Amendment Report

Application for Licence Amendment

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

Licence Number	L5319/1988/12
Licence Holder	Tronox Management Pty Ltd
ACN	009 343 364
File Number	DER2015/000793-1~6
Premises	Cooljarloo Mineral Sands Mine 12051 Brand Highway CATABY WA 6507 Legal description – Mining tenement M70/1398 As defined by the Premises maps attached to the Revised Licence
Date of Report	4 February 2022
Decision	Revised licence granted

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A/MANAGER, RESOURCE INDUSTRIES
REGULATORY SERVICES
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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1. Decision summary

Licence L5319/1988/12 is held by Tronox Management Pty Ltd (Licence Holder) for the Cooljarloo Mineral Sands Mine (the Premises), located at 12051 Brand Highway, Cooljarloo.

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed changes to the emissions and discharges during the operation of the Premises. As a result of this assessment, Revised Licence L5319/1988/12 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this Amendment Report, the department 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

On 26 March 2021, the Licence Holder submitted an application to the department to amend Licence L5319/1988/12 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The licence holder is proposing the following amendments:

- Amend administrative error regarding category 8 throughput;
- Increase in throughput (directly related to category 8 activity) to enable the disposal of additional waste types;
- removal of redundant construction conditions and the incorporation of the cell 8 extension (approved 23 December 2019), into current Mineral Residue Facility (MRF) operational conditions;
- removal of conditions from the Licence relating to an investigation into leakage rates from the dredge pond, as these conditions have been satisfied and are no longer relevant to site operations;
- authorisation to accept and/or dispose of additional waste types into the MRF; and
- a number of administrative corrections regarding site operations.

These are discussed in further detail in the sections below.

2.2.1 Change to premises throughput

The Licence Holder has identified that category 8 premises annual throughput has been incorrectly listed on the licence as the amount of Heavy Mineral Concentrate (HMC) produced rather than the quantity of ore processed per annual period: 26 million tonnes. Historical throughput data has been provided to substantiate this. The production value (heavy mineral concentrate produced), by administrative error, was incorrectly listed on the licence as the premises throughput.

The Licence Holder also proposes to increase the annual disposal throughput for mineral processing residues into the MRF to allow for the disposal of additional waste types into the MRF. These matters are discussed in Sections 2.2.4 and 3.3.2.

No additional changes to current site infrastructure or equipment are proposed to facilitate the increase or changes to throughput. Table 1 below outlines the proposed changes to the existing Licence.

Table 1: Proposed throughput capacity changes

Category	Current throughput capacity	Proposed throughput capacity	Description of proposed amendment
Category 8 Mineral sands mining or processing	810,000 tonnes per annum	26,000,000 tonnes per annum	Throughput has been amended to correct the previous error on the Licence.
N/A – directly related activity Disposal of mineral processing residues into the MRF	500,000 tonnes	550,000 tonnes per annum	Increase in throughput requested to enable the disposal of additional waste types. Discussed in Sections 2.2.4 and 3.3.2.

2.2.2 Operation of Cell 8 – Stage 1 extension

The Licence Holder proposes amendment of the licence to reflect that conditions 2, 3 and 4 for construction of cell 8 Stage 1 extension to the MRF (approved 23 December 2019), have been satisfied. The Licence Holder requests removal of redundant construction conditions and the incorporation of the extension into current MRF operational conditions.

DWER outcome

A compliance report was submitted by the Licence Holder to DWER on 4 June 2020. Due to minor departures made from the design requirements outlined in the amended Licence, DWER requested on 17 July 2020 that the Licence Holder provide further information to demonstrate that the Cell 8 Stage 1 extension was fit for purpose. This information was supplied by the Licence Holder on 14 August 2020, and DWER confirmed that the departures from the design requirements were unlikely to result in an increased risk to public health, public amenity or the environment on 19 August 2020 (DWER ref A1924968). Completed construction conditions will therefore be removed from the licence.

Incorporation of the cell 8 extension into the current operating conditions is further discussed in section 3.3.1.

2.2.3 Dredge pond – investigation

The Licence Holder proposes removal of conditions 18 and 19 from the Licence relating to an investigation into leakage rates from the dredge pond, as these conditions have been satisfied and are no longer relevant to site operations.

DWER outcome

Under the Licence review finalised on 23 December 2019, it was identified that Acid Sulfate Soils (ASS) at the site were historically poorly managed and attempts to maintain dredge pond pH above 6.0 had been inadequate and were likely unsuitable for future management. As a result of these findings, an amended Licence issued on 23 December 2019 included conditions requiring the Licence Holder to conduct an investigation on leakage rates from the pond into groundwater to estimate long-term impacts of seepage from the dredge pond.

This report was submitted by the Licence Holder to DWER on 14 August 2020. DWER completed its review of the report on 15 September 2020 and concluded that seepage from the dredge pond was unlikely to cause significant water quality impacts in an aquifer experiencing regional acidification, and that the contents of the investigation satisfied the requirements of conditions within the Licence (DWER ref A1992394). Conditions 18 and 19 will therefore be removed from the licence.

2.2.4 Receipt and disposal of additional wastes

The Licence Holder is seeking authorisation under this amendment to accept and/or dispose of the following additional waste types into the MRF:

- Filter cake produced by Tronox Management Pty Ltd's Bunbury Pigment Plant, which consists of product processed through the Kemerton chloride plant and the Australind finishing plants;
- Inert wastes potentially contaminated with naturally occurring radioactive material (NORM), arising from premises operations and the Bunbury Pigment Plant;
- Hydrocarbon contaminated soil; and
- Co-burial of inert wastes generated at the Premises with overburden and clay/sand tails within the boundary of the Premises

Table 2 below summarises the types and expected quantities of waste streams proposed by the applicant.

Table 2 Types and expected waste stream quantities

Waste	Approx. maximum volume from Kwinana and Chandala	Approximate maximum volume from Bunbury Pigment Plant	Total	Total + 10%
Filter Cake (IO/NAE)	140,000		140,000	154,000
Pugged waste	45,000		45,000	49,500
Waste fines	3,000		3,000	3,300
Other waste	4,000		4,000	4,400
Pre-screen tailings	7,000		7,000	7,700
White tailings and screen 1 and 2 oversize	45,000		45,000	49,500
Coarse rejects	40,000		40,000	44,000
Filter Cake	110,000	90,000	200,000	220,000
Total of all wastes			484,000	532,400

Filter cake

The Licence Holder is seeking approval to dispose of additional filter cake from a new source, the "Bunbury Pigment Plant", into the MRF at the Premises.

This is further discussed in section 3.3.2.

Inert wastes potentially contaminated with NORM

The Licence Holder currently has approval to dispose of 'Other (Hazardous waste)', including inert waste potentially contaminated with NORM, into the MRF. The Licence Holder requests that similar waste streams also generated at the Cooljarloo and Bunbury Pigment Plant sites locations be listed as source locations for disposal to the MRF. This will contribute to the increase in the overall quantity of waste being disposed of to the MRF sought under this amendment.

This is further discussed in section 3.3.2.

Hydrocarbon contaminated soil

The Licence Holder has requested that hydrocarbon contaminated soils from the Chandala, Cooljarloo and Kwinana sites be permitted for disposal within the MRF. Hydrocarbon contaminated soils are generated in small quantities across all three sites (less than 100 m^3 combined) as a result of hydrocarbon spills and from the cleaning out of washbays.

This is further discussed in section 3.3.2.

Burial of inert wastes

The Licence Holder is seeking approval to dispose of inert (non-mining wastes) generated at the Premises within the MRF. Wastes proposed to be disposed of include:

- Wood (pallets, gluts scrap timber);
- Polypipe (mining pipes);
- Rubber (hoses, belts);
- Metal equipment/structures (from dredges and concentrators); and
- Soil samples (drill cores, test samples).

The combined amount of inert wastes should not exceed 515 tonnes per annual period. The Licence Holder previously had approval to dispose of inert wastes prior to the renewed Licence being granted on 23 December 2019 and wishes to reinstate this approval onto the Licence.

This is further discussed in section 3.3.2.

2.2.5 Proposed corrections

The Licence Holder has provided clarification surrounding current site operations and has highlighted inconsistencies between premises operations and what is reflected in the existing Licence. Additionally, changes in wording and additional controls have been identified for inclusion in the Revised Licence. The following amendments have been requested and are presented with DWER outcomes in Table 3. Proposed amendments are administrative in nature and are therefore addressed below.

Table 3 Proposed corrections

Proposed correction	Applicant justification	DWER outcome
Condition 7 Item 6 of Table 4 Amend *"Drainage designed to divert surface water runoff to a collection sump via a sediment control structure"* to *"Drainage designed to divert surface water runoff to a collection sump"*	The current infrastructure and equipment operational requirement for the Heavy Mineral Concentrate (HMC) stockpile pad requires drainage designed to divert surface water runoff to a collection sump via a sediment control structure. The Licence Holder has clarified that any HMC sediment washed into the sump will be recovered for further processing due to the value of the sediment. The drainage channel and sump act as the sediment control structures without a separate "sediment control structure" being required. As such, the Licence Holder requests reference to a separate sediment control be removed from the Licence.	The justification provided by the Licence Holder outlining the recovery of HMC sediment without the use of a separate sediment control is adequate. Reference to a separate "sediment control structure" will be removed from the licence.
Conditions 14 and 24 Amend Tables 6 and 9:	The licence holder states this amendment would "more accurately describe the	The term "Averaging Period" is standard wording used across DWER issued

Proposed correction	Applicant justification	DWER outcome
change reference to "Averaging Period" within the Licence to "Sample Type (analysis location)"	monitoring requirements."	regulatory instruments. Retaining this wording within the Licence will not impact the statutory intent of the sampling requirements. The wording will therefore not be changed.
Condition 14 Amend Column 4, Line 2 from "Spot sample (in field)" to "Pond survey (in-field)"	Amending the pH sample type to Pond Survey (in-field) more accurately describes the dredge pond pH monitoring requirements. The pH of the dredge pond is measured by a pond survey which consists of numerous spot samples, not just one as suggested by the current requirement of "Spot sample (in-field)".	The wording will be amended to account for the multiple locations tested.
Condition 29 Remove "(ii) buried completely below the water table (PASS material"	This management practice was conducted during dry mining when the overburden was placed in the dry mining void. With dredge mining, it is unsafe to deposit overburden in the pond, and therefore, this management action is currently not applicable to the Cooljarloo operations. As such, Tronox request this management action be removed.	The option to bury PASS overburden completely below the water table is one option of three presented on the Licence, with the two other disposal methods being the burial of untreated PASS at the base of the solar drying dam at least 1≥m above the water table, or treatment at the calculated liming rate for adequate neutralisation. If the burial of PASS beneath the water table is not currently applicable to site operations, as indicated by the Licence Holder, it will be removed from the Licence

2.3 Part IV of the EP Act

The Premises is subject to the conditions of Ministerial Statements M37, M557, MS 977 and M790. A review of the Ministerial Statements was undertaken as a part of the Licence review, which was finalised by DWER on 23 December 2019. This review identified that:

- Many of the conditions across the Ministerial Statements are no longer relevant, as they have since been cleared by the EPA as being completed by the Licence Holder;
- There is no apparent regulatory duplication between the conditions within the Ministerial Statements issued under Part IV of the EP Act and the existing Licence issued under Part V of the EP act;
- Predominantly, the remaining relevant conditions across the Ministerial Statements relate to rehabilitation of native vegetation and rehabilitation performance following mining activities.

