Government of Western Australia
Department of Water and Environmental Regulation

Decision Report

Application for Works Approval

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number	W6158/2018/1
Applicant	Hastings Technology Metals Limited
ACN	122 911 399
File Number	DER2018/000838
Premises	Yangibana Rare Earths Project Early Works Mining Leases M09/158, M09/157, L09/68, L09/70, L09/80, L09/81, G09/14 and E09/1700 WEST LYONS RIVER WA 6705
Date of Report	29 November 2018
Status of Report	Final

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1. Definitions of terms and acronyms

In this Decision Report, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
ACN	Australian Company Number
AER	Annual Environment Report
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
Decision Report	refers to this document.
Delegated Officer	an officer under section 20 of the EP Act.
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation As of 1 July 2017, the Department of Environment Regulation (DER), the Office of the Environmental Protection Authority (OEPA) and the Department of Water (DoW) amalgamated to form the Department of Water and Environmental Regulation (DWER). DWER was established under section 35 of the *Public Sector Management Act 1994* and is responsible for the administration of the *Environmental Protection Act 1986* along with other legislation.
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of, and during this Review
ha	hectare
Issued Licence	The licence issued under Part V, Division 3 of the EP Act
Issued Works Approval	The works approval issued under Part V, Division 3 of the EP Act following the finalisation of this assessment
m^3	cubic metres

Minister	the Minister responsible for the EP Act and associated regulations
MS	Ministerial Statement
mtpa	million tonnes per annum
Noise Regulations	*Environmental Protection (Noise) Regulations 1997* (WA)
Occupier	has the same meaning given to that term under the EP Act.
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report
Primary Activities	as defined in Schedule 2 of the Revised Licence
Review	this Licence review
Revised Licence	the amended Licence issued under Part V, Division 3 of the EP Act following the finalisation of this Review.
Risk Event	As described in *Guidance Statement: Risk Assessment*
TDS	Total Dissolved Solids
UDR	*Environmental Protection (Unauthorised Discharges) Regulations 2004* (WA)
WWTP	Wastewater Treatment Plant
µg/m^3	micrograms per cubic metre
µg/L	micrograms per litre

2. Purpose and scope of assessment

On 14 May 2018, Hastings Technology Metals Ltd (Applicant) submitted an application (Hastings, 2018) to the Department of Water and Environmental Regulation (DWER) for a works approval under the *Environmental Protection Act 1986* (EP Act). This application is for construction of a mobile crushing and screening plant (Category 12), putrescible landfill (Category 64) and wastewater treatment plant (Category 85). These are the early works for the Yangibana Rare Earths Project, and will allow for investigative works and mineral exploration activities to be undertaken.

The Premises is located approximately 270 kilometres (km) east-northeast of the town of Carnarvon in the Gascoyne Region of Western Australia.

The Yangibana Rare Earths Project will involve the mining of rare earth elements (REE) from four deposits, above and below the groundwater table. Ore will be processed onsite (beneficiation and hydrometallurgical processing) to produce a REE concentrate that will be transported via road to Geraldton port for export. Tailings storage facilities (TSFs) will be constructed to receive waste (tailings) generated from the processing of ore. Construction of the processing facilities and TSFs will be subject to a separate Works Approval application.

2.1 Application details

Table 2 lists the documents submitted during the assessment process.

Table 2: Documents and information submitted during the assessment process

Document/information description	Date received
Application form: Works Approval under Part V, *Division 3, Environmental Protection Act 1986, Environmental Protection Regulations 1987,* including Attachments.	14 May 2018
RE: Yangibana Early Works – W6158/2018/1 – further information, email correspondence from Lara Jefferson, 28 September 2018, 1:07pm	28 September 2018

3. Background

The Applicant holds the tenements which form the Yangibana Project under its 100% owned subsidiaries, Gascoyne Metals Pty Ltd and Yangibana Pty Ltd. The Project is located within six tenements, comprising two mining leases (M09/158 and M09/157), four miscellaneous leases (L09/80, L09/81, L09/70, L09/68) and one general purpose lease (G09/14). The borrow pits occur on M09/157, M09/158 and G09/14, the landfill occurs on E09/2018 and the WWTP occurs on L09/80.

The underlying land tenure is pastoral lease, with the Project overlying Gifford Creek and Wanna Stations.

The Application relates to the following Primary Activities at the Premises for the prescribed premises categories defined in Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) as listed in Table 3.

Table 3 lists the prescribed premises categories that have been applied for.

Table 3: Prescribed Premises Categories

Classification of Premises	Description	*Approved Premises production or design capacity or throughput*
Category 12	Screening, etc. of material: premises (other than premises within category 5 or 8) on which material extracted from the ground is screened, washed, crushed, ground, milled sized or separated	363,000 cubic metres (m^3)
Category 64	Class II putrescible landfill site: premises on which waste (as determined by reference to the waste type set out in the document entitled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer and as amended from time to time) is accepted for burial	30 tonnes per year
Category 85	Sewage facility: premises – (a) On which sewage is treated (excluding septic tanks); or (b) From which treated sewage is discharged onto land or into waters	70 cubic metres per day

4. Overview of Premises

4.1 Operational aspects

The preliminary works phase of the Yangibana Project involves the construction of an access road, a 100 person accommodation facility, and a laydown area and equipment storage area to be located at the future processing plant area. A crushing and screening plant will be mobilised to site and utilised to produce construction material for the road base. A WWTP and landfill will be constructed to process and accept waste from the accommodation village.

Self-bunded fuel tanks will be stored onsite and power will be supplied from diesel-fueled generators (two 20kVA) using self-bunded temporary diesel storage tanks. Water will be sourced from an existing groundwater bore and treated through a reverse osmosis (RO) treatment plant to Australian Drinking Water Guidelines. Up to 50 kL per day of reject water from the RO plant, with estimated total dissolved solids (TDS) concentration of 800 mg/L, will be combined with the treated wastewater from the WWTP and discharged to the designated irrigation area.

The Applicant currently operates a forty (40) person capacity fly camp at the Project. A 19 m^3 per day capacity WWTP treats wastewater from the camp, with treated effluent discharged to a 1 hectare (ha) irrigation area.

The operational aspects for the prescribed activities, as defined within the Application (Hastings, 2018) are detailed below:

4.1.1 Category 12 – Screening, etc. of material

Four borrow pits will be required to source material for road base construction. Approximately 85,530 cubic m^3 of fill material will be processed through the mobile crushing and screening plant at each borrow pit location. The borrow pits will be approximately 5.5 m deep, and will accommodate an area of approximately 21 hectares (ha) in aggregate. Land clearing of the borrow pits will occur over a period of approximately 18 months, with one borrow pit being used at a time and at completion, the next borrow pit will then be cleared and the mobile plant moved to the new location.

The mobile crushing and screening plant will comprise of a track mounted mobile crusher with a feed bin, jaw crusher and discharge conveyor. The crushing component of the plant will be powered by a 260 kW diesel engine fitted with hydraulic drives. A track mounted mobile screen will be fitted with a feed bin, double deck screen and discharge conveyors. The screening component of the plant will be powered by a 75 kW diesel engine fitted with hydraulic drives.

4.1.2 Category 64 – Putrescible landfill

The Applicant currently operates a small putrescible landfill at the existing exploration camp. This facility does not require regulation under the EP Act as it accepts less than 20 tonnes of waste per year, which is the threshold for a Category 64 landfill as specified under Schedule 1 of the EP Regulations.

The Applicant has indicated that an additional 0.15 ha disturbance footprint has been allocated to meet any additional volume of putrescible waste from the proposed 100 person accommodation facility, if required. The Applicant has advised (Hastings, 2018) that up to 30 tonnes of waste per year may be landfilled. Putrescible, Inert Waste Type 1 and Inert Waste Type 2 will be accepted at the landfill. Construction waste, chemical waste and hydrocarbons will be disposed of offsite.

The landfill will involve the progressive construction of a series of four small trenches 2 m x 20 m in area, and 2 m in depth. The trenches will be backfilled until level with the surrounding ground on decommissioning and rehabilitated.

