



Report and recommendations of the Environmental Protection Authority



Yangibana Rare Earths Project

Hastings Technology Metals Ltd

Report 1642

June 2019

Environmental impact assessment process timelines

Date	Progress stages	Time (weeks)
21/02/2017	EPA decides to assess – level of assessment set	
22/05/2017	EPA approved Environmental Scoping Document	13
21/09/2018	EPA accepted Environmental Review Document	69
1/10/2018	Environmental Review Document released for public review	1
28/10/2018	Public review period for Environmental Review Document closed	4
26/04/2019	EPA accepted Proponent Response to Submissions	26
16/05/2019	EPA completed its assessment	3
21/06/2019	EPA provided report to the Minister for Environment	5
26/06/2019	EPA report published	3 days
10/07/2019	Close of appeals period	2

Timelines for an assessment may vary according to the complexity of the proposal and are usually agreed with the proponent soon after the EPA decides to assess the proposal and records the level of assessment.

In this case, the Environmental Protection Authority met its timeline objective to complete its assessment and provide a report to the Minister.



Dr Tom Hatton
Chairman

21 June 2019

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Executive summary

The Yangibana Rare Earths Project (the proposal) was referred to the Environmental Protection Authority (EPA) by the proponent Hastings Technology Metals Pty Ltd on 31 January 2017.

The proposal is to mine and process rare earth element ore and is located 270 kilometres east-northeast of Carnarvon in the Shire of Upper Gascoyne.

The proposal includes the development of five open mine pits, groundwater abstraction, on-site processing of ore, tailings storage facilities, waste rock landforms, access and haul roads and supporting infrastructure such as accommodation facilities, administration buildings, utilities (including fresh water supply, power and waste disposal), and an airstrip.

The proposal was assessed as an accredited assessment between the Commonwealth and Western Australian governments as the proposal had been determined to be a controlled action (nuclear action) under the *Biodiversity Conservation Act 1999*.

The EPA conducted an Environmental Impact Assessment on the proposal and concluded the proposal is environmentally acceptable and can be implemented subject to certain conditions.

The EPA examined the potential impacts on five key environmental factors: Flora and Vegetation, Subterranean Fauna, Inland Waters, Terrestrial Environmental Quality and Human Health.

The EPA recommended conditions (listed in Appendix 4) which include requirements for surveys for significant flora and vegetation, modelling of surface water impacts before any clearing, and the preparation a flora and vegetation management plan and a subterranean fauna management plan. The recommended management plans will ensure the environmental values of the proposal's surrounds will be protected.

The EPA considered impacts to Inland Waters, Terrestrial Environmental Quality and Human Health. Having regard to the proponent's proposed management measures, and the requirements under Part V of the *Environmental Protection Act 1986*, the *Rights in Water and Irrigation Act 1914*, the *Radiation Safety Act 1975*, the *Mines Safety and Inspection Act 1994* and the *Mining Act 1978*, the EPA is of the opinion it is unlikely that the proposal would have a significant impact on these factors and that the impacts are manageable. The EPA has provided other advice to the Department of Mines, Industry Regulation and Safety that further geochemical testing should be conducted to inform closure strategies and ensure that rare-earth phosphate minerals in mine wastes do not cause environmental harm through the soil pathway after closure.

1. Introduction

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for Environment on the outcomes of the EPA's environmental impact assessment of the Yangibana rare Earths Project (the proposal) by Hastings Technology Metals Limited. The proposal is to develop a rare earth elements (REE) mine and ore processing facility 270 kilometres (km) east-northeast of Carnarvon in the Shire of Upper Gascoyne.

The EPA has prepared this report in accordance with section 44 of the *Environmental Protection Act 1986* (EP Act). This section of the EP Act requires the EPA to prepare a report on the outcome of its assessment of a proposal and provide this assessment report to the Minister for Environment. The report must set out:

- what the EPA considers to be the key environmental factors identified during the assessment
- the EPA's recommendations as to whether or not the proposal may be implemented and, if the EPA recommends that implementation be allowed, the conditions and procedures to which implementation should be subject.

The EPA may also include any other information, advice and recommendations in the assessment report as it thinks fit.

The proponent referred the proposal to the EPA on 31 January 2017. On 21 February 2017 the EPA decided to assess the proposal and set the level of assessment at Environmental Review with a four week public review period. The EPA approved the Environmental Scoping Document (ESD) for the proposal on 22 May 2017. The Environmental Review Document (ERD) was released for public review from 1 October 2018 to 28 October 2018.

1.1 EPA procedures

The EPA followed the procedures in the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016* and the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual 2016*.

1.2 Assessment on behalf of the Commonwealth

The proposal was determined to be a controlled action by a delegate of the Commonwealth Minister for the Environment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 14 March 2017 as it will, or is likely to have, a significant impact on the following Matter of National Environmental Significance (MNES):

- Nuclear actions (sections 21 and 22A)

The proposal was assessed as an accredited assessment between the Commonwealth and Western Australian governments.

2. The proposal

2.1 Proposal summary

The proponent, Hastings Technology Metals Limited, proposes to mine and process REE ore from five mining pits in the Yangibana project area. The Project area is located 270 km east-northeast of Carnarvon in the Shire of Upper Gascoyne (Figure 1).

The proposal involves mining of a monazite ore rich in REE from five open mine pits, including mining below the watertable, for about 10 years.

The proposal includes:

- clearing of up to 1,000 hectares (ha) of native vegetation (the disturbance footprint) within a 13,373 ha development envelope
- groundwater production bores
- on-site beneficiation and hydrometallurgy processing of ore
- two tailings storage facilities
- waste rock landforms
- access and haul roads
- supporting infrastructure such as an airstrip, Run of Mine pad, accommodation, administration facilities, landfill, wash-down bay, bioremediation area, sewage treatment plant, power generation, linear infrastructure, communications facilities and power infrastructure
- transport of the product by road to Geraldton port for export.

The key characteristics of the proposal are summarised in Tables 1 and 2 below. A detailed description of the proposal is provided in Section 2 of the ERD (Hastings 2018a).

Table 1: Summary of the proposal

Proposal title	Yangibana Rare Earths Project
Short description	The proposal is to develop a mine to extract and process rare earth elements. The proposal includes five open pits, tailings facilities and ancillary infrastructure to support the mining operation. The proposal is located approximately 270 kilometres east-northeast of Carnarvon in the Shire of Upper Gascoyne.

Table 2: Location and proposed extent of physical and operational elements

Element	Location	Proposed extent
<i>Physical elements</i>		
Mine and associated infrastructure	Figure 2	Clearing of no more than 1,000 ha within a development envelope of 13,373 ha.
<i>Operational elements</i>		
Mining	Figure 2	Mining from five pits: <ul style="list-style-type: none"> • Yangibana North • Yangibana West • Bald Hill and Bald Hill SE • Frasers
Groundwater abstraction, from fractured rock aquifer of mine pits and paleochannel of the SipHon Well borefield	Figure 2	No more than 2.5 gigalitres per year of groundwater
Tailings disposal	Figure 2	No more than: <ul style="list-style-type: none"> • 10 million tonnes into Beneficiation tailings storage facility (TSF) • 770,000 tonnes into Hydromet TSF

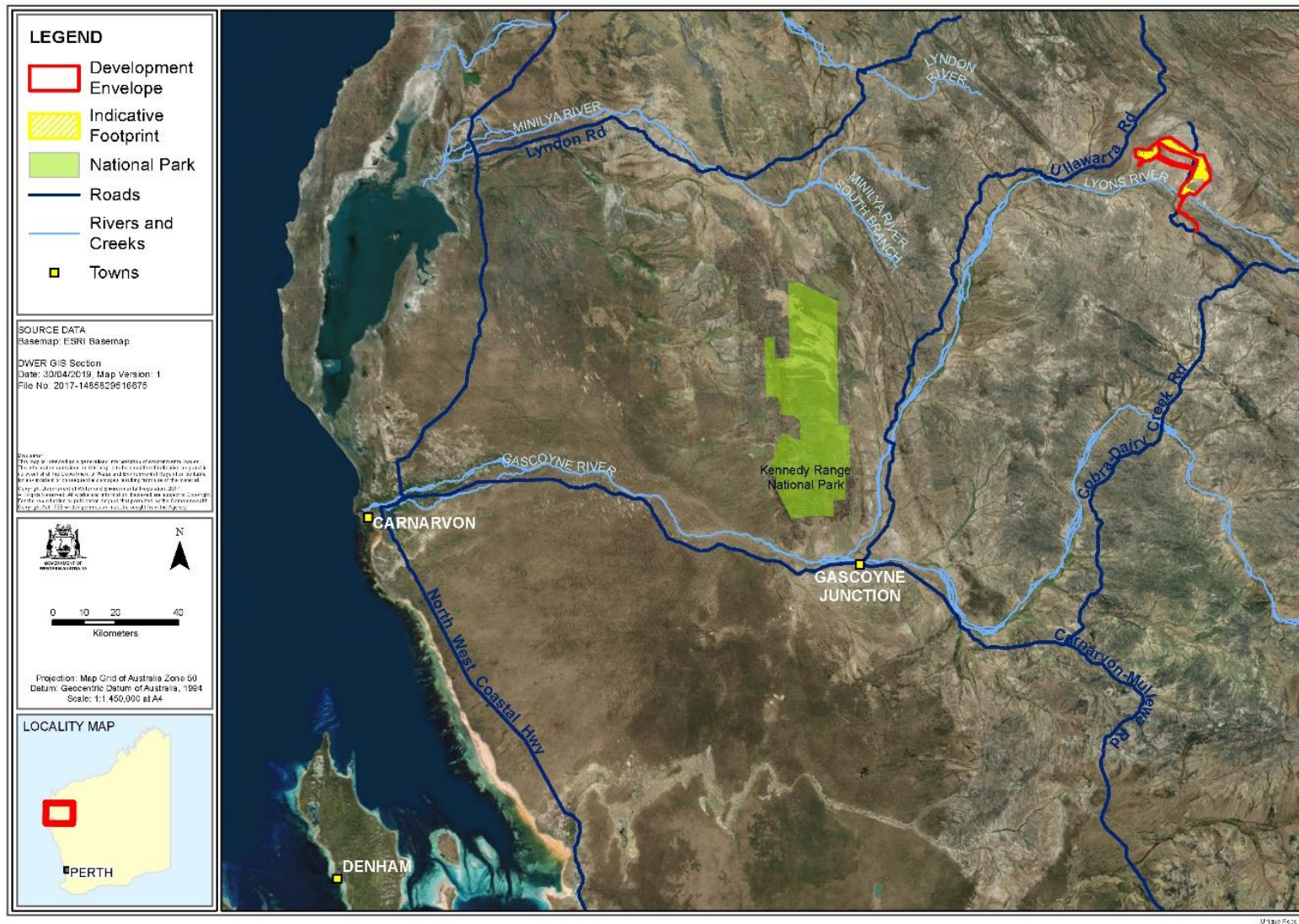


Figure 1: Regional location

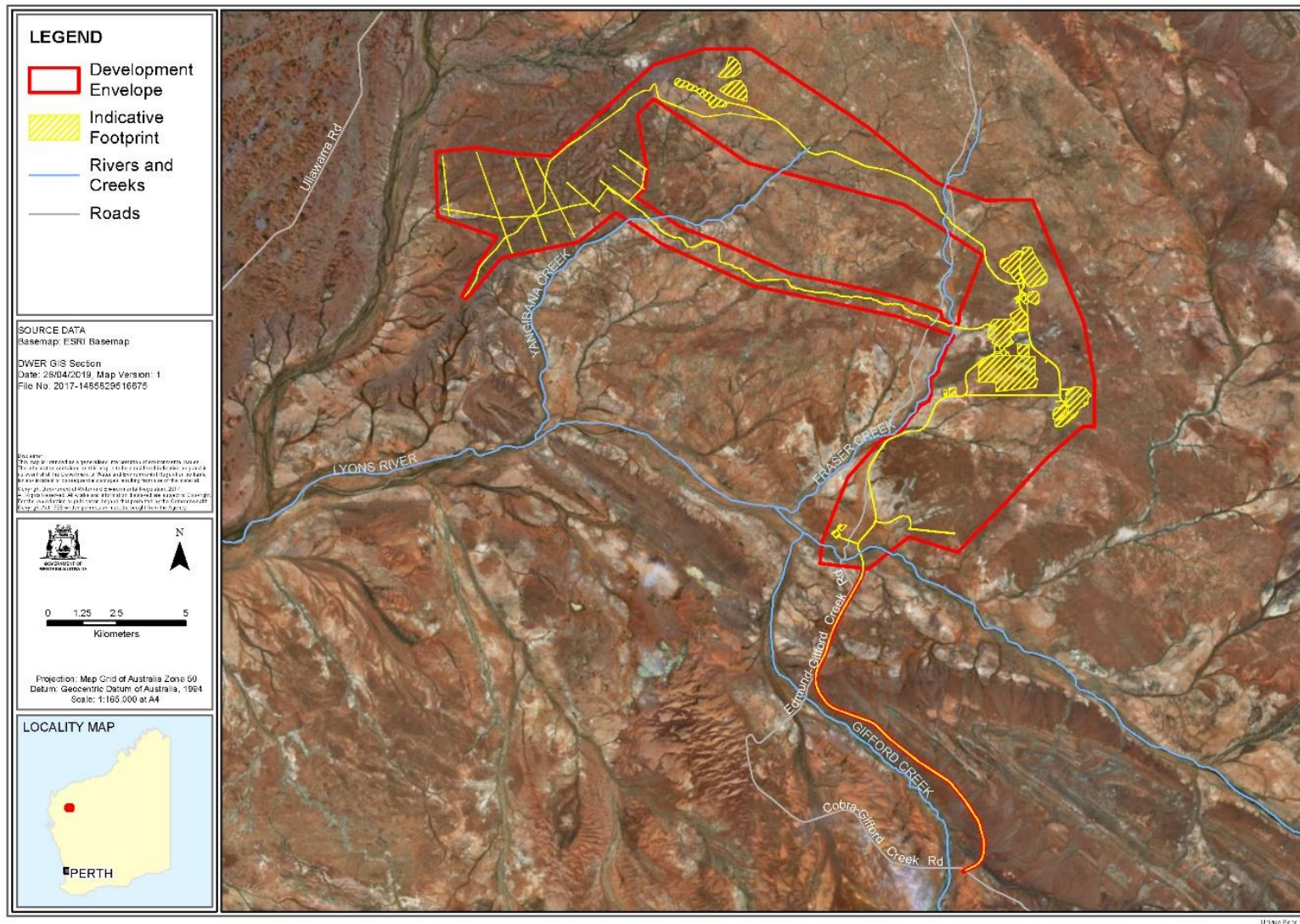


Figure 2: Yangibana development envelope and indicative footprint

2.2 Changes to the proposal during assessment

The proponent requested the EPA consent to it undertaking minor and preliminary works during assessment on 24 July 2017. The works included access road and accommodation village construction to support completion of the assessment. Clearing required for these works are included in Table 2 above

The EPA gave consent under section 41A of the EP Act to the works on 25 August 2017.