2.4 Other relevant approvals

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

The Premises previously operated under State Agreement M268SA which expired on 1 March 2020. DWER received correspondence from Department of Mines, Industry Regulation and Safety on 13 October 2021 that Mining Lease M70/1398 was formally granted under the *Mining Act 1978* (Mining Act) on 2 March 2020. A Mining Proposal and Mine Closure Plan was also approved on 2 March 2020 allowing continued operation of the premises under the Mining Act. The Mining Proposal expiry is 1 March 2041.

In line with the change in approvals, the Delegated Officer will amend the Premises location on the Revised Licence to reflect the new mining tenement

2.4.2 Radiological Council of WA

Deposits of mineral sands contain levels of naturally occurring radioactive material (NORM). The radioactive constituents are mostly thorium with smaller amounts of uranium, and their respective decay products. Monazite is the most common radioactive mineral and typically constitutes less than 0.5% of the mined ore, however any operation in which radioactive containing material is extracted from the ground and processed can potentially concentrate NORM in product, by-product or waste streams.

The management of radiological risk (to human health and the environment) from NORM is undertaken jointly by DMIRS and the Radiological Council of WA (RCWA). Prior to the commencement of any stage of mining to which radiation regulations apply, the licence holder is required to obtain approval for a Radiation Management Plan (RMP) and a Radiation Waste Management Plan (RWMP) for the proposed activities at that stage. Both plans are reviewed by DMIRS and RCWA against defined requirements before being granted approval to operate.

DWER received correspondence from RCWA on 15 September 2021 that the proposed amendment is "…covered by the existing requirements imposed by the Council and DMIRS. However the proponent may be required to reassess the RMP and RWMP which are required under the Code and seek additional approvals from the Council and DMIRS".

DWER will advise the applicant to liaise with RCWA and DMIRS regarding any modifications which may need to be made to their RMP and RWMP.

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 *Guidance Statement: Risk Assessments* (DER 2017).

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 operation which have been considered in this Amendment Report are detailed in Table 4 below. Table 4 also details the proposed control measures the Licence Holder has proposed to assist in controlling these emissions, where necessary.

Table 4: Licence Holder controls

Emission	Sources	Potential pathways	Proposed controls
Dust	Operation of Cell 8 – Stage 1 MRF (incorporation into licence operating conditions)	Air/windborne pathway causing impacts to health and amenity	Existing MRF licence controls • Condition 21 – no dust visible outside of MRF area; • Condition 22 -active dust suppression, stabilisation, covering and capping • Condition 25 – fugitive dust monitoring • Condition 30 – fugitive dust control
MRF leachate – metalloids and radionuclides		Seepage through base and embankments to groundwater	Existing MRF licence controls • Construction requirements (compliance met) for a 300mm clay liner has been installed to achieve a permeability of less than 10^{-9} m/s. • MRF constructed with a minimum 3m separation to groundwater • Condition 24 MRF groundwater monitoring. Includes down-gradient (south-west) monitoring bores WMB15 and WMB16 (installed 2018)
Contaminated surface water (MRF leachate – metalloids and radionuclides)		Overland surface water flow to adjacent Mullering Brook, wetlands and human receptors	Existing licence conditions • Condition 7 - Surface water runoff and leachate to be contained within the MRF perimeter embankment area • Condition 20 - no surface water run-off or leachate from the MRF to enter, overflow, or be discharged to mullering brook or the dredge pond. • Construction also includes 1km bund around the lower edge of the MRF.
Hydrocarbon contaminated seepage	Disposal of hydrocarbon contaminated soil in the MRF (<100m3/year, plus initial placement of stockpiled 600m^3)	Seepage through base and embankments to groundwater	Existing MRF licence controls • Construction requirements (compliance met) for a 300mm clay liner has been installed to achieve a permeability of less than 10^{-9} m/s. • MRF constructed with a minimum 3m separation to groundwater Proposed controls Modification of condition 24 – to include 6 monthly monitoring of benzene, toluene, ethylbenzene, xylene (BTEX) and total recoverable hydrocarbons (TRH) to confirm that hydrocarbon contaminated soil deposited in the MRF is not leaching contaminants into the groundwater See further discussion in Section 3.3.2.
Hydrocarbon contaminated surface water run-off		Overland surface water flow to adjacent Mullering Brook, wetlands and human receptors	Existing MRF controls • Condition 7 - Surface water runoff and leachate to be contained within the MRF perimeter embankment area

Emission	Sources	Potential pathways	Proposed controls
			• Condition 20 - no surface water run-off or leachate from the MRF to enter, overflow, or be discharged to mullering brook or the dredge pond. Construction also includes 1km bund around the lower edge of the MRF. See further discussion in Section 3.3.2.
MRF leachate – metalloids and radionuclides	Disposal of filter cake from a new source (Bunbury pigment plant) into MRF	Seepage through base and embankments to groundwater	<u>Existing MRF licence controls</u> • Construction requirements (compliance met) for a 300mm clay liner has been installed to achieve a permeability of less than 10^{-9} m/s. • MRF constructed with a minimum 3m separation to groundwater <u>Proposed controls</u> The Licence Holder has provided comparative samples of filter cake produced at the Kwinana site, which is currently permitted to be accepted for disposal into the MRF, and produced at the Bunbury Pigment Plant, to demonstrate similarity between the material. Filter cake is found to mainly consist of metal chlorides, oxides, hydroxides, various silicates, unreacted ore and coke. See further discussion in Section 3.3.2.
Contaminated surface water (MRF leachate – metalloids and radionuclides)		Overland surface water flow to adjacent Mullering Brook, wetlands and human receptors	<u>Existing MRF controls</u> • Condition 7 - Surface water runoff and leachate to be contained within the MRF perimeter embankment area • Condition 20 - no surface water run-off or leachate from the MRF to enter, overflow, or be discharged to mullering brook or the dredge pond. Construction also includes 1km bund around the lower edge of the MRF. See further discussion in Section 3.3.2.
Contaminated leachate - radionuclides	Disposal of additional inert waste contaminated with NORM from Bunbury and Cooljarloo sources (Kwinana Pigment Plant is a currently approved source)	Seepage through base and embankments to groundwater	<u>Existing MRF licence controls</u> • Construction requirements (compliance met) for a 300mm clay liner has been installed to achieve a permeability of less than 10^{-9} m/s. • MRF constructed with a minimum 3m separation to groundwater <u>No additional proposed controls:</u> The licence holder indicates inert waste contaminated with NORM from source sites Cooljarloo and Bunbury is “expected to be of broadly comparable composition to that received from Kwinana Pigment Plant, due to the similarity of the facilities”

Emission	Sources	Potential pathways	Proposed controls
			See further discussion in Section 3.3.2.
Contaminated surface water - radionuclides		Overland surface water flow to adjacent Mullering Brook, wetlands and human receptors	Existing MRF controls • Condition 7 - Surface water runoff and leachate to be contained within the MRF perimeter embankment area • Condition 20 - no surface water run-off or leachate from the MRF to enter, overflow, or be discharged to mullering brook or the dredge pond. Construction also includes 1km bund around the lower edge of the MRF. No additional proposed controls: The licence holder indicates inert waste contaminated with NORM from source sites Cooljarloo and Bunbury is "expected to be of broadly comparable composition to that received from Kwinana Pigment Plant, due to the similarity of the facilities" See further discussion in Section 3.3.2.
See section 3.2.2.	Burial of inert waste	See section 3.2.2.	See section 3.2.2.

3.1.2 Receptors

In accordance with the *Guidance Statement: Risk Assessment* (DER 2017), the Delegated Officer has excluded employees, visitors and contractors of the Licence Holder's from its assessment. Protection of these parties often involves different exposure risks and prevention strategies, and is provided for under other state legislation.

Table 5 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 *(Guidance Statement: Environmental Siting* (DER 2016)).

Table 5: Sensitive human and environmental receptors and distance from prescribed activity

Human and heritage receptors	Distance from activity / prescribed premises
Billinue Aboriginal Community (BAC) (population ~43)	SE corner of Mullering Farm, within the prescribed premises (Figure 1 and Figure 2). The BAC supplies the licence holder with native seeds for propagation and rehabilitation purposes. ~2.3km south east of the MRF
Mullering Brook (site ID 4640)	Immediately along the southern extent of the MRF (down gradient) (Figure 1 and Figure 2)
Muralang Pool Camp (site ID 4642) (up-stream of Mullering Brook)	2.5km east of the MRF (up-stream of site) As the Muralang pool camp is located up-stream of the site and is ephemeral only (contains water less than 4 months of the year), the potential for on-going human contact is considered unlikely. See further discussion in Section 3.3.1 – Leachate and