4.1.3 Category 85 – Sewage facility

The proposed WWTP will be a containerized five (5) stage Bardenpho treatment train, housed in a 40 foot sea container with external balance and irrigation tanks. The WWTP will accept sewage and grey water from the 100 person accommodation village. Wastewater from the temporary 80 person fly camp is currently treated through a WWTP, however operates below the design capacity for Category 85 (more than 20 but less than 100 m^3 per day), specified under the EP Regulations.

During the early and preliminary works phase (this application) up to 26 m^3 per day (based on 260 litres of wastewater per day per person) of wastewater from the 100 person accommodation village will be treated. The Applicant has advised that the WWTP also has the capacity to support the larger 300 person village required for the main project's construction workforce, from which approximately 70 m^3 per day of wastewater would be generated.

DWER has assessed the maximum anticipated throughput for the WWTP during the construction phase of the main project, being up to 70 m^3 per day, based on typical wastewater per person per day of approximately 260 litres.

The process comprises (refer Figure 1):

- Waste collection (pump station) – raw sewage is gravity fed from its source and pumped to the balance tank;
- Screening (Spirac screen) – from the pump station, raw influent passes through a Spirac inlet screen which removes inorganic waste, which is subsequently dewatering and disposed of into a bin automatically. Screened influent is gravity fed to the balance tank;
- Mass holding (22kL Balance tank) – designed to handle peak flows from the sewage pump inputs over a 12 hour period, provide a controlled flow twice daily into Primary tank one;
- Anaerobic treatment (Primary tank 1) – holding/mixing tank to introduce sludge drawn from the clarifier to the influent which acts to introduce bacteria to the influent and return the converted nitrates to the anoxic zone to be further converted to nitrogen gas. The mixed influent flows to the Primary tank 2 using a trickle through system to allow the top

surface of the water to overflow to the Primary tank 2;

- Anoxic treatment (Primary tank 2) – denitrification occurs, whereby oxidised nitrogen in solution is converted to nitrogen gas. Trickle through system allows wastewater to flow through to the aeration tank;
- Aeration (Aeration tank) – oxygen is provided via a mixing aerator which is controlled via on/off timers set to maintain the dissolved oxygen levels of between 1-2 mg/L. This allows for oxidation of nutrients, reducing ammonia, Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). Wastewater then flows to the clarifier;
- Clarification (Clarifier tank) – suspended activated sludge is settled out. As influent enters the clarifier is it dosed and mixed with poly aluminium chloride which binds particles together. The treated effluent passes through to the chlorine contact tank. Settled sludge is removed with a pump and returned to primary tank 1 to mix with new incoming raw sewerage. Waste sludge is pumped into the sludge thickening tank;
- Chlorination (Chlorine contact tank) – chlorine is added (tablet form) to reach and maintain a chlorine residue of around 2 mg/L. Water is retained so a 30 minute contact time is achieved before entering the final irrigation tank;
- Irrigation (22 kL irrigation tank) – treated wastewater (Class C) and waste water from the Reverse Osmosis Plant will be directed to the irrigation tank, from where it will be disposed of via irrigation to a designated sprayfield; and
- Sludge thickening (9.5 kL sludge thickening tank) – excess sludge is thickened for removal via a waste disposal truck.

Effluent will be treated to a secondary level of treatment (Category C) in accordance with the *NWQMS, 1997* with effluent achieving the specifications detailed in Table 4.

Table 4: Effluent specifications

Parameter	Units	Value
pH	pH units	6.8-8.5
Biochemical Oxygen Demand	mg/L	<20
Total Suspended Solids	mg/L	<30
Total Nitrogen	mg/L	<30
Total Phosphorus	mg/L	<8
E.coli	cfu/100 mL	<1000

The Class C treated wastewater will be disposed of to a fenced irrigation area. The irrigation area will be constructed in two stages. During the early works phase the irrigation area will be 1.5 ha (Stage 1) in area. During construction of the broader project, the irrigation area will be expanded to 4 ha (Stage 2) to account for the increased wastewater output from construction personnel. Reject water from the reverse osmosis treatment plant will be combined with the treated effluent and disposed of to the irrigation area. The Applicant has advised the quantity of RO reject water added to the WWTP irrigation water will not affect the quality of the WWTP discharge.

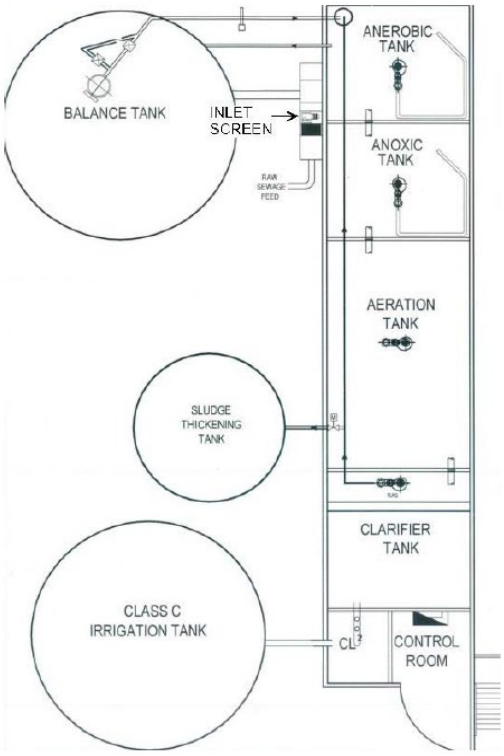

Figure 1: Layout of wastewater treatment plant

4.2 Commissioning activities

The Applicant has indicated that the following commissioning activities will be undertaken:

4.2.1 Mobile crushing and screening plant

The mobile crushing and screening plant will be commissioned over three days; the following will be undertaken:

1. Revalidate the mobile crusher to have a valid operating licence.
2. Confirm location of mobile crusher.
3. Internal audit of clearing footprint, including bunding around borrow pit, no obstruction of drainage channels. This will be undertaken for each borrow pit location.
4. Un-pack from transport position to working position, secure the position of the mobile equipment;
5. Hook up mechanically and electrically any optional items required.
6. Check storage of hydrocarbons is setup on self-bunded containers, spill kit is present and spill procedure is with the spill kit. This will be repeated at each borrow pit location where the mobile plant will be used.
7. Add the diesel fuel and do a pre-start check.
8. Start the engine, and observe for hydrocarbon drips or leaks.
9. Test the individual components of the complete mobile crusher for correct rotations and movements and test drive over a short distance.
10. Commission with actual load, observing dust generation and trial wetting of materials prior to entering crusher, adjust the crushing size if required and check screening operations.

4.2.2 WWTP and irrigation area

The following commissioning actions will be undertaken for the WWTP:

1. Mechanical and electrical checks over a period of approximately three (3) days;
2. Dry commissioning of the system using clean water; checking no hydrocarbon leaks at pumps and power supply, no leaks from the treatment system and sprinklers are operational and no flooding within spray field;
3. Loading of chlorine and bacteria into the appropriate tanks, commencement of wet commissioning using site effluent over a three-month period. During wet commissioning:
    - water samples will be collected approximately every two (2) weeks, laboratory analysis and verification of measurements within specified limits;
    - checks for odour will be undertaken;
    - checks for effluent and hydrocarbon leaks undertaken; and
    - checks for effectiveness of spray field.

4.2.3 Landfill

The Applicant has advised the following actions will be undertaken for commissioning of the landfill:

1. Confirm location and clearing footprint;
2. Establish correct depth of the trench;
3. Establish presence of bunding around the perimeter of the landfill
4. Establish presence of a fire break around the perimeter of the landfill; and
5. Initiate waste disposal to determine the landfill performance and adequate controls.

4.3 Infrastructure

The Premises infrastructure, as it relates to Category 12, 64 and 85 activities, is detailed in Table 5 and with reference to the Site Plan (Premise Map) (Figure 2).