The proponent requested the EPA consent to a change to the proposal during assessment on 8 June 2018. The change was to amend the location of the airstrip and increase the capacity of the tailings storage facilities (TSFs). After this, the proponent requested the EPA consent to a change to the proposal during assessment on 28 March 2019. The change was to combine its TSFs and evaporation pond, increase the TSF capacity, and revise the deposition methodology. These changes have been included in tables 1 and 2 above.

The Chairman, as a delegate of the EPA, concluded that the changes were unlikely to significantly increase any impact that the proposal may have on the environment and gave consent under section 43A of the EP Act to the changes on 26 June 2018 and 10 May 2019 respectively.

2.3 Context

Surrounding land use

The proposal is located 270 kilometres east-northeast of Carnarvon in the Shire of Upper Gascoyne. It is within the Priority 1 *Gifford Creek, Mangaroon, Wanna calcrete groundwater assemblage type on Lyons palaeodrainage on Gifford Creek, Lyons and Wanna Stations* Priority Ecological Community (PEC). This area is a PEC because it has a diverse stygofauna community located within the Lyons paleodrainage channel. The historical land use in the area is pastoral with no other mines within a 100 km radius of the proposal.

Tenure

The Yangibana Rare Earths Project is located within tenure granted under the *Mining Act 1978* (Mining Act), comprising of exploration leases, mining leases and miscellaneous leases.

3. Consultation

The EPA advertised the referral information for the proposal for public comment in February 2017 and received one submission. The submission requested 'Assess – Referral Information'.

The proponent consulted with government agencies and key stakeholders during the preparation of the ERD. The agencies and stakeholders consulted, the issues raised and the proponent's response are detailed in Table 3-1 of its ERD (Hastings 2018a).

Six agency submissions and two public submissions were received during the public review period. The key issues raised relate to:

- potential impacts to downstream riparian vegetation from altered surface water flows during flood events
- potential impacts to the cultural heritage significance of watercourses from changes in water quality.

The proponent addressed the issues raised in the Response to Submissions document (Hastings 2019).

The EPA considers that the consultation process has been appropriate and that reasonable steps have been taken to inform the community and stakeholders about the proposed development. Relevant significant environmental issues identified from this process were taken into account by the EPA during its assessment of the proposal.

4. Key environmental factors

In undertaking its assessment of this proposal and preparing this report, the EPA had regard for the object and principles contained in s4A of the EP Act to the extent relevant to the particular matters that were considered.

The EPA considered the following information during its assessment:

- the proponent's referral information and ERD (Hastings 2018a)
- public comment received on the referral, stakeholder comments received during the preparation of the proponent's documentation and public and agency comments received during the public review of the ERD
- the proponent's response to submissions raised during the public review of the ERD (Hastings 2019)
- the EPA's own inquiries
- the EPA's *Statement of environmental principles, factors and objectives* (EPA 2016a)
- the relevant principles, policy and guidance referred to in the assessment of each key environmental factor in Sections 4.1 to 4.5.

Having regard to the above information, the EPA identified the following key environmental factors during the course of its assessment of the proposal:

- **Flora and Vegetation** – loss of flora and vegetation from clearing and indirect impacts such as altered hydrological regimes
- **Subterranean Fauna** – direct and indirect impacts to subterranean fauna as a result of mining and groundwater abstraction
- **Inland Waters** – changes to hydrological regimes as a result of mining and groundwater abstraction and, alteration of surface water flow, and groundwater and surface water quality
- **Terrestrial Environmental Quality** – contamination of surrounding soil and land from erosion, dust and reduction of tailings storage facility integrity
- **Human Health** – potential impacts to human health from radiation exposure.

The EPA considered other environmental factors during the course of its assessment of the proposal. These factors, which were not identified as key environmental factors, are discussed in the proponent's ERD (Hastings 2018a). Appendix 3 contains an evaluation of why these other environmental factors were not identified as key environmental factors.

Having regard to the EP Act principles, the EPA considered that the following principles were particularly relevant to its assessment of the proposal:

1. **The precautionary principle** – the EPA has considered whether the proponent's investigations into the biological and physical environment provide the means to assess risk and identify measures to avoid or minimise impacts.

Where greater certainty that the risks are well understood is required, the EPA has recommended conditions to ensure that certainty is provided.

2. **The principle of intergenerational equity** – the EPA has considered whether the health, diversity and productivity of the environment would be maintained or enhanced during the implementation of this proposal, with particular regard to the diversity and productivity of flora and vegetation and subterranean fauna. The EPA has recommended conditions to ensure the biological environment is maintained for the benefit of future generations.
3. **The principle of the conservation of biological diversity and ecological integrity** – the EPA has considered the impacts on Flora and Vegetation and Subterranean Fauna with particular regard to the Gifford Creek Calcrete PEC. The EPA has recommended conditions to manage the impacts on conservation significant flora and fauna so that biological diversity is maintained.

Appendix 2 provides a summary of the principles and how the EPA considered these principles in its assessment.

The EPA's assessment of the proposal's impacts on the key environmental factors is provided in Sections 4.1 to 4.5. These sections outline whether or not the EPA considers that the impacts on each factor are manageable. Section 6 provides the EPA's conclusion as to whether or not the proposal as a whole is environmentally acceptable.

Assessment on behalf of Commonwealth

The EPA assessed the proposal on behalf of the Commonwealth Minister for Environment as an accredited assessment. The EPA has addressed MNES under each relevant factor and has summarised its assessment of MNES in Section 5.

4.1 Flora and Vegetation

EPA objective

The EPA's environmental objective for this factor is *to protect flora and vegetation so that biological diversity and ecological integrity are maintained*.

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- *Environmental Factor Guideline – Flora and Vegetation* (EPA 2016b)
- *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016c)

The considerations for environmental impact assessment (EIA) for this factor are outlined in *Environmental Factor Guideline – Flora and Vegetation* (EPA 2016b).

In addition to the relevant current policy and guidance above, the EPA also had regard to flora and vegetation sampling required in *Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004).

EPA assessment

Several flora and vegetation surveys were undertaken for this project. The level 2 survey (Ecoscape 2015) – which covered an area of 50,600 ha – was generally consistent with Guidance Statement No. 51 (which was in effect at the time). However, flora sampling intensity over the development envelope was not high enough to make up for the historic lack of information about flora and vegetation in the Gascoyne IBRA bioregion and vegetation mapping was undertaken at a broad scale. A targeted survey was conducted within the access road disturbance footprint of the development envelope in April and May 2017 (Eco Logical 2018) and a targeted survey focused on the development envelope in March 2019 (Ecoscape 2019).

In having regard to the *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016c), the EPA notes that the vegetation surveys did not meet all aspects of the EPA's guidance. Surveys conducted in 2015 were of a low intensity with no targeted surveys undertaken. The 2017 survey did not target all relevant Priority Flora species and the March 2019 targeted survey was conducted for a subset of species due to the seasonal constraints (no recent rain).

The flora and vegetation surveys identified:

- No threatened ecological communities or PECs.
- No threatened flora species.
- Eleven Priority Flora species (including six significant range extensions).
- Eight significant vegetation units including one groundwater dependent ecosystem (GDE), four potential GDEs, including AcEt, and three other vegetation units considered significant in accordance with Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016c) due to their restricted distribution and likely role as refuges:
 - AtGc, which corresponds to small rocky outcrops and is habitat for *Acacia atopa* (Priority 3)
 - AaSaEs, which corresponds with clay depressions/pans and is habitat for *Goodenia berringbinensis* (Priority 4), other range extensions and is likely habitat for *Elacholoma* sp. showy flowers (C.P. Campbell 1762) (Priority 1).
 - Fs, which corresponds with sandy clay flats.

The majority (99 per cent) of vegetation within the study area was recorded in 'Good to Excellent' condition. Of the 24 introduced (weed) species identified in the survey areas two are listed as Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (Mexican Poppy and Native Thornapple) and require management. No weeds of National Significance were identified during the surveys.

Impacts

Direct and indirect impacts include:

- Clearing of up to 1,000 ha of Good to Excellent native vegetation.
- Direct impacts to GDE and potential GDE vegetation types of up to 2 per cent of the mapped extent.
- Indirect impact to potential GDE AcEt of up to 8 per cent of the mapped extent.
- Direct impacts to other significant vegetation units of up to 2 per cent, with the exception of AtGc, which would be impacted (up to 35 per cent direct of the mapped extent).
- Direct Impacts to 1 per cent of individuals of *Acacia curryana* (Priority 1) and 0.7 per cent of *Rhodanthe frenchii* (Priority 2) recorded in the study area. There is no predicted clearing of other Priority Flora.
- Introduction and spread of weeds, as well as fire.

An assessment was undertaken using the Environmental Risk from Ionising Contaminants Assessment (ERICA) software to model the radiation exposure risk to flora and fauna. The model predicted that the exposure of organisms would be below the threshold dose rate, and that the external gamma dose rate on the surface post-closure would be similar to background levels.

Mitigation and management measures

The proponent has implemented the mitigation hierarchy to:

- avoid vegetation unit AaSaEs and Fs
- minimise impacts from clearing by locating the proposal on previously disturbed areas, such as an exploration track
- limit impacts to GDEs by reducing water demand (abstraction and drawdown) through water reuse
- maintain surface water flow and minimise ponding and shadowing effects through the implementation of methods discussed in Section 4.3 (Inland Waters)
- management measures in the proposed Flora and Vegetation Management Plan that include monitoring of groundwater levels, water quality, potential GDE health and dust, as well as the control of weeds and prevention of fire.

It is noted that the proponent has predicted drawdown impacts to the potential GDE AcEt, however, AcEt is not dominated by *Eucalyptus victrix* and individuals of this species were only occasionally observed (Ecoscape 2015, 2017). Given the information above, the EPA considers that the risk of significant impacts to these vegetation units is low.

There is predicted to be a 35 per cent impact on vegetation unit AtGc. AtGc is significant because it has an apparently restricted distribution it the subject of a high proportion of clearing. The EPA considers that further surveys will demonstrate that this is likely to occur outside of the Ecoscape study area.

The EPA notes that a further 1,443 individuals of *Acacia curryana* (Priority 1) were recorded outside of the development envelope during surveys, indicating a potential regional impact of 14.67 per cent. The EPA considers that further surveys will identify more individuals and thus the species is likely to have a greater representation regionally.

The full extent and distribution of several significant flora species (which have been identified within the project area previously) have yet to be determined as the vegetation mapping was conducted on a broad scale. These species include *Elacholoma* sp. showy flowers (C.P. Campbell 1762), *Isotropis forrestii*, *Rhodanthe frenchii*, *Solanum octonum*, *Wurmbea fluvialis*, *Goodenia berringbinensis* and *Goodenia nuda*.

The EPA is aware that the indirect impact of interruption to surface regimes was not modelled and, therefore, potential impacts to flora and vegetation were not predicted in the ERD. However, measures to minimise indirect impacts including those of linear infrastructure on surface water flow are presented in the proponent's proposed Flora and Vegetation Environmental Management Plan.

The EPA recommends condition 6 is imposed to manage and minimise impacts to significant flora and vegetation (e.g. riparian vegetation and clay depressions). The recommended condition will ensure the impacts are no greater than predicted through the requirement for a targeted survey, the modelling of surface water impacts and the preparation and implementation of a Condition Environmental Management Plan (CEMP). The CEMP must include the findings of the targeted survey discussed above, address indirect impacts (including those of altered surface water flow from pits and infrastructure including TSFs), and meet EPA's guidelines for preparing environmental management plans.

