve further upgrading and separation of the mineral sands concentrate produced from Phase 1, into a product containing approximately 80% monazite concentrate, and separate streams of zircon and ilmenite concentrates. Phase 2 will require the construction of additional processing and separation facilities, and will therefore be subject to a separate works approval application (to be submitted at a later date).

The EMP is estimated to contain around 827,000 tonnes of tailings material containing NORM, with around 30,000 tonnes deposited from the Narngulu MSP annually since 1994.

Mining process

Tailings within the EMP will be re-mined using front end loaders (FEL) that will feed an in-pit mobile screening unit. Screened material will be transported by haul trucks to the processing plant where it will be stockpiled, prior to being passed through a wet vibrating screen to remove oversize rock and trash, followed by two de-sliming cyclones to remove clay fines (slimes). Final product will be stockpiled on-site within a lined bunker, prior to loading into Rotabox containers for transport to the Narngulu MSP site, and ultimate export through the Port of Geraldton.

Processing plant

The plant, which will be constructed adjacent to the EMP, will have a maximum design capacity of 350,000 tonnes per annum, although actual annual throughputs are estimated at

around 105,000 tonnes. About 95% of the tailings material processed will be removed from the Premises as saleable product, with the remaining 5% (approx. 5,000 tpa) returned to existing voids for disposal. Processing equipment will be relocated from the Tutunup South Mineral Sands Mine.

Tailings management

Clay fines removed by the process (containing approx. 0.1 % monazite) will be pumped as a slurry for disposal to an existing open void located directly west of the EMP, where the supernatant water is expected to evaporate. Sand tailings (oversize containing approx. 0.2% monazite) will be returned to the EMP by road haulage from the processing plant. Approximate product and tailings volumes are shown in the table below.

	EMP material processed (tpa)	Products (tpa)	Clay fines		Sand tailings	
			tpa	% monazite	tpa	% monazite
Phase 1	105,000	100,000	3,500	0.1	1,500	0.2

Construction and commissioning

Construction is scheduled to commence in Q3 2019, and is expected to take approximately 4 months to complete. Commissioning will occur directly following completion of construction, with full operation scheduled for early-2020.