Table 5: Yangibana Early Works Category 12, 64 and 85 infrastructure

	Infrastructure	**Site Plan Reference**
	Prescribed Activity Category 12	
A 363,000 m^3 per year capacity mobile crushing and screening plant utilised at four borrow pit locations within the premises to produce road base material for construction of the Yangibana access road		
1	• Track mounted mobile crusher with feed bin, jaw crusher and discharge conveyor; • Track mounted mobile screen fitted with a feed bin, double deck screen and discharge conveyors.	81-8 Borrow Pit, 81-N Borrow Pit, 82-8 Borrow Pit, 82-N Borrow Pit
2	Dust emissions from the crushing and screening plant managed by: • Water carts utilised to wet feed materials; • Water sprays fitted on the mobile crushing plant crusher discharge and conveyor discharge points.	

	Infrastructure	Site Plan Reference
3	Drainage channels and diversion channels constructed to ensure surface water drainage is unimpeded and unaffected by the borrow pits.	
	Prescribed Activity Category 64	
A putrescible landfill to accept up to 30 tonnes of inert waste type 1, inert waste type 2		
1	Four trenches 2 m x 20 m in area, 2 m in depth, located at least 80 m from the nearest drainage line and 200 m from Fraser Creek	Landfill site
2	Earthen bunds and fencing constructed around perimeter of landfill trenches as they are progressively constructed and operated	
	Prescribed Activity Category 85	
A containerized five (5) stage Bardenpho WWTP to accept sewage and grey water from the on-site accommodation village. After treatment the chlorinated water will be discharged to a fenced 1 ha irrigation area, expanded to 3 ha when throughput increases during construction of the broader project.		
1	Bardenpho WWTP comprising of a pump station, Spirac screen, 22kL balance tank, primary tank 1, primary tank 2, aeration tank, clarifier tank, chlorine contact tank, 22 kL irrigation tank and 9.5 kL sludge thickening tank, and associated high density polyethylene pipelines	WWTP and sprayfield
2	1.5 ha irrigation field during the preliminary works phase, expanded to 4 ha when construction of the Yangibana Rare Earths Project processing plant, TSF and ancillary infrastructure commences; and number of onsite personnel increases. Treated wastewater and RO plant reject water combined and irrigated to sprayfield.	
	Other activities	
1	Temporary 40 person fly camp serviced by a 19 m^3 per day WWTP, core yard, laydown area and equipment storage area	Exploration Camp and laydown area
2	Reverse osmosis plant	RO Plant
3	Self-bunded fuel storage tanks	Self-bunded fuel tank

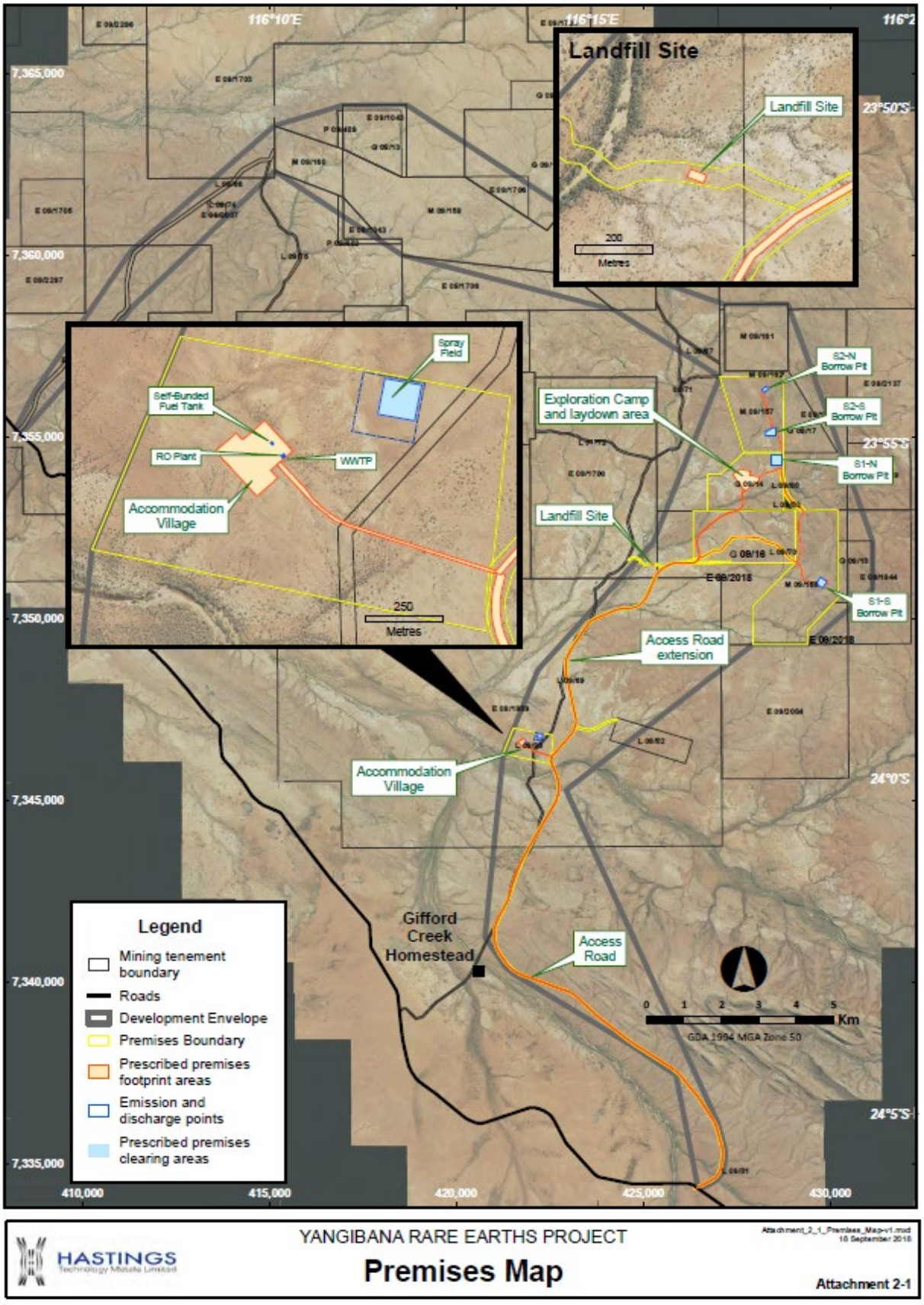

Figure 2: Site Plan

4.4 Exclusions to the Premises

The following activities/infrastructure will be occurring/located at the Premises which are not included in the scope of this assessment:

- Abstraction of groundwater (production borefield) is regulated under the *Rights in Water and Irrigation Act 1914* (RIWI Act);
- Fuel storage area to store up to 65,000 litres of diesel for generator sets and light vehicles;
- Operation of the 80 person capacity fly camp and associated WWTP (below threshold of Category 85 prescribed activity as specified in Schedule 1 of the EP Regulations);
- Access road, including relief and spoon drains, and construction of a concrete causeway and culverts across Lyons River. Concrete aggregate required for the causeway will be sourced off-site;
- Process plant laydown area, including core yard, fuel area and equipment storage;
- Reverse osmosis water treatment plant (below threshold of Category 85B prescribed activity as specified in Schedule 1 of EP Regulations); and
- Diesel-fueled generators (below threshold of Category 52 prescribed activity as specified in Schedule 1 of EP Regulations).

5. Legislative context

Table 6 summarises approvals relevant to the assessment.

Table 6: Relevant approvals and tenure

Legislation	Number	Approval
Environment Protection and Biodiversity Conservation Act 1999 (Cth)	Decision Notice EPBC 2016/7845	The preliminary/minor works of this occur as a component of a larger Project currently assessed as a 'controlled action' under the EPBC Act. Two approvals under section 156 of the EPBC Act has been granted for the minor or preliminary works.
Rights in Water and Irrigation Act 1914	PMB201193(1)	Bed and Banks Permit to construct the access road across the Lyons River and other drainage channels.
	GWL183285(2)	Licence to take water for dust suppression for earthworks and construction purposes, exploratory drilling, mining camp purposes.
Mining Act 1978	Registration ID 72489	Approval for Mining Proposal with a Mine Closure Plan for the Yangibana Rare Earths Project
Radiation Safety Act 1975 *Mines Safety and Inspection Act 1994*	RM-992-310716	Exploration Radiation Management Plan, identification, assessment, control and reporting of radiation hazards and risks
Part IV of the EP Act (WA) - Section 41A(3) Notice of decision to consent to minor or preliminary works issued 25 August 2017 and 23 March 2018.	Assessment No. 2115	Construction and operation of an access road, accommodation facilities, wastewater treatment plant and irrigation field in order to undertake investigative works including water investigations, geotechnical assessments, environmental surveys and mineral exploration activities. Including approval to clear vegetation at landfill, WWTP, irrigation field and borrow

Legislation	Number	Approval
		pit locations.
Part IV of the EP Act	Currently under assessment	Approval for the Yangibana Rare Earths Project, including mining, ore processing, tailings storage and ancillary infrastructure.