	Contaminated Surface Water Run-Off. (Figure 1 and Figure 2)
Cooljarloo Well (site ID 4639) (nearby Mullering Brook)	3.2km west of the MRF (down-stream of site) (Figure 1 and Figure 2)
Environmental receptors	**Distance from activity / prescribed premises**
Geomorphic wetlands – Cervantes South	A section of Mullering Brook is included within the Geomorphic wetlands layer (also listed as a Heritage receptor) After Mullering Brook the closest point 1.6km south-west (down-gradient) (Appendix 6 - Figure 5)
Department of Biodiversity, Conservation and Attractions (DBCA) - managed lands and waters: 'Class A' Conservation Reserves	Unnamed Nature Reserve (R40916) 650m south west of premises boundary. 5km south-west of MRF (Appendix 6 - Figure 6) Unnamed Nature reserve is protected under MS1158 condition 6-1 stating that: "The proponent shall implement the proposal to meet the following environmental objectives: (1) avoid where possible, otherwise minimise direct and indirect impacts to surface and groundwater quality and quantity within the revised proposal development envelope delineated in Figure 2 of Schedule 1 during ground disturbing activities and during all phases of mining activities, as far as practicable; and (2) ensure there are no proposal-related groundwater drawdown or proposal-related direct or adverse indirect impacts to the un-named Nature Reserve (No. R 40916)"
DBCA-managed lands and waters: 'Class C' Conservation Reserves	Unnamed Nature Reserve (R41986) Immediately adjacent to eastern site boundary ~850m north-east of MRF (Appendix 6 - Figure 6)
<u>Threatened and priority ecological communities (TEC)</u> Priority 3 - Banksia Dominated Woodlands of the Swan Coastal Plain	Within the prescribed premises boundary Closest point is 140m east of the MRF (Appendix 6 - Figure 7)
<u>Threatened Flora</u> Surveys summarised by EPA assessment for MS1158 identified the following threatened species may occur within the vicinity of the site and the proposed Cooljarloo west development envelope: • Andersonia gracilis (Andersonia gracilis) – Vulnerable under the *Biodiversity Conservation Act 2016* (BC Act) and Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) • Anigozanthos viridis subsp. terraspectans (Dwarf green kangaroo	Assessment of threatened flora has taken place as part of the Cooljarloo West proposal (MS1158). Threatened flora are protected under conditions in section 5 of MS1158. Closest surveyed location 2km west of MRF. (Appendix 6 - Figure 8)

paw) – Vulnerable under both the BC Act and EPBC Act • Macarthuria keigheryi (Keighery's macarthuria) – Endangered under both the BC Act and EPBC Act • Paracaleana dixonii (Sandplain duck orchid) – Vulnerable under the BC Act and Endangered under the EPBC Act.	
<u>Priority Flora</u> Surveys summarised by EPA assessment for MS1158 identified 25 priority flora species within the vicinity of and to the west of site. Species considered to be more important by the EPA assessment as compared to the proportion of the regional population present are: Priority 2 - Chordifex reseminans Priority 3 - Babingtonia urbana Guichenotia alba Priority 3 Stylidium hymenocraspedum	Assessment of priority flora has taken place as part of the Cooljarloo West proposal (MS1158). Priority flora are protected under conditions in section 5 of MS1158. Closest surveyed location 300m east of MRF. (Appendix 6 - Figure 8)
Threatened/Priority Fauna	Area to the west of site includes Carnaby's cockatoo foraging habitat. A total of 18 fauna species of conservation significance have been recorded within and/or in the vicinity of the Premises as part of terrestrial fauna studies since 1986. A summary of species is included within the decision report for the December 2019 licence review.
Proclaimed groundwater area *Rights in Water and Irrigation Act 1914* (*RIWI Act*) Gingin Groundwater Area	6 mbgl – 20 mbgl across premises area. Groundwater salinity in the superficial aquifer ranges from 120 – 18,000 mg/L (HGEO, 2021) Groundwater flow direction is to the south-west (Figure 3)

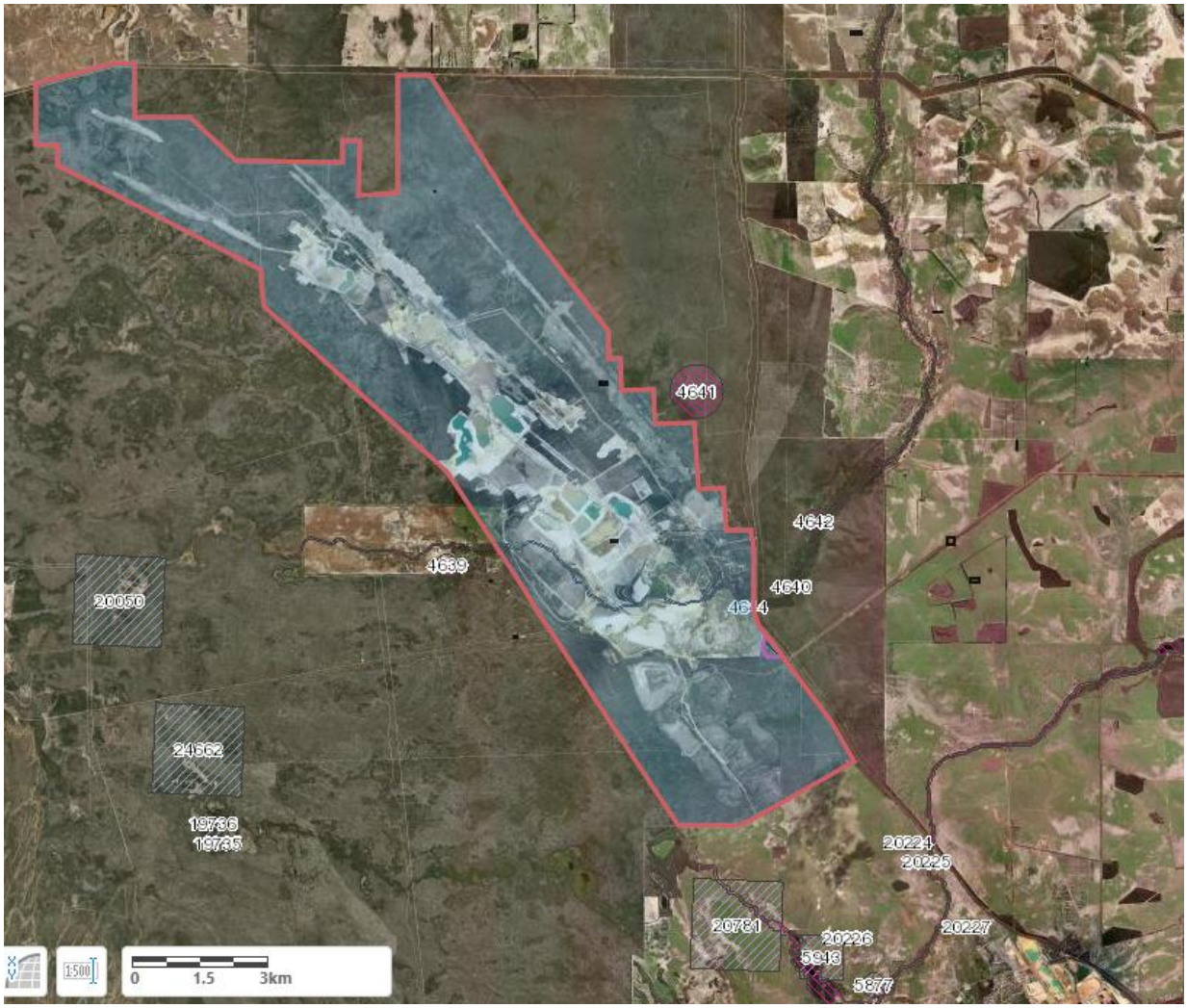

Figure 1: Distance to sensitive heritage receptors (site extent)

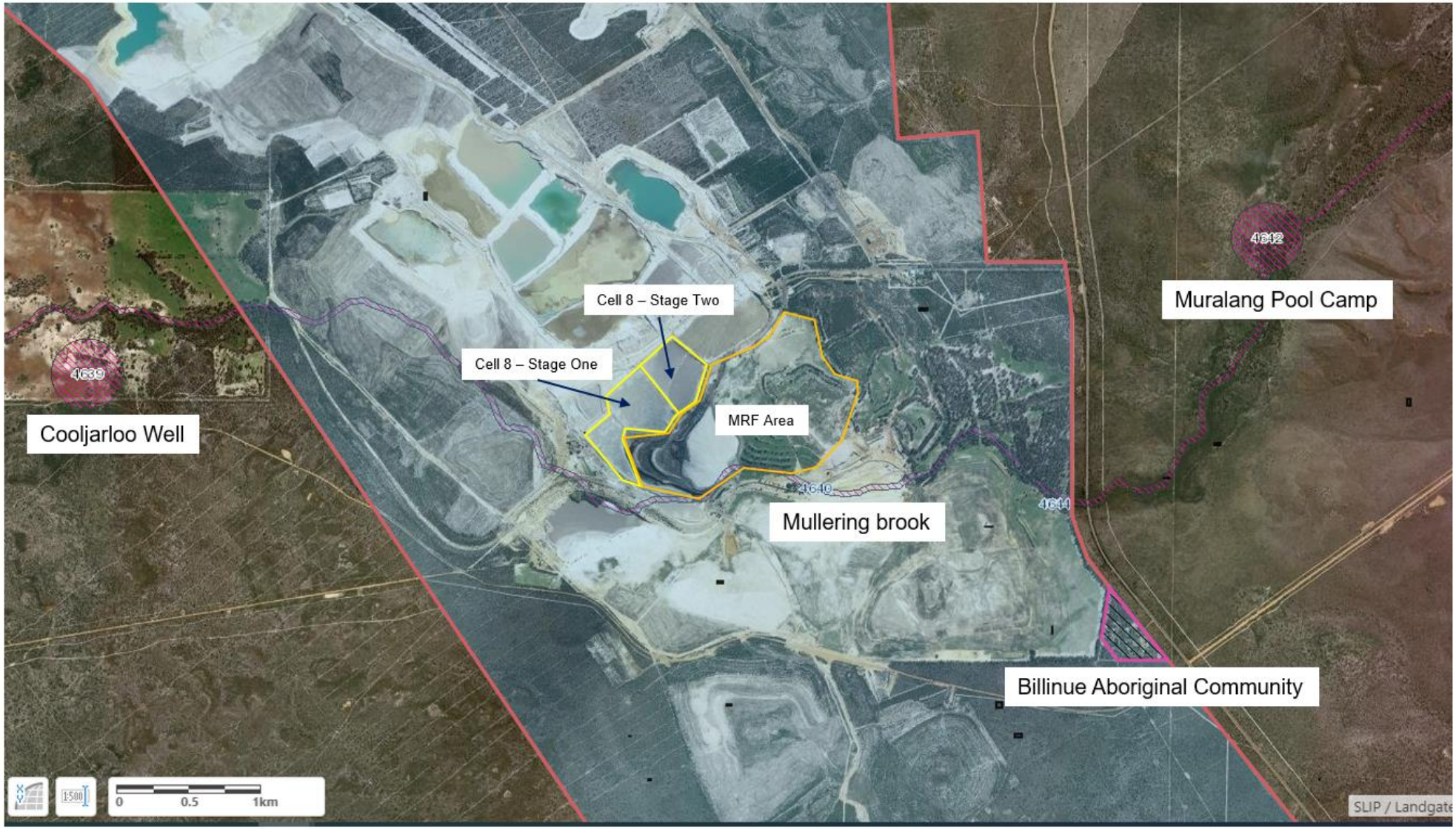

Figure 2 Distance to sensitive heritage receptors (zoomed extent)