Infrastructure

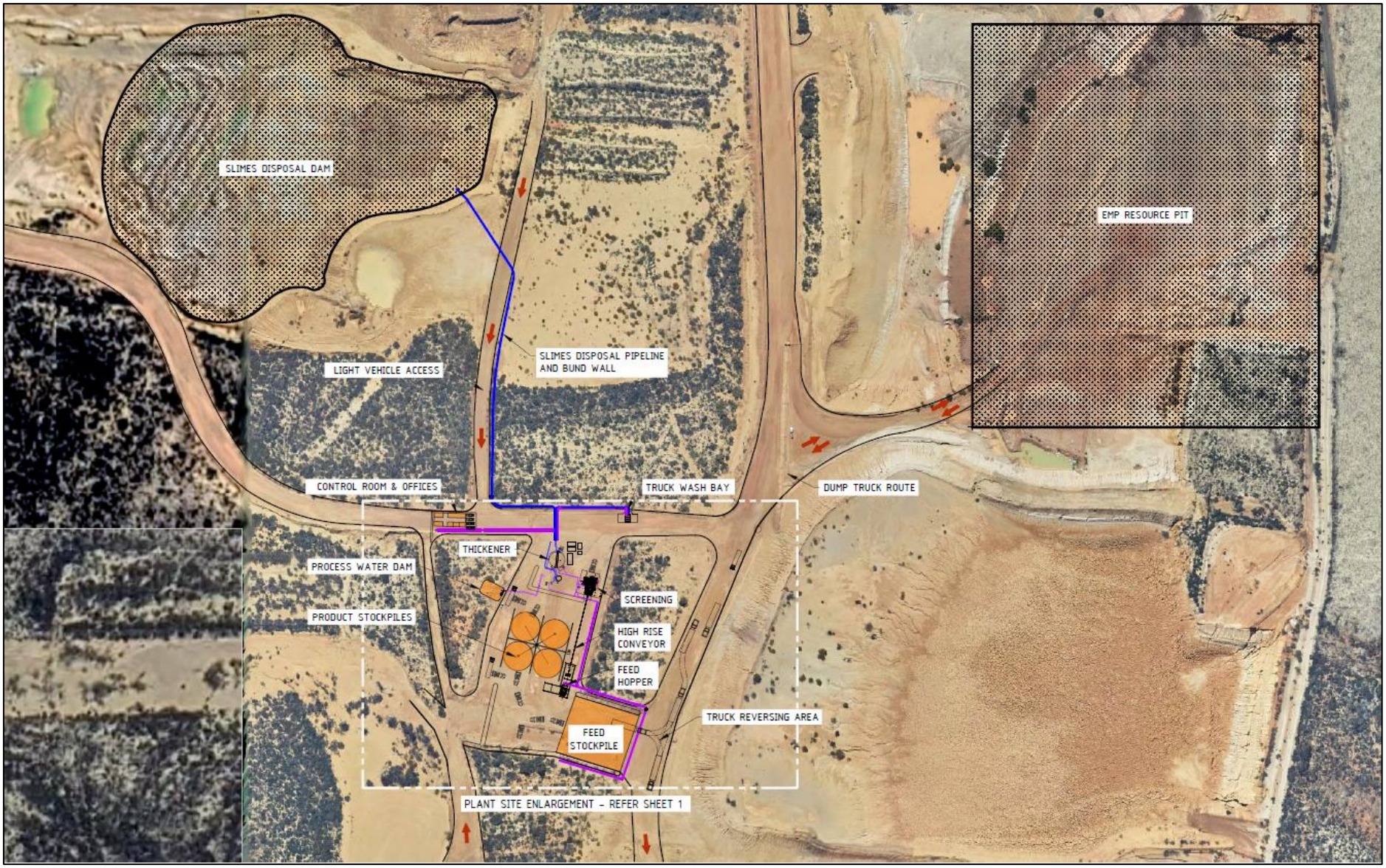
Prescribed Activity Category 8	
Proposed infrastructure	
1	Mineral recovery plant, including conveyor, concentrator and de-sliming cyclones
2	Feed stockpile
3	Product stockpile/ bunker
4	Process water dam
Mobile equipment (indicative)	
1	Mobile screening unit (in-pit)
2	2 x Front end loaders (CAT 980 or similar)
3	2 x Haul trucks (CAT 777 or similar)
4	1 x Water cart (CAT 740 or similar)