5.1 Part IV of the EP Act

5.1.1 Background

The Yangibana Rare Earths Project is currently being assessed by the EPA under Part IV of the EP Act. There was a 8 week public review period of the draft Environmental Review Document, which closed on the 28 October 2018.

On 25 August 2017 the Chairman of the EPA issued a Notice of decision to consent to minor or preliminary works under Section 41A(3) of the EP Act to authorize the clearing of vegetation to allow for the construction of access roads, topsoil storage, the accommodation village, landfill, WWTP and irrigation field, borrow pits and the abstraction of up to 0.28 gigalitres of groundwater in order to undertake investigative works and mineral exploration activities.

On 23 March 2018 a separate Notice was issued under Section 41A(3) for clearing within the project area to allow for the construction of an access road from the accommodation camp to the processing plant, and the borrow pit locations.

This Works Approval relates to infrastructure approved by the EPA under the decisions to consent to minor or preliminary works, as described above. The broader project (mining, processing plant, TSF) will need to be subject to a separate Works Approval application once approved under Part IV of the EP Act.

Pursuant to Section 43A of the EP Act, a notice of decision to consent to change a proposal during assessment was issued by the EPA on 26 June 2018. The changes related to a revision of the development envelope to account for the relocated airstrip and to include a borefield and water pipeline, and to increase the capacity of the tailings storage facilities (TSF1, TSF2 and TSF3). These changes to not relate to the infrastructure subject to this Works Approval.

5.2 Part V of the EP Act

5.2.1 Applicable regulations, standards and guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations.

The guidance statements which inform this assessment are:

- *Guidance Statement: Regulatory Principles (July 2015)*
- *Guidance Statement: Setting Conditions (October 2015)*
- *Guidance Statement: Decision Making (February 2017)*
- *Guidance Statement: Risk Assessments (February 2017)*
- *Guidance Statement: Environmental Siting (November 2016)*

5.2.2 Works approval and licence history

Table 7 summarises the works approval and licence history for the premises.

Table 7: Works approval history

Instrument	Issued	Nature and extent of works approval, licence or amendment
W6158/2018/1	29/11/2018	New Works Approval for the Yangibana preliminary and early works; crushing and screening plant (Category 12), WWTP (Category 54) and landfill (Category 64)

5.2.3 Clearing

Clearing of vegetation will be undertaken in accordance with the Notices of decision to consent to minor or preliminary works, issued to the proponent under Section 41(A)3 in Part IV of the EP Act. These Notices allows for the clearing of native vegetation from the areas where the WWTP, irrigation area, borrow pits and landfill will be located.

6. Consultation

The application was advertised in the Western Australian on 26 July 2018 for a 21 day comment period.

A letter inviting comment was sent to the Shire of Upper Gascoyne on 3 August 2018. No comments were received in response to the invitation for comment.

A letter of referral was sent to the Department of Mines, Industry Regulation and Safety (DMIRS) on 7 August 2018. Comments received from DMIRS related to the location of the putrescible landfill within an Exploration Licence, and the requirements for any future landfill to be located within appropriate tenure, subject to approval under a Mining Proposal. These comments have been noted by the Delegated Officer.

7. Location and siting

7.1 Siting context

The Premises is located approximately 270 km east-northeast of the town of Carnarvon on Gifford Creek and Wanna Stations in the Gascoyne Region of Western Australia. The Thiin-Mah Warriyangka, Tharrkari, Jiwarli (TMWTJ) people have a native title claim over the Project area and beyond. The native title claimants are represented by the Yamatji Marlpa Aboriginal Corporation. A Native Title Agreement with the TMWTJ group has been negotiated, which was ratified in November 2017 (Hastings, 2018).

The topography in the Project area has been influenced by the Lyons River to the south, to a lesser extent the Edmund River to the east, and a small range of hills to the north. The remainder of the area is characterised by subdued topography with rounded granitic hills and open flat areas, cross cut by small dendritic drainages.

7.1.1 Naturally Occurring Radioactive Materials (NORM)

The majority of the rare earths at the Premises are hosted by the phosphate mineral monazite, which contains low levels of thorium and uranium and their decay progeny. The presence of these elements is termed Naturally Occurring Radioactive Materials (NORM) as they are derived from a geological source associated with the granite bedrock and successive hydro-thermal emplacement of ironstone dykes (Hastings, 2018).

Due to the presence of NORM associated with mineralisation, baseline radionuclide monitoring commenced in 2015. The scope of the Minor or Preliminary Works program, subject to this Works Approval, is not associated with the mineralisation and thus do not trigger a requirement to manage radionuclides. However, exploration activities will operate under an Exploration

Radiation Management Plan, and the Applicant will continue to conduct baseline monitoring as a component of the investigative studies that will be on-going prior to and during the implementation of the broader Project.

7.2 Residential and sensitive Premises

The distances to residential and sensitive receptors are detailed in Table 8.

Table 8: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Gifford Creek Homestead	Approximately 6.5 km from WWTP and irrigation area, 12 km from landfill and 15 km from the nearest borrow pit area

7.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of activities at or Emissions and Discharges from the Premises. The distances to specified ecosystems are shown in Table 9. Table 9 also identifies the distances to other relevant ecosystem values which do not fit the definition of a specified ecosystem.

Table 9: Environmental values

Specified ecosystems	Distance from the Premises
Priority Ecological Community (PEC), Priority 1 (P1) Gifford Creek, Mangaroon, Wanna calcrete groundwater assemblage type on Lyons palaeodrainage on Gifford Creek, Lyons and Wanna Stations (Gifford Creek Calcrete PEC). This PEC comprises unique assemblages of invertebrates (stygofauna) that have been identified in the network of groundwater calcretes. Stygofauna occur within both the fractured rock aquifers across the broader Project area as well as the calcrete aquifers within the PEC footprint.	The Project development envelope intersects the northern portion of this PEC, however the prescribed premises will not intersect the shallow calcrete aquifer and there will be no excavation below the groundwater table. The nearest calcrete is approximately 2 km from the nearest borrow pit, 650 m from the WWTP and 525 m from the irrigation area.
Biological component	**Distance from the Premises**
A Level 2 Flora and Vegetation assessment of the Yangibana Study Area (55,000 ha), including the borrow pit and accommodation village locations was undertaken. No threatened flora listed under the EPBC Act and Wildlife Conservation Act 1950 (WA) were recorded. Six Priority Flora listed by the DBCA were recorded in the development envelope of the proposed minor or preliminary works, being: • *Acacia curryana* (Priority 1); • *Rhodanthe frenchii* (Priority 2); • *Wurmbea fluviatilis* (Priority 2); • *Spolobolus blakei* (Priority 3); • *Goodenia Berringbinensis* (Priority 4); and • *Goodenia nuda* (Priority 4).	Six priority species were recorded within development envelope, however are not located within the proposed disturbance footprint of the prescribed activities.
Fauna species of conservation significance recorded in the study area, being: • *Sminthopsis longicaudata* (Long-tailed Dunnart), listed as Priority 4 species by the Department of	Mouse mound identified 15 km south of prescribed premises. Grey Falcon recorded 20 km south of the closest borrow pit location.

Biodiversity, Conservation and Attractions (DBCA); • *Pseudomys chapmani* (Western Pebble-mound Mouse, listed as Priority 4 species by DBCA; • *Falco hypoleuca* (Grey Falcon), listed as a Schedule 3 species under the *Wildlife Conservation Act 1950* (WA)	

7.4 Groundwater and water sources

The distances to groundwater and water sources are shown in Table 10.

