Decision Report

Application for Works Approval

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number	W6215/2019/1
Applicant	Iluka Resources Limited
ACN	008 675 018
File Number	DER2018/001647
Premises	Narngulu Mineral Separation Plant 249 Goulds Road NARNGULU WA 6532 Legal description – Lot 2 on Plan 11238
Date of Report	14 March 2019
Status of Report	Final

Overview of premises

Classification of premises

The Narngulu Mineral Separation Plant (Premises) is an existing mineral separation plant (MSP) located on the outskirts of Geraldton. It has been in operation since 1976 and is subject to the *Mineral Sands (Eneabba) State Agreement Act 1975* (State Agreement).

The Premises is used to separate heavy mineral concentrate (HMC) into individual mineral products using gravity, magnetic and electrostatic separation processes. It is regulated under Licence L5425/1989/11 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.	1,200,000 tonnes per annual period

Presently, the majority of HMC being processed is sourced from the Applicant's Jacintha-Ambrosia (JA) mine in South Australia, in addition to HMC previously mined at Eneabba and non-magnetic HMC (NHMC) from the North Capel MSP.

This application relates to the proposal to process NHMC from the Applicant's new Cataby mine, which requires construction of an additional mineral separation circuit to the existing plant. An application for works approval was submitted by the Applicant under Division 3 Part V of the EP Act on 4 December 2018 (the Application).

Description of proposed activity

NHMC from the new Cataby mine, which is scheduled to commence full mining operations in March 2019, is proposed to be processed at the Premises. It is also proposed to process at the Premises the non-magnetic by-product from processing magnetic HMC from Cataby at the company's North Capel MSP.

Approximately 75,000 – 265,000 tonnes per annum of NHMC (containing zircon and rutile) will be processed at the Premises per year, with no net increase to overall plant throughput.

Cataby NHMC is proposed to be processed on a campaign basis, with JA-HMC continuing to be the primary feed for the MSP. When a sufficient amount of NHMC is received from the Cataby mine it will be washed, attritioned, dried and stored in the Plant 1 feed bins until there is an adequate amount to campaign it through Plant 1. It is expected that Cataby NHMC will be processed in campaigns for 6 – 10 months per year over the life of the Cataby mine.

Barite removal circuit

The Applicant proposes to remove naturally occurring barite (barium sulfate – $BaSO_4$), which is a by-product contained within the Cataby non-magnetic HMC, from the more valuable zircon. A barite removal circuit is proposed, which comprises a flotation circuit to be constructed entirely within the existing Plant 1 Zircon Wet Circuit (ZWC) building. The barite removal circuit has been designed for a nominal operating rate of 15 tonnes per hour (tph) and a maximum operating rate of 20.8 tph.

The flotation circuit has been designed to exploit the differences in surface chemistry of barite and zircon to separate them from each other. Generally, the pH of the flotation slurry will be raised to the optimum level using soda ash while a frother and a collector will be added to bind and remove (i.e. float) the barite from the zircon as air is bubbled through the flotation vessels.

Two additional waste/by-product streams will be created from the barite removal circuit – a process water stream ('Stream 17') and the barite by-product ('Stream 13'). The process water stream (1.6 – 2.2 m^3/hr when operating) will be combined with the existing MSP process water stream and report to the MSP process water dams, where the flotation reagents are expected

to readily biodegrade. The barite by-product (0.2 t/hr when operating) will report to the existing ZWC tails stream and stored within an existing stockpile area to the north of the MSP for potential reprocessing with the mobile processing unit. The Applicant considers that barite is suitable for stockpiling within the existing MSP tails material as it is a naturally occurring mineral and non-leachable.

Reagents

Following commissioning the three reagents used in the flotation circuit will be recycled and reused, with minor volumes required to top up the system from time to time. A brief description of the reagents is as follows:

- Soda ash (sodium bicarbonate – Na_2CO_3) – an alkali chemical that will be used to increase and control pH. In water, Na_2CO_3 readily dissociates into ions that originally exist in nature, and do not accumulate in living tissue.

  The expected addition rate is 20 g/tonne of HMC (3 – 5 tonnes per annum (tpa)). Soda ash is currently used within the ZWC with existing infrastructure for mixing, handling and storage. The product will be supplied and handled within intermediate bulk containers (IBCs) as currently used on-site.

- Frother (Interfloat F236N) – an alcohol-based flotation frothing agent. The ingredients of Interfloat have been classified as non-hazardous.

  The expected addition rate is 20 g/tonne of HMC (3 – 5 tpa). The product will be supplied and handled within IBCs and stored within the Plant 1 annexe adjacent to the ZWC.