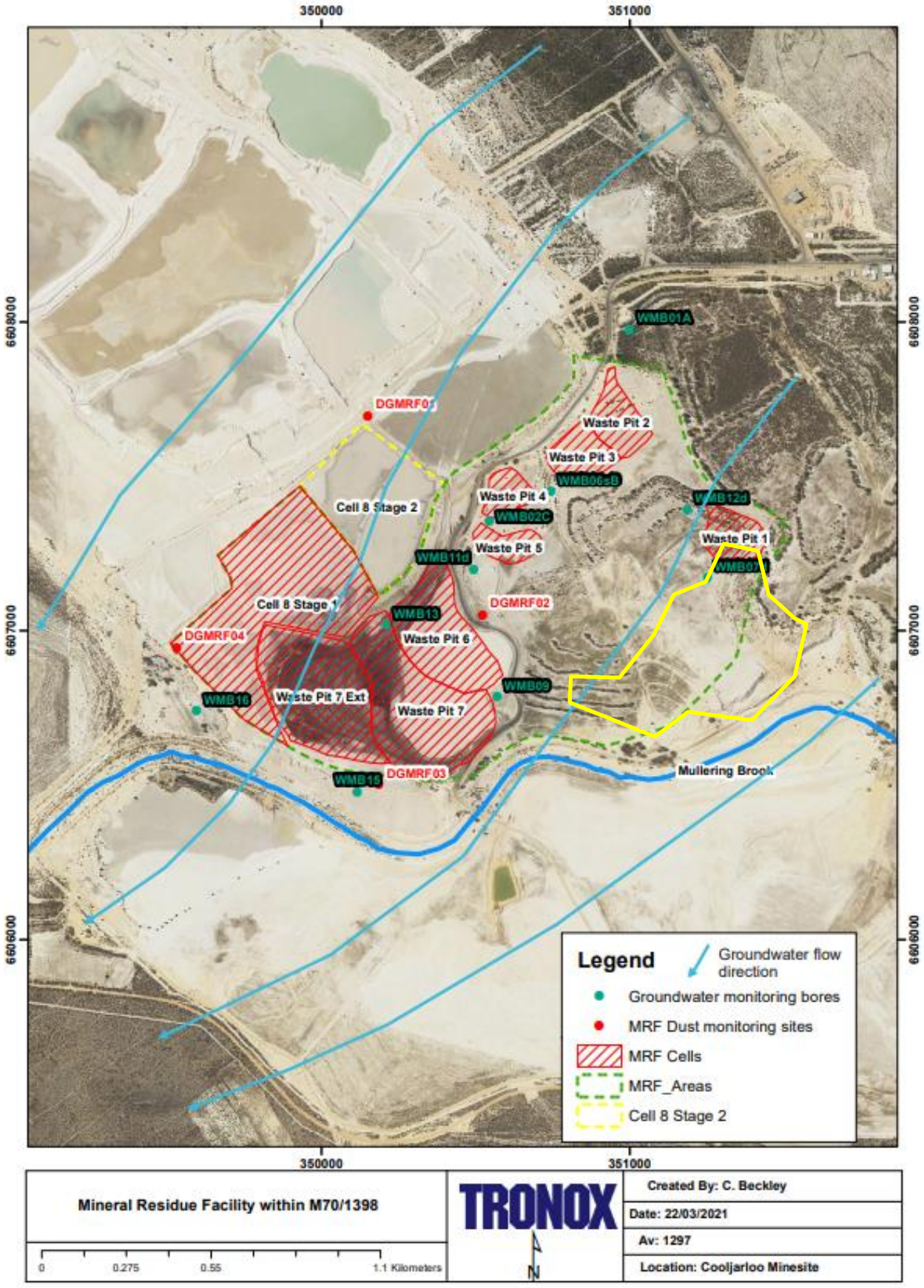

Figure 3 Groundwater flow direction (provided by Tronox)

3.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guidance Statement: Risk Assessments* (DER 2017) for those emission sources which are proposed to change 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 Licence Holder 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 Licence Holder's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the licence as regulatory controls.

Additional regulatory controls may be imposed where the Licence Holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 6.

The Revised Licence L5319/1988/12 that accompanies this Amendment Report authorises emissions associated with the operation of the Premises. The conditions in the Revised Licence have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 6. Risk assessment of potential emissions and discharges from the Premises during operation

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence (note numbers relate to updated condition set)	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder's controls**				
Operation of Cell 8 – Stage 1 MRF (incorporation into licence operating conditions)	Dust	Air/windborne pathway causing respiratory issues/poor health to nearby human receptors	Billinue Aboriginal Community (population ~43) 2.3km south-east of the MRF	See section 3.1.1	C = Moderate L = Unlikely **Medium risk**	Y	<u>Existing licence controls</u> • Condition 16 – no dust visible outside of MRF area; • Condition 17 - active dust suppression, stabilisation, covering and capping • Condition 20 – fugitive dust monitoring • Condition 25 – fugitive dust control	See section 3.3.1 No additional regulatory controls proposed.
		Air/windborne pathway causing poor vegetation health for adjacent environmental receptors	TEC Banksia Woodland, within 9am prevailing wind direction	See section 3.1.1	C = Moderate L = Unlikely **Medium risk**	Y		
	MRF leachate – metalloids and radionuclides	Seepage through base and embankments causing contamination of groundwater and poor health of nearby environmental receptors.	RIWI Act groundwater area 6 – 20 m bgl Mullering Brook, along southern boundary of MRF (down-gradient) Geomorphic wetlands, Cervantes South, closest point 1.6km south-west (down-gradient) TEC Banksia Woodland within prescribed premises (closest point 140m east of MRF) Threatened and priority flora (closest point 300m east of MRF) Muralang pool camp	See section 3.1.1	C = Moderate L = Possible **Medium risk**	N	<u>Existing MRF licence controls</u> • Cell 8 stage 1 MRF extension Construction requirements (compliance met) for a 300mm clay liner has been installed to achieve a permeability of less than 10^{-9} m/s. • Cell 8 stage 1 MRF extension constructed with a minimum 3m separation to groundwater • Conditions 18 and 19 MRF groundwater monitoring. Includes down-gradient (south-west) monitoring bores WMB15 and WMB16 (installed 2018) <u>Additional DWER regulatory controls</u>:	See section 3.3.1 – Leachate and Contaminated Surface Water Run-off

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence (note numbers relate to updated condition set)	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder's controls**				
			(up-stream of site) Cooljarloo Well 3.2km west of MRF				• Modification to condition 19 – addition of Table 10 for surface water monitoring of Mullering Brook	
	Contaminated surface water (metalloids and radionuclides)	Seepage through base and embankments causing contamination of groundwater and poor health of nearby environmental receptors.	Mullering Brook, along southern boundary of MRF (down-gradient) TEC Banksia Woodland within prescribed premises (closest point 140m east of MRF) Threatened and priority flora (closest point 300m east of MRF) Muralang pool camp (up-stream of site) Cooljarloo Well 3.2km west of MRF	See section 3.1.1	C = Moderate L = Possible **Medium risk**	N	<u>Existing licence conditions</u> • Condition 4 - Surface water runoff and leachate to be contained within the MRF perimeter embankment area • Condition 15 - no surface water run-off or leachate from the MRF to enter, overflow, or be discharged to mullering brook or the dredge pond. <u>Additional DWER regulatory controls</u>: • Modification to condition 19 – addition of Table 10 for surface water monitoring of Mullering Brook	See section 3.3.1 – Leachate and Contaminated Surface Water Run-off
Disposal of hydrocarbon contaminated soil in the MRF (<100m^3/year, plus initial placement of stockpiled 600m^3)	Seepage through the base of the MRF	Seepage through base and embankments causing contamination of groundwater and poor health of nearby environmental receptors.	RIWI Act groundwater area 6 – 20 m bgl Mullering Brook, along southern boundary of MRF (down-gradient) Geomorphic wetlands, Cervantes South, closest point 1.6km south-west (down-gradient) TEC Banksia	See section 3.1.1	C = Moderate L = Unlikely **Medium risk**	N	<u>Additional applicant proposed controls</u>: • Modification of condition 19 to include TRH and BTEX in ambient groundwater monitoring surrounding the MRF	See section 3.3.2 – Hydrocarbon contaminated soil

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence (note numbers relate to updated condition set)	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder's controls**				
			Woodland within prescribed premises (closest point 140m east of MRF) Threatened and priority flora (closest point 300m east of MRF) Muralang pool camp (up-stream of site) Cooljarloo Well 3.2km west of MRF					
	Hydrocarbon contaminated surface water run-off	Overland surface water flow to adjacent Mullering Brook, wetlands and human receptors causing surface water contamination.	Mullering Brook, along southern boundary of MRF (down-gradient) TEC Banksia Woodland within prescribed premises (closest point 140m east of MRF) Threatened and priority flora (closest point 300m east of MRF) Muralang pool camp (up-stream of site) Cooljarloo Well 3.2km west of MRF	See section 3.1.1	C = Moderate L = Unlikely **Medium risk**	N	<u>Additional applicant proposed controls</u>: • Modification of condition 19 to include TRH and BTEX in ambient groundwater monitoring surrounding the MRF	See section 3.3.2 – Hydrocarbon contaminated soil
Disposal of filter cake from a new source (Bunbury pigment plant) into MRF	Seepage through base and embankments to groundwater	Seepage through base and embankments causing contamination of groundwater and poor health of nearby	RIWI Act groundwater area 6 – 20 m bgl Mullering Brook, along southern boundary of MRF (down-gradient)	See section 3.1.1	C = Minor L = Unlikely **Medium risk**	Y	<u>Existing MRF licence controls</u> • Cell 8 stage 1 MRF extension construction requirements (compliance met) for a 300mm clay liner has been installed to	See section 3.3.2 – Filter Cake. While filter cake from the Bunbury Pigment Plant has been placed as an authorised source

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence (note numbers relate to updated condition set)	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder's controls**				
		environmental receptors.	Geomorphic wetlands, Cervantes South, closest point 1.6km south-west (down-gradient) TEC Banksia Woodland within prescribed premises (closest point 140m east of MRF) Threatened and priority flora (closest point 300m east of MRF) Muralang pool camp (up-stream of site) Cooljarloo Well 3.2km west of MRF				achieve a permeability of less than 10^{-9} m/s. • Cell 8 stage 1 MRF extension constructed with a minimum 3m separation to groundwater <u>Modifications to existing conditions</u> • Condition 14, Table 7 modified to include Bunbury Pigment Plant as a source	on the part V licence, the licence holder may need to reassess the RMP and RWMP to include the proposed amendments and to seek approval from the Radiological Council and DMIRS before commencing.
	Overland surface water flow to adjacent Mullering Brook, wetlands and human receptors	Overland surface water flow to adjacent Mullering Brook, wetlands and human receptors causing surface water contamination.	Mullering Brook, along southern boundary of MRF (down-gradient) TEC Banksia Woodland within prescribed premises (closest point 140m east of MRF) Threatened and priority flora (closest point 300m east of MRF) Muralang pool camp (up-stream of site) Cooljarloo Well 3.2km west of MRF	See section 3.1.1	C = Minor L = Unlikely **Medium risk**	Y	<u>Existing licence conditions</u> • Condition 4 - Surface water runoff and leachate to be contained within the MRF perimeter embankment area • Condition 15 - no surface water run-off or leachate from the MRF to enter, overflow, or be discharged to mullering brook or the dredge pond. • Construction also includes 1km bund around the lower edge of the MRF. <u>Modifications to existing conditions</u>	