Table 10: Groundwater and water sources

Groundwater and water sources	Distance from Premises	Environmental value
Lyons River, including two semi-permanent pools Gifford Creek	Lyons River approximately 600 m from WWTP and irrigation area. Two semi-permanent pools in the Lyons River occur within 5 km of the proposed preliminary or minor works.	Ephemeral river, only flowing after rainfall events. Riparian vegetation, ephemeral pools with associated groundwater dependant ecosystems and the network of shallow calcrete aquifers associated with the Gifford Creek PEC.
Groundwater	Located within the Gascoyne Groundwater Proclamation Area. Depth to groundwater approximately 10 m below ground level (bgl) in creeks and Lyons River, groundwater measured at 33 m (bgl) at an early works bore installed adjacent to borrow pit. Depth to groundwater at the nearest pastoral bore to the irrigation area is approximately 25 mbgl	Groundwater salinity in the Project area ranges from 600 to 2,800 mg/L total dissolved solids (TDS). pH neutral to slightly alkaline. Pastoral bores used for livestock watering. Abstracted groundwater will be treated and utilised as the Projects water supply.

7.5 Meteorology

7.5.1 Regional climatic aspects

The Premises is within an area classified as arid, with an average annual rainfall of between 200-300 millimetres (mm). Average annual evaporation far exceeds average rainfall, being between 2800-3000 mm. The site is subject to northern monsoonal influences over the summer and early autumn period, and southern frontal influences in late autumn and winter. There are two periods of higher rainfall from January to April and June to July, and a drier period from August to December (Hastings, 2018).

8. Risk assessment

8.1 Determination of emission, pathway and receptor

In undertaking its risk assessment, DWER will identify all potential emissions pathways and potential receptors to establish whether there is a Risk Event which requires detailed risk assessment.

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. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as Part IV of the EP Act, that emission will not be risk assessed further and will be screened out through Table 13.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Tables 11 and 12 below.

Table 11. Identification of emissions, pathway and receptors during construction

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**		
Construction, mobilisation and positioning of infrastructure	Vehicle movements on unsealed access roads	Noise	No residences or other sensitive receptors in proximity Gifford Creek Homestead located approximately 6.5 km from WWTP and irrigation area, 12 km from landfill and 15 km from the nearest borrow pit area	Air/wind dispersion	Amenity impacts	No	The Delegated Officer considers that the separation distance between the source and potential receptor is sufficient to prevent noise and dust impacts from occurring.
		Dust			Amenity impacts	No	
	Earthworks,	Noise	No residences or other	Air/wind	Amenity impacts	No	The Delegated Officer considers that the

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
	construction of new buildings, plant and infrastructure	*Dust*	sensitive receptors in proximity Gifford Creek Homestead located approximately 6.5 km from WWTP and irrigation area, 12 km from landfill and 15 km from the nearest borrow pit area	dispersion	Amenity impacts	No	separation distance between the source and potential receptor is sufficient to prevent noise and dust impacts from occurring.
		Stormwater from construction areas contaminated with sediment and/or hydrocarbons	Drainage lines Riparian vegetation	Stormwater runoff Gravity flow overland	Contamination of drainage lines with sediment and hydrocarbons, potential adverse impacts to ecosystem health. Loss of riparian vegetation.	No	The Delegated Officer has considered the Applicant controls (self-bunded fuel storage), short duration of construction and the disturbance footprint for the preliminary works, and considers that impacts from stormwater runoff will be negligible. The general provisions of the EP Act and *Environmental Protection (Unauthorised Discharges) Regulations 2004* apply.
	Storage and use of hydrocarbons and chemicals	Spills and breach of containment	Soil and vegetation adjacent to the area of spill or breach Groundwater, depending on volume discharged and depth to groundwater	Direct discharges to land	Soil contamination inhibiting vegetation growth and survival. Deterioration of groundwater quality, impacts to pastoral land users and health of PEC	No	Self-bunded fuel tanks used for fuel storage. Storage of dangerous goods in accordance with the *Dangerous Good Safety Act 2004*, and associated Regulations, administered by DMIRS. The general provisions of the EP Act and *Environmental Protection (Unauthorised Discharges) Regulations 2004* apply.

Table 42: Identification of emissions, pathway and receptors during commissioning and operation

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Category 12 Screening, etc. of material	Operation of crushing and screening plant, movement of aggregate through crushing and screening circuit	Dust	No residences or other sensitive receptors in proximity Gifford Creek Homestead located approximately 15 km from the nearest borrow pit area	Air/wind dispersion	Health and amenity impacts	No	The Delegated Officer considers that the separation distance between the source and potential residential receptor is sufficient to prevent dust impacts from occurring.
			Vegetation and flora, including Priority listed species		Dust deposition on foliage reducing photosynthesis, inhibiting plant growth	No	The Delegated Officer considers the natural dust tolerance of vegetation species should prevent vegetation impacts. Dust management measures to be implemented during operation of the crushing and screening plant include: • Using water sprays to water down dust particles on road and soil surfaces; • Wetting of feed materials; • Dust suppression sprays on the mobile crushing plant crusher discharge and conveyor discharge point; • Limiting vehicle speeds; and • Visual monitoring of dust generation. Groundwater will be used for dust suppression. The Delegated Officer notes that the generation of dust during excavation of the borrow pit material is not regulated under Part V of the EP Act. The general provisions of the EP Act with respect to the causing of pollution and environmental harm apply.

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
		Noise	No residences or other sensitive receptors in proximity Gifford Creek Homestead located approximately 15 km from the nearest borrow pit area	Air/wind dispersion	Amenity	No	The Delegated Officer considers that the separation distance between the source and potential residential receptor is sufficient to prevent noise impacts from occurring.
		Stormwater from the crushing plant area contaminated with sediment and/or hydrocarbons	Drainage lines Riparian vegetation	Stormwater runoff Gravity flow overland	Contamination of drainage lines with sediment and hydrocarbons, potential adverse impacts to ecosystem health Loss of riparian vegetation	No	Erosion and sedimentation during rainfall events is likely to be localised given the relatively flat topography of the premises. Drainage channels, within 100 m of the borrow pits, and diversion channels will be constructed to ensure surface water drainage is unimpeded and unaffected by the borrow pits. Rocks will be used to disperse the kinetic energy of surface water draining from the borrow pit. Infrastructure will be inspected following heavy rainfall for evidence of erosion, which will be rectified immediately if identified. Self-bunded fuel tanks used for fuel storage. Storage of dangerous goods in accordance with the *Dangerous Good Safety Act 2004*, and associated Regulations, administered by DMIRS. The general provisions of the EP Act and *Environmental Protection (Unauthorised Discharges) Regulations 2004* apply. The Delegated Officer has considered the site topography, stormwater/erosion management measures and hydrocarbon storage, and considers appropriate controls are in place to manage stormwater associated with the minor and preliminary works.

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**		
Category 64 Putrescible landfill site	Landfilling to active trench	Dust	No residences or other sensitive receptors in proximity Gifford Creek Homestead located approximately 12 km from the landfill Vegetation and flora, including Priority listed species	Air/wind dispersion	Dust deposition on foliage reducing photosynthesis, inhibiting plant growth	No	The Delegated Officer considers that the separation distance between the source and potential residential receptor is sufficient to prevent dust impacts from occurring. The Delegated Officer considers the natural dust tolerance of vegetation species should prevent vegetation impacts. Dust emissions will be sporadic and localised, further reducing the likelihood of vegetation impacts.
		Noise	No residences or other sensitive receptors in proximity Gifford Creek Homestead located approximately 12 km from the landfill	Air/wind dispersion	None (sufficient separation distance)	No	The Delegated Officer considers that the separation distance between the source and potential residential receptor is sufficient to prevent noise impacts from occurring.
		Leachate	Adjacent vegetation Soil Groundwater (used for livestock drinking water) and Gifford Creek Calcrete PEC	Leachate infiltrating through soil, migrating to groundwater	Groundwater contamination and contaminated soils impacting growth of vegetation. Impact to health of stygofauna in Gifford Creek Calcrete PEC	Yes – refer to section 8.4	Potential impacts to groundwater, including the Gifford Creek Calcrete PEC and livestock drinking water. Bunds constructed and maintained around the trenches will prevent stormwater ingress into the landfill and minimise the generation of leachate. The closest pastoral bore to the landfill is Frasers Well, located approximately 390 m away. Depth to groundwater at this well is approximately 23.5 mbgl. The general provisions of the EP Act and *Environmental Protection (Unauthorised Discharges) Regulations 2004* apply.
		Stormwater		Stormwater containing sediment discharging to drainage lines			
		Odour	No residences or other sensitive receptors in	Air/wind dispersion	None (sufficient separation distance)	No	The Delegated Officer considers that the separation distance between the source and potential residential receptor is sufficient to