- Collector (Intercol C7256) – a flotation collector agent with the active ingredient being sodium alkyl sulfate (90 – 98%), a water soluble salt that acts as a wetting agent. The ingredients of Intercol have been classified as non-hazardous.

  The expected addition rate is 50 to 200 g/tonne of HMC (10 – 15 tpa). Intercol is readily biodegradable on exposure to UV light and begins to breakdown within 24 hours and therefore will be batched in small quantities, as required.

  The product will be supplied in drums as a solid (free flowing waxy needles) that will be mixed with heated water in a mixing tank. A designated storage and mixing area has been designed for the collector and will be constructed outside of the existing Plant 1 Jig building.

Cataby NHMC stockpile and existing JA-HMC stockpile

The Applicant proposes to stockpile Cataby NHMC on a new unlined storage pad to be constructed to the north-west of the existing lined JA-HMC stockpile pad. This new pad has a design capacity of 40,000 tonnes and has been designed to protect the integrity of the existing liner and drainage of the JA-HMC pad.

The Applicant considers that Cataby NMHC does not require storage on a lined area as it will be processed using fresh water at the Cataby mine, unlike JA-HMC that has been processed using hypersaline water at the JA mine.

Construction and commissioning

Construction is scheduled to commence in Q1 2019, and is expected to take approximately 4 months to complete. Commissioning will occur directly following completion of construction, with full operation scheduled for mid-2019.

Infrastructure

Prescribed Activity Category 8	
Existing infrastructure	
1	Plant 1 – Mineral Separation Plant commissioned in 1975
2	Plant 2 – Mineral Separation Plant commissioned in 1990
3	Zircon Finishing Plant (ZFP) – commissioned in 1991
4	Wash plant – commissioned in 2009 to enable processing of JA-HMC
5	Mobile Processing Unit (MPU) – commissioned in 2012 to reprocess sand tailings
6	HMC stockpile pad with surface water runoff containment pond
7	Process water dams (6)
8	Product storage shed
Proposed infrastructure (barite removal circuit)	
1	Cataby NHMC stockpile pad
2	Barite removal plant, including flotation circuit
3	'Collector' mixing area

Environmental siting

The Premises is located within the Narngulu industrial estate, approximately 11 km south-east of Geraldton and within the City of Greater Geraldton. The industrial estate is surrounded by a number of buffer areas under the Greater Geraldton Structure Plan, to guide future development of the area and to separate incompatible land uses and minimise land use conflicts.

The Premises is zoned 'industrial' under the Geraldton Region Plan and 'general industry' under the City of Greater Geraldton Local Planning Scheme No.1.

The site is predominantly surrounded by commercial and general industry. DWER records indicate a number of prescribed premises are also located within the Narngulu industrial estate, including the Meru landfill facility, the Narngulu Wastewater Treatment Plant and the Applicant's synthetic rutile plant. The nearest residential receptors are located around 1 km to the east and south-east of the Premises.