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence (note numbers relate to updated condition set)	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder's controls**				
							Condition 14, Table 7 modified to include Bunbury Pigment Plant as a source	
Disposal of additional inert waste contaminated with NORM from Bunbury and Cooljarloo sources (Kwinana Pigement Plant is a currently approved source)	Contaminated leachate - radionuclides	Seepage through base and embankments causing contamination of groundwater and poor health of nearby environmental receptors.	RIWI Act groundwater area 6 – 20 m bgl Mullering Brook, along southern boundary of MRF (down-gradient) Geomorphic wetlands, Cervantes South, closest point 1.6km south-west (down-gradient) TEC Banksia Woodland within prescribed premises (closest point 140m east of MRF) Threatened and priority flora (closest point 300m east of MRF) Muralang pool camp (up-stream of site) Cooljarloo Well 3.2km west of MRF	See section 3.1.1	C = Minor L = Unlikely **Medium risk**	Y	<u>Modifications to existing conditions</u> Condition 14 – authorised waste types	See section 3.3.2 – Inert waste contaminated with NORM While the Bunbury Pigment Plant and Cooljarloo have been placed as authorised source sites on the part V licence, the licence holder may need to reassess the RMP and RWMP to include the proposed amendments and to seek approval from the Radiological Council and DMIRS before commencing
	Contaminated surface water - radionuclides	Overland surface water flow to adjacent Mullering Brook, wetlands and human receptors causing surface water contamination.	Mullering Brook, along southern boundary of MRF (down-gradient) TEC Banksia Woodland within prescribed premises (closest point 140m east of MRF)	See section 3.1.1	C = Minor L = Unlikely **Medium risk**	Y	<u>Modifications to existing conditions</u> Condition 14 – authorised waste types	

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence (note numbers relate to updated condition set)	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder's controls**				
			Threatened and priority flora (closest point 300m east of MRF) Muralang pool camp (up-stream of site) Cooljarloo Well 3.2km west of MRF					
Burial of inert waste	N/A – see section 3.3.2 "burial of inert waste"						Modifications to existing conditions Condition 14 – authorised waste types modified to include 515 tonnes/year inert waste	See section 3.3.2 "burial of inert waste"

3.3 Detailed risk assessment

3.3.1 Incorporation of cell 8 extension into current operating conditions

Dust

As part of the December 2019 licence amendment and review, Tronox requested that dust monitoring gauges be amended, indicating that most of the dust gauges (DG01, DG05, DG06, DG08, DG11, DG 13 and DG14) were >1km distance from the MRF and unlikely to capture any material associated with the landform. The licence holder proposed four directional dust gauges (DGMRF01 – 04) to be installed around the active cell to evaluate windblown dust from the MRF. These were added to the licence and replaced DG01-DG14.

Results for subsequent dust monitoring of DGMRF01-04 in 2020 are presented in Table 7 below. Results have been compared against an internal performance target of <10g/m^2/month for inorganic dust deposition. Tronox indicated that there were exceedances of the internal target due to lower than average rainfall in 2020, and high winds during May.

Table 7 MRF dust monitoring results 2020 (g/m^2 /month) – licence monitoring points

Gauge:	DGMRF01	DGMRF02	DGMRF03	DGMRF04	Mean
Jan-20		8.50			**8.50**
Feb-20		1.20			**1.20**
Mar-20	5.10	1.60	1.60	20.30	**7.15**
Apr-20	2.20	0.20	0.50	1.00	**0.98**
May-20	21.90	4.90	10.50	29.00	**16.58**
Oct-20	3.90	0.70	0.50	4.10	**2.30**
Nov-20	3.00	1.80	0.30	3.30	**2.10**
Dec-20	2.80	0.70	0.20	2.20	**1.48**
Mean 2020	**6.48**	**2.45**	**2.27**	**9.98**	

While no longer conditioned on the licence, Tronox continued to monitor DG01 – DG14 in 2020, shown in Table 8 below. Similar to DGMRF01 – 04, elevated levels of dust were detected in May 2020. The applicant believes the elevated result for DG13 in December may be due to external interference. The New South Wales, Environmental Protection Authority guidance for deposited dust[1] indicates that for impacts to amenity, the recommended value is a maximum of 4g/m^2/30 days. Results from monitoring of DG13, adjacent to the Billinue Aboriginal Community, indicate dust deposition gauges recorded less than 4g/m^2/month on 5 out of 8 months monitored. Elevated dust detected during the remaining months may have also been subject to external interference (i.e. not associated with dust from the MRF).

[1] Dust is assessed as insoluble solids as defined by AS 3580.10.1–1991 (AM-19) - Methods for sampling and analysis of ambient air - Part 10.1: Determination of particulates - Deposited matter - Gravimetric method

Table 8 Dust gauges – formerly licensed monitoring points

Gauge:	DG01	DG05	DG06	DG07	DG08	DG11	DG13	DG14	Mean
Jan-20	0.70	1.30	0.70	1.50	*	0.30	1.00	1.80	**1.05**
Feb-20	1.00	1.60	0.60	5.60	*	1.00	3.50	**	**2.20**
Mar-20	1.90	1.90	3.00	3.40	2.00	1.80	5.10	0.80	**2.55**
Apr-20	0.40	0.90	0.80	0.40	0.70	1.60	0.50	1.30	**0.63**
May-20	10.80	10.40	11.30	11.60	11.40	14.20	8.40	6.70	**11.03**
Oct-20	0.30	0.90	0.60	0.80	1.40	0.20	3.40	2.20	**0.65**
Nov-20	0.80	1.20	0.40	0.30	1.20	0.20	2.40	3.20	**0.68**
Dec-20	0.30	0.80	0.90	3.70	2.30	0.80	17.50	4.70	**1.43**
Mean 2020	**2.03**	**2.38**	**2.29**	**3.41**	**12.18**	**2.51**	**5.23**	**2.96**	

* DG08 was moved to its current position in March 2020.

** Dust sample compromised by a large volume of bees

Annual wind roses (including wind speed, direction and frequency) for the nearest weather station recording climate data (Badgingara station 009037, ~28.5km north-east of the premises) are provided in Figure 4. The 9am prevailing wind direction originates predominantly from the east and north-east towards Banksia woodlands (threatened ecological community) to the west and south-west. Winds originating from the east occur less than 30% of the time with a majority of wind speeds 10-30km per hour. Winds originating from the north-east occur less than 20% of the time with a majority of wind speeds 10-30km per hour.

The 3pm prevailing wind direction originates predominantly from the south-west, west and south, towards DBCA legislated Unnamed Nature Reserve R40916 and geomorphic wetlands to the east, connected with Mullering Brook. Winds originating from the south-west occur less than 30% of the time with a majority of wind speeds 20-30km/hour. Winds originating from the south occur less than 20% of the time with a majority of wind speeds 20-30km/hour. Winds originating from the west occur less than 20% of the time with a majority of wind speeds 20-30km/hour.

Guidance for the Assessment of Environmental Factors No. 3 – “Separation Distances between Industrial and Sensitive Land Uses” (Environmental Protection Authority, 2005) indicate that the distance between sensitive land uses and mining of mineral sands and processing to produce concentrate (synthetic rutile) should have a buffer of between 3 and 5km. The Billinue Aboriginal community is located 3.5km south-east of the cell 8 stage one extension and does not fall downwind of either the 9am or 3pm prevailing wind direction. Internal technical advice indicated that given the distance and prevailing wind directions, risk to the community is low.

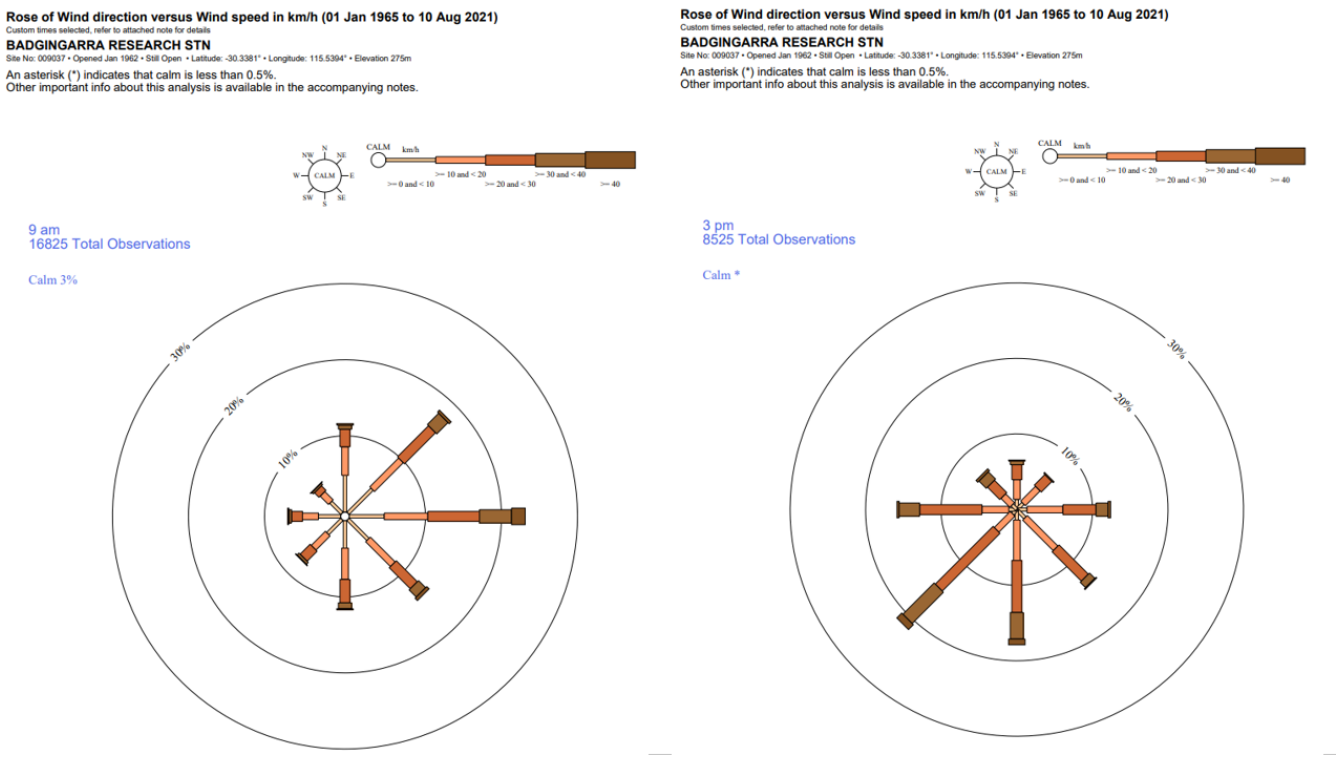

Figure 4 9am and 3pm windroses – Badgingarra Research Station 009037

The applicant does not propose additional controls to those currently conditioned on the licence. Existing licence controls are summarised in section 3.1.1 and include no dust from the MRF to be visible outside the MRF area, active dust suppression, stabilization and capping, fugitive dust monitoring (DBMRF01 – 04) and requirements for fugitive dust control (controls for transport and monitoring).