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
			proximity Gifford Creek Homestead located approximately 12 km from the landfill				prevent odour impacts from occurring.
		Windblown waste	Terrestrial ecosystems	Direct discharge/movement by surface water following rainfall	May attract vermin-feral animals	No	Regular covering of waste will prevent windblown waste from leaving the premises.
Category 85 Sewage facility	Treatment of sewage	Odour	No residences or other sensitive receptors in proximity Gifford Creek Homestead located approximately 6.5km from the WWTP and irrigation area.	Air/wind dispersion	None (sufficient separation distance)	No	The Delegated Officer considers that the separation distance between the source and potential residential receptor is sufficient to prevent odour impacts from occurring.
	Sewage pipes and holding tanks	Sewage discharge from the rupture of pipes or overtopping of holding tanks	Vegetation adjacent to discharge area	Direct discharge to land	Soil contamination inhibiting vegetation growth and survival Stormwater runoff with elevated nutrients can result in eutrophication of waterways and ecosystem disruption	Yes – refer to section 8.5	Potential soil contamination from the release of untreated effluent.
	Irrigation of treated effluent	Treated effluent to land	Terrestrial ecosystems			Yes – refer to section 8.5	Potential for increase in nutrients in soils if effluent not treated sufficiently, and potential for stormwater with elevated nutrients to enter drainage lines.
	Chemical storage	Breach of containment causing chemical discharge to land	Ecosystems adjacent to storage area	Direct discharge	Soil contamination inhibiting vegetation growth and survival and health impacts to fauna	No	The general provisions of the EP Act and *Environmental Protection (Unauthorised Discharges) Regulations 2004* apply.

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Ancillary infrastructure	Bulk fuel storage	Breach of containment causing hydrocarbon discharge to land	Ecosystems adjacent to storage area	Direct discharge	Soil contamination inhibiting vegetation growth and survival and health impacts to fauna	No	Self-bunded fuel tanks used for fuel storage. Storage of dangerous goods in accordance with the *Dangerous Good Safety Act 2004*, and associated Regulations, administered by DMIRS. The general provisions of the EP Act and *Environmental Protection (Unauthorised Discharges) Regulations 2004* apply.

8.2 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 13 below.

Table 53: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 14 below.

Table 14: Risk criteria table

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
			Environment	Public health* and amenity (such as air and water quality, noise, and odour)
Almost Certain	The risk event is expected to occur in most circumstances	Severe	• **onsite impacts**: catastrophic • **offsite impacts local scale**: high level or above • **offsite impacts wider scale:** mid-level or above • Mid to long-term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded	• Loss of life • **Adverse health effects:** high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • **Local scale impacts:** permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	• **onsite impacts**: high level • **offsite impacts local scale**: mid-level • **offsite impacts wider scale**: low level • Short-term impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are exceeded	• **Adverse health effects:** mid-level or frequent medical treatment • Specific Consequence Criteria (for public health) are exceeded • **Local scale impacts**: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	• **onsite impacts**: mid-level • **offsite impacts local scale**: low level • **offsite impacts wider scale**: minimal • Specific Consequence Criteria (for environment) are at risk of not being met	• **Adverse health effects:** low level or occasional medical treatment • Specific Consequence Criteria (for public health) are at risk of not being met • **Local scale impacts:** mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	• **onsite impacts**: low level • **offsite impacts local scale**: minimal • **offsite impacts wider scale**: not detectable • Specific Consequence Criteria (for environment) likely to be met	• Specific Consequence Criteria (for public health) are likely to be met • **Local scale impacts:** low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	• **onsite impact**: minimal • Specific Consequence Criteria (for environment) met	• **Local scale**: minimal to amenity • Specific Consequence Criteria (for public health) met

^ Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting.*

* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines.*

"onsite" means within the Prescribed Premises boundary.

8.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment table 15 below:

Table 15: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

8.4 Risk Assessment – Risk Event 1 - Landfill operations including waste disposal and leachate

8.4.1 Description of landfill operations and leachate management

Putrescible waste, inert waste type 1 and inert waste type 2 (plastics and rubber/tyres) in accordance with the *Landfill Waste Classifications and Waste Definitions* will be disposed of into the Premises landfill. The most significant impact of the putrescible landfill on the surrounding environment is from leachate.

8.4.2 Identification and general characterisation of emission

Leachate discharges can enter groundwater through seepage, and runoff of contaminated storm water.

8.4.3 Description of potential adverse impact from the emission

Leachate quality varies throughout the operational life of the landfill and after its closure as well. During the early stages of waste degradation and leachate generation the composition is acid and high in volatile fatty acids (the acetogenic phase). This acid leachate may dissolve other components of the wastes, such as heavy metals. The leachate also contains high concentrations of ammoniacal nitrogen and has both a high organic carbon concentration and a biochemical oxygen demand.

8.4.4 Criteria for assessment

Landfill Waste Classification and Waste Definitions and *ASC NEPM*.

8.4.5 Applicant controls

The Applicant's controls for the landfill are set out in Table 16.

Table 16: Applicant's proposed controls for the landfill

Site infrastructure	Construction	Operation details
Inert and putrescible landfill	Landfill constructed to accept up to 30 tonnes of waste per annum Landfill does not intersect the shallow calcrete aquifer (Gifford Creek Calcrete PEC) and will not be excavated below the watertable Groundwater at the landfill is approximately 23.5 mbgl (measured at Frasers Well approximately 390 m from landfill). Landfill located 200 m from Fraser Creek, 100 m from small drainage line to the south of the landfill and 80 m from a small drainage line to the south of the landfill Perimeter fenced to prevent access by livestock and capture windblown waste Earthen bunding constructed around trench perimeter to prevent stormwater ingress	Landfill will be covered regularly with 100 mm of soil fortnightly, depending on occupancy of accommodation village and amount of waste generated. Windblown waste will be pick up immediately and returned to the landfill

8.4.6 Consequence

Based on the distance to groundwater, waste types and volume to be accepted at the landfill, an environmental impact from the waste disposed and leachate could result in minimal on-site impacts. Therefore the consequence is **minor.**

8.4.7 Likelihood of Risk Event

Based upon the distance to groundwater and Applicant controls, the likelihood of an environmental impact from waste disposal and leachate associated with the landfill will not occur in most circumstances. Therefore, the likelihood of the consequence is **unlikely**.

8.4.8 Overall rating of landfill operations including waste disposal and leachate (Risk Event 1)

Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 14) determines the overall rating for the risk of the landfill during operation to be **medium.**

8.5 Risk Assessment – Risk Event 2 - WWTP rupture of pipes, storage tank failure and irrigation during operation

8.5.1 Description of WWTP rupture of pipes, storage tank failure and irrigation during operations.

Sewage from ablutions and other facilities at the accommodation villages will be treated through the containerised five (5) stage Bardenpho WWTP. If the WWTP has a breakdown of pumps, rupture of pipes and/or tank failure, there is the potential for untreated, partially untreated or

treated wastewater (depending on component of plant breakdown) to be released to the environment. During normal operations, treated wastewater and the RO plant reject water will be combined and discharged to the irrigation area.

8.5.2 Identification and general characterisation of emission

Wastewater may contain high levels of pathogens and nutrients; concentrations dependant on level of treatment reached when discharge occurs.

Elements in RO reject water may concentrate during the treatment process, posing a risk to the receiving environment.