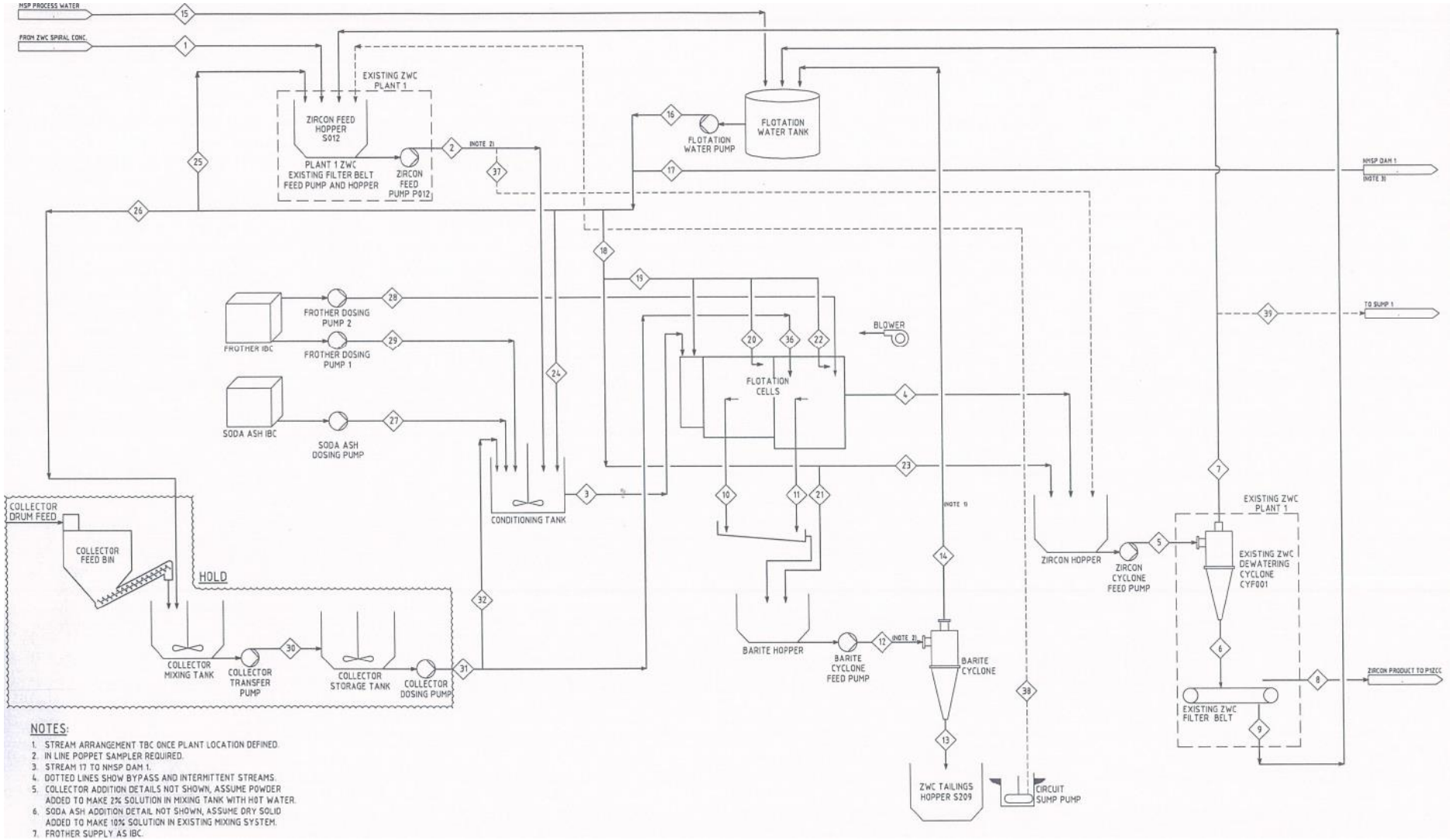
The Applicant advises that it has consulted with immediate neighbouring premises, and that no objections were raised.

No 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 seasonal creek located 1.5 km south within Rudds Gully, however the Applicant advises there are no records of water ever flowing in this creek.

<u>Geology</u>

The geology beneath the site consists predominantly of highly interbedded sands, silts and clays (surficial deposits including the Tamala Limestone) overlying the Cadda Formation, categorised into the following main units:

- an upper reddish-brown sand unit with inclusions of silts, clays, gravels and some localised limestone; a clay unit with inclusions of sand and gravel of variable thickness (2 – 6 m);
- a yellow/brown sand unit with inclusions of silts, clays and gravels; and
- the Cadda Formation – consisting of a layer of limestone (1 – 5 m thick) underlain by sand, siltstone (2 – 3 m thick), shale and another layer of sand.



▲ Barite removal circuit – process flow diagram.

Immediately to the west of the site is an outcrop of Tamala Limestone, and to the west of the Tamala Limestone are sand dunes associated with the Safety Bay Formation.

Hydrogeology

The regional groundwater flow at the site is west/south-west towards the Indian Ocean. The surficial aquifer is recharged by infiltration associated with rainfall events. Groundwater is generally encountered beneath the site within the surficial deposits at about 12.6 to 32.6 m below ground level, resulting the in upper sand unit being predominantly unsaturated with only the bottom few metres being below the water table. Both the clay and second sand units are completed saturated with a saturated aquifer thickness of 25 m and 32 m.

The surficial aquifer is underlain by the Cadda Formation which is described as shale, siltstone and sandstone with shelly sandy limestone. Due to the limestone and siltstone formations located in the upper portions of the Cadda Formation, it is likely this formation is hydrogeologically separated from the surficial aquifer.

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 processing of Cataby NHMC was approved by the Minister for State Development in August 2018. A proposal outlining the design and operation of the barite removal plant has been submitted to JTSI in parallel with this Application.