DWER outcome

Given the distance and position of the Billinue Aboriginal Community with respect to prevailing wind direction, the assessed risk is considered 'medium' with a consequence rating of 'moderate' and likelihood 'unlikely'. No public complaints with respect to dust have been received by the licence holder or by the department. Dust deposition adjacent to the Billinue Aboriginal Community was found to exceed 4g/m^2/month (for amenity) only 3 months of the 8-month monitoring period and may have been subject to external dust interference.

The assessed risk to the banksia woodlands downwind from the 9am prevailing wind direction is 'medium', with a consequence rating of 'moderate' and likelihood of 'unlikely'.

Licence conditions already include several measures for minimising and monitoring dust associated with the MRF. Based on information provided for 2020 MRF dust monitoring, the existing licence controls are considered sufficient for ongoing operation of the MRF cell 8, stage one extension.

Leachate and Contaminated Surface Water Run-Off

Leaching of Mineral Processing Residues and Surface Water Run-Off

Leaching of mineral processing residues associated with construction and operation of the MRF cell 8 stage one extension was assessed as part of the licence amendment and review issued December 2019. The review identified the potential for heavy metals to be mobilised in leachate and for the release of sulfate, iron and manganese to groundwater. See section 8.7 of the licence review for further detail.

The review also indicated the potential for surface water run-off contaminated with mineral

processing residues and leachate to enter Mullering Brook and associated nearby wetlands. See section 8.8 of the licence review for further detail.

Mullering Brook

The closest nearby sensitive receptor which could be impacted by localised shallow groundwater contamination and contaminated surface water run-off is Mullering Brook, immediately south of the MRF facility (Figure 2). Element Hydrographic Solutions (Element 2020); consultant report included within 2020 AER) indicates that Mullering Brook is an ephemeral stream with highly variable rates of discharge in response to localised rainfall. Element (2020) have conducted monitoring of baseline sediment load and water level flow at two surface water monitoring stations along Mullering Brook since 2016. Suspended sediment concentrations are stated to vary considerably in response to changing discharge rates, land usage changes within the catchment and seasonal rainfall.

A comprehensive review of groundwater monitoring data for the Cooljarloo minesite (Arcadis, 2018) noted:

"There is a plausible pathway between the groundwater and the aquatic ecosystems within the Mullering Brook and the Mount Jetty Creek. Fauna residing within these ecosystems are considered at risk of ingesting or coming into direct contact with contaminated soils (through run off) and, if the groundwater is connected to these surface water bodies, migration of contaminated groundwater into the surface water bodies as baseflow" (section 3.3).

This conclusion indicates that there is a potential risk that ecological receptors in Mullering Brook may be exposed to potential contaminants if there is any failure of management controls relating to seepage and runoff from the MRF. DWER internal technical advice recommends that surface water monitoring of Mullering Brook should be included in the conditions of the amended licence.

Internal technical advice indicate that health-based guidelines are considered unlikely to be relevant for Mullering Brook, even if the Muralang Pool Camp is being accessed for recreational activities (unknown). Heath-based guidelines for drinking water quality and recreational water quality are based on exposure scenarios that include frequent exposure and, as Mullering Brook is an ephemeral watercourse that is dry for many months of the year, frequent human exposure over an extended period is considered unlikely. In addition, as Mullering Brook is quite small and shallow, potential human exposure during times when the brook is flowing is likely to be 'incidental' (i.e. activities such as wading).

DWER outcome

The assessed risk for human contact with Muralang pool camp is considered 'medium', with a consequence rating of 'moderate' and a likelihood of 'unlikely'.

The assessed risk to aquatic organisms of Mullering Brook is considered 'medium', with a consequence rating of 'moderate' and a likelihood rating of 'possible'.

While it is conditioned in the licence that no surface water run-off or leachate may enter Mullering Brook from the MRF, there are currently no monitoring requirements for Mullering Brook to verify this. To ensure that there is minimal contamination of Mullering Brook which could impact potential surface-water and aquatic organisms, surface water monitoring of Mullering Brook will be included in the conditions of the amended licence.

The monitoring locations will include one up-gradient location, Mullering Brook at Brand Highway and one location down-stream of MW16. The down-stream sampling location should also be located downstream of the likely discharge point(s) for runoff or overflow from the MRF. An analysis of local topography drainage lines should be used to determine this location. Results should be compared with guideline values for the protection of freshwater aquatic ecosystems (at the 95% species protection level).

3.3.2 Receipt and disposal of additional wastes

Filter Cake

The Licence Holder is seeking approval to dispose of additional filter cake from a new source, the "Bunbury Pigment Plant" also known as the "Kemerton Pigment Plant", into the MRF at the Premises. The acceptance of filter cake from the Bunbury Pigment Plant will contribute to the requested increase in annual MRF disposal volumes by approximately 90,000 tonnes, which equates to a 25% increase in the current volume received by the facility each year.

The applicant has advised that Bunbury Pigment plant is "made up of two plants, one (the chlorinators) at the Kemerton Industrial Estate and the other (the finishing plant) at the Australind site. The filter cake originates predominantly from the Kemerton plant. The Kemerton plant provides feed for the finishing plant at Australind and only together do they comprise the full process to produce titanium dioxide pigment" (part V licences L6036/1988/13 and L6022/1988/13).

The Licence Holder currently has approval to dispose of filter cake from three other sites which they own and operate:

- the Chandala Mineral Separation Plant – operating under DWER Licence L5939/1988/11, Category 8;
- the Chandala Synthetic Rutile Plant – operating under DWER Licence L5939/1988/11, Category 8; and
- The Kwinana Pigment Plant – operating under DWER Licence L5320/1988/14, Categories 31, 60, 61 and 67.

The Licence Holder has provided comparative samples of filter cake produced at the Kwinana site, currently accepted for disposal into the MRF, and the Bunbury Pigment Plant, to demonstrate similarity between the material. Filter cake is found to mainly consist of metal chlorides, oxides, hydroxides, various silicates, unreacted ore and coke. A comparison of radiological data has not been provided.

The Licence Holder has provided compliance documentation (submitted to DWER on 4 June 2020) to demonstrate that the new MRF Cell 8 Stage 1 has been built as per design specifications and is clay lined, with a minimum 3m separation distance to groundwater to reduce the likelihood of seepage from the cell.

Monitoring of groundwater for radionuclides is included within the RMP (last reviewed 5 January 2021). Bores sampled include those surrounding the MRF and include down-gradient monitoring bores WMB15 and WMB16. Bores are sampled six monthly for Radium-226 and Radium-228.

The Radiological Council of Western Australia commented on 15 September 2021 that "the proposed amendment to the licence under the Environmental Protection Act appears to be covered by the existing requirements imposed by the Council and DMIRS. However, the proponent may be required to reassess the RMP and RWMP which are required under the Code and seek additional approvals from the Council and DMIRS." This advice also applies to the inert waste contaminated with NORM which is mentioned below.

DWER outcome

As comparative samples for Bunbury filter cake have been provided, indicating similar composition to filter cake currently accepted on-site, the risk profile associated with remains unchanged. As MRF cell 8, Stage 1 has been constructed with a clay liner with a minimum 3m separation distance to groundwater, the assessed risk of seepage from the MRF to nearby sensitive receptors is 'medium risk' with a consequence rating of 'moderate' and likelihood of 'unlikely'.

Filter cake from the Bunbury plant will be added to the authorised waste types for condition 19,

Table 7. However, as per advice received from the Radiological Council, DWER advises the licence holder that they may need to reassess the RMP and RWMP to include the proposed amendments and to seek approval from the Radiological Council and DMIRS before commencing.

Inert waste contaminated with NORM

The Licence Holder currently has approval to dispose of 'Other (Hazardous waste)', including inert waste potentially contaminated with NORM, into the MRF. They have provided a summary of the types and quantity of this waste type historically disposed of at the MRF (Appendix 1). Waste from proposed source sites Cooljarloo and Bunbury is "expected to be of broadly comparable composition to that received from Kwinana Pigment Plant, due to the similarity of the facilities".

DWER Outcome

As the applicant has indicated that proposed waste types will be comparable to those already accepted at the MRF, the assessed additional risk to nearby sensitive receptors is 'medium risk' with a consequence rating of 'minor' and likelihood of 'unlikely'. Cooljarloo and Bunbury pigment plants will be added to the source list. However, to ensure that the waste disposed is comparable to that disposed historically, a table with a summary of the inert waste types provided by the applicant will be placed in Schedule 3 of the licence as an approved list of "inert waste types potentially contaminated with NORM".

As per advice received from the Radiological Council, DWER advises the licence holder that they may need to reassess the RMP and RWMP to include the proposed amendments and to seek approval from the Radiological Council and DMIRS before commencing.

Hydrocarbon contaminated soil

The Licence Holder has been permitted on former versions of the licence to dispose of hydrocarbon contaminated soils to the MRF, prior to the renewed Licence being granted on 23 December 2019. DWER removed disposal of hydrocarbon contaminated wastes from the licence as the existing MRF did not demonstrate appropriate design for wastes other than run-of-mine wastes or address potential risks to sensitive receptors. Additionally, DMIRS advised at the time of the licence review that non-mining wastes are typically disposed within waste dumps and not within TSFs, and this activity would have to be assessed and approved under a Mining Proposal.

The Licence Holder has provided justification that the new MRF Cell 8 Stage 1 is clay lined, meets a permeability of at least 1×10^{-9} m/s, with a minimum 3 m separation distance to groundwater to reduce the likelihood of seepage (built as per design specifications, report submitted to DWER on 4 June 2020, DWER reference A1900040 and A1924968).

The Licence Holder is also proposing to amend MRF groundwater monitoring requirements for bores WMB13, WMB15 and WMB16 to include the parameters BTEX (benzene, toluene, ethylbenzene and xylene) and Total Recoverable Hydrocarbons (TRH) (C6 – 36) at a monitoring frequency of 6 months, to confirm that hydrocarbon contaminated soil deposited in the MRF is not leaching contaminants into the groundwater.

DWER Outcome

The mineral processing facility, not being a standard tailings storage facility, has historically accepted mixed waste streams associated with category 8 activities. Accepting mixed waste streams is unique to mineral sands operations. The initial licence review indicated that the existing MRF was not suitable to accepted hydrocarbon contaminated material. The licence holder proposes that the new MRF cell 8 stage one cell extension, including liner and groundwater separation distance is sufficiently designed to accommodate the additional risk associated with disposal of hydrocarbon contaminated material.

