## Environmental Impact Assessment Process Timelines

<table>
<thead>
<tr>
<th>Date</th>
<th>Progress stages</th>
<th>Time (weeks)</th>
</tr>
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<tbody>
<tr>
<td>15/12/2015</td>
<td>EPA decides to assess – level of assessment set</td>
<td></td>
</tr>
<tr>
<td>04/07/2016</td>
<td>EPA approved Environmental Scoping Document</td>
<td>29</td>
</tr>
<tr>
<td>10/01/2017</td>
<td>EPA accepted Environmental Review Document</td>
<td>27</td>
</tr>
<tr>
<td>16/01/2017</td>
<td>Environmental Review Document released for public review</td>
<td>1</td>
</tr>
<tr>
<td>13/02/2017</td>
<td>Public review period for Environmental Review Document closed</td>
<td>4</td>
</tr>
<tr>
<td>18/05/2017</td>
<td>EPA accepted Proponent Response to Submissions</td>
<td>13</td>
</tr>
<tr>
<td>13/07/2017</td>
<td>EPA received final information for assessment</td>
<td>8</td>
</tr>
<tr>
<td>21/09/2017</td>
<td>EPA completed its assessment</td>
<td>5</td>
</tr>
<tr>
<td>04/10/2017</td>
<td>EPA provided report to the Minister for Environment</td>
<td>2</td>
</tr>
<tr>
<td>09/10/2017</td>
<td>EPA report published</td>
<td>3 days</td>
</tr>
<tr>
<td>23/10/2017</td>
<td>Close of appeals period</td>
<td>2</td>
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</table>

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  
4 October 2017
Summary

This report provides the Minister for Environment with the outcomes of the Environmental Protection Authority’s (EPA’s) environmental impact assessment of the Thunderbird Mineral Sands Project on the Dampier Peninsula as proposed by Sheffield Resources Limited (the proponent).

Proposal

The proponent proposes to construct and operate a heavy mineral sands mining operation with a mine life of approximately 42 years on the Dampier Peninsula, approximately 95 kilometres north east of Broome and 75 kilometres west of Derby (Figure 1).

The project will mine and process heavy mineral sands to create six final products: Ilmenite, Ilmenite LTR450, Primary Zircon, Zircon Concentrate, Titano Magnetite and HiTi88 leucoxene. The proponent will export packaged mineral sand products via Broome Port and bulk mineral sands products via Derby Port.

Background and context

The Environmental Protection Act 1986 requires that the EPA’s report on the outcome of its assessment sets out the key environmental factors identified in the course of the assessment, as well as the EPA’s recommendations as to whether or not the proposal may be implemented and, if so, the conditions and procedures that should apply. The EPA may also include any other information, advice and recommendations in the assessment report that it thinks fit.

Public submissions

Key issues raised in the submissions received during the public review period included the following:

- managing impacts on terrestrial fauna, in particular the Greater bilby;
- managing impacts on groundwater and surface water;
- rehabilitation of flora and vegetation, and habitat for fauna;
- consultation with Traditional Owners; and
- cumulative impacts in the Kimberley Region, in particular the Dampier Peninsula.

The EPA noted that 30 of the 52 respondents supported the project. However, respondents that supported the project for economic or other non-environmental reasons have not informed this assessment as these matters lay outside the scope of the EPA’s assessment. These submissions have been noted only for completeness.

In regard to all comments related to environmental matters, the proponent gave full responses and provided further information where appropriate. This information was
made available to the public on the EPA’s website and has been considered in this assessment where appropriate.

**Key environmental factors and relevant principles**

The EPA identified the following key environmental factors (see Section 4) during the course of its assessment:

1. **Terrestrial Fauna** – Loss of habitat and potential impacts to local populations of threatened fauna species (in particular the Greater bilby).
2. **Flora and Vegetation** – Loss of flora and vegetation from clearing, and potential impacts from dust, spills, groundwater abstraction, alterations to surface flows, flooding, vehicles, and weeds.
3. **Social Surroundings** – Amenity and Heritage were identified as preliminary key environmental factors during the earlier stages of the assessment. These factors are now considered under Social Surroundings in the new EPA policy framework.
   (a) **Amenity** – Potential noise and dust impacts from transportation and bulk loading activities in the town of Derby.
   (b) **Heritage** – Potential impacts on Aboriginal Heritage sites (loss or disturbance) and potential impacts on traditional cultural activities from temporary and/or permanent restricted access to areas.
4. **Hydrological Processes and Inland Waters Environmental Quality** – Potential impacts on aquifer water supplies for abstraction and groundwater and surface water flows; potential impacts on water quality from mine closure.
5. **Marine Environmental Quality** – Potential impacts on water quality, sediment and biota from operation of port facilities.

In identifying the key environmental factors, the EPA had regard to the object and principles set out in s. 4A of the *Environmental Protection Act 1986*. The EPA considered that the following principles were particularly relevant to this assessment (see Section 4):

1. precautionary principle;
2. principle of intergenerational equity;
3. principle of the conservation of biological diversity and ecological integrity;
4. principles relating to improved valuation, pricing and incentive mechanisms; and
5. principle of waste minimisation.

**Assessment**

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

- the impacts to all the key environmental factors;
- the EPA’s confidence in the proponent’s proposed mitigation measures;
the relevant *Environmental Protection Act 1986* principles and the EPA’s objectives for the key environmental factors; and

- the EPA’s view that the impacts to the key environmental factors are manageable, provided the recommended conditions are imposed.

### Conclusion and recommendations

Having assessed the Proposal, the EPA has concluded that the Proposal is environmentally acceptable.

The EPA recommends that the Minister notes:

1. That the Proposal assessed is to construct and operate a heavy mineral sands mining operation on the Dampier Peninsula and transport the mineral sand products to Derby and Broome for export.

2. The key environmental factors identified by the EPA in the course of its assessment are Terrestrial Fauna; Flora and Vegetation; Social Surroundings; Hydrological Processes and Inland Water Environmental Quality; and Marine Environmental Quality, set out in Section 4.

3. The EPA has concluded that the Proposal may be implemented, provided the implementation of the Proposal is carried out in accordance with the recommended conditions and procedures set out in Appendix 5. Matters addressed in the conditions include the following:
   
   (a) environmental management plan to minimise impacts to conservation significant terrestrial fauna, principally the Greater bilby;

   (b) exclusion zones to avoid impacts to Aboriginal heritage sites;

   (c) restriction on the area of groundwater drawdown to prevent impacts on other groundwater users;

   (d) progressive rehabilitation to restore mine pits to habitat for the Greater bilby;

   (e) an offset to counterbalance the significant residual impact to habitat for threatened fauna; and

   (f) an additional offset should the progressive rehabilitation of Greater bilby habitat be unsuccessful.
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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 proposal by Sheffield Resources Limited (the proponent) to mine, process and export mineral sands at the Thunderbird Mineral Sands Project (the Proposal) on the Dampier Peninsula.

The EPA has prepared this report in accordance with s. 44 of the Environmental Protection Act 1986 (EP Act), which requires that the EPA 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 in the course of the assessment; and
- 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 20 November 2015. On 15 December 2015 the EPA decided to assess the Proposal and set the level of assessment at Public Environmental Review (PER) with a four week public review period, with the proponent to prepare the Environmental Scoping Document (ESD).

The EPA approved the ESD for the Proposal on 4 July 2016. The Public Environmental Review document (PER document) was released for public review from 16 January 2017 to 13 February 2017.

1.1 EPA procedures

The EPA introduced a new suite of environmental impact assessment procedures on 13 December 2016.

The Proposal was, however, assessed under the Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012, which allowed the continued assessment under the Bilateral Agreement between the Commonwealth and Western Australian governments.

The EPA consulted the proponent on the application of the current procedures to its assessment of the Proposal.

1.2 Assessment on behalf of 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 7 April 2016 as it will, or is likely to have, a significant impact on the following Matters of National Environmental Significance (MNES):
Listed threatened species and communities (s. 18 and 18A).

The Proposal was assessed under the Bilateral Agreement relating to environmental assessment (2014) between the Commonwealth and Western Australian governments.
2. The proposal

2.1 Proposal summary

The proponent, proposes to construct and operate a heavy mineral sands mining operation with a mine life of approximately 42 years on the Dampier Peninsula, approximately 95 kilometres (km) north east of Broome and 75 km west of Derby (Figure 1).

The project will mine and process heavy mineral sands to create six final products: Ilmenite, Ilmenite LTR450, Primary Zircon, Zircon Concentrate, Titano Magnetite and HiTi88 leucoxene. The proponent will export packaged mineral sand products via Broome Port and bulk mineral sands products via Derby Port.

The key characteristics of the Proposal are summarised in Tables 1 and 2 below. These characteristics are derived from the description of the Proposal in Section 2 of the ESD (Sheffield, 2016). The tables include the change to Proposal approved by the EPA under s. 43A of the EP Act on 13 December 2016 and several minor changes incorporated during the assessment process.

Table 1: Summary of the Proposal

<table>
<thead>
<tr>
<th>Proposal title</th>
<th>Thunderbird Mineral Sands Project</th>
</tr>
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<tbody>
<tr>
<td>Short description</td>
<td>The Thunderbird Mineral Sands Project is a heavy mineral sands operation located approximately 95 km north east of Broome and 75 km west of Derby on the Dampier Peninsula. It includes the mining, processing and export of mineral sands over approximately 42 years. The project includes the following: • Heavy mineral sands mining above and below the water table. • Groundwater abstraction from the Broome aquifer to provide processing water and access to mineral sands below the water table. • Processing of heavy mineral sands. • Tailings storage facility. • Export of bulk mineral sand products from the mine site via Derby Port, including storage facilities at Derby Port. • Export of packaged mineral sand products via Broome Port, including use of existing storage facilities at Broome Port. • Progressive backfilling of the mine pit to above the water table and rehabilitation of backfilled areas. • Upgrade and extension of an existing road to provide an approximately 32 km long site access road linking the project to the Great Northern Highway. • Supporting infrastructure including internal roadways, accommodation village, power plant, workshops, offices, wastewater treatment plant and a landfill.</td>
</tr>
<tr>
<td>Element</td>
<td>Location</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>Physical elements</strong></td>
<td></td>
</tr>
<tr>
<td>Mine pits</td>
<td>Figure 2</td>
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<tr>
<td>Processing and supporting infrastructure, including the tailings storage facility, site access road, borefield, accommodation, and other mine site supporting infrastructure</td>
<td>Figure 2</td>
</tr>
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<td>Derby Port Storage and Export Facility</td>
<td>Figure 3</td>
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<tr>
<td><strong>Operational elements</strong></td>
<td></td>
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<td>Tailings storage facility (TSF)</td>
<td>Figure 4</td>
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<td>Overburden waste and tailings disposal and management (backfilling mine voids)</td>
<td>Figure 4</td>
</tr>
<tr>
<td>Groundwater abstraction</td>
<td>N/A</td>
</tr>
<tr>
<td>Groundwater reinjection</td>
<td>N/A</td>
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<td>Transport and storage of bulk mineral sand products – Derby Port</td>
<td>Figure 3</td>
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<tr>
<td>Element</td>
<td>Location</td>
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<td>------------------------------------------------------------------------</td>
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<tr>
<td>Transport and storage of bulk mineral sand products – Broome Port</td>
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<td>Transhipment of bulk mineral sands from Derby Port</td>
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<td>Shipping for export (Derby Port)</td>
<td>N/A</td>
</tr>
<tr>
<td>Shipping for export (Broome Port)</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Figure 1: Regional location
Figure 2: Mine site development envelope
Figure 3: Derby Port development envelope
Figure 4: Indicative Footprint (mine site and access road)
Figure 5: Indicative Footprint (mine area)
2.2 Changes to the proposal during assessment

The proponent requested consent from the EPA on 28 November 2016 to change the Proposal during assessment. The change requested included the export of packaged mineral sand products via Broome Port as part of the Proposal, among other minor changes.