Environmental siting

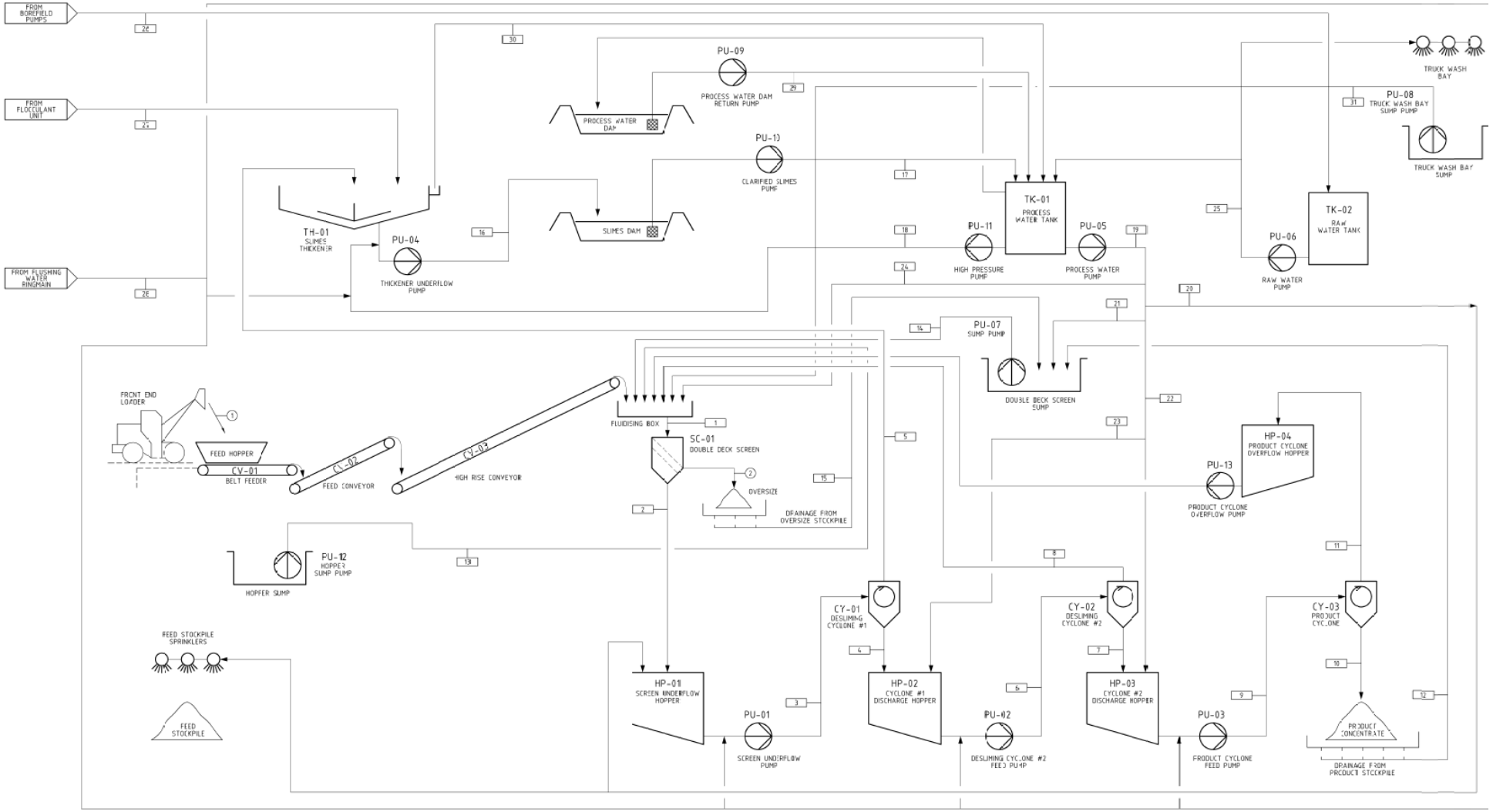
The EMP is located on vacant Crown land and is contained entirely within the existing State Agreement tenement (AM70/267). It is situated on the eastern-most flank of the mine lease within the South mine area, and is about 8 km south of the town of Eneabba.

The EMP is surrounded by areas of remnant vegetation to the east of the pit that are largely undisturbed; areas of rehabilitated native vegetation to the west and south of the pit; and previously mined open areas and tailings voids which are yet to be rehabilitated to the north. The nearest residential receptors are located within the Eneabba town site, and the Brand Hwy runs parallel to the site in a north-south direction about 5 km to the west of the pit.

The South Eneabba Nature Reserve is located about 2 km south of the EMP within the mine lease area and contains an area that was previously mined. No other specified ecosystems or areas of high conservation value have been identified in proximity that may be directly impacted from the proposed activities. There are no naturally occurring surface water bodies or surface expressions of groundwater in the immediate area. The nearest surface water body is a small seasonally inundated channel located about 3 km north of the pit, and a basin of smaller seasonally inundated wetlands to the west of the mined area, which are perched and have no connection with the deeper water table.



▲ Mineral sands recovery project – site layout.



▲ Mineral sands recovery plant – process flow diagram.

Geology

The Eneabba region overlies the Dandaragan Trough, which forms part of the Perth Basin, extending east to the Urella and Darling Fault and west to the coast. The trough consists of Quaternary sediments of the Superficial Formation overlying early Jurassic to late Cretaceous sediments of the Yarragadee Formation. The site geology consists of unconsolidated superficial sediments comprised of undifferentiated sandy clay and clayey sand and minor sand which are typically 15 – 20 m thick.

Hydrogeology

Beneath the mine, groundwater occurs only in the Yarragadee Formation in multi-layered water-bearing zones that are unconfined to confined. On a regional level, groundwater is recharged to the Yarragadee Formation via rainfall and surface runoff infiltration through the overlying unsaturated superficial formations.

Ambient groundwater is sodium chloride-type, but typically has higher proportions of calcium/magnesium where, coupled with relatively higher total dissolved solids concentrations of around 1,000 mg/L, the groundwater has been impacted by past seepage from tailings facilities and process water dams used as part of the historical Zircon Upgrade Plant operations. Groundwater levels around the EMP are typically 30 – 35 m below natural ground level.