The licence holder is proposing disposal of low volumes of hydrocarbon contaminated soil, <100m^3/year, plus initial placement of stockpiled 600m^3. At the low quantities proposed, the assessed additional risk to nearby sensitive receptors is 'medium risk' with a consequence rating of 'moderate' and likelihood of 'unlikely'. The applicant proposed controls for groundwater monitoring of TRH and BTEX will be placed on the licence as regulatory controls. Disposal will only be permitted to the MRF cell 8 extension.

Burial of inert waste

The Licence Holder is seeking approval to dispose of inert (non-mining) wastes, generated at the Premises within the MRF. These will include:

- wood (pallets, scrap timber);
- used polypipe (mining pipes);
- rubber (rubber hoses, belts etc);
- metal equipment/structures from the dredges and concentrator; and
- soil samples (drill cores, test samples).

The combined amount of inert wastes proposed for disposal will not exceed 515 tonnes per annual period. In previous Part V licences issued for the Premises, the MRF had been referred to as a landfill, with specific reference to Category 64: Class II or III putrescible landfill. This category was removed as part of the licence review, issued December 2019.

The previously held State Agreement (expired on 1 March 2020, now continuing operation under *The Mining Act 1978*), viewed operation of multiple sites as a closed circuit, i.e. process wastes from Chandala and Kwinana were returned to the Premises for disposal and considered a component of mineral sands processing for the purposes of the EP Regulations. The environmental risk for disposal of mineral processing residues from Chandala and Kwinana was therefore included within the scope of Category 8. See section 4.1.6 of the 2019 licence review for further detail.

DWER outcome:

As per the conclusions reached in the 2019 licence review, the Mineral Residue Facility is a 'dry stack' tailings storage facility and not a landfill. However, as inert wastes potentially contaminated by NORM (considered associated with category 8 activities) have already been authorised for disposal within the MRF, further disposal of inert waste, at relatively low quantities (less than 515 tonnes per annual period), is unlikely to alter the risk profile of the premises. The delegated officer has determined to include inert waste disposal within the MRF, with the associated quantity limit proposed by the applicant.

4. Consultation

Table 9 provides a summary of the consultation undertaken by the department.

Table 9: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website 4/6/2021	None received	N/A
Local Government Authority, Shire of Dandaragan, advised of proposal 4/6/2021	None received	N/A

Department of Mines, Industry Regulation and Safety (DMIRS) advised of proposal 4/6/2021	A summary of comments received is included in Appendix 5.	See Appendix 5
Radiological Council of Western Australia advised of proposal 4/6/2021	The Radiological Council of Western Australia commented on 15 September 2021 that "the proposed amendment to the licence under the Environmental Protection Act appears to be covered by the existing requirements imposed by the Council and DMIRS. However, the proponent may be required to reassess the Radiation Management Plan and Radioactive Waste Management Plan which are required under the Code and seek additional approvals from the Council and DMIRS."	DWER will advise the licence holder that they may need to reassess the Radiation Management Plan and Radioactive Waste Management Plan to include the proposed amendments and to seek approval from the Radiological Council and DMIRS before commencing.
Licence Holder was provided with two drafts on 20 December 2021 and 24 January 2022 respectively.	Comments were received for the first draft on 12 January 2022 and are included in Appendix 3. No comments were received for the second draft, and the remaining comment period waived on 3 February 2022.	See Appendix 3.

5. Conclusion

Based on the assessment in this Amendment Report, the Delegated Officer has determined that a Revised Licence will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

The licence holder is advised that they may need reassess the *Radiation Management Plan* and *Radioactive Waste Management Plan* to include the proposed amendments and to seek approval from the Radiological Council and DMIRS before commencing.

Additionally, DMIRS has raised concerns regarding the long-term stability of the final landform and that final landform design and landform evolution modelling is required to demonstrate the landform is stable in a closure time frame and will not result in loss of tailings to the environment. DWER recommends the applicant consult with DMIRS with respect to these concerns.

5.1 Summary of amendments

Table 10 provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the Revised Licence as part of the amendment process.

Table 10: Summary of licence amendments

Condition no.	Proposed amendments
Cover page	Update to include mining tenement M70/1398, to reflect the sites operation under the *Mining Act 1978* (formerly under state agreement). Update of assessed production capacity.
1	Inclusion of MRF cell 8 – stage one extension under authorised emissions
2 - 4	Removal of construction conditions for MRF cell 8 – stage one extension Remaining subsequent conditions have been renumbered following the removal of these conditions.
4 (formerly 7)	Inclusion of MRF cell 8 – stage one extension within the infrastructure table
11 (formerly 14)	Wording amended from “spot sample” to “pond survey”
14 and 15 (formerly 17 and 18)	Removal of dredge pond investigation conditions
16 (formerly 19)	Amendment of authorised waste types to include a maximum allowable quantity and hydrocarbon contaminated soil
20 and 21 (formerly 23 and 24)	Update to include surface water monitoring
26 (formerly 29)	Removed overburden (ii) for burial of overburden beneath the water table (PASS material)
Schedule 3	Inclusion of Schedule 3 for approved inert waste types potentially contaminated with NORM

References

Department of Environment Regulation (DER) 2016, *Guidance Statement: Environmental Siting*, Perth, Western Australia.

1. Arcadis, 2018, Groundwater Data Review, Cooljarloo Mine Site, 12051 Brand Highway, Cataby, Western Australia
2. DER 2017, *Guidance Statement: Risk Assessments*, Perth, Western Australia.
3. DER 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
4. DWER 2020 – Correspondence to applicant – Cell 9 Stage 1 Construction – DWER reference A1924968
5. DWER 2020 – Correspondence to applicant – Dredge pond compliance – DWER reference A1992394
6. HGEO Pty Ltd, 2021 – Cooljarloo Mine Annual Aquifer Review 2020
7. New South Wales Environmental Protection Authority, 2016, *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*
8. West Australian Environmental Protection Authority, 2005, *Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) – Separation Distances between Industrial and Sensitive Land Uses*

Appendix 1: Historical Inert Waste Contaminated with NORM

The table below summarises the types and quantities of inert waste potentially contaminated by NORM historically disposed of at the MRF

Site	Inert waste potentially contaminated by NORM
Chandala	Building rubble
Chandala	Dried DM clay fines (process waste)
Chandala	Demister pads from the waste gas scrubber-Sr plant
Chandala	Pond 4A Dam Waste
Chandala	Process waste from Pond 2B
Chandala	Blue Metal
Chandala	Dry Mill insulation
Chandala	Sidewall Conveyor
Chandala	Screened oversize material
Chandala	Rubble form the boneyard storage bays
Chandala	Refractory from Dry Mill Dryer and SR Plant
Chandala	Conveyor belt
Cooljarloo	Building rubble
Cooljarloo	HMC spirals
Kwinana	Fibreglass spools
Kwinana	Spoil from our groundwater well installation
Kwinana	Obsolete cement product
Kwinana	Waste bitumen from a shed
Kwinana	White powder blended with filter cake
Kwinana	6 chlorinator boxes (rusted metal) crushed and mixed with filter cake
Kwinana	Rubber lining from sump tank D202
Kwinana	Rubber lining from sump tank D202
Kwinana	Redundant fibreglass D220 tank

Appendix 2. Summary of DMIRS comments received

Summary of DMIRS comments on Licence Holders application and supporting documents	Department's response
DMIRS replied on 29/7/2021 with the following concerns: • Requesting clarification on source of filter cake, part of process and further radiological data; • Noting that attachment 3B_3 comparison of filter cake contains no radiological data; • Notes that the application has not sufficiently addressed radionuclide contamination of groundwater.	DWER notes that the Radiological Council of Western Australia commented on 15 September 2021 that "the proposed amendment to the licence under the *Environmental Protection Act* appears to be covered by the existing requirements imposed by the Council and DMIRS. However, the proponent may be required to reassess the Radiation Management Plan and Radioactive Waste Management Plan which are required under the Code and seek additional approvals from the Council and DMIRS." DWER has advised the applicant to update the Radiation Management Plan and Radioactive Waste Management Plan and seek additional approvals from the Council and DMIRS.
• Notes that no data has been provided regarding radioactive properties of the inert mining waste, soil samples in particular; • Recommends ambiguous title of "soil samples" for disposal be better defined.	DWER requested further information regarding the nature of the soil samples for disposal and the applicant indicated "These are soil samples obtained during drilling, and as such, are composed of benign naturally occurring sand and clay material"
• Notes that the current arrangement for disposal of non-mining wastes into the MRF will be closely assessed by DMIRS at the time of the next review.	-
• DMIRS does not consider the non-mining wastes such as those (non-soil samples) listed in Appendix 7 fall within the descriptor of "mineral processing residues" and would recommend against the disposal of these wastes into the same facility.	DWER has assessed additional risk associated with currently approved and proposed additional waste streams. See section 3.3.2 of this report for discussion and associated outcomes.
• The direction of groundwater flow should be indicated to demonstrate if the groundwater monitoring bores are appropriately positioned and if there are downstream sensitive receptors.	The applicant has provided additional information with respect to local groundwater flow in the vicinity of the MRF (Figure 3). Sensitive receptors identified by DWER are summarised in section 3.1.2 of this report.
• The [applicant's] risk assessment does not address the long-term stability of the final landform. The final landform design and landform evolution modelling is required to demonstrate the landform is stable in	DWER has recommended the applicant consult with DMIRS regarding landform stability.

Summary of DMIRS comments on Licence Holders application and supporting documents	Department's response
a closure time frame and will not result in loss of tailings to the environment.	
• The [applicant's] risk assessment does not consider the nearest land users and potential implications for the Billinue Aboriginal Community.	DWER has conducted an assessment of risk to nearby sensitive receptors, including the Billinue Aboriginal Community. See section 3 of this report.
• There is no [applicant] analysis of the efficacy of current risk management controls implemented at the existing MRF site.	DWER notes the application's limitations and has conducted a risk assessment based on the information provided, as well as information provided in the annual environmental reports.

Appendix 3. Summary of Licence Holder's comments on risk assessment and draft conditions

Condition	Summary of Licence Holder's comment	Department's response
14	Request amendment to waste stream limits into the following: • 227,700 tonnes per annum for combined Filter Cake (IO/NAE), pugged waste, waste fines and other waste; • 102,300 tonnes per annum for combined pre-screen tailings, white tailings and screen 1 and 2 oversize, coarse rejects; • 220,000 pigment plant filter cake	DWER has modified the condition to include the grouping of waste streams proposed, with the exception of "Other (hazardous waste)", "inert waste", and "hydrocarbon contaminated soil", which are not the primary waste streams for which the MRF was designed. The risk assessment undertaken for disposal of these non-primary waste streams includes the applicant provided quantity limit restrictions, which will remain on the licence. Note that the licence holder will still be required to abide by condition 21 of the licence requiring that the amount, type and location of waste streams for disposal be recorded should DWER wish to audit the site for compliance purposes. Also note that condition 14 includes a requirement that hydrocarbon contaminated soil only be disposed of within the MRF cell 8 extension.
Schedule 3	Request for inclusion of "scaled plant equipment" containing NORM to be disposed within the MRF.	The original application did not include inclusion of scaled plant equipment within the MRF. Inclusion of equipment for disposal would require additional risk assessment and stakeholder consultation which has already been conducted for this application. Scaled plant equipment will therefore not be allowed for disposal within the MRF for this amendment.