The proponent has completed a Preliminary Mine Closure Plan (Hastings 2018b) the objective to ensure its rehabilitated areas support self-sustaining and resilient vegetation, and avoid any increase in the distribution or abundance of weed species in rehabilitated areas compared with undisturbed sites. Long-term impacts to vegetation and soil will be minimised by progressive rehabilitation and through topsoil stockpile management to retain the viability of local provenance native seedbank. The EPA notes that a Mine Closure Plan will be required by the Department of Mines, Industry Regulation and Safety (DMIRS) under the Mining Act.

Summary

The EPA has paid particular attention to the:

- *Environmental Factor Guideline – Flora and Vegetation* (EPA 2016b)

- the proponent's flora and vegetation investigations
- mitigation and management measures proposed to avoid and minimise disturbance to significant flora and vegetation.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Flora and Vegetation that the impacts to this factor are manageable and would no longer be significant, provided there is:

- control through authorised extent in schedule 1 of the Recommended Environmental Conditions (Appendix 4)
- implementation of measures to avoid and minimise direct and indirect impacts to significant flora and vegetation (condition 6) through:
 - a targeted flora and vegetation survey conducted under appropriate seasonal conditions
 - the modelling of impacts from altered surface water regimes
 - the preparation and implementation of a CEMP.

The EPA notes that there is a requirement for:

- submission of a Mine Closure Plan to the DMIRS under the Mining Act
- licensing of emissions and discharges from prescribed activities by the Department of Water and Environmental Regulation (DWER) under Part V of the EP Act
- licensing of water abstraction by the DWER under the *Rights in Water and Irrigation Act 1914* (RIWI Act).

4.2 Subterranean Fauna

EPA objective

The EPA's environmental objective for this factor is *to protect subterranean fauna so that biological diversity and ecological integrity are maintained.*

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- *Environmental Factor Guideline – Subterranean Fauna* (EPA 2016d)
- *Technical Guidance – Subterranean Fauna Surveys* (EPA 2016e)
- *WA Environmental Offsets Policy* (Government of Western Australia 2011)
- *WA Environmental Offsets Guidelines* (Government of Western Australia 2014).

The considerations for EIA for this factor are outlined in *Environmental Factor Guideline – Subterranean Fauna* (EPA 2016d).

EPA assessment

The proposal is partly located within an area the Department of Biodiversity Conservation and Attractions (DBCA) has listed as a Priority 1 PEC Gifford Creek Calcrete. The stygofauna within this PEC are considered to have unique assemblages within the groundwater calcretes.

A number of studies were undertaken on behalf of the proponent which include the subterranean fauna reports (Ecoscape 2016 and Bennologia 2018), and the hydrogeological assessments (Global Groundwater 2016; GRM 2017, 2018a).

The EPA considers that the surveys undertaken for subterranean fauna meet the requirements of the *Technical Guidance Subterranean Fauna Surveys* (EPA 2016e).

Stygofauna

The Gifford Creek Calcrete PEC comprises unique assemblages of invertebrates (stygofauna) that have been identified in a network of shallow calcrete aquifers associated with major drainage lines, such as the Lyons River, Fraser Creek and Yangibana Creek covering an area of 296,142 ha).

Surveys identified at least 80 stygofauna species in the broader Gifford Creek Calcrete PEC. About 50 of these are not known elsewhere and are probably restricted to the PEC. These findings support the Priority 1 listing and demonstrate that the Gifford Creek Calcrete PEC hosts a highly diverse stygofaunal assemblage.

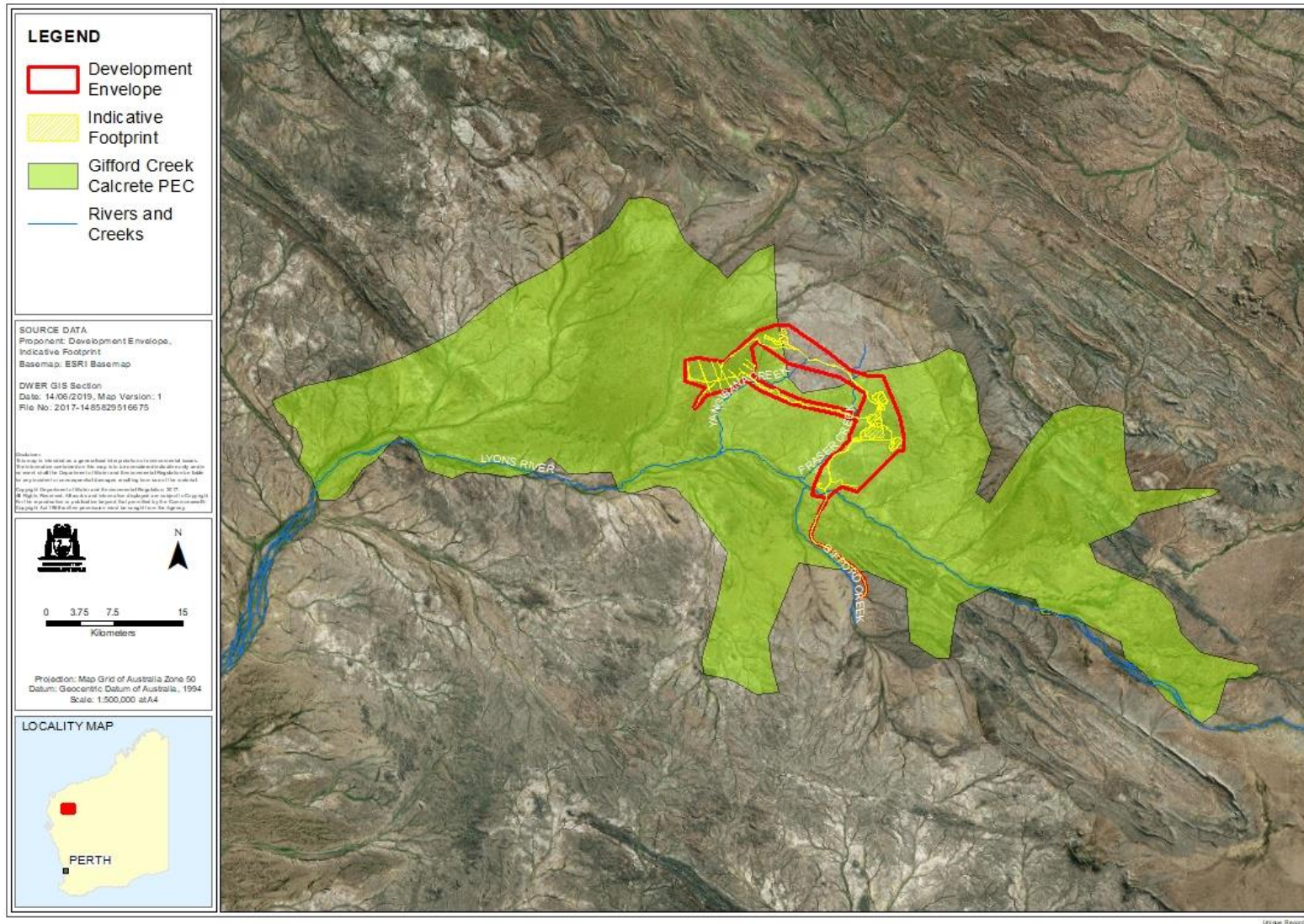


Figure 3: Yangibana development envelope and Gifford Creek Calcrete PEC

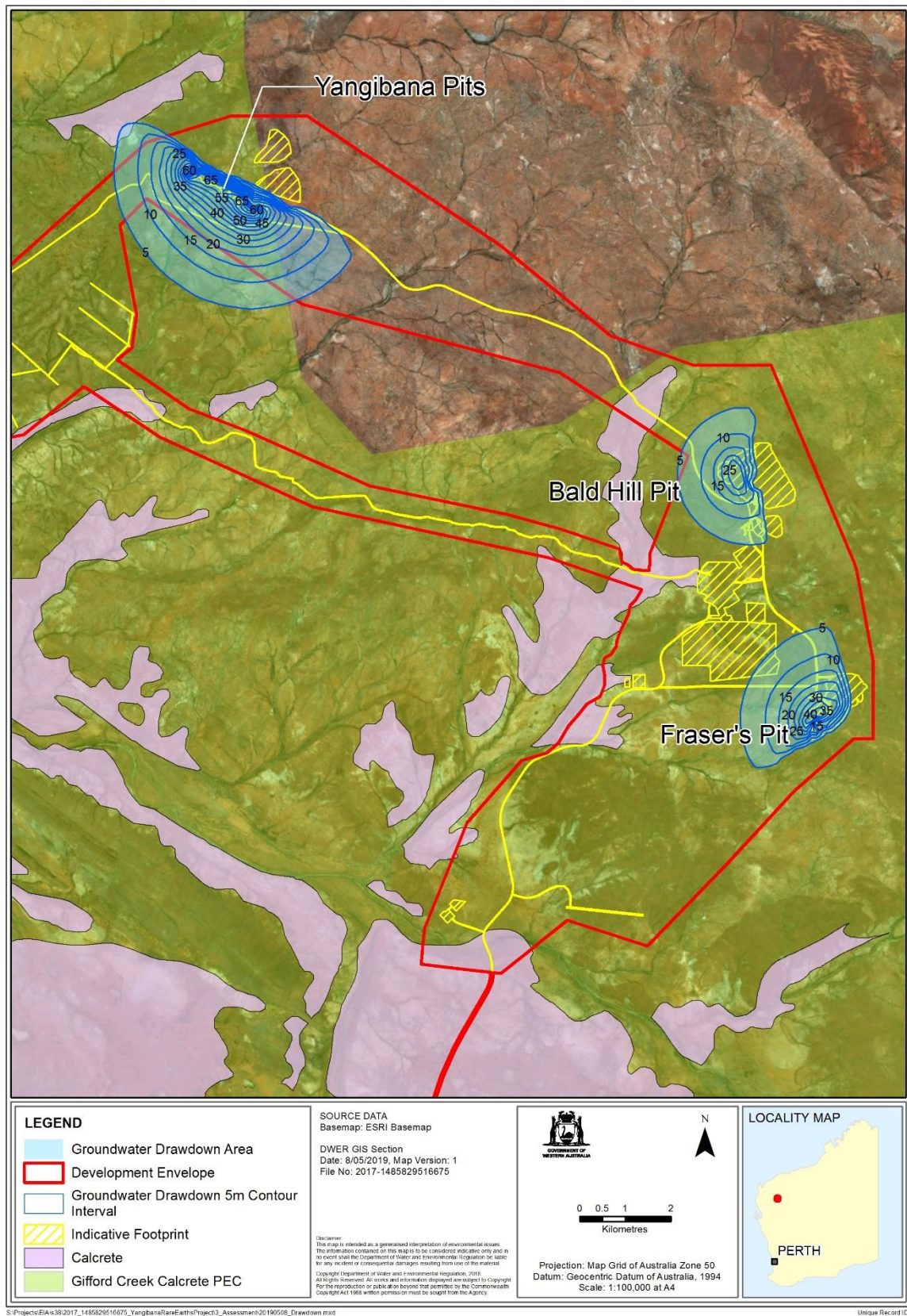


Figure 4: Groundwater drawdown from Yangibana West and North Pits extending beneath a local calcrete aquifer

Stygofauna impacts

Likely impacts to stygofauna are loss of habitat, mortality and alterations to habitat due to groundwater abstraction and drawdown.

The surveys and investigations undertaken on behalf of the proponent predicted that:

- Eight of the 80 identified stygofauna species were recorded in mine pits or predicted areas of groundwater drawdown associated with the pits. The mine pit areas intersect stygofauna habitat that is not composed of calcrete.
- Seven of the eight species are common species that are widespread outside the study area. The remaining species is considered endemic to the PEC and was recorded in moderate abundance throughout the study area and reference areas (Bennelongia 2018).
- No stygofauna specimens were recorded from the SipHon Well borefield and associated water drawdown areas, which intersect a deep sand aquifer that is unlikely to be stygofauna habitat.
- There will be a loss of 116 ha (0.05 per cent) of low value (no calcrete) Gifford Creek Calcrete PEC.
- At the end of mining there will be a 5m drawdown contour from Yangibana West pit underlying a local calcrete aquifer outcrop to the north of the pit (Figure 4).

Mitigation and management

The proponent has addressed the mitigation hierarchy by committing to:

- avoid dewatering the Gifford Creek Calcrete PEC
- no significant groundwater abstraction from an aquifer with direct hydraulic connection to the Gifford Creek Calcrete PEC
- minimise impacts to stygofauna by limiting groundwater abstraction to meet operational requirements and collecting and reusing water where possible.

The EPA notes that the eight species located in the mine pit areas and predicted drawdown contours are found outside the study area with the smallest known range of about 1,000 km². Given this, the EPA considers that habitat for these stygofauna species extends outside the proposed project area.

The EPA notes that the proponent has committed to avoiding dewatering the Gifford Creek Calcrete PEC or any aquifer with a direct hydraulic connection.

Based on the isotopic analysis and hydrogeological assessment (GRM2018a) the proponent has concluded that direct connectivity is unlikely between the local calcrete outcrop aquifer and the fractured rock aquifer of the Yangibana West pit (Figure 4). The proponent considers that any potential impact from drawdown (as a result of the Yangibana West pit) beneath the calcrete outcrop would not be significant. 'Significant' is defined as 'drawdown greater than 5 m over an area greater than 50 per cent of the identified local [calcrete] outcrop'.