Legislative context and other approvals

Relevant approvals

Legislation	Details
Mineral Sands (Eneabba) State Agreement Act 1975	Operations at the Premises are subject to a State Agreement which is overseen by the Department of Jobs, Tourism, Science and Innovation (JTSI) on behalf of the Minister for State Development. The Minister for State Development provided consent under the State Agreement for the sale of monazite from the current stockpile on M267SA in April 2019. The recovery, processing and export of monazite from M267SA is considered a significant modification to the existing approved proposals under the State Agreement. A proposal seeking approval for the proposed activities has been submitted to JTSI in parallel with this Application.
Mines Safety and Inspection Act 1994 *Radiation Safety Act 1975*	The project falls within the remit of Part 16, Divisions 1 & 2 of the *Mines Safety and Inspection Regulations 1997*, and as such will require submission and approval of a Radiation Management Plan (RMP), prior to operations commencing. The Applicant has indicated that a RMP will be submitted to DMIRS for this project, which is separate to the existing RMP for the Eneabba mine site. The project also falls within the remit of the *Radiation Safety Act 1975*, and as such will require approvals from the Radiological Council for aspects such as transport on public roads, etc.

Works approval and licence history

Instrument	Issued	Amendment
L5646/1994/8	26/02/2007	Licence renewed (3 years). Tyre disposal conditions removed. Altered monitoring requirements for Max's Dam.
L5646/1994/8	25/03/2010	Licence renewed (5 years). Annual Audit Compliance Report condition added.

W5057/2011/1	01/12/2011	Works Approval for construction of a temporary 12MW gas-fired power station.
L5646/1994/10	26/03/2015	Licence renewed (5 years).
L5646/1994/10	14/04/2016	Licence review and amendment to authorise disposal of monazite from Narngulu with ASS characteristics at the Eneabba Monazite Pit. Ambient monitoring conditions updated to specify the physical location. Updated to current licence format. Expiry extended to 2031 to align with M70/879.
L5646/1994/10	20/10/2016	Amendment Notice 1 – relocation of ambient air monitoring location 'AQ2'.
L5646/1994/10	22/08/2017	Amendment Notice 2 – reduction of environmental monitoring requirements for low risk areas.
L5646/1994/10	24/04/2019	Amendment Notice 3 – reduction of environmental monitoring requirements given non-operating status. Conditions added to enable progression towards mine closure and relinquishment.
W6251/2019/1	05/08/2019	Works Approval for the monazite recovery project (this Works Approval).