The EPA 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. The EPA Chairman gave consent to the change under s. 43A of the EP Act on 13 December 2016.

The proponent requested further consent from the EPA on 4 September 2017 to again change the Proposal during assessment. The change was a result of ongoing design work and planning for the Proposal and represented a reduction in the area of clearing required for infrastructure associated with the Proposal.

The EPA 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. The EPA Chairman gave consent to the change under s. 43A of the EP Act on 14 September 2017.

Tables 1 and 2 above include all the changes, with the initial changes incorporated into the PER document before it was released for public review.

2.3 Context

The Dampier Peninsula is located within the Dampierland bioregion and Pindanland subregion under the Interim Biogeographic Regionalisation of Australia classification system.

Conservation Reserves associated with the Dampier Peninsula are found on the coastal areas along the western side of the peninsula. These areas include the Coulomb Point Nature Reserve and the Roebuck Bay Marine Park. Roebuck Bay is also a listed Ramsar Wetland. The EPA notes the importance of Roebuck Bay as summer refuges for migratory birds protected under international agreements.

The West Kimberley was added to the National Heritage List in 2011. The majority of the area covered by the listing extends east and north of Derby. It also extends along the western side of the Dampier Peninsula as well as all of King Sound. However, much of the Dampier Peninsula, including the mine site development envelope for the Proposal, is not within the area covered by the heritage listing.

On the Dampier Peninsula, development has generally been restricted to the surrounds of populated areas. The wider region is being explored for its potential for unconventional gas resources and irrigated agriculture. None of these proposals have progressed to a stage where construction has commenced, and only a strategic proposal for a gas processing hub at James Price Point has been through the formal EP Act Part IV Environmental Impact Assessment process.
Also, to support the development of irrigated agriculture in the region, the Western Australian Government’s Water for Food Program has been developed to help identify suitable water and land resources. The intent of the program is to identify where water is available for agriculture and its quality and quantity.

At a local level, the mine site development envelope is surrounded by active pastoral leases. Indigenous communities are also nearby, with Bidan being the closest community.

Regional threats to the environment in the Kimberley are from altered fire regimes and climate change (including changed rainfall patterns). The WA Government’s Kimberley Science and Conservation Strategy was released in 2011 and provides further detail on these and other conservation challenges in the Kimberley (Government of Western Australia, 2011a).
3. Consultation

The EPA advertised the referral information for public comment in November 2015 and received ten submissions. Three of the submissions requested the Proposal be assessed at the level of PER. There were seven submissions requesting the Proposal be assessed at the level of API B (Assessment on Proponent Information, Category B - Proposal Environmentally Unacceptable).

On 15 December 2015, the EPA decided to assess the Proposal at the level of PER with a four week public review period, with the proponent to prepare the ESD.

The proponent consulted with government agencies and key stakeholders during the preparation of the PER document. The agencies and stakeholders consulted and their key interests are detailed in Table 44 of the proponent’s PER document.

The PER document was advertised for public comments on 16 January 2017, and 12 state government agency submissions and 40 public submissions were received during the four week public review period. The following key issues were raised:

- managing impacts on terrestrial fauna, in particular the Greater bilby;
- managing impacts on groundwater and surface water;
- rehabilitation of flora and vegetation, and habitat for fauna;
- consultation with Traditional Owners; and
- cumulative impacts in the Kimberley Region, in particular the Dampier Peninsula.

The EPA noted that 30 of the 52 respondents supported the project. Submissions that supported the project for economic or other non-environmental reasons have not informed the EPA’s assessment as these matters lie outside the scope of the assessment.

In regard to all comments related to environmental matters, the proponent gave full responses and provided further information where appropriate. This information was made available to the public and has been considered in this assessment where relevant.

In May 2017, EPA Members visited the proposed mine site and Derby Port. While in the region they met with the Shire Councils and invited those who commented on the PER document to make further representations or ask questions of the EPA. Several individuals and organisations subsequently met with the EPA Members. No significant new environmental issues were raised during the consultation, rather the respondents took the opportunity to expand on previous comments and ask questions about the EPA’s assessment process.

The EPA considers that the consultation process has been appropriate and that reasonable steps have been taken to inform the community and stakeholders on the Proposal. 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 assessment report, the EPA had regard for the object and principles contained in s. 4A 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 PER document;
- public comments received on the referral, stakeholder comments received during the preparation of proponent documentation and public and agency comments received on the PER document;
- the proponent's response to submissions raised during the public review of the PER document;
- the EPA's own inquiries, including information gained during the site visit and associated stakeholder consultation; and
- the EPA's Statement of environmental principles, factors and objectives.

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

- **Terrestrial Fauna** – Loss of habitat and potential impacts to local populations of threatened fauna species (in particular the Greater bilby).
- **Flora and Vegetation** – Loss of flora and vegetation from clearing, and potential impacts from dust, spills, groundwater abstraction, alterations to surface flows, flooding, vehicles, and weeds.
- **Social Surroundings** – Amenity and Heritage were identified as preliminary key environmental factors during the earlier stages of the assessment. These factors are now considered under Social Surroundings in the new EPA policy framework.
  - **Amenity** – Potential noise and dust impacts from transportation and bulk loading activities in the town of Derby.
  - **Heritage** – Potential impacts on Aboriginal Heritage sites (loss or disturbance) and potential impacts on traditional cultural activities from temporary and/or permanent restricted access to areas.
- **Hydrological Processes and Inland Waters Environmental Quality** – Potential impacts on aquifer water supplies for abstraction and groundwater and surface water flows; potential impacts on water quality from mine closure.
- **Marine Environmental Quality** – Potential impacts on water quality, sediment and biota from operation of port facilities.

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 Environmental Review Document (Thunderbird Mineral Sands Project – Public Environmental Review, January 2017).
Appendix 4 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 and making its recommendation to the Minister for Environment:

1. **Precautionary principle** – Investigations on the biological and physical environment undertaken by the proponent have provided sufficient certainty to assess risks and identify measures to avoid or minimise impacts.

2. **Principle of intergenerational equity** – The EPA notes the proponent has considered the mitigation hierarchy and undertaken measures to avoid, minimise, rehabilitate and offset impacts and EPA has recommended management plans that allow for adaptive management.

3. **Principle of the conservation of biological diversity and ecological integrity** – The EPA has considered the impacts to flora and fauna species and recommended conditions to manage impacts to conservation significant fauna so that biological diversity is maintained. Rehabilitation of the mine was also considered in regards to ecosystem function post mining.

4. **Principles relating to improved valuation, pricing and incentive mechanisms** – The EPA notes that the proponent would bear the cost relating to management of waste and pollution, including avoidance, containment, and rehabilitation.

5. **Principle of waste minimisation** – While the Proposal will generate waste, the EPA notes the approach by the proponent to implement an ‘avoid, reduce, re-use, reprocess, recycle, recovery, and dispose’ hierarchy of waste management approach across all components and phases of the project, in accordance with the objectives of the *Waste Avoidance and Resource Recovery Act 2007.*

Appendix 3 provides a summary of the principles and how the EPA considered these principles in its assessment.

The EPA’s assessment of the Proposal and in particular its impacts on the key environmental factors is provided in Sections 4.1–4.5. These sections outline whether or not the EPA considers that the impacts to each factor are manageable. Section 7 provides the EPA’s conclusion as to whether or not the Proposal as a whole is environmentally acceptable and therefore may be implemented.

**Changes to EPA environmental policy and guidance**

The EPA introduced a new suite of environmental guidance for environmental impact assessment on 13 December 2016. This replaced EPA policy and guidance that were current at the time of referral and the preparation of the PER document for the Proposal.

In its assessment of the Proposal, the EPA considered and gave due regard to, where relevant, its current and any applicable former environmental impact
assessment policy and guidance documents. The EPA consulted the proponent on the application of the current environmental impact assessment policy and guidance documents relevant to their environmental review and the EPA’s assessment of the Proposal.

**Assessment on behalf of Commonwealth**

The EPA assessed the Proposal on behalf of the Commonwealth Government under the Bilateral Agreement. The EPA has addressed MNES under each relevant key environmental factor and has summarised its assessment of MNES in Section 6.

### 4.1 Terrestrial Fauna

**EPA Objective**

The EPA’s environmental objective for this factor is *to protect terrestrial 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 – *Terrestrial Fauna* (EPA, 2016a);
- Technical Guidance – *Sampling Methods for Terrestrial Vertebrate Fauna* (EPA, 2016b);
- Technical Guidance – *Terrestrial Fauna Surveys* (EPA, 2016c); and

The considerations for environmental impact assessment (EIA) for this factor are outlined in Environmental Factor Guideline – *Terrestrial Fauna* (EPA, 2016a).

**EPA Assessment**

Other than the short range endemic invertebrate survey, the proponent’s fauna surveys, including a Targeted Survey for the Greater bilby, were peer reviewed by Western Wildlife, which found the surveys to be generally consistent with relevant EPA guidance. Overall, the EPA is of the opinion that despite some variance to the guidelines, the terrestrial fauna surveys meet the requirements of the ESD and sufficient information has been provided to describe the receiving environment and assess potential impacts.

The mine site development envelope contains three broad fauna habitat types. Pindan Shrubland is the dominate habitat type in the development envelope and represents the largest amount of habitat to be disturbed as shown in Table 3 below, which was adapted from the PER document.
Table 3: Habitat types mapped and proposed disturbance

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Total mapped (ha)</th>
<th>Proposed disturbance (ha)</th>
<th>Percentage of mapped area to be disturbed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pindan Shrubland</td>
<td>9,908.1</td>
<td>1,762.7</td>
<td>17.8%</td>
</tr>
<tr>
<td>Sandstone Range and Footslopes</td>
<td>3,835.5</td>
<td>84.6</td>
<td>2.2%</td>
</tr>
<tr>
<td>Savannah Woodland</td>
<td>1,950.3</td>
<td>104.0</td>
<td>5.3%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15,693.9</strong></td>
<td><strong>1,951.3</strong></td>
<td><strong>17.8%</strong></td>
</tr>
</tbody>
</table>

It is considered that these habitats only have limited potential for containing microhabitats suitable for short range endemic (SRE) species other than leaf litter type habitats, logs on the ground, and several minor rock outcrops in the Sandstone Range and Footslopes habitat type. Leaf litter and log type habitats are widespread outside the mine site development envelope and Sandstone Range and Footslopes habitat is only seeing minor disturbance (noting that actual rock outcrops are not being disturbed – See Social Surroundings).

SRE species surveys identified 200 invertebrate specimens. Twenty-three were thought to be potential SRE species, with one species (the land snail *Rhagada bulgana*) confirmed a SRE. However, results show all species identified in the potential impact area were also recorded outside the impact area. Given the uniform and continuous nature of the habitat types above, none of the potential and confirmed SRE species are likely restricted to the development envelope. If there were species restricted they would be those inhabiting rocky outcrops and as noted above, such areas are not being disturbed.

Fauna surveys recorded a total of 20 mammals, 118 birds, 44 reptiles and eight amphibians occurring within the mine site development envelope and surrounding areas (Sheffield, 2017a). There were 15 conservation significant fauna species that were either identified in the development envelope during surveys or were considered as having a medium or high likelihood of being present in the development envelope. Seven of these 15 species were found in the development envelope, with two of these species also being found within the conceptual disturbance footprint. Most of the species are Schedule 5 migratory birds (12 species) or ranked as Priority 4 species (two species). Two species are considered most at risk based on the potential for significant impacts: the Greater bilby (*Macrotis lagotis*) (Schedule 3 under the *Wildlife Conservation Act 1950* and Vulnerable under the EPBC Act) and the Dampier Peninsula goanna (*Varanus sparnus*) listed as a Priority 1 species in Western Australia.