DBCA has advised that the proponent is likely to be able to effectively manage the potential impacts from drawdown on the Gifford Creek Calcrete PEC – subject to full implementation of the proposed avoidance measures.

Given the Gifford Creek Calcrete PEC is one of the most diverse stygofauna assemblages in Western Australia, the EPA recommends condition 7 be imposed to ensure that actual drawdown is consistent with the model predictions. The EPA also notes the proponent's commitment to avoid dewatering the calcrete aquifer to support the PEC and considers this will be ensured by abstraction being limited through the authorised extent in schedule 1 of the recommended conditions.

The EPA notes that the proposal will result in the loss of 0.05 per cent of low value habitat from the Gifford Creek Calcrete PEC. Given the predicted residual impacts on the biological diversity of stygofauna and habitat is not significant, the EPA does not require an offset.

Troglofauna

The surveys (Ecoscape 2016; Bennelongia 2018) identified 15 species, seven of which were located within the proposed mine pits. Two of these seven species are considered to be widespread.

Bennelongia (2018) found that yields of troglofauna were low for both abundance and species per sample, and it that the project area had a low-to-moderately diverse troglofaunal assemblage.

Impacts

Mining may result in the loss of individuals, reduced troglofauna habitat and a reduction in habitat humidity levels due to groundwater abstraction.

The proposal will result in impacts to the following five troglofauna species that are considered to be restricted:

- *Schendylidae* sp. – located at the Frasers and Yangibana proposed pits
- *Chilenophilidae* sp. B09 – located at the Frasers and Yangibana proposed pits
- *Parajapygidae* sp. 41 – located at the Yangibana North proposed pit
- *Troglarmadillo* sp. B60 – located at the Frasers proposed pit
- *Scutigerella* sp. B09 – located at the Bald Hill proposed pit

Mitigation and management

As discussed above the proponent has committed to minimising groundwater abstraction, which will limit impacts on the humidity of troglofauna habitat.

The EPA note that the information the proponent has provided (Hastings 2018a, 2019) illustrates the likely connectivity of habitat between the locations where *Parajapygidae* sp. B4, *Troglarmadillo* sp. B60 and *Scutigerella* sp. B09 were collected and non-impact

areas outside of the proposed pit boundaries. The EPA therefore considers it is unlikely the proposal would substantially impact on these taxa.

The proponent's view is that the two *Schendylidae* sp are the same taxon and the two *Chilenophilidae* sp. are the same taxon (Bennelongia 2018). The rationale for this conclusion is reasonable although it is not supported by adequate evidence. The specimens were too damaged to provide certain identification on a morphological or genetic basis and it remains possible that these specimens represent a total of four taxa known only from the impact areas. Given the above the EPA considers that impacts to four taxa (*Schendylidae* sp. (Frasers), *Schendylidae* sp. (Yangibana), *Chilenophilidae* sp. (Frasers) and *Chilenophilidae* sp. B09 (Yangibana)) should be assessed.

Based on expert advice (Ecoscape 2016; Bennelongia 2018, 2019) the proponent considers that suitable habitat for the *Schendylidae* and *Chilenophilidae* taxa occurs outside the impact areas as follows:

- Several vuggy lithology types (weathered granite, ironstone and sometimes saprolite) were identified in the pits which are consistent across the landscape.
- Lithologies containing these habitat types occur between the pits where these taxa were found.
- The other troglotauna identified above (*Parajapygidae* sp. B41 and *Troglarmadillo* sp. B60, *Scutigera* sp. B09) were found in vuggy granite.

The EPA notes some uncertainty about the geological stratum from which the taxa were sampled and therefore the extent of the habitat. Expert advice indicates that the *Schendylidae* and *Chilenophilidae* taxa are not likely to be restricted to the proposal's impact areas. As a result, their biological diversity is unlikely to be significantly impacted by the proposal.

Based on the evidence presented above, the EPA considers that the risk to these taxa is low given their habitat is likely to extend beyond the pit boundaries.

Summary

The EPA has paid particular attention to the:

- *Subterranean Fauna and Technical Guidance – Subterranean Fauna Surveys* (EPA 2016e)
- The proponent's subterranean fauna investigations
- the loss of 0.05 per cent of low value habitat in the Gifford Creek Calcrete PEC
- the eight species of stygofauna located in the mine pits (not calcrete habitat) are not restricted to the impact area
- the likely connectivity of habitat for troglotauna
- proponent's application of the mitigation hierarchy, which includes its commitment to avoid abstracting water from Gifford Creek Calcrete PEC to minimise the impacts of drawdown.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Subterranean Fauna, the impacts to this factor are manageable and would no longer be significant, provided there is:

- control through authorised extent in schedule 1 of the Recommended Environmental Conditions (Appendix 4)
- implementation of condition 7 to ensure that impacts on the local calcrete outcrop associated with the Gifford Creek Calcrete PEC are not significant.

4.3 Inland Waters

EPA objective

The EPA's environmental objectives for this factor are *to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected*.

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- *Environmental Factor Guideline – Inland Waters* (EPA 2018a).

The considerations for EIA for this factor are outlined in *Environmental Factor Guideline – Inland Waters* (EPA 2018a).

EPA assessment

Surface water

The hydrology assessment (JDA 2016) identified that most mining areas and infrastructure occur outside of flood impact areas and would be unaffected by flooding or impact flood regimes.

Groundwater

Investigations undertaken on behalf of the proponent include a hydrogeological appraisal (Global Groundwater 2016; GRM 2017), and hydrogeological assessments of the fractured rock aquifers (GRM 2018a) and paleochannel tributary (GRM 2018b).

The investigations show that the proposed mine pits contain semi-confined fractured rock aquifers. Dewatering of mine pits and the use of bores in fractured rock aquifers will provide operational water. This will be supplemented with water from the paleochannel tributary groundwater of the SipHon Well borefield. The paleochannel tributary aquifer has been identified as confined, with possible slight leakage.

Direct dewatering of the calcrete aquifer associated with the Gifford Creek Calcrete PEC will be avoided. Any potential indirect impacts to this aquifer will be addressed under Section 4.2 (Subterranean Fauna) of this report. The potential impact of

groundwater drawdown on GDEs is addressed in Section 4.1 (Flora and Vegetation) of this report.

Water quality

As noted in Section 2.2, the proposal was amended in May 2019 so that the TSFs and evaporation pond discussed in the ERD were combined as follows:

- TSF 1 and TSF 2 combined to Beneficiation TSF
- TSF3 and evaporation pond combined to Hydromet TSF.

The geochemical testing found the waste rock was benign geochemically and non-acid forming (NAF) (Trajectory and Graeme Campbell 2016; Hastings 2018c; JRHC 2019). The tailings of the Beneficiation TSF were also considered to be benign with slight to moderate enrichments of metals (fluoride and molybdenum) in the solid tailings and contact waters. Static leach testing showed that over time, soluble fluoride and molybdenum concentrations were reduced to below (TSF1) and near (TSF2) Australia's livestock drinking water quality guideline (ANZECC and ARMCANZ 2000). The tailings for the Hydromet TSF were found to be slightly acidic and NAF with high levels of the salt, magnesium sulphate (MgSO_4), thus exceeding the livestock drinking water quality guideline. Elevated levels of fluoride in pore water were also found, along with elevated molybdenum in tailings solids.

The tailings in the Beneficiation TSF have an average radionuclide level of 0.8 becquerels per gram (Bq/g) with rates up to 1.4 Bq/g for short periods during commissioning and ramp-up. The predicted levels before the TSFs were combined were less than 1 Bq/g for TSF 1 and 4 Bq/g for TSF2. Tailings of the Hydromet TSF had elevated average levels of radionuclides (33 Bq/g). Radionuclides in pore water were shown to be negligible to very low (same range as that recorded in regional pastoral bores, 0.003–0.165 mg/L).

Impacts

The following modelling and investigations were undertaken on behalf of the proponent:

- Pit lake modelling was run for a number of climate scenarios over 500 years (GRM 2018a). The modelling shows that the water level in the five open mine pits will rise and reach an equilibrium after 20 years, that the pits act as groundwater sinks and that the salinity will rise from fresh to brackish over 500 years (900 to 4,000 mg/L total dissolved solids (TDS)) to saline (about 34,000 mg/L TDS) due to evapo-concentration.
- TSF design reports (ATC Williams 2017; GHD 2019) considered the design specifications and location on impermeable granite bedrock when undertaking seepage modelling. The modelling indicates that vertical seepage is unlikely to occur and horizontal seepage is expected to remain within the TSF footprint for the life of the project. Therefore, confined groundwater located beneath the granite bedrock is unlikely to be affected.

Mitigation and management

Proponent has applied the mitigation hierarchy to avoid and minimise impacts on inland waters by:

- avoiding disturbance (except for a road crossing) within 150 m of Yangibana and Fraser creeks
- locating infrastructure out of the flood plain (which includes locating the TSF at a higher elevation within the water catchment outside of the flood zone for a 100 year annual return interval rainfall event)
- ensuring drawdown impacts associated with dewatering (mine pits and SipHon Well borefield) will not affect other groundwater users
- designing the TSF to ensure no long-term impacts on surface and groundwater
- inspection of the TSF to ensure stability is maintained.

The EPA notes that the proponent must obtain a ‘bed and banks’ permit under the RIWI Act to ensure surface water flow is maintained and erosion is minimised for all river, creek and drainage channel crossings. Industry-standard management measures will be undertaken to divert overland flow around mine pits, the TSF, Waste Rock Landforms (WRLs) and infrastructure so that surface water regimes are maintained.

The EPA notes the DWER will regulate the processing of ore and any emissions and waste from this, including the TSF under Part V of the EP Act.

The proponent has applied geochemical testing methodologies that are commonly used to assess the risks of chemical constituents leaching from mine-wastes at hard-rock mine sites. The DWER has advised that the proponent should carry out further kinetic testing of waste rock and tailings to fully characterise the risks of metals being mobilised from mine-wastes and leached into the surrounding area due to the unusual mineralogy of the deposits in the project area.

The proponent has committed to a program of further kinetic testing of mine waste to determine the risk that mining and mineral processing in the area could increase the concentrations of chemical constituents in the surrounding environment including groundwater.

The EPA notes the site has unusual geology (i.e. rare earth mine) and further testing – during the life of the mining operation – of host rock, waste rock and tailings material should be undertaken, such as kinetic tests and sequential-extraction leaching tests. These tests will identify what the long-term leachate from these sources is likely to contain and will be particularly useful for management and modelling post-closure scenarios.

The DMIRS has advised the EPA that it can regulate rehabilitation and closure of the proposal and the proponent is required to submit a mining proposal and Mine Closure Plan to the DMIRS before development of the proposal.

The EPA considers that the proponent has provided enough information to show that the TSF can manage tailings disposal and that the DWER and DMIRS can regulate the TSF adequately.

Summary

The EPA has paid particular attention to the:

- *Environmental Factor Guideline – Inland Waters* (EPA 2018)
- hydrological and hydrogeological investigations conducted within a local and regional context
- the design of the proposal whereby changes to natural drainage and groundwater impacts are minimised
- the proponent's application of mitigation hierarchy to avoid impacts to water regimes through the specific location of infrastructure across the site where possible.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Inland Waters that the impacts to this factor are manageable and would no longer be significant, provided there is:

- control through authorised extent in schedule 1 of the Recommended Environmental Conditions
- implementation of condition 7 to ensure that impacts on the local calcrete outcrop associated with the Gifford Creek Calcrete PEC are not significant, as discussed in Section 4.2.

The EPA notes requirements for:

- a permit to interfere with the bed and banks of a watercourse from the DWER under the RIWI Act
- a licence to abstract water from the DWER under the RIWI Act
- works approval and licensing (including processing, sewage treatment and landfill) from the DWER under Part V of the EP Act
- submission of a Mine Closure Plan to the DMIRS under the Mining Act and that the plan would need to be reviewed and updated every three years.

4.4 Terrestrial Environmental Quality

EPA objective

The EPA's environmental objective for this factor is *to maintain the quality of land and soils so that environmental values are protected*.

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- *Environmental Factor Guideline – Terrestrial Environmental Quality* (EPA 2016f)

The considerations for EIA for this factor are outlined in *Environmental Factor Guideline – Terrestrial Environmental Quality* (EPA 2016f).

EPA assessment

Most of the project area is underlain by granitic rocks (Global Groundwater 2016) with intrusions of the Gifford Creek Ferrocarbonatite Complex (ironstone) dykes. These dykes contain the REE bearing mineral phosphate monazite which contains low levels of thorium and uranium and their decay progeny as Naturally Occurring Radioactive Materials.

The REE ore has evaluated levels of radiation (0.9 $\mu\text{Sv/h}$): this is concentrated through the waste stream at processing and through to tailings in the TSF.

Geochemical characterisation (Trajectory and Graeme Campbell 2016) of the waste rock indicates that it is NAF. The proponent undertook sampling of waste rock to determine radiation content. This showed that a small proportion of waste rock (8 to 9 per cent) had slightly elevated naturally occurring radionuclide levels (thorium elevated near mineralisation with uranium levels consistently low).