Risk assessment

Risk Event					Consequence rating	Likelihood rating	Risk	Reasoning	Regulatory controls (Refer to conditions of the granted Works Approval)
Source/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway & receptor (impact)**					
Construction, mobilisation, positioning of infrastructure and other pre-processing works	Civil excavation / earthworks/ vehicle movements on unsealed roads Construction of screening plant, de-sliming circuits, feed & product stockpiles, etc.	Noise and dust associated with construction activities	Users of Brand Hwy ~5.0 km from site Residential premises located ~8.0 km from site	Air / wind dispersion, causing amenity impacts/ health impacts	Low level on-site impacts, minimal off-site impacts, on local scale **Minor**	May occur in exceptional circumstances only **Rare**	**Low** Acceptable, not subject to controls	Based on the separation to off-site receptors (at least 5 km), the Delegated Officer does not reasonably foresee off-site receptors being impacted by noise and dust during construction works.	None specified.
Commissioning works and restricted operating period	Pre-production mining, screening, haulage and stockpiling	Noise associated with heavy vehicle movements	Users of Brand Hwy ~5.0 km from site Residential premises located ~8.0 km from site	Air / wind dispersion, causing amenity impacts/ health impacts / soil contamination / vegetation deaths			**Low** Acceptable, not subject to controls	Based on the separation to off-site receptors (at least 5 km), the Delegated Officer does not reasonably foresee off-site receptors being impacted by noise and dust during mining, screening, haulage and stockpiling works.	None specified.
		Dust from heavy vehicle movements					**Low** Acceptable, not subject to controls		None specified.
		Dust lift-off from feed stockpile	Soil, remnant vegetation		Mid-level on-site impacts, minimal off-site impacts on locale scale **Moderate**	Could occur during adverse weather conditions **Possible**	**Medium** Acceptable, subject to Licence Holder controls conditioned	There is an inherent risk of airborne dust containing NORM to be generated during mining, screening, haulage and stockpiling, where it can impact on nearby environmental values such as soil and remnant vegetation. Implementation of dust management controls as specified in the site's existing Dust Management Plan (Iluka, 2018) are expected to minimise the risk of unacceptable impacts. In accordance with DWER's Guidance Statement: Risk Assessments (DER, 2017a), as dust controls lower the risk of impacts to receptors, they will be imposed on the Works Approval.	Specified actions: - Feed material must be stockpiled within an earthen bunker containment area; - Must operate a sprinkler systems on feed stockpile during dry, windy conditions; - Apply water to unsealed operational areas; - Reduce dust generated during haulage and material handling, such as low vehicle speeds, loading/unloading procedures to minimise dust generation; - Regular housekeeping to remove mineral spillage from the plant area
							Medium Acceptable, subject to Licence Holder controls conditioned		
			Users of Brand Hwy ~5.0 km from site Residential premises located ~8.0 km from site		Low level on-site impacts, minimal off-site impacts, on local scale **Minor**	May occur in exceptional circumstances only **Rare**	**Low** Acceptable, not subject to controls	Based on the separation to off-site receptors (at least 5 km), the Delegated Officer does not reasonably foresee off-site receptors being impacted by dust from the feed stockpile.	None specified.
	Commissioning and operation of processing plant	Contaminated surface water runoff	Soil, remnant vegetation	Runoff from processing area, causing increased load of sediment to stormwater / soil contamination / vegetation deaths		Probably not occurring in most circumstances **Unlikely**	**Medium** Acceptable, subject to Licence Holder controls conditioned	There is a risk of surface water runoff from the plant area contaminating surrounding areas of soil and impact remnant vegetation, if not adequately controlled and contained. Implementation of surface water controls, including the use of bunding, cut-off drains and channels are expected to minimise the risk of unacceptable impacts. In accordance with DWER's Guidance Statement: Risk Assessments (DER, 2017a), as stormwater controls lower the risk of impacts to receptors, they will be imposed on the Works Approval.	Infrastructure controls: - surface water drainage to be constructed to contain all stormwater runoff from the plant area to within the operational footprint or directed to the process water dam - any material with potential to contain NORM must be recovered and returned to the process
		Noise and dust associated with commissioning and	Users of Brand Hwy ~5.0 km from site	Air / wind dispersion, causing amenity impacts/		May occur in exceptional circumstances	**Low** Acceptable, not subject	Based on the separation to off-site receptors (at least 5 km), the Delegated Officer does not reasonably foresee off-site receptors	None specified.