All the migratory bird species identified in the PER document are considered widespread and unlikely to be reliant on the habitat within the development envelope. Regionally significant habitat for migratory birds is found at Roebuck Bay and Eighty Mile Beach, which are not impacted by the Proposal (Department of Parks and Wildlife, 2014; 2015).
The Gouldian finch (Priority 4) was not identified in the development envelope. This species is believed to be a transient visitor. As with the migratory bird species, the proposed removal of habitat would unlikely significantly impact this species given the development envelope is not considered core habitat. The short-tailed mouse (Priority 4) was found in the development envelope but is considered to have suitable habitat throughout most of the surrounding areas (Sheffield, 2017a). It has persisted on the Dampier Peninsula alongside pastoral land use and appears resilient to change.

The Greater bilby and the Dampier Peninsula goanna may be significantly impacted by the Proposal as these have been recorded within and near the development envelope. Direct impacts from mining activities and loss of habitat are the main threats to these species.

The Dampier Peninsula hosts Australia’s most northerly and most coastal population of the Greater bilby. The Dampier Peninsula is a stronghold for this species because at present it is largely free of predation pressure from the red fox, which has been implicated as a major driver of the local extinction of the Greater bilby from most of its former range in Australia. The Dampier Peninsula population of the Greater bilby is therefore significant in terms of the survival of this species in Western Australia, and meets the criteria for being considered an ‘important population’ as defined by the Australian Government’s Matters of National Environmental Significance: Significant Impact Guidelines 1.1.

Greater bilby individuals will be impacted by the Proposal, including from habitat loss. It has been identified that up to 17.8% of Pindan Shrubland (1762.7 ha within 9,908 ha), and 5.3% of Savannah Woodland (104 ha of 1,950 ha) mapped during baseline surveys were proposed to be impacted over the life of the Proposal. These communities and habitat types are essentially the common Pindan vegetation found across the Dampier Peninsula and wider in the Kimberley region (Mattiske, 2016a). The actual impact on these habitat types has been reduced due to the ongoing design work that the proponent undertook, so these impacts represents the very upper extent.

The EPA notes that the Dampier Peninsula population is an important population of Greater bilbies. The EPA also notes that the habitat for this species, particularly the Pindan Shrubland, is widespread across the Dampier Peninsula and that the Proposal would impact on at most 17.8% of the mapped extent in the vicinity of the mine site development envelope and on a smaller portion of this habitat type at a regional scale.

The EPA notes that whilst the red fox is currently absent from the Dampier Peninsula, feral cats and dogs pose a risk to the Greater bilby on the Dampier Peninsula. Domestic waste disposal and permanent water storage facilities associated with the Proposal will need to be managed to prevent an increase in the numbers of feral animals in the area that predate on Greater bilby.

Although limited information is available with regard to the habitat preferences of the Dampier Peninsula goanna, this species has been reported to utilise Pindan Sands and Savannah Woodland habitats. Ten of the twelve Varanus individuals recorded in
baseline studies for the Proposal were observed in Pindan Shrubland habitat with the remaining two observed in Sandstone Range and Footslopes. It is noted that the twelve records were collected before *Varanus sparnus* was described as a new species. Subsequent analysis by the Western Australian Museum of a vouchered specimen collected during surveys for the Proposal confirmed the specimen to be *Varanus sparnus* and not *Varanus brevicauda*. Therefore at least one of the twelve records for the Proposal is *Varanus sparnus* and therefore this species is considered to occur in the area of the Proposal.

These habitat types are widely recorded across the Dampier Peninsula. Given four disjunct location records exist approximately 85 km apart (one at the Proposal and three at Coulomb Point), and habitats occupied by the species are common between these locations, it is considered likely *Varanus sparnus* occurs throughout the Dampier Peninsula, wherever suitable sandy substrate habitat exists.

In summary, habitat for both the Greater bilby and the Dampier Peninsula goanna extends beyond the development envelope and these species are unlikely to be impacted significantly at a regional scale when considering the known distribution and habitat availability of these species.

The proponent proposes pre-clearing monitoring, trapping, relocation, and measures to prevent the return of the Greater bilby to areas about to be cleared. Avoidance measures for terrestrial fauna involve utilisation of existing cleared areas, in particular the use of existing pastoral track as the access road rather than developing a new road. The proponent has indicated it is undertaking ongoing project design and mine planning to reduce the required disturbance footprint further.

Although footprints of processing and other supporting infrastructure can be minimised, there will be residual impacts. The Proposal will see up to 326.1 ha of semi-permanent infrastructure and development. Although this is to be decommissioned and rehabilitated post-mining, the loss is effectively long-term as the mine life is in excess of 40 years.

The mining area (1,635 ha) will be progressively mined, then backfilled and rehabilitated. If rehabilitation successfully returns suitable habitat for the Greater bilby (for both foraging and breeding) within an appropriate timeframe, the impact to this 1,635 ha could be considered temporary. The key criteria for this is vegetation assemblages being returned to pre-mining condition and soil density profiles being suitable for burrowing.

The EPA received advice that the regulation of rehabilitation and closure of aspects of the Proposal that are located on *Mining Act 1978* (Mining Act) tenure can be managed by the Department of Mines, Industry Regulation and Safety (DMIRS) under the mine closure provision of the Mining Act.

However, whilst DMIRS can manage general mine closure aspects of the Proposal, the EPA considers that rehabilitation of Greater bilby is important in reducing the impacts on the Greater bilby. Therefore the EPA recommends that a condition should be placed on the Proposal that requires development of a Greater Bilby Habitat Rehabilitation Plan.
The EPA notes that the proponent is required to obtain a licence to take fauna under the Wildlife Conservation Act 1950. These licenses will include conditions for the conservation and management of fauna. The EPA considers that these licenses will include specific detail on how trapping and relocation should be undertaken.

The proponent proposes the following management measures to address these issues, including vehicle speed limits, limits on dusk-to-dawn travel, feral animal control programs, putrescible waste management systems, fire management programs, and managing open trenches and water bodies.

The EPA also considers that a condition is required to ensure that a Terrestrial Fauna Management Plan is developed (Condition 6). The objective of the management plan is to prevent impacts on the Greater bilby and the Dampier Peninsula goanna outside the mine site development envelope and minimise the impacts to the Greater bilby within the mine site development envelope.

In accordance with the WA Environmental Offsets Guidelines (Government of WA 2014), the Proposal would have a significant residual impact as it will cause the loss of habitat used by the Greater bilby, a Schedule 3 threatened species. As such, the EPA is of the opinion that a significant residual impact remains and that in addition to requiring management and monitoring of a conservation significant species, an offset would be required to counterbalance the environmental impact of the Proposal.

The EPA notes that attempts to rehabilitate disturbed mining areas to habitat suitable for the Greater bilby in the Kimberley are limited. However, the EPA also notes and agrees with the proponent’s contention that the rehabilitation proposed for the Proposal is simpler than other mined landforms in the Kimberley. Rehabilitation for the Proposal relates to backfilled pits with similar topography to pre-existing landforms rather than constructed slopes typical of waste rock dumps and tailings storage facilities for hard rock mines.

This is supported by the EPA/Department of Mines and Petroleum Guidelines for Preparing Mine Closure Plans which recognise that the progressive rehabilitation of mineral sands mines that employ strip mining is likely to be more feasible compared to other types of mining (EPA/DMP, 2015).

Therefore, it is considered that areas not proposed for progressive rehabilitation represent a long term impact of the Proposal. This means the 326.1 ha of Greater bilby habitat within areas not proposed for progressive rehabilitation is considered a significant residual impact. The significant residual impact may increase should the rehabilitation of the Proposal fail to return Greater bilby habitat to the mine voids, where progressive rehabilitation is proposed.

Information that the EPA considers necessary to determine the success of Greater bilby habitat rehabilitation would include:

- completion criteria that can be used to evaluate the success of Greater bilby habitat rehabilitation and an assessment of performance against these completion criteria;
• details of the methods that were used to undertake rehabilitation of Greater bilby habitat; and
• details of the monitoring regime in areas of restored Greater bilby habitat, including the detection of the presence and activity patterns of the Greater bilby (if this species returns to restored areas) during the monitoring period.

Noting the importance regarding the success of rehabilitating Greater bilby habitat, the EPA has recommended a condition (Condition 9) that requires a Greater Bilby Habitat Rehabilitation Plan.

The EPA considers that if the progressive rehabilitation cannot restore the area as suitable habitat for the Greater bilby, and it is noted there is some uncertainty in regards to this, then an additional significant residual impact would result. Therefore the EPA has recommended condition 11 that would require an additional offset to counterbalance the additional significant residual impact.

Measures taken to mitigate and offset the impacts on the Greater bilby will also benefit the Dampier Peninsula goanna and prevent significant impacts on this species. Therefore a separate offset for the Dampier Peninsula goanna is not considered necessary.

Due to the significant residual impact to the Greater bilby (326.1 ha of semi-permanent infrastructure and development), the EPA has recommended a condition (Condition 10) that requires a Greater Bilby Offset Plan to be developed. The requirements of the offset are discussed in more detail in Section 5.

Given there is some uncertainty about the potential success of the rehabilitation of Greater bilby habitat outside that 326.1 ha considered a significant residual impact, Condition 11 requires an additional offset should the proponent not be able to demonstrate successful rehabilitation of Greater bilby habitat within a reasonable timeframe.

Summary
The EPA has paid particular attention to the:

(a) Environmental Factor Guideline – *Terrestrial Fauna*;
(b) proponent’s application of the mitigation hierarchy to avoid and minimise disturbance of habitat;
(c) proponent’s application of monitoring and translocation programs prior to clearing to minimise direct impacts on the Greater bilby and Dampier Peninsula goanna;
(d) implementation of a management system to control and limit vehicular movements on the mine site, have in place fire management systems, manage waste, and other proposed management measures including feral animal control;
(e) habitat for both the Greater bilby and the Dampier Peninsula goanna remaining in areas beyond the development envelope;
(f) progressive rehabilitation of mined areas and returning it to pastoral land and suitable habitat for the Greater bilby and the Dampier Peninsula goanna; and

(g) significant residual impact that requires offsetting.

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

- control of the amount of clearing through the authorised extent in schedule 1 of the Recommended Environmental Conditions;
- implementation of measures to manage and monitor the impacts on the Greater bilby through the preparation and implementation of an Environmental Management Plan (Condition 6);
- review of the success of measures taken to progressively rehabilitate disturbed areas to habitat for the Greater bilby (Condition 9);
- implementation of an offset to address significant residual impacts from the long term loss of habitat (Condition 10); and
- implementation of an additional offset should the progressive rehabilitation required by Condition 9 not be successful (Condition 11).

The EPA notes that there is a requirement for:

- licensing of the take of fauna by the Department of Biodiversity, Conservation and Attractions (DBCA) through the Wildlife Conservation Act 1950; and
- management of mine closure and rehabilitation by the DMIRS through the Mining Act.

The EPA considers that these are the most appropriate regulatory mechanisms for managing the impacts from these activities.

4.2 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, 2016e); and
- Technical Guidance – Flora and Vegetation Surveys for Environmental impact Assessment (EPA, 2016f)

The considerations for EIA for this factor are outlined in Environmental Factor Guideline – Flora and Vegetation (EPA, 2016e).
EPA Assessment

The Proposal involves the direct disturbance of 1,961.1 ha of native vegetation, currently used as pastoral land. All of the proposed disturbance is associated with the mine site. No disturbance of native vegetation at Derby or Broome ports is proposed.

Although the timing and environmental conditions for some surveys undertaken for this Proposal may not have been ideal (issues of rainfall and seasonality may have effected some results), the EPA is of the opinion that taken as a whole, the series of surveys and assessments have met the requirements of the ESD and relevant EPA guidance, and have provided sufficient information to describe the receiving environment and assess potential impacts.