8.5.3 Description of potential adverse impact from the emission

Wastewater discharged to the environment during the treatment process may cause localised soil contamination. If wastewater is discharged to the irrigation field prior to meeting emission standards this could lead to the facilitated growth of weeds, increase in nutrient levels in soils and ponding in the irrigation field.

8.5.4 Criteria for assessment

The Applicant has provided a commitment (Hastings, 2018) that the effluent will be treated to a secondary level of treatment (Category c) in accordance with NWQMS, 1997 with effluent achieving the specifications detailed in Table 4 of this report.

8.5.5 Applicant controls

The Applicant's controls for the WWTP and irrigation field are set out in Table 17 below.

Table 17: Applicant's proposed controls for the WWTP and irrigation field

Site infrastructure	Construction	Operation details
WWTP	Containerized five (5) stage Bardenpho WWTP installed adjacent to construction accommodation village. Balance and irrigations tanks fitted with water level exceedance triggers which issue alarms and flashing beacons. Bunding constructed around facility to protect from flood waters and contain leaks and spills. HDPE pipelines will convey wastewater, treated wastewater and reverse osmosis reject water. Nearest calcrete is 650 m from the WWTP	Maximum throughput of 70 m^3/day during the minor and preliminary works phase of the project. Daily and weekly inspections of the WWTP infrastructure and tank levels. The wastewater will be treated before being discharged to a dedicated irrigation field. The WWTP will meet the following emission standards: Biochemical Oxygen Demand <20 mg/L Total Suspended Solids <30 mg/L Total Dissolved Solids: RO plant: 800 mg/L WWTP output: 100 mg/L Total Nitrogen <30 mg/L Total Phosphorus <8 mg/L pH 6.8-8.5 *E.coli* <1000 coliform forming units per 100 mL (cfu/100mL)

Site infrastructure	Construction	Operation details
Irrigation field	Construction in two stages: • Stage 1 – 1.5 ha irrigation area (minor or preliminary works); and • Stage 2 – 4 ha irrigation area (construction of the main project). • Fenced	Daily and weekly inspections of the irrigation field equipment.

8.5.6 Consequence

Based on the information detailed above and that the wastewater will undergo treatment prior to discharge, the impact of WWTP rupture, tank failure and the irrigation of treated wastewater will result in low level on-site impacts. Therefore, the consequence is **minor**.

8.5.7 Likelihood of Risk Event

Based upon the treatment applied to the wastewater prior to irrigation and Applicant controls, the likelihood of an environmental impact from WWTP pipe ruptures, tank failure and the irrigation of treated wastewater will not occur in most circumstances. Therefore, the likelihood of the consequence is **unlikely**.

8.5.8 Overall rating of WWTP - rupture of pipes, storage tank failure and irrigation during operation (Risk Event 2)

Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 14) determines the overall rating for the risk of discharges to land from the WWTP and irrigation field is **medium**.

8.6 Summary of acceptability and treatment of Risk Events

A summary of the risk assessment and the acceptability or unacceptability of the risk events set out above, with the appropriate treatment and control, are set out in Table 18 below. Controls are described further in section 9.

Table 18: Risk assessment summary

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	Source	Pathway/ Receptor (Impact)			
1	Landfill operations including waste disposal and leachate	Disposal of waste Leachate to soil	Discharges to land Seepage through soil	Refer to Applicant controls as required in section 8.4.5	Minor consequence Unlikely likelihood **Medium Risk**	Acceptable subject to Applicant construction controls conditioned. Submission of compliance document to ensure that

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	**Source**	**Pathway/ Receptor (Impact)**			
						infrastructure has been constructed as per Works Approval Application and supporting documentation (Hastings, 2018). Operational controls including monitoring requirements.
2	WWTP rupture of pipes, storage tank failure and irrigation during operation	Ruptures of pipes Overtopping of tanks due to failure of equipment Irrigation of treated effluent	Discharges to land potentially causing soil contamination Facilitated growth of weeds due to increase in nutrients in soil Ponding in irrigation field	Refer to Applicant controls as detailed in section 8.5.5	Minor consequence Unlikely likelihood **Medium Risk**	Acceptable subject to Applicant construction controls conditioned. Submission of compliance document to ensure that infrastructure has been constructed as per Works Approval Application and supporting documentation (Hastings, 2018). Operational controls including monitoring requirements.

9. Regulatory controls

A summary of regulatory controls determined to be appropriate for the Risk Event is set out in Table 19. The risks are set out in the assessment in section 8 and the controls are detailed in this section. DWER will determine controls having regard to the adequacy of controls proposed by the Applicant. The conditions of the Works Approval will be set to give effect to the determined regulatory controls.

Table 19: Summary of regulatory controls to be applied

		Controls (references are to sections below, setting out details of controls)		
		9.1 Infrastructure and equipment	9.2 Operational requirements	Monitoring
Risk Items (see risk analysis in section 10)	1. mobile crushing and screening plant	●		
	2. WWTP and irrigation of treated wastewater to designated irrigation field	●	●	●
	3. Landfill	●	●	●

9.1 Works Approval controls

9.1.1 Mobile crushing and screening plant infrastructure and equipment

Table 20: Infrastructure requirements for the mobile crushing and screening plant

Infrastructure	Requirements (Design and Construction)
Mobile crushing and screening plant	One 363,000 m^3 per annual period capacity crushing and screening plant to be used at four borrow pit locations within the premises Drainage and diversion channels constructed at appropriate locations at borrow pits to manage stormwater

9.1.2 Landfill infrastructure and equipment

The following infrastructure and equipment (Table 21) should be constructed to manage the landfill:

Table 21: Infrastructure requirements for the management of the landfill

Infrastructure	Requirements (Design and Construction)
Inert and putrescible landfill	Landfill located at least 80 m from the nearest surface water features Landfill located greater than 3 m above the groundwater table Trenches to be 2 metres in width, 20 metres in length and 2 metres in depth Earthen bunding and perimeter fencing constructed

9.1.3 WWTP and irrigation field infrastructure and equipment

The following infrastructure and equipment (Table 22) should be constructed to manage the WWTP and irrigation field:

Table 22: Infrastructure requirements for the management of the WWTP and irrigation field

Infrastructure	Requirements (Design and Construction)
WWTP	Containerized five (5) stage Bardenpho WWTP installed adjacent to construction accommodation village, comprising of a pump station, Spirac screen, 22kL balance tank, primary tank 1, primary tank 2, aeration tank, clarifier tank, chlorine contact tank, 22 kL irrigation tank and 9.5 kL sludge thickening tank. Balance and irrigations tanks fitted with water level exceedance triggers which issue alarms and flashing beacons. Tanks fitted with malfunction alarms. Earthen bunding constructed around facility. Associated pipelines to be constructed of HDPE.
Irrigation field for disposal of treated effluent and reverse osmosis reject water	Stage 1 – constructed to 1.5 ha Stage 2 – expanded to 4 ha (during construction of broader project) Fenced
RO plant reject water	Monitoring of water quality to verify that it is of acceptable quality, and within ANZECC guidelines.

9.1.4 Works Approval reporting

The Applicant has stated that construction is scheduled to commence in November 2018, following receipt of relevant approvals. Compliance reporting will be required for the mobile crushing and screening plant, landfill and WWTP. A suitably qualified person will be required to confirm that each item of infrastructure specified in the Works Approval has been constructed to the specified requirements.

Commissioning of the WWTP is authorized under the Issued Works Approval for a period of no longer than six (6) months following submission of the compliance report. A six (6) month commissioning timeframe has also been authorized for the mobile crushing and screening plant and landfill under the Issued Works Approval.

The Applicant will required an Issued Licence, prior to operation of the mobile crushing and screening plant, landfill and WWTP.

9.2 Licence controls

The following controls will be imposed as conditions on the Issued Licence to manage the risk of emissions during operation at the Premises (for the categories assessed in this report). It should be noted that these controls are not final and will be subject to compliance with conditions of the Issued Works Approval and may change if additional information becomes available or there are changes.