Impacts

Potential contamination of surrounding soil and land could occur as a result of:

- Disturbance and dispersal of saline, sodic and alkaline soils. The soils assessment identified 5 per cent (61 ha) of the soil to be disturbed as Plain Soil, with most of the project area located on Hill Soil (about 95 per cent, 1,173 ha).
- WRL landform erosion
- Dust generated from the run of mine (ROM) pad storing the REE ore and TSF (which would have elevated radiation levels) and dust from the processing plant (which would contain processing reagents, chemicals etc.).
- Reduction of TSF integrity.

The potential for tailings stored in the TSF to affect groundwater via the soil profile is addressed in Section 4.3 (Inland Waters) of this report.

Mitigation and management

Proponent's application of the mitigation hierarchy includes the following measures to minimise impacts to terrestrial environmental quality:

- The Plain Soil removed for the construction of some linear infrastructure will be stockpiled and signposted and finally buried in one of the four borrow pits (once they have been utilised) or in the WRL.

- Waste rocks with elevated radiation levels will be covered with benign rock materials in WRLs. The radionuclide levels in the waste rocks will be, on average, lower than the 1 Bq/g threshold¹.
- Ongoing characterisation and management of waste rock will be undertaken to ensure erosive materials are not used on surface slopes of WRLs.
- The generation of dust will be minimised through the proponent's proposed management measures. The processing plant and TSFs will remain wet during operations to minimise the risk of dust generation. During closure, dust management measures – such as surface spraying or temporary cover – will be put in place while allowing tailings to consolidate before capping. Dust generation from the ROM pad will be prevented by management measures such as covers, surface sprays and sprinklers on the ore stockpiles.
- The landform evolution studies (Trajectory 2017, 2019) were conducted for the TSF under a range of climatic events. The proponent incorporated the studies' recommendations into its design to maintain TSF integrity over the long-term (at least 1,000 years).

The EPA notes that the clearing undertaken for minor and preliminary works under s41A of the EP Act disturbed about half of the 5 per cent (61 ha) of Plain Soil discussed above. The EPA considers that the amount of Plain Soil to be affected by the proposal is relatively small, and that the proponent will manage and minimise the risk of impact to surrounding soils through its proposed management measures.

The EPA also notes that an objective of the proponent's preliminary Mine Closure Plan (Hastings 2018b) is to design WRLs that are safe, stable and non-polluting. These will be rehabilitated with local provenance species and ecological communities.

Given the management measures outlined above, the EPA considers that potential dust generation from the ROM, processing facilities and TSF would not significantly affect Terrestrial Environmental Quality. The impacts of dust containing alpha particles (radioactive) on human health are discussed in Section 4.5 of this report.

As discussed in Section 4.3, a geochemical analysis of the tailings was conducted. The proponent also identified potential pathways of the tailings into the environment.

The DWER has advised that the proponent should consider the soil pathway for the migration of metals into the ecosystems from mine waste disposal areas (TSF and WRL) after closure. Chemical constituents of concern, such as the readily bio-accumulated molybdenum and tungsten, may be taken up by vegetation and soil-fauna in soils – leading to metals entering local foodwebs.

The proponent has committed to a research program to further understand the release of metals from mine waste associated with REE mining and processing (Hastings 2019).

¹ The *National Directory for Radiation Protection Radiation Protection Series Publication No. 6* (ARPANSA 2017) exempts exposures from materials containing radionuclides of natural origin from radiation protection legislation where the concentration of each radionuclide is below 1 Bq/g.

The DMIRS has advised that based on the information and approaches presented, it is likely the project can be operated and closed to minimise environmental liabilities post-closure.

The EPA notes that the proponent will be required to submit a mining proposal with a Mine Closure Plan to the DMIRS for assessment under the Mining Act. The EPA considers that rehabilitation and decommissioning can be adequately assessed under the Mining Act. The EPA recommends the DMIRS asks for further geochemical testing, including sequential extraction and leaching tests during the life of the mine, to develop closure strategies to ensure REE phosphate minerals in mine wastes do not cause environmental harm through the soil pathway after closure.

The EPA is also aware that the TSF will be regulated by the DWER under Part V of the EP Act and, if required, the TSF will be remediated under the *Contaminated Sites Act 2003* (Contaminated Sites Act) post closure.

Summary

The EPA has paid particular attention to the:

- *Environmental Factor Guideline – Terrestrial Environmental Quality* (EPA 2016f)
- the proponents proposed management measures to minimise the dispersal of saline sodic soils
- proposed measures to minimise dust
- WRL designed to be safe, stable and non-polluting
- TSF design to ensure long-term integrity
- potential for chemical constituents of concern to be mobilised and bio-accumulated from mine waste facilities.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Terrestrial Environmental Quality that the impacts to this factor are manageable and would no longer be significant, provided there is:

- control through authorised extent in schedule 1 of the Recommended Environmental Conditions (Appendix 4)
- further geochemical testing including sequential extraction and leaching tests during the life of the mine.

The EPA notes requirements for:

- licensing from the DWER under Part V of the EP Act
- Remediation, from the DWER under, the Contaminated Sites Act if a contaminated site is identified

- submission of a Mine Closure Plan to the DMIRS under the Mining Act and that the mine closure plan would need to be reviewed and updated every three years.

The EPA's view is that the requirements for this proposal can be adequately regulated through the Mining Act, Part V of the EP Act and the Contaminated Sites Act, rather than a condition under Part IV of the EP Act.

4.5 Human Health

EPA objective

The EPA's environmental objective for this factor is *to protect human health from significant harm*.

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- *Environmental Factor Guideline – Human Health* (EPA 2016g)

The considerations for EIA for this factor are outlined in *Environmental Factor Guideline – Human Health* (EPA 2016g).

EPA assessment

The proposal is to mine REE ore, which contains naturally elevated concentrations of uranium and thorium. Baseline surveys conducted on behalf of the proponent have demonstrated that background radiation levels in the proposal area are elevated near the ore, which is comparable with other REE mining regions of Australia. These levels are above the average total natural background dose of radiation to people living in Australia which is 1.5 millisieverts per year (mSv/y).

Impacts from mining of REE to Flora and Vegetation, and Terrestrial Environmental Quality are discussed under Sections 4.1 and 4.4 respectively so have not been considered here in detail.

Impacts

Mining of ore will disturb areas that contain elevated concentrations of uranium and thorium or other elevated radionuclides. The potential impact of radiation exposure to humans occurs through four main exposure pathways:

- gamma irradiation and absorption, from a person being near material with elevated radioactive levels
- inhalation of radon decay products and thoron decay products
- inhalation of radionuclides in dust
- ingestion of animals or plants that have come in contact with emissions.

A number of studies were undertaken on behalf of the proponent to produce a baseline radiation level (RadPro 2016a), characterise the radiation waste (Rad Pro 2016b; JRHC Enterprises 2016) and conduct a radiation impact assessment (JRHC Enterprises 2016, 2019).

Naturally occurring concentrations of radionuclides will increase with each stage of the process. The radiation impact assessments predict the following combined dose rates for full time (2,000 hours per year) employees would not exceed:

- 1.2 mSv/y – mine workers
- 0.7 mSv/y - beneficiation plant workers
- 6.8 mSv/y - hydrometallurgical plant workers.

Beneficiation and hydrometallurgical plant workers would also work in the TSF where the waste streams are kept.

The radiation impact assessments predict a total dose rate for other workers, such as administrative staff and truck workers, to be less than 1 mSv/y.

The radiation impact assessments also demonstrated that the exposure pathways for people at sensitive receptors would be through the inhalation of radon gas and ingestion of local food. Total dose rates at sensitive receptors during operation are predicted to be:

- accommodation village – 0.006 to 0.007 mSv/y based on 4,000 hours of occupancy
- Gifford Creek Station – 0.002 mSv/y based on 100 per cent occupancy per year
- Edmund Station homestead – 0.004 to 0.006 mSv/y based on 100 per cent occupancy per year.

Mitigation and management

To reduce impacts on workers and members of the public, the proponent proposes to minimise impacts through various methods, which include:

- Locating and designing the TSF to reduce the risk of exposure pathways for members of the public, which will be monitored for effectiveness.
- Implementing the Radiation Management Plan (Hastings 2016a) to monitor radiation, implement contingency actions to ensure human health – radiation exposure below the occupational limit of 20 mSv/a – and minimise dust emissions.
- Managing dust emissions, including:
 - the use of wet processes
 - maintaining ‘wet’ tailings during operations to eliminate dust and ensure radiation dose rates are negligible

- progressive covering of drying tailings during decommissioning.

Management measures to reduce dust to as low as reasonably achievable are further discussed in Section 4.4 (Terrestrial Environmental Quality) of this report.

The proponent intends to design the TSF covers to control of radiation emission at closure, so that the radiation levels are no greater than background. The proponent has considered a number of TSF cover types and thicknesses for the different facilities. The final design will take into account advice of the Radiation Council and the DMIRS.

In schedule 1 of the Radiation Safety (General) Regulations 1983, the regulatory public dose limit above background is 1 mSv/yr and the regulatory occupational dose limit is 20 mSv/yr above background. Given the levels predicted by the studies, the EPA considers it is highly unlikely that workers or members of the public would be exposed to levels above the annual occupational and public dose limits.

The proponent will manage and monitor potential impacts to human health under the Radiation Management Plan. This plan will ensure that exposure to radiation is reduced to 'as low as reasonably achievable' to ensure no unacceptable health risk to people. The Radiation Management Plan is required and regulated by the Radiological Council under the *Radiation Safety Act 1975* (Radiation Safety Act) and the DMIRS under the *Mines Safety and Inspection Act 1994* (Mines Safety and Inspection Act) and associated Mine Safety and Inspection Regulations 1995. Part 16 of these regulations also requires adequate waste management which the proponent has addressed in its Radiation Waste Management Plan (Hastings 2016b). The Radiation Council has advised that the risks associated with radiation can be adequately monitored and managed under the Radiation Management Plan. The DMIRS has also advised that it is likely that the project can be operated and closed to minimise environmental impacts post-closure.

Summary

The EPA has paid particular attention to the:

- *Environmental Factor Guideline – Human Health* (EPA 2016g)
- the remote location of the proposal site
- the radiation impact assessment identifying potential exposure below dose limits
- the proposed mitigation and management measures.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Human Health that the impacts to this factor are manageable and would no longer be significant, provided there is:

- control through authorised extent in schedule 1 of the Recommended Environmental Conditions (Appendix 4)

The EPA notes that the preparation of a Radiation Management Plan that addresses the above points is a statutory obligation (not a discretionary decision) under regulation 16.7 of the Mines Safety and Inspection Regulations 1995. The DMIRS and the Radiological Council have both confirmed that they require a Radiation Management Plan to be submitted for approval.

The EPA's view is that the potential impacts to human health as a result of this proposal can be adequately regulated through the Mines Safety and Inspection Regulations 1995 and the Radiation Safety Act, rather than a condition under Part IV of the EP Act.

5. Matters of National Environmental Significance

The Commonwealth Minister for the Environment has determined that the proposal is a controlled action under the EPBC Act as it is likely to have a significant impact on one or more MNES. It was determined that the proposed action is likely to have a significant impact on the following matters protected by the EPBC Act:

- Nuclear actions (sections 21 and 22A)

The EPA has assessed the controlled action on behalf of the Commonwealth as an accredited assessment under the EPBC Act.

This assessment report is provided to the Commonwealth Minister for Environment who will decide whether or not to approve the proposal under the EPBC Act. This is separate from any Western Australian approval that may be required.

Commonwealth policy and guidance

The EPA had regard to the following relevant Commonwealth guidelines, policies and plans during its assessment:

- *National Waste Policy: Less Waste, More Resources* (Department of the Environment, Water, Heritage and the Arts 2009)
- *Guide for Radiation Protection of the Environment* (ARPANSA 2015).

EPA assessment

The EPA notes that the proponent has given attention in the ERD to the intent of Commonwealth policy, guidelines and plans considered to be relevant for this matter.

Impacts to the environment are covered under the key environmental factors of Flora and Vegetation, Inland Waters, Terrestrial Environmental Quality, Human Health.

Nuclear actions

The EPA's assessment of the proposal's likely environmental impacts is provided in Section 4 of this report. In particular, the EPA has assessed the potential impacts of radiation on people in Section 4.5 (Human Health) and Section 4.4 (Terrestrial Environmental Quality), as well as in sections 4.1 and 4.3 (Flora and Vegetation and Inland Waters). See Appendix 4 for the EPA's consideration of other aspects of the environment not discussed in Section 4.

A permit will be required for the site, along with a Radiation Management Plan to ensure that exposure to radiation is eliminated or reduced to 'as low as reasonably achievable', in accordance with the Radiation Safety Act. A Radioactive Waste Management Plan will also be required under the *Mines Safety and Inspection Regulations 1995*.

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Summary

The EPA has paid particular attention to:

- environmental factor guidelines for Human Health (EPA 2016g), Terrestrial Environmental Quality (EPA 2016f), Flora and Vegetation (EPA 2016b) and Inland Waters (EPA 2018)
- the radiation impact assessment identifying potential exposure below dose limits
- the proposed mitigation and management measures.