In the 15,693.9 ha area survey, 15 vegetation communities, 255 vascular plant taxa (representative of 129 genera and 44 families) and 11 weed species (including *Sida acuta*, a Declared Pest) were identified. Surveys and desktop analysis found vegetation to be in good to excellent condition despite grazing. No Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) were identified within the development envelope.

Of the 15 vegetation communities within the survey area, most will not be directly impacted by the Proposal or will only incur very minor direct impacts. Having consideration for the number of hectares to be disturbed and the percentage of a community surveyed being disturbed, the communities with potential for significant impacts are described in Table 4 below.

<table>
<thead>
<tr>
<th>Code</th>
<th>Mapped area (ha)</th>
<th>Proposed clearing area (ha)</th>
<th>Percentage of mapped area to disturbed</th>
</tr>
</thead>
<tbody>
<tr>
<td>W6</td>
<td>3,432.0</td>
<td>71.9</td>
<td>2.1%</td>
</tr>
<tr>
<td>W8</td>
<td>12,834.5</td>
<td>1747.7</td>
<td>13.6%</td>
</tr>
<tr>
<td>W10</td>
<td>964.3</td>
<td>75.7</td>
<td>7.8%</td>
</tr>
<tr>
<td>W12</td>
<td>519.8</td>
<td>25.1</td>
<td>4.8%</td>
</tr>
</tbody>
</table>

The W6 and W8 are Pindan vegetation communities and represent over 86% of the area surveyed. These communities are the most impacted community from the Proposal, however, they are considered common and widespread throughout the Kimberley area. W10 and W12 (both communities in drainage areas) will be directly impacted by clearing but remain well represented in the survey area with less than 10% of the area mapped to be impacted by clearing.

The EPA notes that local vegetation community losses from clearing will occur but the impacts are unlikely to threaten biological diversity as these communities will persist within and beyond the development envelope. In addition up to 1,635 ha of vegetation being disturbed for mining will be progressively rehabilitated over the life of the mine.

Table 4: Vegetation communities and percentage impact
No Threatened flora species were identified during the surveys but five Priority flora species were. These are listed in Table 5 below.

All the Priority flora species identified within the development envelope exist beyond the area being impacted. Two Priority 3 species (*Pterocaulon intermedium* and *Triodia caelestialis*) will be impacted but both species were found to be widely distributed within the survey area and are known to occur on the Dampier Peninsula beyond the area surveyed, as well as more widely in the Kimberley region.

Table 5: Priority flora species recorded during surveys

<table>
<thead>
<tr>
<th>Flora Species</th>
<th>DBCA Conservation Status</th>
<th>Total population surveyed</th>
<th>Plants within development envelope</th>
<th>Plants within conceptual disturbance footprint</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pterocaulon intermedium</em></td>
<td>Priority 3</td>
<td>94</td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td><em>Triodia caelestialis</em></td>
<td>Priority 3</td>
<td>135,363</td>
<td>10,413</td>
<td>518</td>
</tr>
<tr>
<td><em>Tephrosia valleculata</em></td>
<td>Priority 3</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Fuirena incrassate</em></td>
<td>Priority 3</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Fuirena nudiflora</em></td>
<td>Priority 1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Two areas were initially identified as potentially Groundwater Dependent Ecosystems (GDEs). The first was a nearby soak, however, subsequent studies at the end of the 2016 dry season showed the dominant species *Melaleuca alsophila* and *Melaleuca viridiflora* in a stressed condition likely from severe water restriction, indicating that they do not have access to groundwater when water is not available in the soil profile (Mattiske, 2016b). Additionally, studies suggested that the area is likely to be a perched aquifer not connected to the deeper Broome Sandstone Aquifer (Rockwater, 2016).

The second potential GDE area is the W14 vegetation community mapped in the Fraser River South valley to the south east of the mine area. This community has been identified as potentially groundwater dependent due to the presence of the riparian species *Eucalyptus camaldulensis*. The W14 potential GDE is not under threat of direct impacts from the Proposal, although groundwater abstraction poses an indirect risk to this vegetation community.

It is noted though that *Eucalyptus camaldulensis* in the W14 potential GDE is found widely outside of the project area and across most of the Australian mainland. Additionally, abstraction will be from the Broome Sandstone Aquifer with modelling showing drawdown would be gradual over a 32 year abstraction period, to a total of 2.7 metres (m) (equating to a 9 cm lowering per year, assuming consistent pumping rates).

The EPA notes that *Eucalyptus camaldulensis* is classified as a facultative phreatophyte – meaning that this species will preferentially use soil moisture but will extend its root system in search of groundwater if water in the soil profile is not available. As such, a gradual drawdown may allow for root growth at a pace
consistent with drawdown. Should this not be sufficient, reinjection operations can also be used to maintain higher water table levels to prevent impacts to this potential GDE.

Where possible disturbance is being kept to a minimum by utilising already disturbed areas on the station (existing tracks for example) and designing the processing and other infrastructure areas to minimise the disturbance footprint. The proponent has also prepared a vegetation management plan. Operations would be managed to mitigate and minimise impacts from dust, fire, and weeds.

The 1,635 ha mining area will also be progressively cleared, mined, and rehabilitated. Rehabilitation will utilise stored topsoil and vegetation (including woody debris) to act as a seed source and to protect the soil from erosion, and local provenance seed and propagated material will be used to rehabilitate disturbed areas if required.

The EPA received advice that the regulation of rehabilitation and closure of aspects of the Proposal that are located on Mining Act tenure can be managed by the DMIRS under the mine closure provision of the Mining Act. The requirements to rehabilitate the area to habitat for Greater bilby are in addition to the requirements under the Mining Act.

The only potentially significant vegetation is the W14 community as it may have some reliance on groundwater and could therefore be at risk from groundwater abstraction activities and limits may be required on drawdown. This is addressed in Section 4.4 of this report (Hydrological Processes and Inland Waters Environmental Quality) and the recommended conditions relating to Hydrological Processes.

Consequently, with there being no conservation significant flora or vegetation requiring special protection (except for the W14 community which would be addressed under conditions related to Hydrological Processes), the issue of fauna habitat loss being addressed in Section 4.1 (Terrestrial Fauna), and the ability for DMIRS to manage mine closure, the EPA do not consider a flora and vegetation specific condition necessary as there are unlikely any significant impacts from implementation of the Proposal.

Summary
The EPA has paid particular attention to the:

(a) Environmental Factor Guideline – Flora and Vegetation;
(b) absence of conservation significant flora and vegetation except for the potential GDE;
(c) flora and vegetation present being regionally common and extending beyond the mine site development envelope;
(d) current land use being pastoral grazing;
(e) proponent’s application of the mitigation hierarchy to avoid, manage and mitigate disturbance of flora and vegetation; and
(f) habitat value of the flora and vegetation being considered and assessed under Section 4.1 (Terrestrial Fauna) of this report.

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, and no Flora and Vegetation specific condition is required provided there is:

- control of the clearing through the authorised extent in schedule 1 of the Recommended Environmental Conditions;
- restriction of groundwater drawdown in the vicinity of the GDE through Condition 8; and
- progressive rehabilitation undertaken of the mine pits to provide habitat for Greater bilby (Condition 9).

The EPA notes that there is a requirement for the management of mine closure and rehabilitation by the DMIRS through the Mining Act. The EPA considers that this is the most appropriate regulatory mechanism for managing the impacts from mine closure.

4.3 Social Surroundings

EPA Objective

The EPA’s environmental objective for this factor is to protect social surroundings 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 – Social Surroundings (EPA, 2016g)

The considerations for EIA for this factor are outlined in Environmental Factor Guideline – Social Surroundings (EPA, 2016g).

In addition to the relevant current policy and guidance above, the EPA also had regard to the guidance on assessing Aboriginal Heritage as outlined in its Guidance for the Assessment of Environmental Factors – Assessment of Aboriginal Heritage – No. 41 (EPA, 2004) and the EPA’s assessment has been consistent with this guidance.

EPA Assessment

Aboriginal Heritage

The Proposal is located on the Dampier Peninsula in the Kimberley region. The west Kimberley contains a vast array of significant Aboriginal heritage sites which continue to hold spiritual significance to the local communities who care for and interact with these sites (Sheffield, 2017a). The Aboriginal Heritage values of the West Kimberley contributed to its listing on the National Heritage List.
The EPA understands there are sites of significance within the mine site development envelope. However, in this area the types of sites and their locations are not specifically known to the EPA or registered with the Department of Planning, Lands and Heritage (formerly the Department of Aboriginal Affairs) as their locations have been kept confidential at the request of Traditional Owners.

The nearest known registered site registered under the *Aboriginal Heritage Act 1972* is the Nilli Bubbaca Well, approximately 2 km from the intersection of the site access road and the Great Northern Highway. This site is listed as a camp and water source but is some distance from the Proposal.

Although the EPA has not been provided specific information on the types and locations of significant Aboriginal sites of significance (due to confidentiality agreements), the proponent has undertaken five heritage surveys in consultation with Traditional Owners to identify the heritage values that may be impacted.

Surveys involved aerial (helicopter) and on-ground (driving and walking) methodologies. Each survey involved representatives from various Traditional Owners as named in the table above. The surveys were undertaken in relation to specific works proposed. The surveys covered the entire development envelope and surrounding areas as shown in Figure 6.

Aboriginal heritage survey reports with the specific site details were not included in the PER document as the locations of such sites are considered confidential. However, confidential ‘open’ reports were provided to the then Department of Aboriginal Affairs (DAA) and the then Office of the EPA after the PER document was published. These reports allow for a determination of areas the Traditional Owners consider acceptable for the proponent to undertake works; areas where works could proceed conditionally, and areas where works should not occur, rather than identifying specific sites requiring protection.

The series of surveys undertaken have been presented by the proponent as evidence that the Proposal will unlikely impact any Aboriginal Heritage sites. The EPA notes that the DAA met with the proponent and discussed the findings of the heritage surveys as reported in the closed heritage survey reports. The DAA confirmed that the requirements of the *Aboriginal Heritage Act 1972* had been met.

The DAA also provided information that indicated that consultation was undertaken with people with appropriate Aboriginal heritage knowledge of the area and that this included the surveys that were undertaken. This is a requirement in the *Aboriginal Heritage Due Diligence Guidelines* (Department of Aboriginal Affairs and Department of Premier and Cabinet, 2013), and also a requirement of the Bilateral Agreement relating to environmental assessment (2014) between the Commonwealth and Western Australian governments.

The National Native Title Tribunal (NNTT) in its determination that a future act may be done (being the granting of the mining lease) commented that it gave weight to the 2016 closed heritage report, in particular the exclusion zones, on the grounds that the knowledge of significant areas or sites resides with the Mount Jowlaenga
people. The NNTT also noted that the 2016 survey was specific to proposed mining operations within the mining lease and that it was satisfied that the Mount Jowlaenga people had identified areas and sites of potential or real significance within the mining lease.

The EPA notes that the 2016 survey is particularly relevant and reliable to characterise the receiving environment in regard to Aboriginal heritage, albeit by way of exclusion zones.

It is therefore accepted by the EPA that although it does not have specific information about the types and location of sites, significant sites have been identified by the proponent through the surveys and mining exclusion zones created to avoid heritage sites. The exclusion zones are shown in Figure 7.

The EPA’s Environmental Factor Guideline for Social Surroundings notes that the EP Act can, in some instances, complement the Aboriginal Heritage Act 1972. For example, in cases where actual physical protection of the environment is required to protect sites of heritage significance.

Given there is agreement for exclusion zones around sites or areas of significance, and an agreement to maintain landscape connectivity to the Claypan Exclusion Zone, the EPA considers a condition (Condition 7 in Appendix 5) that enforces these exclusion zones would complement the Aboriginal Heritage Act 1972 in this manner.