Appendix 4: Sensitive Receptors

Figure 5. Geomorphic Wetlands – Cervantes South

Figure 6 DBCA Legislated Tenure

Figure 7 Threatened ecological communities – Banksia Dominated Woodlands of the Swan Coastal Plain (Endangered)

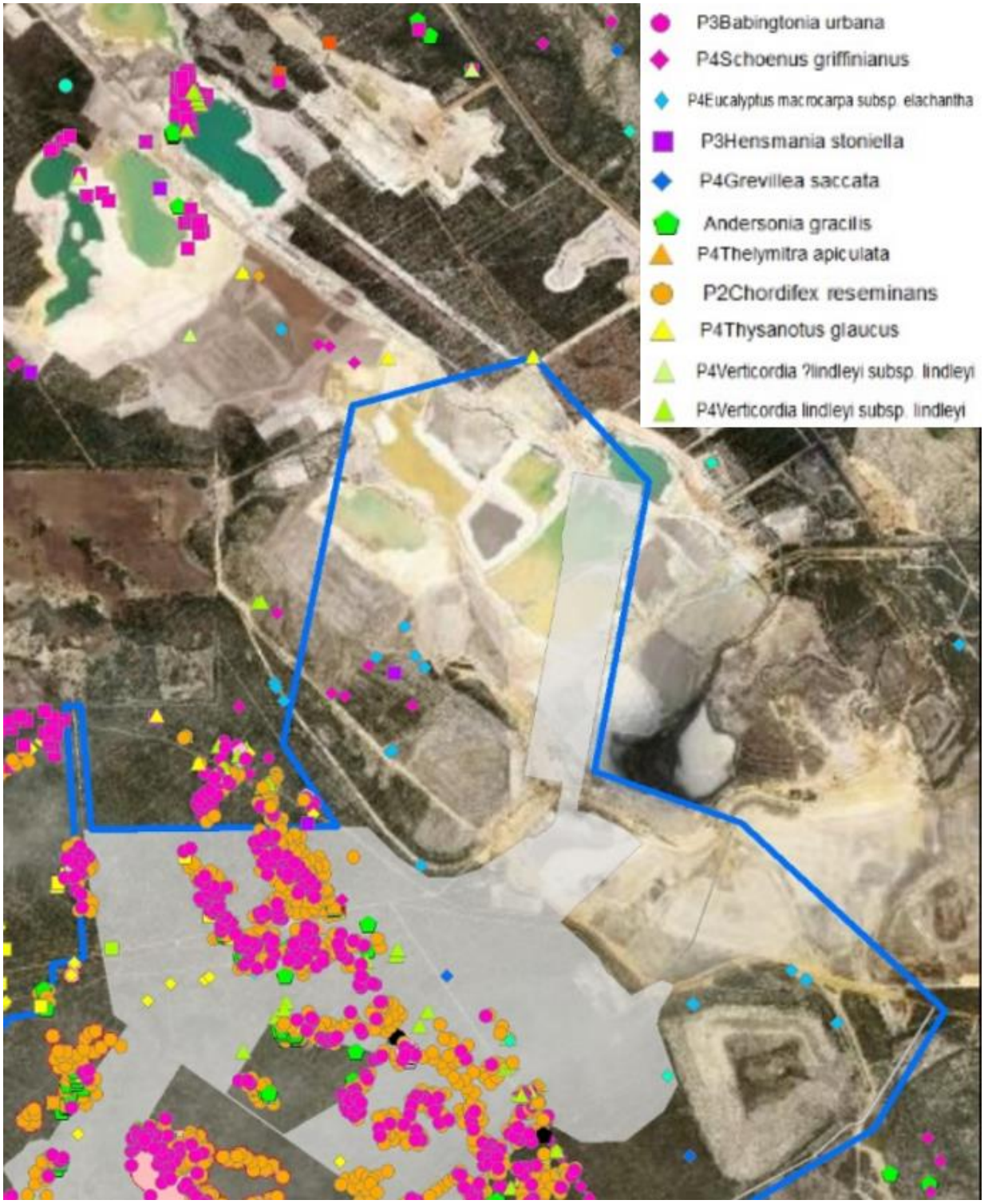

Figure 8 Threatened and priority flora (extract from EPA assessment for MS1158)

Appendix 5: Application validation summary

<table>
<tr><th colspan="6">SECTION 1: APPLICATION SUMMARY</th></tr>
<tr><td colspan="6">Application type</td></tr>
<tr><td rowspan="2">Amendment to licence</td><td rowspan="2">☒</td><td>Current licence number:</td><td colspan="3">L5319/1988/12</td></tr>
<tr><td>Relevant works approval number:</td><td></td><td>N/A</td><td>☒</td></tr>
<tr><td colspan="2">Date application received</td><td colspan="4">26 March 2021</td></tr>
<tr><td colspan="6">Applicant and Premises details</td></tr>
<tr><td colspan="2">Applicant name/s (full legal name/s)</td><td colspan="4">Tronox Management Pty Ltd</td></tr>
<tr><td colspan="2">Premises name</td><td colspan="4">Tronox Cooljarloo Mine Site</td></tr>
<tr><td colspan="2">Premises location</td><td colspan="4">Tenement M70/1398
Cataby WA 6507</td></tr>
<tr><td colspan="2">Local Government Authority</td><td colspan="4">Shire of Dandaragan</td></tr>
<tr><td colspan="6">Application documents</td></tr>
<tr><td colspan="2">HPCM file reference number:</td><td colspan="4">DER2015/000793-1~7</td></tr>
<tr><td colspan="2">Key application documents (additional to application form):</td><td colspan="4">Attachment 1A Certificate of Title
Attachment 1A M70_1398
Attachment 2A Premises Map
Attachment 2B Figure 2 MRF
Attachment 3B_0 Requested Licence Amendments
Attachment 3B_1 Compliance Response Letter – MRF Cell 8 (stage 1) CQA validation rep
Attachment 3B_2 L5319 Compliance – Dredge pond hydro report condition 17
attachment 3B_3 Comparison Kwinana and Bunbury PP analysis
Attachment 3B_3 Filter cake analysis
Attachment 3B_4 Risk assessment for expanding the MRF area
Attachment 3B_5 Risk assessment for disposal of hydrocarbon waste
Attachment 3B_6 Inert waste supporting info
Attachment 3B_7 risk assessment co burial of inert waste with OB and Tails
Attachment 9 Amendment fee calculator</td></tr>
<tr><td colspan="6">Scope of application/assessment</td></tr>
</table>

Summary of proposed activities or changes to existing operations.	Licence amendment In August 2020, the LH received confirmation from DWER that the recently constructed Cell 8 Stage 1 expansion of the Mineral Residue Facility (MRF) is fit for purpose. The LH is requesting the Licence be amended to incorporate the operation of Cell 8 Stage 1 into Licence conditions. Additional amendments sought under this application include: • An increase in category 8 annual throughput from 810,000 tonnes to 26,000,000 tonnes reflect the amount of ore processed, not the final volume of heavy mineral concentrate – previously an error in throughput on the Licence • Approval to dispose of the filter cake produced by the Bunbury Pigment Plan (Kemerton chloride plant and Australind finishing plant) into the MRF, as the composition of the filter cake is similar to that already authorised for disposal at the site • An increase in the volume of mineral residue approved for disposal from 500,000 tpa to 550,000 tpa, to enable the disposal of the additionally sought material at the site • Change in condition wordings to reflect current site operations more accurately • Remove conditions that have previous been satisfied by the submission of reports • Authorisation to dispose of inert waste potentially contaminated with NORM from the Cooljarloo minesite and Bunbury pigment plant – no RAD Council approval, will need to refer to Rad Council • Authorisation to dispose of hydrocarbon contaminated soils into the MRF as per previous approval at the site • Authorisation for the co burial of inert waste generated at site with overburden and clay/sand tails, as per previous approvals at the site; and • Inclusion of TRH monitoring requirements

Category number/s (activities that cause the premises to become prescribed premises)

Table 1: Prescribed premises categories

Prescribed premises category and description	Assessed production or design capacity	Proposed changes to the production or design capacity
Category 8: Mineral sands mining or processing	810,000 tonnes per annual period	26,000,000 tonnes per annual period
N/A – assessed activities directly related to the above category Disposal of mineral processing residues into the MRF	500,000 tonnes per annual period	550,000 tonnes per annual period

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 ☐ No ☒	Referral decision No: Managed under Part V ☒ Assessed under Part IV ☐
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes ☒ No ☐	Ministerial statement No: MS [MS37, M557, M790, M977]
Has the proposal been referred and/or assessed under the EPBC Act?	Yes ☐ No ☒	Reference No:
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes ☒ No ☐	Certificate of title ☒ General lease ☐ Expiry: Mining lease / tenement ☐ Expiry: Other evidence ☐ Expiry:
Has the applicant obtained all relevant planning approvals?	Yes ☐ No ☒ N/A ☐	Approval: Expiry date: No approvals provided. Will refer to other regulatory bodies for comment.
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes ☐ No ☒	CPS No: N/A No clearing is proposed.
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes ☐ No ☒	Application reference No: N/A Licence/permit No: N/A No clearing is proposed.
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes ☐ No ☒	Application reference No: Licence/permit No: Licence / permit not required.
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes ☐ No ☐	Name: Jurien Groundwater Area Type: Proclaimed Groundwater Area Has Regulatory Services (Water) been consulted? Yes ☐ No ☐ N/A ☒ Regional office: Mid-West Gascoyne

Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes ☐ No ☒	Name: N/A Priority: N/A Are the proposed activities/ landuse compatible with the PDWSA (refer to WQPN 25)? Yes ☐ No ☐ N/A ☒
Is the Premises subject to any other Acts or subsidiary regulations (e.g. *Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx*)	Yes ☒ No ☐	*Mining Act 1978*
Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes ☐ No ☒	
Is the Premises subject to any EPP requirements?	Yes ☐ No ☒	
Is the Premises a known or suspected contaminated site under the *Contaminated Sites Act 2003*?	Yes ☒ No ☐	Classification: possibly contaminated – investigation required (PC–IR) Portion of the southern area of the premises Date of classification: 10 June 2018