The EPA considers, having regard to the relevant EP Act principles and environmental objectives for human health, terrestrial environmental quality, flora and vegetation and Inland waters that the impacts to this factor are manageable and would no longer be significant, provided there is:

- appropriate management of radiation through the implementation of a Radiation Management Plan and Radiation Waste Management Plan required under the Mines Safety and Inspection Regulations 1995 and the Radiation Safety Act
- appropriate management of the Mine Closure Plan required under the Mining Act.

The EPA's view is that the impacts from the proposal on the above listed MNES are therefore not expected to result in an unacceptable or unsustainable impact on the environment.

6. Conclusion

The EPA has considered the proposal by the proponent to develop the Yangibana Rare Earths Project, located 270 km east-northeast of Carnarvon.

Application of mitigation hierarchy

Consistent with relevant policies and guidance, the proponent has addressed the mitigation hierarchy by identifying measures to avoid, minimise and rehabilitate environmental impacts including:

- avoiding significant vegetation unit AaSaEs and Fs
- avoiding directly dewatering the Gifford Creek Calcrete PEC
- avoiding disturbance (with the exception of a road crossing) within 150 m of Yangibana and Fraser creeks
- minimising impacts to surface water flow and, as a result, flora and vegetation through:
 - the placement of infrastructure outside of flood impact areas
 - construction of linear infrastructure across river, creek and drainage channel crossing in accordance with a ‘bed and banks’ permit required under the RIWI Act
 - implementation of management measures to divert overland flow around pits, TSF, WRL and other infrastructure
- minimising impacts to groundwater, groundwater dependent vegetation, and subterranean fauna by limiting groundwater abstraction and the reusing of water where possible
- minimising impacts to the quality of soils by limiting clearing of the saline, sodic and alkaline Plain Soil and implementation of management measures
- minimisation of exposure pathways through the soil and groundwater, and for members of the public through the location and design of the TSF
- managing weeds where increases in diversity or extent are identified as a result of the proposal
- managing rehabilitation and closure under the Mining Act
- managing dust emissions through the use of wet processes, wet tailings and the progressive covering of the TSF
- managing the potential impacts to human health from radiation exposure in accordance with the Mines Safety and Inspection Regulations 1995 and the Radiation Safety Act.

Conclusion

The EPA has taken the following into account in its assessment of the proposal as a whole, including the:

- impacts on all the key environmental factors
- our confidence in the proponent's proposed mitigation measures
- relevant EP Act principles and our objectives for the key environmental factors
- our view that the impacts to the key environmental factors are manageable, provided the recommended conditions are imposed.

Given the above, the EPA has concluded that the proposal is environmentally acceptable and therefore recommends that the proposal may be implemented subject to the conditions recommended in Appendix 4.

7. Other advice

Terrestrial Environmental Quality – TSF

The EPA notes that the proponent has undertaken commonly used geochemical testing methodologies. The DWER has advised that further testing should be required, not only because the Yangibana deposits contain unusual mineralogy, but also to determine whether a post-closure soil pathway is likely.

The EPA recommends that, under the Mining Act, the DMIRS asks for further geochemical testing – including sequential extraction and leaching tests during the life of the mine. This is to develop closure strategies to ensure that REE phosphate minerals in mine wastes do not cause environmental harm through the soil pathway after closure.

Future expansion

It is noted that the proponent's supporting documents (GRM 2018a) refer to additional pits (such as Auer and Auer North) that have not been assessed in this proposal. Any expansion of this proposal will require further assessment by the EPA and the results of investigations into surface water, groundwater, flora and vegetation, and subterranean fauna – which have been conducted in accordance with EPA policy and guidance – should be provided.

8. Recommendations

That the Minister for Environment notes:

1. That the proposal assessed is for the development of the Yangibana Rare Earths Project located 270 km east-northeast of Carnarvon.
2. The key environmental factors identified by the EPA in the course of its assessment are Flora and Vegetation, Subterranean Fauna, Inland Waters, Terrestrial Environmental Quality and Human Health, set out in Section 4.
3. The EPA has concluded that the proposal may be implemented, provided it is carried out in accordance with the recommended conditions and procedures set out in Appendix 4. Matters addressed in the conditions include the following:
 - a) targeted surveys, surface water modelling and an environmental management plan to minimise impacts on significant vegetation and Priority Flora
 - b) limiting drawdown to a local calcrete aquifer outcrop associated with the Gifford Creek Calcrete PEC to ensure impacts are not significant.

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Trajectory and Graeme Campbell and Associates (Trajectory and Graeme Campbell) 2016, *Waste Rock and Preliminary Tailings Characterisation Report*, Bridgetown, WA.

Appendix 1: List of submitters

Organisations:

Department of Biodiversity Conservation and Attractions
Department of Environment and Energy
Department of Health
Department of Mines, Industry Regulation and Safety
Department of Planning, Lands and Heritage
Radiological Council
Wildflower Society of Western Australia

Individuals:

One private submission

Appendix 2: Consideration of principles

EP Act Principle	Consideration
<p>1. The precautionary principle</p> <p><i>Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In application of this precautionary principle, decisions should be guided by –</i></p> <ol style="list-style-type: none"> <i>1. careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and</i> <i>2. an assessment of the risk-weighted consequences of various options.</i> 	<p>In considering this principle, the EPA notes that Flora and Vegetation, Subterranean Fauna, Inland Waters, Terrestrial Environmental Quality and Human Health could be significantly impacted by the proposal. The assessment of these impacts is provided in this report.</p> <p>Investigations into the biological and physical environment have been undertaken by the proponent. Some uncertainty remains for a number of factors which are discussed below.</p> <p>Flora and Vegetation surveys were not fully consistent with the <i>Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment</i> (EPA 2016c) and with the exception of groundwater drawdown indirect impacts to flora and vegetation were not adequately addressed in the ERD. As a result, the EPA has recommended a condition to ensure that risks to significant vegetation and flora are avoided and minimised, and that relevant measures are undertaken by the proponent to manage residual impacts.</p> <p>The proponent provided information that supported its conclusion that the impact to a localised area of calcrete associated with the Gifford Creek Calcrete PEC was not significant. Given the sensitivity of the areas the EPA has recommended a condition to ensure the impacts are no greater than predicted and not significant.</p> <p>The proponent has presented a reasonable argument that the troglofauna taxa <i>Schendylidae</i> sp. (Frasers) <i>Schendylidae</i> sp. (Yangibana), <i>Chilenophilidae</i> sp. (Frasers) and <i>Chilenophilidae</i> sp. B09 (Yangibana) are not likely to be restricted to impact areas and are therefore unlikely to be significantly impacted by the implementation of the proposal. The EPA notes there is some level of uncertainty about the extent of the habitat.</p>

EP Act Principle	Consideration
	<p>Given the evidence presented by the proponent and expert advice the EPA considers the risk to the taxa is low.</p> <p>The EPA notes that when appropriately managed the risks to Inland Waters, Terrestrial Environmental Quality and Human Health are low and can be adequately managed under other Acts.</p> <p>From its assessment of this proposal the EPA has concluded that there is no threat of serious or irreversible harm.</p>
<p>2. The principle of intergenerational equity</p> <p><i>The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.</i></p>	<p>In considering this principle, the EPA notes that Flora and Vegetation and Subterranean Fauna could be significantly impacted by the proposal. The assessment of these impacts is provided in this report.</p> <p>The EPA notes that the proponent has identified measures to avoid or minimise impacts. The EPA has considered these measures during its assessment.</p> <p>The EPA is confident the health, diversity and productivity of the environment will be maintained subject to the implementation of recommended conditions.</p> <p>From its assessment of this proposal, the EPA has concluded that environmental values will be protected and that the health, diversity and productivity of the environment will be maintained for the benefit of future generations.</p>
<p>3. The principle of the conservation of biological diversity and ecological integrity</p> <p><i>Conservation of biological diversity and ecological integrity should be a fundamental consideration.</i></p>	<p>In considering this principle, the EPA notes that Flora and Vegetation and Subterranean Fauna could be significantly impacted by the proposal. The assessment of these impacts is provided in this report.</p> <p>The EPA notes that the proponent has conducted surveys and provided analysis of the flora, vegetation and subterranean fauna of the proposal</p>

EP Act Principle	Consideration
	<p>area, and proposed measures to avoid or minimise impacts to biological diversity, including avoidance and management of significant species.</p> <p>The EPA has recommended conditions to ensure impacts to significant vegetation, flora and subterranean fauna are avoided and minimised.</p> <p>From its assessment of this proposal the EPA has concluded that the proposal would not compromise the biological diversity and ecological integrity of the affected areas.</p>
<p>4. Principles relating to improved valuation, pricing and incentive mechanisms</p> <p><i>(1) Environmental factors should be included in the valuation of assets and services.</i></p> <p><i>(2) The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.</i></p> <p><i>(3) The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.</i></p> <p><i>(4) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimize costs to develop their own solution and responses to environmental problems.</i></p>	<p>In considering this principle, the EPA notes that the proponent would bear the cost relating to waste and pollution, including avoidance, containment, decommissioning, rehabilitation and closure.</p> <p>The EPA has had regard to this principle during the assessment of the proposal.</p>
<p>5. The principle of waste minimisation</p> <p><i>All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.</i></p>	<p>In considering this principle, the EPA notes that the proponent proposes to minimise waste by adopting the hierarchy of waste controls (avoid, minimise, reuse, recycle and safe disposal).</p>

EP Act Principle	Consideration
	The EPA has had regard to this principle during the assessment of the proposal.

Appendix 3: Evaluation of other environmental factors

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
AIR			
Air Quality	<p>Greenhouse gases emissions will come from:</p> <ul style="list-style-type: none"> Onsite power generation using diesel Fuel usage in the sulphation bake kilns Diesel combustion in vehicles and equipment Onsite waste water handling Onsite emissions from landfill. <p>Greenhouse gas emissions are predicted to be between 12,937.4 tonnes per annum of carbon dioxide equivalent (CO₂-e).</p>	There were no comments on this factor received during consultation with government agencies.	<p>As stated in the EPA's <i>Environmental Factor Guideline – Air Quality</i> (EPA 2016h), the EPA may decide to assess greenhouse gas emissions within the environmental impact assessment process if a proposal's expected total greenhouse gas emissions are deemed to be significant. The EPA defines this as proposals that have the potential to significantly increase the state's greenhouse gas emissions</p> <p>Having regard to predicted greenhouse gas emissions being below 100,000 tonnes per annum, the EPA considers it is unlikely that the proposal would have a significant impact on greenhouse gas emissions and that the impacts to this factor are manageable.</p> <p>Accordingly, the EPA did not consider greenhouse gas emissions to be a key environmental factor at the conclusion of its assessment.</p>
PEOPLE			

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
Social Surroundings (Heritage)	<p>The proposal may potentially impact cultural heritage values including:</p> <ul style="list-style-type: none"> • areas of heritage significance • excavation of human remains • radiation impacts on bush tucker. <p>Ethnographic and cultural heritage surveys have been conducted covering the majority of the operational area. Five Aboriginal heritage places are located within the development envelope. Currently no Aboriginal heritage places have been identified within the indicative footprint.</p> <p>The proponent considers that no known areas of heritage significance will be impacted by the proposal.</p>	<p>Agency comments</p> <p>The Department of Planning, Lands and Heritage has advised that any potential impact tot Aboriginal sites can be managed through the process as outlined in the <i>Aboriginal Heritage Act 1972</i>.</p> <p>The Commonwealth Department of the Environment and Energy raised concerns regarding impacts to cultural heritage significance of watercourses from changes in water quality.</p>	<p>Social Surroundings was not identified as a preliminary key environmental factor when the EPA decided to assess the proposal or in the ESD.</p> <p>A cultural heritage management plan (CHMP) has been developed for the proposal. The plan identifies heritage and cultural values, details management strategies to avoid impacts and includes a monitoring and reporting framework. The contents of these managements are confidential between the proponent and the Traditional Owners.</p> <p>The EPA note that potential impacts to the cultural heritage significance of water courses are addressed under the CHMP.</p> <p>Having regard to:</p> <ul style="list-style-type: none"> • consultation undertaken with Traditional Owners • the CHMPs being in place for the proposal • The findings of the ERICA assessment • the <i>Environmental Factor Guideline – Social Surroundings</i> (EPA 2016I)

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
	<p>The proponent will continue to conduct consultation and appropriate heritage surveys with the native title claimants Thin-Mah Warianga, Tharrikari, Jiwarli people.</p> <p>A Tier 2 Environmental Risk from Ionising Contaminants: Assessment and Management (ERICA) was conducted for bush tucker which indicates that there is no radiological risk to reference plants and animals from the proposal.</p>		<ul style="list-style-type: none"> the significance considerations in the Statement of Environmental Principles, Factors and Objectives (EPA 2016a), <p>the EPA considers it is unlikely that the proposal would have a significant impact on Social Surroundings and that the impacts to this factor are manageable.</p> <p>Accordingly, the EPA did not consider Social Surroundings to be a key environmental factor at the conclusion of its assessment.</p>

Appendix 4: Identified Decision-Making Authorities and Recommended Environmental Conditions

Identified Decision-making Authorities

Section 44(2) of EP Act specifies that the EPA's report must set out (if it recommends that implementation be allowed) the conditions and procedures, if any, to which implementation should be subject. This Appendix contains the EPA's recommended conditions and procedures.