The EPA is confident based on the information it has, DAA’s advice and NNTT determination and guidance, that it has adequate information to be able to provide advice and make a recommendation on the Proposal.
Figure 6: Aboriginal Heritage survey coverage
Figure 7: Heritage exclusion zones
Amenity

The Proposal is located 95 km north east of Broome and 75 km west of Derby. The Proposal involves transporting mineral sand products by road train to the ports of Derby and Broome for export. The transport will be predominantly along Great Northern Highway except in areas closer to Broome and Derby where local roads will be utilised.

In Derby there is no dedicated heavy haulage road and as a result road trains will pass through the centre of town. Consequently, the receiving environment includes multiple sensitive premises such as residential properties, schools, hospitals, hotels, and other amenities. At the port there is a restaurant and the area is used for commercial fishing operations. The nearest residence is approximately 2 km south east from the port. The port and surrounding area is also used by the local community. In Broome there is a dedicated haulage road to the port so road trains will traverse the same route as other users. Although the transport corridor passes potentially sensitive premises, the road is a dedicated heavy haulage route and the proposed use is consistent with this classification.

The proponent identified the nearest sensitive receptors near the mine site development envelopment in the PER document. The nearest residence, Mt Jowlaenga Station Homestead (currently uninhabited), is located approximately 2 km from the mine site development envelope. The identified nearest potential sensitive human receivers (and their distance from the mine site development envelope) are:

- Mine site accommodation village - 5 km;
- Nillibubbica designated rest area, Great Northern Highway - 27 km;
- Bidan (formerly known as Bedanburu) Aboriginal Community - 28 km;
- Yeeda Outstation, Mt Jowlaenga Road - 28 km.

The EPA note that Yeeda Pastoral Company (the holder of the Mt Jowlaenga Pastoral Lease) provided a submission generally in support of the Proposal and this submission demonstrated a desire to work with the proponent to manage the impacts of the Proposal rather than being in objection to the Proposal.

Stakeholder consultation undertaken during the site visit also identified that impacts on water are the biggest concerns from nearby communities rather than amenity impacts. Impacts on groundwater users is addressed in Section 4.4 of this report (Hydrological Processes and Inland Waters Environmental Quality).

Due to the Proposal’s remote location and the distance to the nearest inhabited sensitive receptor, impacts from dust, noise, odour, or other related matters as they relate to amenity are unlikely to be significant.

Modelling of noise and dust show that the camp site (which sits behind a hill) is highly unlikely to be impacted by noise and dust from mining activities. Workers quarters and work areas fall under occupational health and safety laws.
Dust at Derby

The proponent undertook an air quality assessment for Derby. The proponent estimated worst case background dust levels by using average ambient dust concentrations found in north-west Western Australia. Modelling was then undertaken using AERMOD modelling system. Modelling was based on expected export rates, with dust emission factors for port operations and road trains derived from the National Pollutant Inventory (NPI) Emissions Estimation Handbook (EEH) for Mining.

Road train dust emissions have been calculated based on the NPI EEH for Mining factors, using their average weight of 171 tonnes (t) empty with a 115 t payload, giving an average weight for the return journey (i.e. from the mine site to the port and back again) of 228.5 t (Atmospheric Solutions, 2016). Meteorological wind data from 2015 was used for the modelling.

Model outputs were then used to estimate maximum dust concentrations for the Derby Townsite, which were then compared to various guidelines. This is outlined in Table 6 below.

**Table 6: Dust limits**

<table>
<thead>
<tr>
<th></th>
<th>Background</th>
<th>Modelling (maximum concentrations for Derby townsite)</th>
<th>Guideline limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM10</td>
<td>20 µg/m3 averaged over 24 hours</td>
<td>22 µg/m3 averaged over 24 hours</td>
<td>50 µg/m3 over a 24 hour period¹</td>
</tr>
<tr>
<td>PM2.5</td>
<td>7 µg/m3 averaged over 24 hours</td>
<td>8 µg/m3 averaged over 24 hours</td>
<td>25 µg/m3 over a 24 hour period²</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8 µg/m3 averaged over one year²</td>
</tr>
<tr>
<td>Dust deposition</td>
<td>N/A</td>
<td>0.8 g/m2/month</td>
<td>4 g/m2/month³</td>
</tr>
<tr>
<td>TSP (Total Suspended Particles)</td>
<td>40 µg/m3 averaged over 24 hours</td>
<td>41 µg/m3 (annual average)</td>
<td>90 µg/m3 on an annual average³</td>
</tr>
</tbody>
</table>

¹ Limit - National Environment Protection Measure for Ambient Air Quality
² Advisory Standard - National Environment Protection Measure for Ambient Air Quality
³ New South Wales Environmental Protection Agency (NSW EPA) Criteria

The modelling showed small increases to background concentrations, however, the EPA notes this is taking background as being the worst case scenario found in north-west Western Australia. However, adding these worse case numbers with the modelled dust emissions does show that total concentrations are substantially below National Environment Protection Measure for Ambient Air Quality limits and advisory standards, as well as New South Wales Environmental Protection Authority criteria for Dust Deposition and Total Suspended Particles (TSP).
Noise at Derby
The proponent undertook noise monitoring and modelling to assess potential impacts at the Derby townsite. Noise from port operations and traffic were considered.

Modelling was done using SoundPLAN (version 7.4) Industrial Module using climatic parameters outlined in the EPA Guidance for the Assessment of Environmental Factors No. 8 *Environmental Noise*. Sound Power Levels for the road trains and equipment being used at the port were provided by the proponent and used in the modelling. Background traffic noise was also monitored to assist with the modelling noise from the road trains going through Derby.

For the port operations, assigned levels in the Environmental Protection (Noise) Regulations 1997 were used to assess whether noise would be acceptable. The sensitive receptor considered were the Jetty Café and the resident on Elder Street approximately two kilometres away from the port.

Traffic (which is exempt from the noise regulations) was considered against Western Australian Planning Commission (WAPC) State Planning Policy 5.4 “Road and Rail Transport Noise and Freight Considerations in Land Use Planning”, which has targets and limits in regard to noise sensitive developments near roads and rail. There are multiple sensitive premises along the transport route so an average distances to receivers were used being 20 m along Loch Street and 30 m along Derby Highway.

The outcomes of the modelling against the relevant targets and limits are shown in Tables 7 and 8 below. Table 7 compares modelling against night time assigned levels in the Noise Regulations as these are more stringent so compliance with these levels means compliance with day time levels.

### Table 7: Modelled Noise Assessment for Port Operations

<table>
<thead>
<tr>
<th>Sensitive Receptor</th>
<th>Assigned Level</th>
<th>Assigned Level (dB)</th>
<th>Modelled Noise (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential (Elder Street)</td>
<td>(L\text{A}_{10}) (Night)</td>
<td>40</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>(L\text{max}) (Night)</td>
<td>60</td>
<td>38</td>
</tr>
<tr>
<td>Jetty Café</td>
<td>(L\text{A}_{10}) (Night)</td>
<td>60</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>(L\text{max}) (Night)</td>
<td>80</td>
<td>71</td>
</tr>
</tbody>
</table>

### Table 8: Modelled Noise Assessment for Transport Route in Derby

<table>
<thead>
<tr>
<th>Location</th>
<th>Assessment Period</th>
<th>Background Traffic Noise (dB)</th>
<th>WAPC Target Criteria (dB)</th>
<th>WAPC Limit Criteria (dB)</th>
<th>Modelled Total Traffic Noise (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Derby Hwy – 30 m setback</td>
<td>L\text{A}_{eq}(Day)</td>
<td>50.7</td>
<td>55</td>
<td>60</td>
<td>53.5</td>
</tr>
<tr>
<td></td>
<td>L\text{A}_{eq}(Night)</td>
<td>43.4</td>
<td>50</td>
<td>55</td>
<td>48.1</td>
</tr>
<tr>
<td>Loch St – 20 m setback</td>
<td>L\text{A}_{eq}(Day)</td>
<td>53.2</td>
<td>55</td>
<td>60</td>
<td>56.1</td>
</tr>
<tr>
<td></td>
<td>L\text{A}_{eq}(Night)</td>
<td>41.2</td>
<td>50</td>
<td>55</td>
<td>48.7</td>
</tr>
</tbody>
</table>
As the tables above show, all noise modelling demonstrates that the port would comply with the Environment Protection (Noise) Regulations 1997 and that increases in traffic noise from the road trains delivering mineral sand products to Derby Port will still see noise remain below WAPC limits, though it is noted that Loch Street may not comply with the target criteria.

Modelling indicates that dust and noise will remain within guidelines and limits. As such the EPA considers there will not be any significant impacts at the town of Derby. In addition, storage of bulk product at the port would be within an enclosed shed which reduces the dust that would be emitted from product stockpiles.

The Department of Water and Environmental Regulation (DWER) advised that all emissions and discharges associated with construction and operation of the mineral sands mining and processing facilities, product storage and shiploading at the Port of Derby, the wastewater treatment plant, the landfill and the power generation plant, can be managed under Part V of the EP Act.

The DWER have also advised that transport of the product from the mine site to the Port of Derby does not fall within the scope of Part V of the EP Act. However, given the modelling shows that noise will remain below WAPC limits, the EPA considers that a condition relating to amenity is not required for the transport route.

Export of product through Broome will use existing port facilities and a dedicated heavy haulage route. This is considered unlikely to cause any impacts of environmental significance on the social surroundings of the transport.

Summary

The EPA has paid particular attention to the:

(a) Environmental Factor Guideline – *Social Surroundings*;
(b) monitoring and modelling at the Derby townsite that shows dust and noise levels from port operations and road train movements are within with relevant guidelines and limits;
(c) export of packaged material and the use of an existing haulage route and port facilities in Broome;
(d) modelling at the mine site that shows dust and noise levels from mining operations will be acceptable, and the worksite camp is part of the Proposal and will be covered under occupational health and safety requirements;
(e) proponent’s application of the mitigation hierarchy to avoid Aboriginal Heritage sites identified by creating exclusion zones; and
(f) Proposal’s remote location and the distance to the nearest inhabited sensitive receptor.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Social Surroundings that the impacts to this factor are manageable and would no longer be significant, provided there is:
control of the clearing through the authorised extent in schedule 1 of the
Recommended Environmental Conditions; and
implementation of an Aboriginal Heritage Protection condition to ensure no
disturbance is permitted in the Aboriginal Heritage Exclusion Zones identified
in surveys and agreed to between the proponent and the Mount Jowlaenga
people (Condition 7).

The EPA notes that there is a requirement for:

- licensing of emissions and discharges by the DWER under Part V of the EP
  Act; and
- management of mine closure and rehabilitation by the DMIRS through the
  Mining Act.

The EPA considers that these are the most appropriate regulatory mechanisms for
managing the impacts from these activities.

4.4 Hydrological Processes and Inland Waters Environmental
Quality

EPA Objective

The EPA’s environmental objectives for these factors are:

- to maintain the hydrological regimes of groundwater and surface water so
  that environmental values are protected.
- to maintain the 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 – Hydrological Processes (EPA, 2016h); and
- Environmental Factor Guideline – Inland Waters Environmental Quality (EPA,
  2016i).

The considerations for EIA for these factors are outlined in Environmental Factor
Guideline – Hydrological Process (EPA, 2016h) and Environmental Factor Guideline
– Inland Waters Environmental Quality (EPA, 2016i).

EPA Assessment

Groundwater

The Proposal is located on the Dampier Peninsula. There has been limited historical
studies on the groundwater resources of the Peninsula (Searle, 2012). However the
then Department of Water have undertaken more recent studies to help address this
information shortfall. In addition the proponent commissioned hydrogeological
studies for the Proposal (Rockwater, 2016). The Proposal sits within the proclaimed
Canning-Kimberley Groundwater Area (specifically the Canning-Pender sub-area) under the *Rights in Water and Irrigation Act 1914*. Within the mine development envelope the depth to groundwater is approximately 20 metres and flows in a southwards direction.