9.2.1 Operational requirements for the mobile crushing and screening plant

Infrastructure	Management Controls
Mobile crushing and screening plant	One 363,000 m^3 per annual period capacity crushing and screening plant to be used at four borrow pit locations within the premises, as designated in Prescribed Premises map Drainage and diversion channels constructed at appropriate locations at borrow pits to manage stormwater

9.2.2 Operational requirements for the landfill

Infrastructure	Management Controls
Landfill	Design capacity of 30 tonnes per annum Four trenches 2 m x 20 m in area, 2 m in depth Landfill will be covered on a fortnightly basis with inert material Regular inspections Bunding maintained around trench perimeter Windblown waste will be collected and put back in the landfill

9.2.3 Operational requirements for the WWTP and irrigation area

Infrastructure	Management Controls
WWTP	Design capacity of 70 m^3/day The wastewater will be treated before being discharged to a dedicated irrigation field WWTP will be operated in two stages: • Stage 1: Up to 35 m^3 per day of wastewater treated; and • Stage 2: Up to 122.5 m^3 per day of wastewater treated. The WWTP will meet the following emission standards: Biochemical Oxygen Demand <20 mg/L

	Total Suspended Solids	<30 mg/L
	Total Dissolved Solids	RO plant: 800 mg/L WWTP: 1,000 mg/L
	Total Nitrogen	<30 mg/L
	Total Phosphorus	<8 mg/L
	pH	6.8-8.5
	E.coli 100 mL (cfu/100mL)	<1000 coliform forming units per
Irrigation field	Designated as an emission point on Licence Will accept up to 50 kL per day of reject water from the RO plant Operated in two stages: • Stage 1: Up to 35 m^3 per day of treated wastewater irrigated; and • Stage 2: Up to 122.5 m^3 per day of treated wastewater irrigated. Effluent discharge managed to ensure there is no surface ponding or runoff from the irrigation field	

9.2.4 Monitoring requirements for landfill

Waste acceptance criteria (including waste type, quantity limit and specifications), cover requirements and the monitoring of inputs will be applied to the Issued Licence for the landfill.

9.2.5 Monitoring requirements for the WWTP

Waste acceptance criteria (including waste type, quantity limit and specifications; monitoring of inputs and outputs (volume – continuous and monthly cumulative); and the quarterly monitoring of treated wastewater shall be applied to the Issued Licence for the WWTP.

9.2.6 Licence reporting

An Annual Environmental Report and Annual Audit Compliance Report will be required to be submitted as a condition of the Issued Licence.

10. Determination of Works Approval conditions

The conditions in the issued Works Approval in Attachment 1 have been determined in accordance with the *Guidance Statement: Setting Conditions*.

Table 23 provides a summary of the conditions to be applied to this Issued Works Approval.

Table 23: Summary of conditions to be applied

Condition Reference	Grounds
Infrastructure and Equipment Conditions 1, 2, 3, 4, 5 and 6	These conditions are valid, risk-based and contain appropriate controls.
Emissions Condition 7	This condition is valid, risk-based and consistent with the EP Act.

Record-keeping Conditions 8 and 9	These conditions are valid and are necessary administration and reporting requirements to ensure compliance.

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 Works Approval under the EP Act.

11. Applicant's comments

The Applicant was provided with the draft Decision Report and draft Works Approval on 1 November 2018. The Applicant responded on 11 November 2018 and provided minor additional information to complete the Decision Report, as requested in DWER's correspondence. The additional information provided by the Applicant is summarised in Appendix 2.

On 29 November 2018, further consultation was undertaken with the Applicant regarding the requirement to monitor the quality of RO reject water to verify that it is of acceptable quality to irrigate. The Applicant advised in email correspondence (Lara Jefferson, 29 November 2018) they had no objection to the inclusion of the monitoring requirements.

12. 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 1).

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

Alana Kidd
MANAGER, RESOURCE INDUSTRIES
REGULATORY SERVICES
Delegated Officer
under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Key documents

	Document title	In text ref	Availability
1.	Australian Standard AS 1940-2004 The storage and handling of flammable and combustible liquids	AS 1940	accessed at http://dmirs.wa.gov.au
2.	*DFS Study – Stage 1 Hydrogeological Assessment, Yangibana Rare Earths Project*, Groundwater Resource Management, February 2017	Groundwater Resource Management, February 2017	accessed at www.epa.wa.gov.au
3.	*Guidance Statement: Regulatory principles.* Department of Water and Environmental Regulation, July 2015	DER 2015a	accessed at www.dwer.wa.gov.au
4.	*Guidance Statement: Setting conditions,* Department of Water and Environmental Regulation, October 2015	DER 2015b	
5.	*Guidance Statement: Risk Assessments*, Department of Water and Environmental Regulation, November 2016	DER 2016b	
6.	*Guidance Statement: Decision Making*, Department of Water and Environmental Regulation, November 2016	DER 2016c	
7.	*Landfill Waste Classifications and Waste Definitions 1996 (as amended 2018),* Department of Water and Environmental Regulation	Landfill Waste Classification and Waste Definitions	accessed at http://der.wa.gov.au
8.	National Water Quality Management Strategy*, Australian Guidelines for Sewerage Systems Effluent Management*, Agriculture and Resource Management Council of Australia and New Zealand and Australian and New Zealand Environment and Conservation Council, 1997	*NWQMS 1997*	accessed at www.environment.gov.au

9.	National Water Quality Management Strategy, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality,* Agriculture and Resource Management Council of Australia and New Zealand and Australian and New Zealand Environment and Conservation Council	ANZECC 2000	accessed at www.waterquality.gov.au
10.	RE: Review of draft works approval and decision report, email correspondence from Lara Jefferson received 12:48, 29 November 2018	Lara Jefferson, 2018	DWER records (A1743629)
11.	Threatened and Priority Fauna List, Department of Biodiversity, Conservation and Attractions	Threatened and Priority Fauna List	accessed at http://dpaw.wa.gov.au
12.	Threatened Fauna – Specially Protected Fauna Notice, Department of Biodiversity, Conservation and Attractions	Wildlife Conservation (Specially Protected Fauna) Notice 2017	
13.	*Yangibana Rare Earths Project, Minor or Preliminary Works: Works application*, Supplementary documentation, Hastings Technology Metals Limited, 14 May 2018	Hastings, 2018	DWER records (A1673535)

Appendix 2: Summary of applicant's comments on risk assessment and draft conditions

WORKS APPROVAL		
Condition	**Summary of Licence Holder comment**	**DWER response**
8	Details provided of the WWTP contingency overflow, consisting discharge to three pump pits to store wastewater if required. Details of TDS concentrations in output from the RO plant and WWTP provided	Infrastructure and equipment requirements table updated with contingency overflow details and anticipated wastewater TDS concentrations.
DECISION REPORT		
Pages 4, 9 and 11	Applicant requested that reference to the '80 person fly camp' be replaced with '40 person fly camp', and advised that the capacity of the WWTP servicing the camp in 19 m^3 per day, with treated wastewater discharged to a designated 1 ha irrigation area.	Decision report updated.
Page 5	Applicant advised on components of the crushing and screening plant	Decision report updated.
Page 6	Applicant advised that the RO plant provider could not provide the RO reject water quality parameters, however advised Hastings that the quantity of RO reject water added to the WWTP irrigation water is below any parameters that would affect the quality of the WWTP discharge.	A Hydrogeological Assessment (Groundwater Resource Management, February 2017) has been undertaken for the Yangibana Rare Earths Project, and was submitted to the EPA as part of the referral documentation for the broader project. The Delegated Officer notes that as part of the assessment, groundwater samples were analysed for a suite of parameters. There were no

WORKS APPROVAL		
Condition	**Summary of Licence Holder comment**	**DWER response**
		exceedances of the recommended water quality trigger values (low risk) for heavy metals and metalloids in livestock drinking water as outlined in section 4.3.4 of the ANZECC guidelines. In order to verify the quality of the RO reject water, the Delegated Officer has included the requirement to monitor the quality of reject water and to submit the results to DWER with the commissioning report for consideration.
Pages 8 and 18	Details of dust suppression for crushing and screening plant provided.	Decision report updated.
Page 15	Applicant confirmed distance from WWTP to Lyons River is 600 m.	Decision report updated.
Page 30	Applicant advised construction scheduled to commence in November 2018.	Decision report updated.

Attachment 1: Issued Works Approval W6158/2018/1