Works approval and licence history

Instrument	Issued	Amendment
L5425/1989/10	23/08/2007	Licence renewed – issued for 5 years.
L5425/1989/11	31/08/2012	Licence renewed – issued for 5 years.
L5425/1989/11	20/06/2017	Amendment Notice 1 – extend expiry date by 12 months.
L5425/1989/11	19/03/2018	Amendment Notice 2 – approval to dispose asbestos-contaminated material and NORM in the historic Jennings landfill area.
L5425/1989/11	17/07/2018	Amendment Notice 3 – extend expiry date by 12 months.
W6215/2019/1	12/03/2019	Works approval to construct a barite removal circuit (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	Construction of barite removal circuit, collector mixing area, extension to existing wash plant area and Cataby NHMC stockpile pad	Noise associated with construction works	Adjacent industrial and commercial premises Residential premises located ~1.0 km from site	Air / wind dispersion	Amenity impacts	Minor	Rare	Low	Some additional noise is expected during construction works, however this is not considered to be significantly different from noise levels during normal operations or maintenance outages at the Premises.	None specified in WA and Licence. Any actual noise impacts that may arise can be regulated under the provisions of the Noise Regulations.
		Dust associated with machinery and vehicle movements				Minor	Rare	Low	Apart from earthworks to expand the existing wash plant stockpile area, construction will predominantly take place inside existing buildings.	None specified in WA and Licence. Any actual dust impacts that may arise can be regulated under the provisions Section 49 of the EP Act.
Commissioning works and subsequent operation	Stockpiling of Cataby NHMC on new storage area	Seepage of water entrained within NHMC	Soil, groundwater	Through base of unlined storage area	Groundwater contamination	Moderate	Unlikely	Medium	The water table beneath the Premises is >12 m and of brackish water quality. Cataby NHMC will be washed with fresh water at the Cataby mine, therefore the quality of entrained water is not expected to pose a significant groundwater contamination risk.	None specified in WA. Any actual groundwater impacts are likely to be identified through the existing groundwater monitoring program.
					Groundwater mounding	Minor	Rare	Low	The majority of water entrained within the HMC is expected to have been drained at the mine site, therefore low volumes of seepage are expected.	
		Contaminated stormwater runoff		Direct discharge	Soil and groundwater contamination	Minor	Unlikely	Medium	Stormwater runoff from the new Cataby NHMC storage pad will be contained on the Premises within the existing lined stormwater pond.	Infrastructure controls to be imposed in the WA and Amended Licence, requiring all stormwater runoff from the Cataby NHMC storage pad to be contained.
		Dust lift-off from stockpile(s)	Industrial/ commercial/ residential premises (see above)	Air / wind dispersion	Amenity impacts	Minor	Possible	Medium	There is potential for fugitive dust lift-off from this additional stockpile, however this is not expected to be significant if dust controls applied to existing stockpiles on the Premises are implemented. Controls include the use of water sprinklers and suppressants other than water (e.g. gluon) on stockpiles, in addition to ongoing dust monitoring.	Dust controls to be imposed in the WA and Amended Licence, consistent with existing Applicant controls.
	Washing and drying of Cataby NHMC	Wastewater	Soil, groundwater	Direct discharge	Soil and groundwater contamination	Minor	Possible	Medium	Wash water from the existing wash plant is pumped to a HDPE-lined dam at the adjacent SR plant site (SD8).	None specified in WA and Licence. Activity is regulated under the SR plant licence.
		Air emissions from Dryer 605	Industrial/ commercial/ residential premises (see above)	Air / wind dispersion	Amenity impacts	Minor	Unlikely	Medium	The drying of Cataby NHMC using the washplant dryer (Dryer 605) is not expected to result in any significant increase in particulate emissions from existing operations.	None specified in WA and Licence. Any actual impacts to air are likely to be identified through the existing stack monitoring program.
	Commissioning and operation of barite removal circuit	Noise associated with operation of circuit				Minor	Rare	Low	Not expected to be significant for the reasons stated above.	See above comment.
	Discharge of wastewater (Stream 17) to existing NMSP process water ponds	Pond liner leakage	Soil, groundwater	Through base of pond	Soil and groundwater contamination	Minor	Rare	Low	The process water ponds are HDPE-lined, therefore the risk of pond leakage is considered to be Low. The addition of the Stream 17 process water bleed to the MSP process water stream is not considered to increase the material risk of soil and groundwater impacts from pond leakage.	None specified in WA and Licence. Any actual soil and groundwater impacts are likely to be identified through the existing groundwater monitoring program.
	Stockpiling of barite by-product (Stream 13) at existing unlined tails area	Seepage of water entrained within barite tails		Through base of stockpile area		Minor	Rare	Low	Barite (barium sulfate) is mostly insoluble in water and therefore poses a low risk of leaching contaminants into groundwater.	

Consultation

The Application was publicly advertised on DWER's website in January 2019 for a period of 21 days. No submissions were received within the specified timeframe.