The Broome Sandstone Aquifer is the largest shallow aquifer across most of the Peninsula (Searle, 2012). Generally groundwater in the Broome Aquifer is fresh inland, becoming marginal to saline at the coast. Salinities from the Broome town water supply borefield suggest either upconing or intrusion is starting to affect water quality at depths of around 100 m below ground level up to 10 km inland from the coast at Broome. This aquifer is used for the Broome town water supply, as well for rural subdivisions, horticultural areas and pastoral properties. Recharge of the Broome Aquifer is principally from wet season rainfall.

The Jarlemai Siltstone underlies the Broome Aquifer and acts as a major aquiclude (an impermeable body that acts as a barrier to the flow of groundwater) between the Broome Aquifer and the Wallal Aquifer below. Current groundwater use on the Dampier Peninsula is concentrated in the Broome Aquifer. Given the presence of the aquiclude, which will not be intersected by excavation for the mine, impacts are not expected on any of the deeper aquifers, the EPA’s assessment has focused on the potential impacts to the Broome Aquifer.

Water will be abstracted via a borefield for the first 15 years of project life as mining will be above the water table. From year 15 onwards, mining will move below the water table and groundwater abstraction will be both from bores and inflows into the mine void. Peak abstraction is predicted to be 32.7 GL/a, with reinjection of 22 GL/a expected to be required after 15 years of operation. The abstraction will cause drawdown of the groundwater table around the mine pit by around 40 metres over the life of the mine (Figure 8).

The DWER regulates the abstraction of groundwater under the provisions of the *Rights in Water and Irrigation Act 1914* and a licence is required under this act to abstract water for the Proposal.

Advice has been received from the DWER that indicates that an operating strategy is a tool that can be used to ensure drawdown remains within the development envelope (as per the drawdown contours depicted in the PER document). This would mean that impacts on groundwater levels are contained to an area predominantly within the mine site development envelope.

As the drawdown is largely contained within the development envelope. The EPA notes the proponent’s view that it is unlikely that the Proposal will have significant adverse impacts on other parts of the aquifer or other beneficial users. The EPA also notes that potential impacts on the saltwater interface from groundwater drawdown are not likely to be an issue for the Proposal given the distance to the coastal areas where the saltwater interface lies.
Figure 8: Predicted groundwater drawdown contours
The proponent undertook hydrogeological investigations to better understand the interactions between groundwater and surface water in the area (Rockwater, 2016). Two areas were identified where the surface water systems (drainage lines and possible seasonal ponding) may interact with groundwater:

- **Fraser River South** – this is located about 8 km south east of the deposit area. Depths to groundwater range from less than 5 m to more than 20 m. Vegetation in this area is potentially groundwater dependent; and
- **Seasonal Soak** – this was identified by Traditional Owners and is located 3 km south east of the deposit. Investigations showed that groundwater levels in this location are 18 m below surface, indicating groundwater is part of the Broome Aquifer.

The PER document identifies the most significant potential impact of groundwater abstraction on the Fraser River South, from the lowering of groundwater levels causing vegetation decline in groundwater dependent ecosystems. The EPA has considered the impacts on potentially groundwater dependent vegetation associated with Fraser River South through the assessment of Flora and Vegetation in section 4.2 of this report.

The Seasonal Soak is an intermittent and ephemeral soak that is not considered to be groundwater fed. The soak sits within an area where the Jarlemai Sandstone outcrops and lies above the Broome Aquifer. As the Jarlemai Sandstone has low-permeability, water in the soak is unlikely to be fed from the Broome Aquifer and is more likely to be ponding of surface water. As part of their agreement with Traditional Owners, the proponent currently maintains a two kilometre buffer around this ‘soak’, which is left undisturbed. It is located off the main watercourses leading from the mine site and will not receive surface runoff from the mine site development envelope.

In regards to reinjection, groundwater mounding is predicted to be in the order of 12 m. The area where the groundwater mounding is predicted to occur has an unsaturated zone of 30 m and therefore groundwater mounding from the reinjection is not predicted to cause waterlogging at the surface. Seepage of water from the tailings storage facility may also potentially cause groundwater mounding. Similar to reinjection, this is also not predicted to result in significant groundwater mounding (Sheffield, 2017a).

After mining ceases, groundwater levels are expected to recover. The modelling carried out by the proponent shows that around ten years after mining ceases groundwater levels are expected to recover to within two metres of their pre-mining levels.

The EPA has stated a preference for aquifer reinjection as opposed to surface water discharge to creeks, as discharged water can alter hydrological regimes leading to changes in ecology and destabilisation of the banks of waterways. The impacts of discharge would be particularly pronounced in ephemeral systems like Fraser River South. Therefore the EPA supports the approach to reinject excess water rather than discharge the water to surface drainage. The EPA has been advised that reinjection
for the purpose of disposing of excess mine water can be regulated by the DWER as an emission under Part V of the EP Act.

Water efficiency measures, in particular water recycling within the process water circuit, will be implemented to minimise the quantity of water required to be abstracted. Water storage facilities used in processing will also be designed to minimise losses of water through seepage. Groundwater monitoring bores will be installed to assess the actual impacts of drawdown and mounding. This will include the installation of monitoring bores at Fraser River South and the Soak prior to the commencement of mining so that changes to groundwater levels can be detected and management measures implemented if necessary. These measures include relocation of the reinjection borefield so that water levels in areas of potential groundwater dependence can be managed to prevent significant impacts.

**Surface water**
Surface drainage is poorly developed over much of the Dampier Peninsula. Sheet flooding is the main drainage pattern, with much of the water infiltrating to groundwater. There are numerous ephemeral creeks, and runoff is usually only generated after heavy summer rainfall (Searle, 2012).

The Proposal sits within the upper catchments of the Fraser River, Fraser River South and Little Logue River. The mine site development envelope is located on sandy soils that have low capacity to generate run-off. As a consequence there is no defined watercourses within the main mine development areas. There are also no permanent surface water bodies within the area, with the nearest ephemeral pools being found 25 km downstream in Fraser River South. The development envelope is not within a proclaimed surface water area under the *Rights in Water and Irrigation Act 1914*.

Surface water regimes may be altered principally through construction of infrastructure and diversion of water around the mine site. The mine access road crosses Fraser River South and the proposed pipeline for aquifer reinjection crosses drainage lines that feed into the river. The access road is proposed to be designed with engineered drainage systems to allow natural flows to pass the crossing. Whilst, the reinjection pipelines will be buried where it crosses drainage lines so as not to impact on surface water flows.

The proponent proposes to ensure that final closure landforms and structures that are left will not materially change hydrological processes from surface water ponding or alteration of run-off patterns. This is consistent with the EPA/DMP *Guidelines for Preparing Mine Closure Plans* which gives a closure objective as being no long term reduction in the availability of water to meet local environmental values.

**Water quality**
The potential impacts of the Proposal on water quality during operations are from accidental spills or loss of wastewater, hydrocarbons and other chemicals; exposure of potentially acid forming materials causing contamination; and release of poor quality water from the TSF, particularly as a result of high rainfall. Poor mine closure practices leading to acid mine drainage or leaching from the TSF may also impact on water quality.
The EPA notes the lack of significant surface water features, particularly permanent surface water features in the mine development envelope means significant impacts of water quality is unlikely from such events. The EPA notes the proposed management, in particular the design of chemical storage in line with legislative requirements and Australian Standards.

The proponent has also proposed to implement a monitoring and assessment program for groundwater and surface water to verify that management measures are working and water quality is not being significantly impacted by the Proposal.

As part of the Proposal the proponent has committed to backfilling the mine void and therefore there is not expected to be impacts on water quality from pit lakes. The EPA considers the backfilling of mine voids is important to prevent impacts on water quality.

The EPA notes that the in order to meet the requirements of recommended condition 9, backfilling of mine voids would be required so that the mine pits can be rehabilitated to habitat suitable for the Greater bilby. This condition will therefore ensure backfilling occurs, and therefore a separate specific condition requiring backfilling is therefore not considered necessary.

The EPA considers that ensuring drawdown largely remains within the mine site development as predicted is important in ensuring there are no significant impacts on groundwater resources and other groundwater users outside the drawdown cone. The EPA has ensured that this restriction has been included in the recommended conditions (Condition 8), which requires groundwater drawdown not to be exceeded at the predicted two metre groundwater drawdown contour.

The EPA has noted the advice of the DWER that abstraction of groundwater under the provisions of the Rights in Water and Irrigation Act 1914 can be readily managed through that Act within the mine site development envelope, but not for areas outside the development envelope.

Therefore the EPA considers that a condition that specifically relates to water management is not required, except for the restriction on drawdown as noted above. This approach would help avoid regulatory duplication with the requirements of Rights in Water and Irrigation Act 1914, whilst ensuring groundwater drawdown does not exceed the predicted levels.

The DWER has also advised that all emissions and discharges associated with construction and operation of the mineral sands mining and processing facilities, product storage and shiploading at the Port of Derby, the wastewater treatment plant, the landfill and the power generation plant, can be managed under Part V of the EP Act.

The EPA notes the advice from the DMIRS that rehabilitation and closure can be managed through the mine closure requirements of the Mining Act.
Summary

The EPA has paid particular attention to the:

(a) Environmental Factor Guideline – *Hydrological Processes*;
(b) Environmental Factor Guideline – *Inland Waters Environmental Quality*;
(c) proponent’s application of the mitigation hierarchy to avoid and minimise the volume of water required to be abstracted and the drawdown of groundwater levels;
(d) groundwater values of Broome Aquifer in the vicinity of the mine site development envelope;
(e) impacts of drawdown being largely confined to the mine site development envelope;
(f) absence of significant surface water features within the mine site development envelope;
(g) use of aquifer reinjection to minimise the impacts on groundwater levels;
(h) quality of groundwater and surface water being high;
(i) saltwater interface not being impacted by the Proposal;
(j) legislative requirements for managing hydrocarbons, chemicals and wastewater;
(k) backfilling of mine voids to prevent impacts from pit lakes; and
(l) other proposed management measures for groundwater and surface water.

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

- control of the volume of dewatering and reinjection through the authorised extent in schedule 1 of the Recommended Environmental Conditions (Appendix 7);
- requirement to backfill mine voids through the Proposal description in schedule 1 of the Recommended Environmental Conditions (Appendix 7); and
- a condition that restricts the groundwater drawdown to predominantly within the mine site development envelope (Condition 8).

The EPA notes that there is a requirement for:

- licensing of water abstraction by the DWER under the *Rights in Water and Irrigation Act 1914*;
- licensing of emissions and discharges, including reinjection, by the DWER under Part V of the EP Act; and
- management of mine closure and rehabilitation by the DMIRS through the Mining Act.
The EPA considers that these are the most appropriate regulatory mechanisms for managing the impacts from these activities.

4.5 Marine environmental quality

EPA Objective

The EPA’s environmental objective for this factor is to maintain the quality of water, sediment and biota 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 – Marine Environmental Quality (EPA, 2016); and
- Technical Guidance – Protecting the Quality of Western Australia’s Marine Environment (EPA, 2016).

The considerations for EIA for this factor are outlined in Environmental Factor Guideline – Marine Environmental Quality (EPA, 2016).

The technical guidance for Marine Environmental Quality is focussed primarily on managing the impacts of planned direct discharges to the marine environment. The Proposal does not include any significant deliberate discharges or dredging of sediment but instead may cause impacts as a result of accidental discharge through loss of product during transport and loading. Therefore the EPA considers that the Technical Guidance is not specifically relevant to the Proposal.

EPA Assessment

The port area is used by the public for fishing, boat launching, and sightseeing. Dangers such as currents from high tidal movements and presence of crocodiles limits the recreational activities around the port area and the associated environmental values.