Section 45(1) requires the Minister for Environment to consult with decision-making authorities (DMAs), and if possible, agree on whether or not the proposal may be implemented, and if so, to what conditions and procedures, if any, that implementation should be subject.

The following decision-making authorities have been identified:

Decision-making Authority	Legislation (and approval)
Minister for Environment	<i>Biodiversity Conservation Act 2016</i> (Taking of flora and fauna)
Minister for Water	<i>Rights in Water and Irrigation act 1914</i> (Water abstraction licence)
Minister for Aboriginal Affairs	<i>Aboriginal Heritage Act 1972</i> (Section 18 clearances)
Minister for Mines and Petroleum	<i>Mining Act 1978</i>
CEO, Department of Water and Environment Regulation	<i>Environmental Protection Act 1986</i> (Works Approval and Licence)
Department of Mines, Industry Regulation and Safety Director, Environment Division Mining Registrar State Mining Engineer Chief Dangerous Goods Officer	<i>Mining Act 1978</i> (Mining proposal) <i>Mining Act 1978</i> (Miscellaneous licences) <i>Mines Safety and Inspection Act 1994</i> (Mine safety) <i>Dangerous Goods Safety Act 2004</i> (Dangerous goods)
Radiological Council	<i>Radiation Safety Act 1975</i>
Chief Health Officer, Department of Health	<i>Health Act 1911</i> (Treatment of Sewage and Disposal of Effluent and Liquid Waste Regulation 1974)
Shire of Upper Gascoyne	<i>Building Act 2011</i> (Building permit for worker accommodation) <i>Development Act 2005</i> (Planning approval for worker accommodation)

Note: In this instance, agreement is only required with DMAs 1 to 4 since these DMAs are Ministers.

RECOMMENDED ENVIRONMENTAL CONDITIONS
STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
(Environmental Protection Act 1986)

YANGIBANA RARE EARTHS PROJECT

Proposal: The proposal is to develop a mine to extract and process rare earth elements. The proposal includes five open pits, tailings facilities and ancillary infrastructure to support the mining operation. The proposal is located 270 kilometres east-northeast of Carnarvon in the Shire of Upper Gascoyne.

Proponent: Hastings Technology Metals Ltd
Australian Company Number ACN 122 911 399

Proponent Address: Level 8 Westralia Plaza
167 St Georges Terrace
Perth WA 6000

Assessment Number: 2115

Report of the Environmental Protection Authority: 1642

Pursuant to section 45 of the *Environmental Protection Act 1986*, it has been agreed that the proposal described and documented in Table 1 of Schedule 1 may be implemented and that the implementation of the proposal is subject to the following implementation conditions and procedures:

1 Proposal Implementation

1-1 When implementing the proposal, the proponent must not exceed the authorised extent of the proposal as defined in Table 2 of Schedule 1, unless amendments to the proposal and the authorised extent of the proposal have been approved under the EP Act.

2 Contact Details

2-1 The proponent must notify the CEO of any change of its name, physical address or postal address for the serving of notices or other correspondence within twenty-eight (28) days of such change. Where the proponent is a corporation or

an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State.

3 Time Limit for Proposal Implementation

- 3-1 The proponent must not commence implementation of the proposal after five (5) years from the date of this Statement, and any commencement, prior to this date, must be substantial.
- 3-2 The proponent must provide to the CEO documentary evidence demonstrating they have complied with condition 3-1 no later than 14 days after the expiration of five (5) years from the date of this statement.

4 Compliance Reporting

- 4-1 The proponent must prepare, and maintain a Compliance Assessment Plan which is submitted to the CEO at least six (6) months prior to the first Compliance Assessment Report required by condition 4-6, or prior to implementation of the proposal, whichever is sooner.
- 4-2 The Compliance Assessment Plan must indicate:
 - (1) the frequency of compliance reporting;
 - (2) the approach and timing of compliance assessments;
 - (3) the retention of compliance assessments;
 - (4) the method of reporting of potential non-compliances and corrective actions taken;
 - (5) the table of contents of Compliance Assessment Reports; and
 - (6) public availability of Compliance Assessment Reports.
- 4-3 After receiving notice in writing from the CEO that the Compliance Assessment Plan satisfies the requirements of condition 4-2 the proponent must assess compliance with conditions in accordance with the Compliance Assessment Plan required by condition 4-1.
- 4-4 The proponent must retain reports of all compliance assessments described in the Compliance Assessment Plan required by condition 4-1 and must make those reports available when requested by the CEO.
- 4-5 The proponent must advise the CEO of any potential non-compliance within seven (7) days of that non-compliance being known.
- 4-6 The proponent must submit to the CEO the first Compliance Assessment Report fifteen (15) months from the date of issue of this Statement addressing the twelve (12) month period from the date of issue of this Statement and then

annually from the date of submission of the first Compliance Assessment Report, or as otherwise agreed in writing by the CEO.

The Compliance Assessment Report must:

- (1) be endorsed by the proponent's Chief Executive Officer or a person delegated to sign on the Chief Executive Officer's behalf;
- (2) include a statement as to whether the proponent has complied with the conditions;
- (3) identify all potential non-compliances and describe corrective and preventative actions taken;
- (4) be made publicly available in accordance with the approved Compliance Assessment Plan; and
- (5) indicate any proposed changes to the Compliance Assessment Plan required by condition 4-1.

5 Public Availability of Data

5-1 Subject to condition 5-2, within a reasonable time period approved by the CEO of the issue of this Statement and for the remainder of the life of the proposal the proponent must make publicly available, in a manner approved by the CEO, all validated environmental data (including sampling design, sampling methodologies, empirical data and derived information products (e.g. maps)), management plans and reports relevant to the assessment of this proposal and implementation of this Statement.

5-2 If any data referred to in condition 5-1 contains particulars of:

- (1) a secret formula or process; or
- (2) confidential commercially sensitive information;

the proponent may submit a request for approval from the CEO to not make these data publicly available. In making such a request the proponent must provide the CEO with an explanation and reasons why the data should not be made publicly available.

6 Flora and Vegetation

6-1 The proponent must manage the implementation of the proposal to meet the following environmental objectives:

- (1) Avoid where possible, and minimise direct and indirect impacts to
 - (a) Vegetation units AtGc, AaSaEs and Fs;

- (b) listed Priority Flora including but not limited to *Acacia curryana*, *Rhodanthe frenchii* and species subject to further targeted surveys under condition 6-2; and
 - (c) vegetation communities associated with claypans/depressions, drainage lines, creeks and riparian vegetation.
- 6-2 Prior to the commencement of ground disturbing activities, the proponent must undertake a targeted vegetation and flora survey within and outside of the development envelope in accordance with Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016) for:
 - (1) vegetation units AtGc and AaSaEs;
 - (2) *Acacia curryana*, *Elacholoma* sp. Showy flowers (C.P. Campbell 1762), *Isotropis forrestii*, *Rhodanthe frenchii*, *Solanum octonum*, *Wurmbea fluviatilis*, *Goodenia berringbinensis* and *Goodenia nuda*; and
 - (3) vegetation communities associated with claypans/depressions, drainage lines, creeks and riparian vegetation.
- 6-3 Prior to the commencement of ground disturbing activities, the proponent must undertake modelling to determine indirect impacts from altered surface water regimes on vegetation communities associated with claypans/depressions, drainage lines, creeks and riparian vegetation and the associated Priority Flora as identified in condition 6-2(2).
- 6-4 Prior to the commencement of ground disturbing activities, the proponent must prepare and submit a Condition Environmental Management Plan to the satisfaction on of the CEO. The plan must demonstrate that the environmental objectives in condition 6-1 will be met.
- 6-5 The Condition Environmental Management Plan required by condition 6-4 must:
 - (1) specify the environmental objectives to be achieved, as specified in condition 6-1;
 - (2) specify management actions that will be implemented to achieve compliance with the environmental objective specified in 6-1;
 - (3) specify management targets to determine the effectiveness of the risk-based management actions;
 - (4) specify monitoring to measure the effectiveness of management actions against management targets, including but not limited to, parameters to be measured, baseline data, monitoring locations, and frequency and timing of monitoring;

- (5) specify a process for revision of management actions and changes to proposal activities, in the event that the management targets are not achieved. The process must include an investigation to determine the cause of the management target(s) not being achieved;
- (6) provide the format and timing for the reporting of monitoring results against management targets to demonstrate that condition 6-1 has been met over the reporting period in the Compliance Assessment Report required by condition 4-6 including but not limited to:
 - (a) verification of the implementation of management actions; and
 - (b) reporting on the effectiveness of management actions against management target(s).
- (7) Provide details of the timing and methodology and results of additional surveys required by condition 6-2.
- (8) Specify management actions to be undertaken to minimise direct and indirect impacts to vegetation units AtGc, AaSaEs and Fs, vegetation communities associated with claypans/depressions, drainage lines, creeks and riparian vegetation, and Priority Flora, *Acacia curryana*, *Elacholoma* sp. Showy flowers (C.P. Campbell 1762), *Isotropis forrestii*, *Rhodanthe frenchii*, *Solanum octonum*, *Wurmbea fluvialis*, *Goodenia berringbinensis* and *Goodenia nuda*.
- (9) Specify management actions to be undertaken to avoid direct or indirect impacts to records of vegetation units AaSaEs and Fs, vegetation communities associated with claypans/depressions, drainage lines, creeks and riparian vegetation, and individuals and populations of Priority Flora species *Acacia curryana*, *Elacholoma* sp. Showy flowers (C.P. Campbell 1762), *Isotropis forrestii*, *Rhodanthe frenchii*, *Solanum octonum*, *Wurmbea fluvialis*, *Goodenia berringbinensis* and *Goodenia nuda*, informed by survey outcomes, to maximise representation of vegetation and Priority Flora within areas that will not be disturbed as defined in Figure 1 of Schedule 1.
- (10) Provide details of monitoring to be conducted within and outside the predicted indirect impact areas as defined in Figure 1 of Schedule 1, including, but not restricted to, groundwater drawdown extent.
- (11) Provide details of the outcomes of vegetation health monitoring, groundwater drawdown levels, weed monitoring, surface water monitoring to detect potential for indirect impacts to vegetation units AtGc, AaSaEs and Fs, vegetation communities associated with claypans/depressions, drainage lines, creeks and riparian vegetation, and Priority Flora, *Acacia curryana*, *Elacholoma* sp. Showy flowers (C.P.

Campbell 1762), *Isotropis forrestii*, *Rhodanthe frenchii*, *Solanum octonum*, *Wurmbea fluviatilis*, *Goodenia berringbinensis* and *Goodenia nuda*.

- 6-6 Failure to implement one or more of the management actions required by condition 6-5(2) represents non-compliance with these conditions.
- 6-7 After receiving notice in writing from the CEO that the Condition Environmental Management Plan satisfies the requirements of conditions 6-5 the proponent must:
- (1) implement the Condition Environmental Management Plan, or any subsequent approved versions; and
 - (2) continue to implement the Condition Environmental Management Plan until the CEO has confirmed by notice in writing that the proponent has demonstrated the objectives specified in condition 6-1 have been met.
- 6-8 In the event that monitoring, tests, surveys or investigations indicate one or more management actions specified in the Condition Environmental Management Plan have not been implemented, the proponent must:
- (1) investigate to determine the cause of the management action(s) not being implemented;
 - (2) investigate to provide information for the CEO to determine potential environmental harm or alteration of the environment that occurred due to the failure to implement management actions;
 - (3) provide a report to the CEO within seven (7) days of the non-compliance being identified. The report must include:
 - (a) cause for failure to implement management actions;
 - (b) the findings of the investigation required by conditions 6-8 (1) and 6-8 (2);
 - (c) relevant changes to proposal activities; and
 - (d) measures to prevent, control or abate the environmental harm which may have occurred.
- 6-9 The proponent:
- (1) may review and revise the Condition Environmental Management Plan, or
 - (2) must review and revise the Condition Environmental Management Plan as and when directed by the CEO.

- 6-10 The proponent must implement the latest revision of the Condition Environmental Management Plan required by condition 6-4, which the CEO has confirmed by notice in writing, satisfies the requirements of conditions 6-5.

7 Subterranean Fauna

- 7-1 The proponent must manage the implementation of the proposal during the construction and operations phases to meet the following environmental outcome for stygofauna:
- (1) ensure that groundwater drawdown of the local calcrete aquifer outcrop as defined in Figure 2 of Schedule 1 does not exceed five (5) m over an area greater than 50% of the local calcrete aquifer extent.
- 7-2 Prior to the commencement of ground disturbing activities of the Yangibana North and West pits, the proponent must prepare and implement a Condition Environmental Management Plan to the satisfaction of the CEO. The plan must demonstrate that the environmental outcomes specified in condition and 7-1 will be met.
- 7-3 The Condition Environmental Management Plan required by condition 7-2 must:
- (1) specify the environmental outcomes to be achieved, as specified in condition 7-1;
 - (2) specify trigger criteria that must provide an early warning that the threshold criteria identified in condition 7-3(3) may not be met;
 - (3) specify threshold criteria to demonstrate compliance with the environmental outcomes specified in condition 7-1. Exceedance of the threshold criteria represents non-compliance with these conditions;
 - (4) specify monitoring to determine if trigger criteria and threshold criteria are exceeded;
 - (5) specify trigger level actions to be implemented in the event that trigger criteria have been exceeded;
 - (6) specify thresholds contingency actions to be implemented in the event that threshold criteria are exceeded; and
 - (7) provide the format and timing for the reporting of monitoring results against trigger criteria and threshold criteria to demonstrate that condition 7-1 has been met over the reporting period in the Compliance Assessment Report required by condition 4-6.
- 7-4 After receiving notice in writing from the CEO that the Condition Environmental Management Plan satisfies the requirements of conditions 7-2 and 7-3 the proponent must:
- (1) implement the Condition Environmental Management Plan, or any subsequent approved versions; and

- (2) continue to implement the Condition Environmental Management Plan until the CEO has confirmed by notice in writing that the proponent has demonstrated the objectives specified in condition 7-1 have been met.