DWER has provided comments to JTSI on the barite removal circuit proposal, as part of an application to vary the State Agreement.

The Applicant was provided with drafts of the Decision Report and Works Approval on 11 March 2019 and made no additional comments.

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).

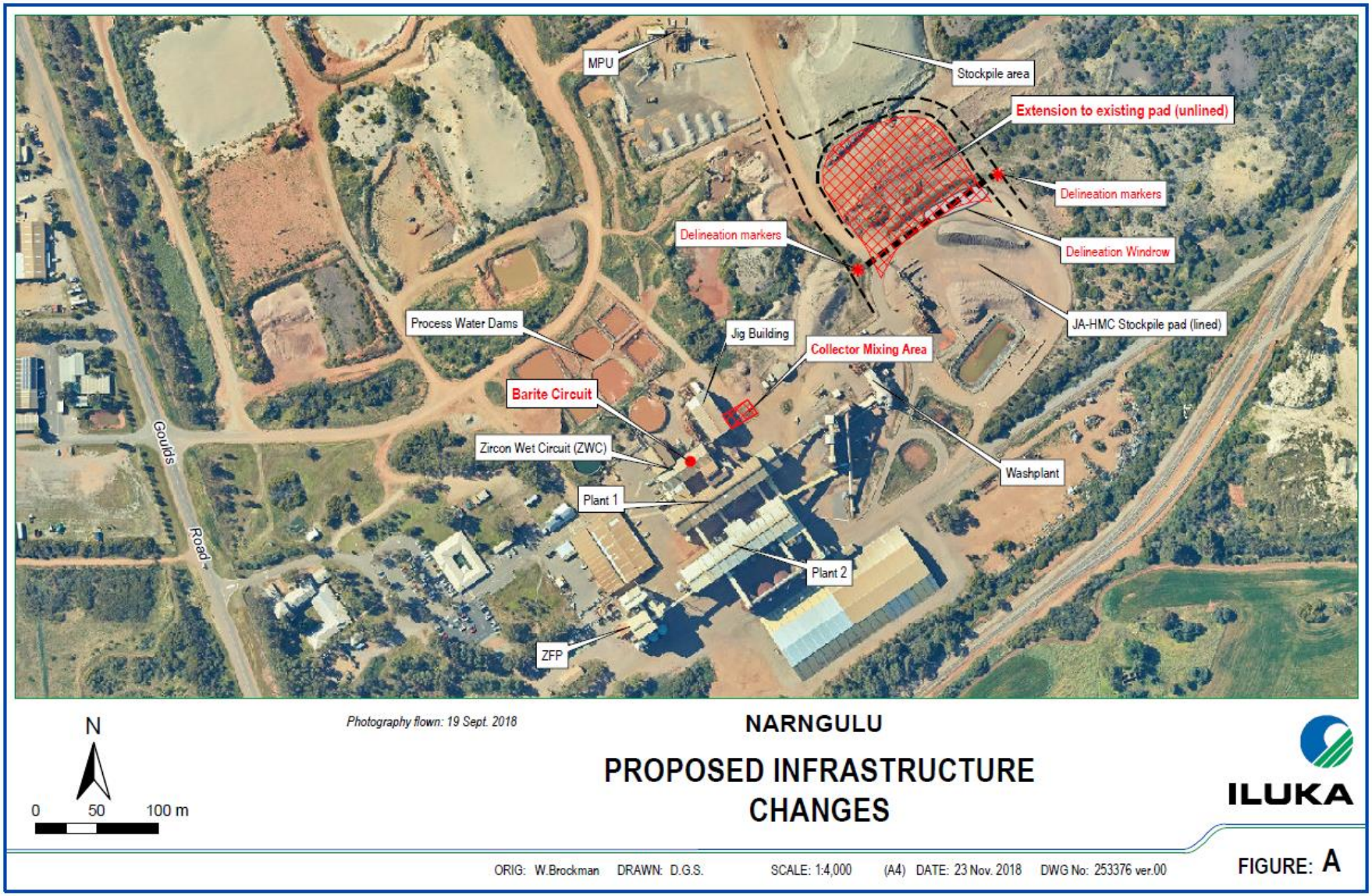
Based on this assessment, it has been determined that the Works Approval will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

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.

Danielle Eyre
SENIOR MANAGER – RESOURCE INDUSTRIES
REGULATORY SERVICES

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

Appendix 1: Proposed infrastructure changes



Appendix 2: Key documents

Document title	In text ref	Availability
Iluka Resources Ltd – Narngulu Operations Barite Removal Circuit – Works Approval application and supporting information	Application	DWER records (A1745325)
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	