Owing to its historical use as a port, in particular for shipping of lead and zinc, soils around the port have elevated levels of some metals. The proponent undertook sampling of soil and sediments around the port to establish baseline levels of possible contaminants. Elevated levels of lead, nickel and copper have been recorded in the marine sediments, with levels exceeding the lower level Interim Sediment Quality Guidelines (there is no exceedances of higher level guidelines). The Sediment Quality Guidelines were developed under the Australian and New Zealand Guidelines for Fresh and Marine Water Quality to protect environmental values. The full contamination assessment is provided as Appendix 14 to the PER document.

As the Derby Port (Figure 9) is already constructed no dredging is required for the Proposal. This means that there will be no impacts from dredge plumes or from
mobilisation metals that have accumulated in the sediment from historical activities at the port.

There are potential impacts from the loss of radioactive product during the loading of product into barges at the port. At the time of preparing the ESD the proponent had not undertaken all testing of the products to determine radioactivity levels. Since the ESD, the proponent has finalised testing that shows that the products being shipped have low levels of radiation.

Bulk products (Ilmenite and Ilmenite LTR450) will not be classified as radioactive substances as their radiation concentrations will be less than one Bq/g. It is the bulk products that would be shipped out of Derby Port. Transfer of product at the port will be through a covered conveyor to help minimise the loss to the marine environment.

Packaged products (Zircon Concentrate, Primary Zircon and HiTi88 Leucoxene) will be classified as radioactive substances as their radiation concentration will exceed one Bq/g. However the products will have a specific activity concentration below 10 Bq/g and as such will not be required to have their transport regulated under the Radiation Safety Act 1975. These products are proposed to be shipped out of the Port of Broome. The Proponent is proposing to use existing licensed storage and ship loading facilities at the Port of Broome. Each bag will have a relatively small volume in size and the products are considered inert. As this part of the Proposal involves the shipping of sealed bagged product to an existing licensed facility the risks of spillage having significant impacts on the environmental values of the Broome port area is low and this is not assessed further in relation marine environmental quality.

Samples of the orebody material (naturally enriched in uranium and thorium) assessed in the Thunderbird Mineral Sands Project Mine Waste Characterisation confirm that uranium, thorium and other metals and metalloids are highly insoluble (even under mild acid conditions) consistent with the process of formation of these mineral sands. Hence chemically the materials are considered benign in the environment (Sheffield, 2017b).

In the response to submissions the proponent further indicated that the mineral sand products are inert and insoluble, meaning that if spilt into the marine environment no components will become bioavailable to recreational fish species (Sheffield, 2017b).
Figure 9: Derby Port
The proponent contends that, as the products being shipped through Derby Port are considered environmentally benign and would remain in-situ, the potential for significant impacts are reduced and a suitable response would allow for removal by suction dredge. Based on the evidence provided the EPA agrees with this contention.

The DMIRS is responsible for regulating the mining and processing of radioactive materials with this responsibility formalised in a Memorandum of Understanding between the DMIRS and the Radiological Council dated December 2012. The Proponent will produce a Radiation Management Plan, Radiation Waste Management Plan and Radiation Transport Management Plan as required by Radiological Council and the DMIRS to address employee occupational exposures at Broome and Derby Ports. The Radiation Management Plan would be required to comply with both the Radiation Safety Act 1975 and the Mines Safety and Inspection Act 1994 and regulations.

The proponent included a preliminary Port Environmental Management Plan (EMP) with the PER document. The EMP includes further detail about the management targets and monitoring proposed to be utilised to prevent significant impact on Marine Environmental Quality. Principally the measures contained within the EMP focus on clean up any spills, including spilt product, and upgrade of existing facilities to prevent impacts.

The DWER have advised that all emissions and discharges associated with construction and operation of the mineral sands mining and processing facilities, product storage and shiploading at the Port of Derby, the wastewater treatment plant, the landfill and the power generation plant, can be managed under Part V of the EP Act.

As part of the Radiation Management Plan required by the Radiological Council and the DMIRS, the proponent will undertake monitoring of environmental radiation levels. These will be benchmarked against the background levels measured in the soil, sediment and airborne dust, with the sediment samples being most relevant to marine environmental quality. The proponent has stated it will undertake sampling before commencing construction of infrastructure to determine background levels of radiation.

The EPA notes the Proposal to suction dredge any contaminants lost during loading and unloading. The EPA considers that in a dynamic environment like King Sound suction dredging is not guaranteed to capture all lost product. However given the low radiation level of the products to be shipped through Derby the risk of impacts to marine environmental quality at Derby are low.

The EPA considers that measures taken to reduce exposure of employees to radiation as required by the Radiation Safety Act 1975 will also reduce the potential for radiation impacts on the marine environment.

The EPA has noted the advice of the DWER that emissions and discharges can be readily managed through Part V of the EP Act. Therefore the EPA considers that a
condition that specifically requires an environmental management plan for emissions and discharges at the port is not required.

The EPA notes the low level of radiation and the benign nature of the final products to be produced and considers that a condition to manage transport of the products to prevent impacts from radiation is not necessary. The EPA also notes the requirements to prepare a Radiation Management Plan in accordance with the *Radiation Safety Act 1975* and *Mines Safety and Inspection Act 1994*.

**Summary**

The EPA has paid particular attention to the:

(a) Environmental Factor Guideline – *Marine Environmental Quality*;
(b) characteristics of the receiving environment of Derby Port, including its historical use as a port;
(c) further testing indicating that products to be shipped through Derby are not classified as radioactive;
(d) statutory requirements in regards to hydrocarbon spill management; and
(e) the management measures contained in the preliminary Port EMP.

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

- control on the volume of transport and handling of product at ports through authorised extent in schedule 1 of the Recommended Environmental Conditions.

The EPA notes that there is a requirement for:

- licensing of emissions and discharges by the DWER under Part V of the EP Act; and

The EPA considers that these are the most appropriate regulatory mechanisms for managing the impacts from these activities.
5. Offsets

Relevant policy and guidance

The EPA considers that the following policy and guidance is relevant to its assessment of offsets for the Proposal:

- *WA Environmental Offsets Policy* (Government of Western Australia 2011); and
- *WA Environmental Offset Guidelines* (Government of Western Australia 2014).

EPA Assessment

Environmental offsets are actions that provide environmental benefits which counterbalance the significant residual impacts of a proposal. The EPA may apply environmental offsets where it determines that the residual impacts of a proposal are significant, after avoidance, minimisation and rehabilitation have been pursued.

Mitigation measures are assessed under the relevant environmental factor (see 4.1 – 4.5). In applying the residual impact significance model (Government of Western Australia 2014), the EPA considers that the Proposal would have a significant residual impact from the clearing of up to 1,961.1 ha of native vegetation which is habitat for the Threatened fauna Greater bilby.

The proponent considers that the significant residual impact of the Proposal is 321.6 ha of Greater bilby habitat. This is based on the proponent’s view that 321.6 ha of the proposed clearing associated with processing and supporting infrastructure is a permanent impact and the remaining 1,632.9 ha of clearing for the mine pits is a temporary impact. The proponent considered the 1,632.9 ha as temporary because it was to be progressively rehabilitated to habitat suitable for the Greater bilby over the life of the Proposal. Based on this, the proponent proposed the following offsets package as part of the PER document:

- Establishment of the Kimberley Greater Bilby Trust – the purpose of the Trust will be to administer funds for research into the Greater bilby. The proposed amount is $750,000 over the life of the project with 60% to be allocated for projects completed by end of Year 20.
- Work to establish a WA Bilby Record Database and fund the administration of this database for 10 years. Estimated costs are $40,000 for establishment in the first year and $5,000 per year for nine years for a total of $85,000.
- Provide logistical support for people undertaking relevant research projects. Estimated costs are $10,000 per person per project per year for a total of $90,000 (three research projects for three year’s duration each).
- Feral animal control within the mine site development envelope. The proponent will allocate $5,000 per year for 45 years for a total of $225,000.

As part of establishing the Kimberley Greater Bilby Trust, the proponent has undertaken consultation with stakeholders including Traditional Owners, pastoralists,
non-government organisations, government departments, and other groups and individuals and intends to continue this engagement with the Kimberley community through implementation of offsets projects.

Due to a lack of historical offsets in the Kimberley on which to base calculations, the proponent based the proposed offset funding on recent offset rates applied in the Pilbara. The proponent has stated that land acquisition was not an option due to the surrounding land consisting of long term (99 years) pastoral leases, Aboriginal Reserves or Unallocated Crown Land.

The preliminary view of the EPA was that there were inconsistencies with the proposed offsets package and the WA Government’s Environmental Offsets Policy and Environmental Offsets Guidelines and further information was requested from the proponent.

The proponent provided additional information as well as a revised offsets package. The revised package was:

- Establish the Kimberley Greater Bilby Trust. The purpose of this Trust will be to administer funds for research into the Greater bilby. The proponent will commit a total of $600,000 over the life of the project with 60% of the Proponent funds to be allocated for completion of projects by the end of Year 20.

- Provide logistical support for people undertaking relevant research projects (flights, accommodation, and field work assistance) for research projects. Estimated costs are $10,000 per person per study project per year for a total of $60,000 based on two research projects for three years duration each.

- Feral animal control for areas external to the mine site development envelope. The proponent will allocate $200,000 or circa $4,760 per year for 42 years.

The EPA is of the view that the proponent’s revised proposed offsets package is consistent with four of the six principles of the WA Environmental Offsets Policy (Government of Western Australia 2011). The two Principles at variance are explained below.

Principle 3 requires environmental offsets to be proportionate to the significance of the environmental value being impacted. The EPA notes that the proponent indicated it considers the significant residual impact to be 326.1 ha. However, as discussed under Section 4.1 (Terrestrial Fauna) and further below, the EPA considers the significant residual impact may be up to 1,961.1 ha if the progressive rehabilitation of the mine pits does not restore the temporarily disturbed area to adequate habitat for the Greater bilby. If this rehabilitation is unsuccessful the proposed offset would be at variance with Principle 3 as the significant residual impact to Greater bilby habitat would be considered larger than 326.1 ha.

The EPA considers that whilst progressive rehabilitation has the potential to return the area to habitat for the Greater bilby, some uncertainty remains. This uncertainty principally relates to a lack of historical attempts to return areas to habitat for the Greater bilby in the Kimberley to demonstrate that rehabilitation can be successful.
Given this the EPA considers that the significant residual impact of the Proposal will be greater if rehabilitation attempts are not successful. To address this, the EPA has recommended condition 9 that requires the proponent to, in the first instance, undertake rehabilitation to return the area to habitat for Greater bilby and if this should prove unsuccessful, an additional significant residual impact would result and an additional offset would be required to counterbalance the additional impact.

Principle 6 states that ‘Environmental offsets will be designed to be enduring, enforceable and deliver long term strategic outcomes’. However, part of the proposed offsets package refers to the establishment of a Trust and the contribution of funds to this Trust. As third parties cannot be conditioned to deliver outcomes and there is no indication of what benefits the Trust will deliver for the Greater bilby, the EPA is not satisfied that Principle 6 will be met.

In order to counterbalance the significant residual impact to the Greater bilby from the loss of up to 1,961.1 ha of habitat, consistent with the six principles of the WA Environmental Offsets Policy (Government of Western Australia 2011), the EPA has recommended two conditions that require the proponent to fund research projects and on-ground conservation projects that contribute to positive, lasting conservation outcomes for the Greater bilby on the Dampier Peninsula. The proponent would only be required to implement the second condition (Condition 11) if it fails to successfully undertake progressive rehabilitation that recreates habitat that is suitable for the Greater bilby.

Although recommended condition 10 does not refer to the establishment of a Trust, the proponent is not constrained from establishing a Trust to implement the research projects. However, the EPA expects that the funds should contribute directly to the projects and not contribute to the establishment or administration of a Trust or any other mechanism to implement the projects.

The EPA notes that the proponent has also indicated that it is undergoing further mine planning and design work and that this is likely to result in a reduction of the total area required to be cleared for the Proposal. The recommended offset conditions allow for this as the proponent will only be required to offset actual clearing undertaken.