		operation	Residential premises located ~8.0 km from site	health impacts / soil contamination / vegetation deaths		only **Rare**	to controls	being impacted by noise and dust from commissioning or operation of the plant.	
	Stockpiling of product	Dust lift-off from product stockpiles, spillages, etc.					**Low** Acceptable, not subject to controls	Based on the separation to off-site receptors (at least 5 km), the Delegated Officer does not reasonably foresee off-site receptors being impacted by dust from product stockpile(s).	None specified.
		Seepage of water entrained within product stockpile	Soil, groundwater	Through base of unlined storage area, causing soil, groundwater contamination from NORMs		Probably not occurring in most circumstances **Unlikely**	**Medium** Acceptable, subject to Licence Holder controls conditioned	The 'mineral concentrate' will be stockpiled on a compacted surface and allowed to drain to around 5% w/w. There is a risk of water runoff contaminating surrounding areas of soil and impact remnant vegetation, if not adequately controlled and contained. Implementation of surface water controls, including the use of bunding, cut-off drains and channels are expected to minimise the risk of unacceptable impacts. In accordance with DWER's Guidance Statement: Risk Assessments (DER, 2017a), as stormwater controls lower the risk of impacts to receptors, they will be imposed on the Works Approval.	<u>Infrastructure controls:</u> - surface water drainage to be constructed to contain all stormwater runoff from the stockpile area to within the operational footprint or directed to the process water dam
	Disposal of clay slimes to existing mine void	Seepage of water entrained in the clay slimes to groundwater	Soil, groundwater	Through base of mine void, leading to groundwater contamination			**Low** Acceptable, not subject to controls	The percentage of clay slimes within the feed material is expected to be minimal. Once deposited, clay slimes will settle and consolidate, and effectively self-seal the base of the void given the natural water retention properties (>40% clay content). The Delegated Officer reasonably foresees that some seepage will initially occur, but is not expected to be significant.	<u>Specified actions:</u> - location of mine void authorised for disposal to be specified.
				Through base of mine void, leading to groundwater mounding		May occur in exceptional circumstances only **Rare**	**Low** Acceptable, not subject to controls		None specified.
		Rupture of pipeline causing clay slimes discharge to land	Soil, remnant vegetation adjacent to pipeline alignment	Direct discharge, leading to soil contamination / vegetation deaths		Probably not occurring in most circumstances **Unlikely**	**Medium** Acceptable, subject to Licence Holder controls conditioned	Clay slimes will be slurried with process water, therefore ruptures may impact on remnant vegetation through sedimentation or erosion impacts. Flow meters and pressure gauges on pipelines should enable early detection of spills and leaks.	<u>Infrastructure controls:</u> - automatic cut-outs / secondary containment / pressure sensors to be maintained on pipelines.
		Dust lift-off from dried clay in mine void	Users of Brand Hwy ~5.0 km from site Residential premises located ~8.0 km from site	Air / wind dispersion, causing amenity impacts/ health impacts		May occur in exceptional circumstances only **Rare**	**Low** Acceptable, not subject to controls	Based on the separation to off-site receptors (at least 5 km), the Delegated Officer does not reasonably foresee off-site receptors being impacted by dust from dried clay slimes.	None specified.
		Overtopping/ breach of containment causing discharge to land	Soil, remnant vegetation adjacent to mine void	Direct discharge, leading to soil contamination / vegetation deaths		Probably not occurring in most circumstances **Unlikely**	**Medium** Acceptable, subject to Licence Holder controls conditioned	Clay slimes will be pumped to an existing below ground excavation for solar drying, which minimises the risk of overtopping or breach of containment. Operational controls for containment dams on the Existing Licence will be implemented, such as maintaining an operational freeboard and returning supernatant water to the process pond. In accordance with DWER's Guidance Statement: Risk Assessments (DER, 2017a), as these controls lower the risk of impacts to receptors, they will be imposed on the Works Approval.	<u>Infrastructure controls:</u> - must maintain operational freeboard whilst in use - decant overflow water returned to the process water dam <u>Specified actions:</u> - visual inspections to be conducted daily whilst operating
	Disposal of sand tailings to EMP	Seepage of water entrained in the tailings to groundwater	Soil, groundwater	Through base of EMP, leading to soil / groundwater contamination		May occur in exceptional circumstances only **Rare**	**Low** Acceptable, not subject to controls	Sand tailings (consisting principally of silica sand and other minor impurities) will have undergone physical separation only and are therefore unlikely to contain contaminants that might otherwise be present in sand tailings that have undergone secondary processing.	None specified.

Consultation

The Application was publicly advertised on DWER's website in June 2019. No submissions were received within the specified timeframe.

JTSI has consulted with DWER on the proposed activities, as part of the Applicant seeking approval of a proposal under the State Agreement.

DMIRS Mines Safety Division advises it met with the Applicant in June 2019 to discuss a draft RMP for the project, which requires approval prior to operations commencing.

The Applicant was provided with drafts of the Decision Report and Works Approval on 15 July 2019, with only minor corrections raised which have been addressed in the final.

Conclusion

This assessment of the risks of activities on the premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this decision report (summarised in Appendix 2).

Based on this assessment, it has been determined that the Works Approval will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

DWER notes that it may review the appropriateness and adequacy of controls at any time and that, following a review, DWER may initiate amendments to the approval under the EP Act.