7-5 In the event that monitoring, tests, surveys or investigations indicate exceedance of threshold criteria specified in the Condition Environmental Management Plan, the proponent must:

- (1) report the exceedance in writing to the CEO within seven (7) days of the exceedance being identified;
- (2) implement the threshold level contingency actions specified in the Condition Environmental Management Plans within twenty four (24) hours and continue implementation on those actions until the CEO has confirmed by notice in writing that it has been demonstrated that the threshold criteria are being met and the implementation of the threshold contingency actions is no longer required;
- (3) investigate to determine the cause of the threshold criteria being exceeded;
- (4) Investigate to provide information for the CEO to determine potential environmental harm that occurred due to the threshold criteria being exceeded; and
- (5) provide a report to the CEO within twenty one (21) days of the exceedance being reported as required by condition 7-5(1). The report must include:
 - (a) details of threshold contingency actions implemented;
 - (b) the effectiveness of the threshold contingency actions implemented, against the threshold criteria;
 - (c) the finding of the investigations required by conditions 7-5(3) and 7-5(4);
 - (d) measures to prevent the threshold criteria being exceeded in the future;
 - (e) measures to prevent, control or abate the environmental harm which may have occurred; and
 - (f) justification of the threshold remaining, or being adjusted based on better understanding, demonstrating that outcomes would continue to be met.

7-6 The proponent:

- (1) may review and revise the Condition Environmental Management Plan,
or
- (2) must review and revise the Condition Environmental Management Plan
as and when directed by the CEO.

7-7 The proponent must implement the latest revision of the Condition Environmental Management Plan required in condition 7-2, which the CEO has confirmed by notice in writing, satisfies the requirements of condition 7-3.

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Table 1: Summary of the Proposal

Proposal Title	Yangibana Rare Earths Project
Short Description	The proposal is to develop a mine to extract and process rare earth elements. The proposal includes five open pits, tailings facilities and ancillary infrastructure to support the mining operation. The proposal is located 270 km east-northeast of Carnarvon in the Shire of Upper Gascoyne.

Table 2: Location and authorised extent of physical and operational elements

Element	Location	Proposed extent
Physical elements		
Mine and associated infrastructure	Figure 1	Clearing of no more than 1,000 ha within a development envelope of 13,373 ha.
Operational elements		
Mining	Figure 1	Mining from five pits: <ul style="list-style-type: none"> • Yangibana North • Yangibana West • Bald Hill and Bald Hill SE • Frasers
Groundwater abstraction, from fractured rock aquifer of the Yangibana North and West, Bald Hill and Bald Hill SE and Frasers mine pits and the paleochannel of the SipHon Borefield	Figure 1	no more than 2.5 GL/a of groundwater
Tailings disposal	Figure 1	no more than: 10 Mt into Beneficiation TSF 770,000 t into Hydromet TSF

Table 3: Abbreviations and Definitions

Acronym or Abbreviation	Definition or Term
CEO	The Chief Executive Officer of the Department of the Public Service of the State responsible for the administration of section 48 of the <i>Environmental Protection Act 1986</i> , or his delegate.
EP Act	<i>Environmental Protection Act 1986</i>
ha	Hectare
Gifford Creek Calcrete Priority	Priority 1 Gifford Creek, Mangaroon, Wanna calcrete groundwater assemblage type on Lyons palaeodrainage on Gifford Creek, Lyons and Wanna Stations Priority Ecological Community

Ecological Community	
GL/a	Gigalitre per annum
Ground Disturbing Activity	Activities that are associated with the substantial implementation of a proposal including but not limited to, digging (with mechanised equipment), blasting, earthmoving, vegetation clearance, grading, gravel extraction, construction of new or widening of existing roads and tracks.
km	kilometres
m	Metre
Mt	Million tonnes
Priority Flora	Plant taxa listed by Department of Biodiversity Conservation and Attractions that are either under consideration as threatened flora but are in need of additional survey to adequately determine their status, or are adequately known but require monitoring to ensure that their security does not decline.
Significant Flora	Flora may be considered significant for a range of reasons, including, but not limited to the following: <ul style="list-style-type: none"> • being identified as threatened or priority species • locally endemic or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems) • new species or anomalous features that indicate a potential new species • representative of the range of a species (particularly, at the extremes of range recently discovered range extensions, or isolated outliers of the main range) • unusual species, including restricted subspecies, varieties or naturally occurring hybrids • relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.
t	Tonnes
TSF	Tailings Storage Facility

Figures (attached)

Figure 1 Yangibana development envelope and indicative footprint

Figure 2 Potential area of groundwater drawdown on calcrete aquifer outcrop associated with the Gifford Creek PEC

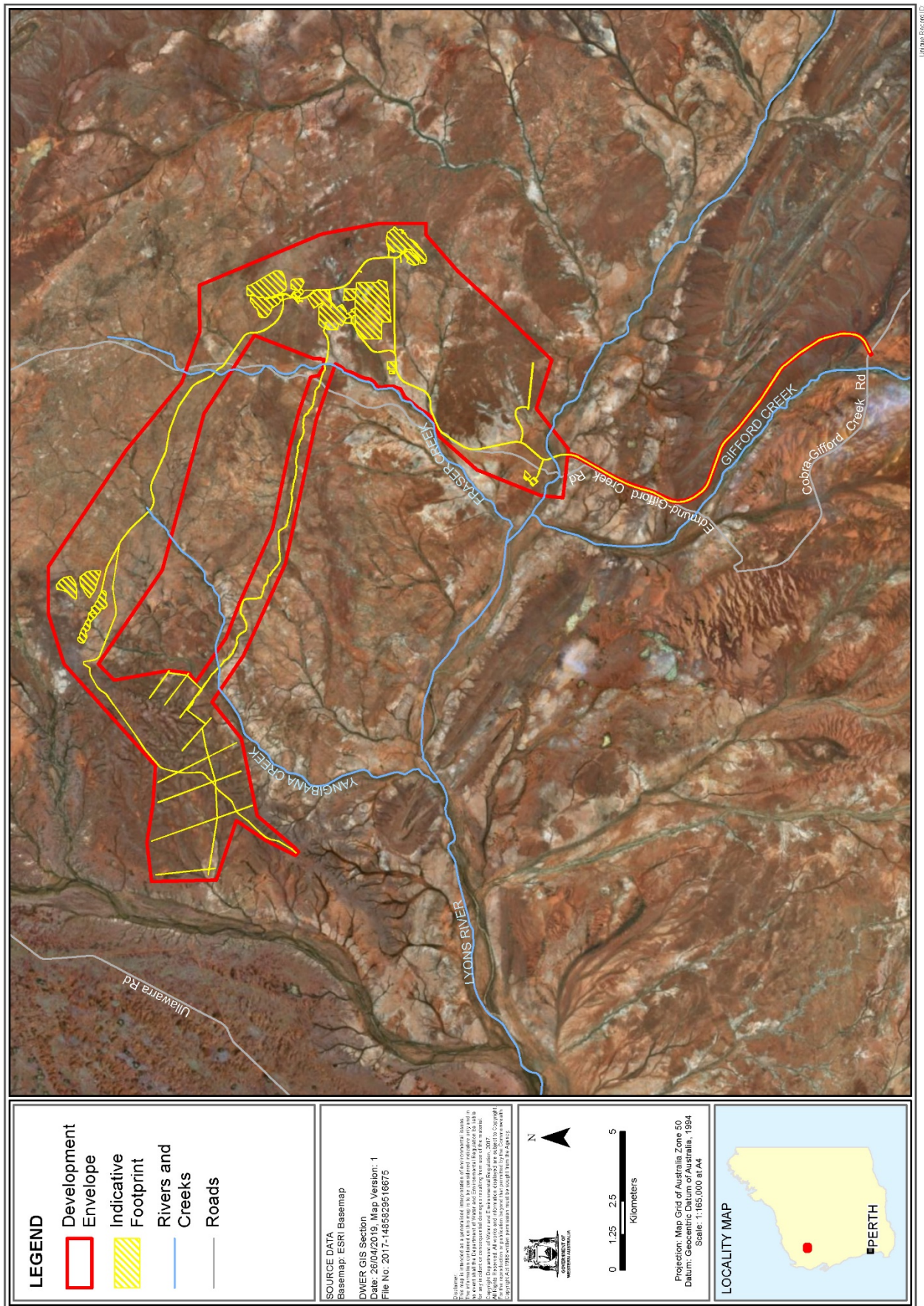


Figure 1 Yangibana development envelope and indicative footprint

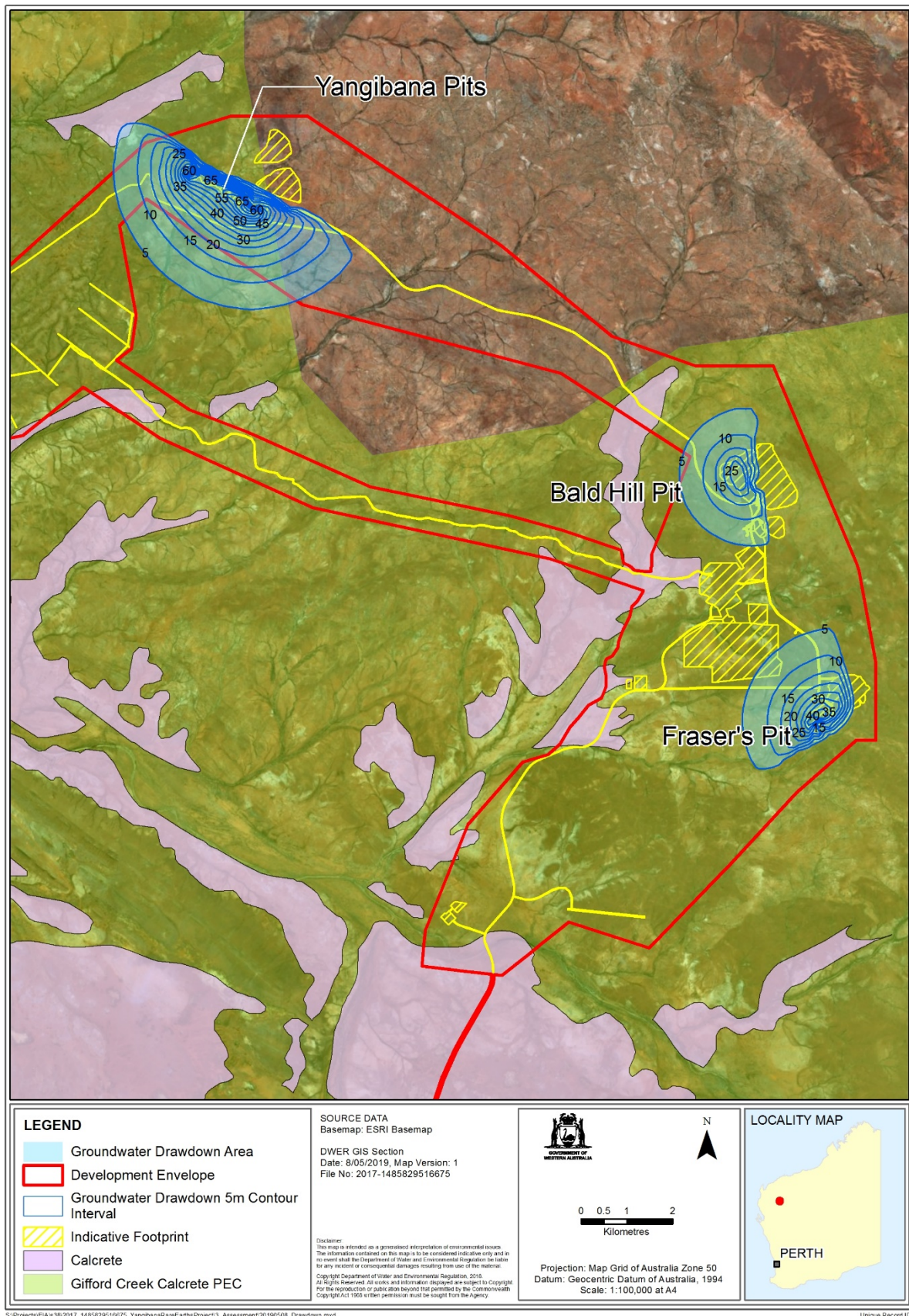


Figure 2 Potential area of groundwater drawdown on calcrete aquifer outcrop associated with the Gifford Creek PEC

Schedule 2

Co-ordinates defining the areas referred shown in Figures 1 and 2 of Schedule 1, and referred to in Ministerial Conditions 7 and 8 are held by the Department of Water and Environmental Regulation under the following reference number DWERDT-168166.