Tim Gentle

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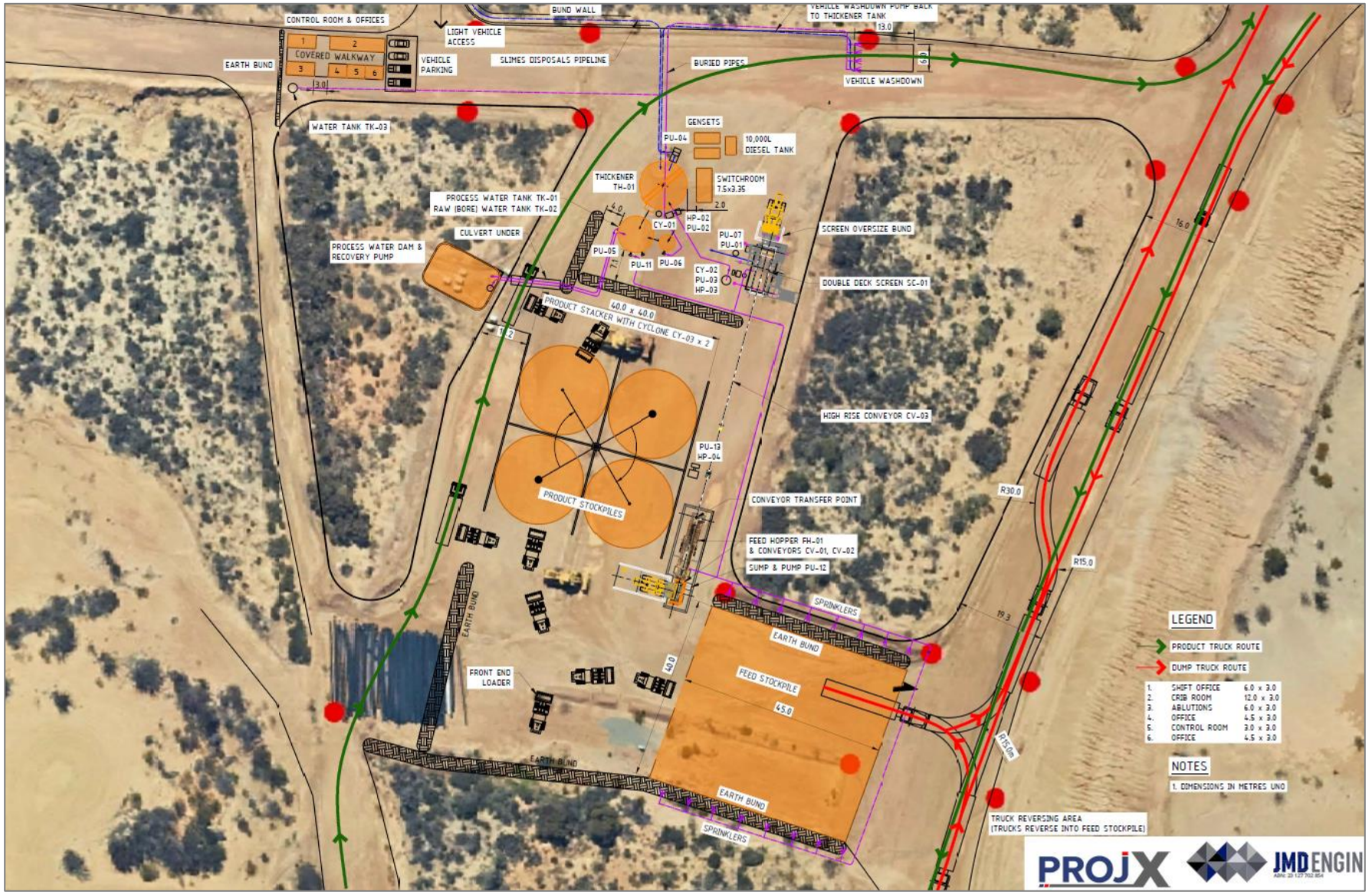
Date: 2019.08.01 15:21:38 +08'00'

Tim Gentle
MANAGER, RESOURCE INDUSTRIES
REGULATORY SERVICES

Delegated Officer
Under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Proposed plant layout



Appendix 2: Key documents

Document title	In text ref	Availability
Iluka Resources Ltd – Eneabba Mineral Sands Recovery Project Phase 1 – Works Approval application and supporting information	Application	DWER records (A1792800)
DER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth.	DER, 2015a	accessed at www.dwer.wa.gov.au
DER, October 2015. *Guidance Statement: Setting Conditions.* Department of Environment Regulation, Perth.	DER, 2015b	
DER, February 2017. *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth.	DER, 2017a	
DER, February 2017. *Guidance Statement: Decision Making*. Department of Environment Regulation, Perth.	DER, 2017b	
Mineral Sands (Eneabba) State Agreement Act 1975	State Agreement	accessed at: www.legislation.wa.gov.au
Iluka Resources Ltd, 2018. Dust Management Plan – Eneabba Operations	Iluka, 2018	DWER records (A1794986)