In determining the appropriate value (per hectare of impact) for the offset, the EPA notes that the Dampier Peninsula Greater bilby population is an important population of this species. The EPA further notes that the area to be disturbed is not critical habitat for the survival of the population, is part of a habitat type that is widespread across the Dampier Peninsula and not yet subject to significant cumulative impacts; and the habitat is within an active pastoral lease and therefore not in excellent condition.

The Proponent has proposed a rate of $2,500 per hectare for area of permanent disturbance on the basis that the condition of vegetation in the disturbance area was assessed during baseline surveys to range from Poor to Excellent with an average of Very Good and that the land use is and will continue post mining to be pastoral (rangeland grazing of cattle). Based on the information provided by the proponent, the EPA considers that a rate of $2,500 per hectare of clearing to be spent on
research and on ground projects is appropriate to offset the significant residual impact for the Proposal. Given the length of time the Proposal will be operating, and consistent with other proposals, the EPA recommends that the real value of this rate be maintained over time using CPI. The proponent will be required to submit a Greater Bilby Research and Conservation Plan which details the specific research and on-ground projects which the funds will be spent on and how these projects will benefit the Greater bilby.

The recommended conditions for offsets requires the proponent to define the environmental outcomes of the research and on-ground projects to ensure they contribute a positive conservation outcome for the Greater bilby, consistent with Principle 6 of the WA Environmental Offsets Policy. The EPA considers that the DBCA should be consulted when defining these outcomes. This is reflected in the requirements of the recommended offsets conditions. The EPA also supports the proponent’s intention to undertake stakeholder consultation across the Dampier Peninsula.

The EPA considers that the DBCA will also be able to provide advice on objectives that align with other conservation projects for the Greater bilby in Western Australia, including any that are being undertaken through the Western Australian Biodiversity Science Institute. This is consistent with Principle 5 of WA Environmental Offsets Policy, which states that “Environmental Offsets will be applied within a framework of adaptive management.”

Summary

The EPA recommends that an offset condition (condition 10) is imposed to counterbalance the significant residual impacts to habitat for the Greater bilby as a result of implementation of the processing and supporting infrastructure element of the Proposal. The EPA has also recommended a condition (condition 11) that requires an additional offset should Greater bilby habitat rehabilitation of mine pits not be successful. The EPA recommends that the offsets include a Greater Bilby Research and Conservation Plan. The requirements of this plan include:

- discrete research and on-ground conservation projects that align with the Greater Bilby Recovery Plan and relevant Threat Abatement Plans; and
- stakeholder consultation undertaken in regards to the research and conservation projects.
6. 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:

- Listed threatened species and communities (s. 18 and 18A).

The EPA has assessed the controlled action on behalf of the Commonwealth under the Bilateral Agreement relating to environmental assessment (2014) made under s. 45 of the EPBC Act.

The proposed action has been assessed by the EPA in a manner consistent with Schedule 1 of the Bilateral Agreement and this assessment report satisfies clause 6.2 of Schedule 1.

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:

- Commonwealth EPBC Act Environmental Offsets Policy (Commonwealth of Australia, 2012);
- National Recovery Plan for the Greater bilby *Macrotis lagotis*;
- Approved Conservation Advice for *Macrotis lagotis* (Greater bilby); and
- Threat abatement plans for Predation by Feral Cats; Competition and Land Degradation by Rabbits; Predation by the European Red Fox.

EPA Assessment

The EPA notes that the proponent has addressed the intent of EPA and Commonwealth policy, guidance and plans considered to be relevant for this factor in the PER document.

Listed threatened species and communities

The EPA notes that the decision of the Commonwealth Department of the Environment and Energy that the Proposal is a controlled action, states that the Proposal site has a Greater bilby population that is likely to be negatively impacted by mining and associated activities.

The Greater bilby is known to occur in the development envelope and the whole development envelope is considered potential habitat. The proposal would result in the clearing of up to 1,961.1 ha of breeding and foraging habitat for the Greater bilby.
The proponent has designed the Proposal to use an existing pastoral track as the site access road to minimise the additional clearing required for the Proposal.

Activities associated with the Proposal that have the potential to cause impacts on the Greater bilby are the direct clearing of vegetation; vehicle strikes; increased predation from feral animals; light and noise pollution; and altered fire regimes.

**Management**

The proponent has prepared a preliminary Bilby Management Plan which details the measures proposed to minimise impacts on the Greater bilby. Measures contained with the plan include:

- pre-clearing surveys to determine if burrows are present and evidence of recent Greater bilby activity;
- trapping and translocation of bilbies from active burrows before clearing is undertaken;
- speed limits within the mine site development envelope and restrictions on travel between dusk and dawn to only essential activities, with reduced speed limits during this time; and
- Greater bilby monitoring programs.

The proponent proposes to undertake progressive rehabilitation of the mining area. The intent is to rehabilitate the area to a standard where it provides appropriate habitat for recolonisation by Greater bilbies. Given a lack of historical precedent for rehabilitation of this nature on the Damper Peninsula, there is some uncertainty as to whether the Proposal can be rehabilitated to a level where it provides habitat for Greater bilbies. Therefore the EPA has determined that the residual impact of the clearing will be the 326.1 ha for long term clearing, or up to 1,961.1 ha in total if progressive rehabilitation of Greater bilby habitat is not successful within the mine pits.

**Summary**

The EPA has recommended the following environmental conditions to minimise impacts on MNES:

- limit the location and authorised extent of the clearing of vegetation of up to 1961.1 ha in Table 2 of Schedule 1;
- Condition 6 which requires the preparation and implementation of a Greater Bilby Management Plan; and
- Condition 9 which requires progressive of the mine pits to return the area to habitat for the Greater bilby (Condition 9).

The EPA considers that there will be a significant residual impact from clearing of up to 1,961.1 ha of habitat for Greater bilby. The EPA has recommended an offset in Condition 10 (see Section 5) which takes into account the significant residual impact to the Greater bilby. The EPA also considered relevant Commonwealth policy and guidance in recommending the offset.
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 Greater bilby as a listed Threatened species.
7. Conclusion

The EPA has considered the Proposal by Sheffield Resources Limited to develop the Thunderbird Mineral Sands Project.

**Environmental values**

The Dampier Peninsula has a number of significant regional environmental values, including the nature reserves, marine parks, national heritage listing and internationally important wetlands. However in its assessment, the EPA noted that the Proposal is not located in close proximity to these areas of high environmental value and therefore not expected to have impacts.

At a local scale, the EPA has identified the key environmental factors as Terrestrial Fauna; Flora and Vegetation; Social Surroundings; Hydrological Processes and Inland Waters Environmental Quality, and Marine Environmental Quality. The EPA has recognised the interconnected nature of these factors where appropriate, including the link between hydrological regimes and vegetation and the role that vegetation plays as fauna habitat.

To minimise the impacts the Proposal has on the environmental values into the future, the EPA has recognised the importance of the proposed approach to mine closure and rehabilitation. The EPA has also noted the role that the DMIRS play in managing mine closure in Western Australia.

**Application of the 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:

- utilising existing cleared areas where possible;
- agreeing to mining exclusion zones around identified sites of Aboriginal heritage;
- undertaking groundwater reinjection to minimise the impacts on groundwater levels, including in areas where vegetation is potentially groundwater dependent;
- targeted management measures for the Greater bilby, including pre-clearing surveys and translocation; and
- backfilling of mine to prevent formation of pit lakes and progressive rehabilitation of the area.

**Offsets**

The Proposal would have a significant residual impact based on the impacts to breeding and foraging habitat for the Greater bilby, which is considered a conservation significant fauna species. The EPA has recommended a condition that requires an offset for the significant residual impact to this species for long term
clearing associated with processing and supporting infrastructure. An additional offset is required if the Proponent’s attempts to rehabilitate the mine pits to habitat for the Greater bilby are not successful.

**Conclusion**

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

- the impacts to all the key environmental factors;
- the EPA’s confidence in the proponent’s proposed mitigation measures;
- the relevant EP Act principles and the EPA’s objectives for the key environmental factors; and
- the EPA’s 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 5.
8. Recommendations

That the Minister for Environment notes:

1. That the Proposal assessed is to construct and operate a heavy mineral sands mining operation on the Dampier Peninsula and transport the mineral sand products to Derby and Broome for export.

2. The key environmental factors identified by the EPA in the course of its assessment are Terrestrial Fauna; Flora and Vegetation; Social Surroundings; Hydrological Processes and Inland Water Environmental Quality; and Marine Environmental Quality, set out in Section 4.

3. The EPA has concluded that the Proposal may be implemented, provided the implementation of the Proposal is carried out in accordance with the recommended conditions and procedures set out in Appendix 5. Matters addresses in the conditions include the following:
   
   (a) environmental management plan to minimise impacts to conservation significant terrestrial fauna, principally the Greater bilby;

   (b) exclusion zones to avoid impacts to Aboriginal heritage sites;

   (c) restriction on the area of groundwater drawdown to prevent impacts on other groundwater users;

   (d) progressive rehabilitation to restore mine pits to habitat for the Greater bilby;

   (e) an offset to counterbalance impact to habitat for threatened fauna; and

   (f) an additional offset should the progressive rehabilitation be unsuccessful.
Appendix 1

References


Department of Mines and Petroleum and EPA 2015, *Joint Guidelines for Preparing Mine Closure Plans*, Department of Mines and Petroleum and Environmental Protection Authority, Perth, WA.


Environmental Protection Authority 2016a, *Environmental Factor Guideline – Terrestrial Fauna*, EPA, Perth, WA.


Environmental Protection Authority 2016e, *Environmental Factor Guideline – Flora and Vegetation*, EPA, Perth, WA.


Environmental Protection Authority 2016g, *Environmental Factor Guideline – Social Surroundings*, EPA, Perth, WA.

Environmental Protection Authority 2016h, *Environmental Factor Guideline – Hydrological Processes*, EPA, Perth, WA.

Environmental Protection Authority 2016i, *Environmental Factor Guideline – Inland Waters Environmental Quality*, EPA, Perth, WA.
Environmental Protection Authority 2016j, Environmental Protection Authority 2016c, *Environmental Factor Guideline – Marine Environmental Quality*, EPA, Perth, WA.

Environmental Protection Authority 2016k, *Technical Guidance – Protecting the Quality of Western Australia’s Marine Environment*, EPA, Perth, WA.


Government of Western Australia 2011b, *WA Environmental Offsets Policy*, Government of Western Australia, Perth, WA.

Government of Western Australia 2014, *WA Environmental Offset Guidelines*, Government of Western Australia, Perth, WA.


Appendix 2

List of submitters
Organisations:

Apprenticeship Australia
Bidan Aboriginal Corporation
Broome Branch of the Liberal Party
Buru Energy Ltd
Department of Aboriginal Affairs (WA) (now Department of Planning, Lands and Heritage)
Department of Environment Regulation (WA) (now Department of Water and Environmental Regulation)
Department of Fisheries (WA) (now Department of Primary Industries and Regional Development)
Department of Health (WA)
Department of Lands (WA) (now Department of Planning, Lands and Heritage)
Department of Mines and Petroleum (WA) (now Department of Mines, Industry Regulation and Safety)
Department of Parks and Wildlife (WA) (now Department of Biodiversity, Conservation and Attractions)
Department of Planning (WA) (now Department of Planning, Lands and Heritage)
Department of the Environment and Energy (Cth)
Department of Transport (WA)
Department of Water (WA) (now Department of Water and Environmental Regulation)
Derby Chamber of Commerce (INC)
Derby Landcare Group
Energy Developments Pty Ltd
Environ Kimberley
Kimberley Pilbara Cattlemen's Association
Kimberley Ports Authority
Kimberley Prawn Company
Madjulla Inc.
Mary Island Fishing Club
Mount Jowlaenga Polygon #2 Native Title Claim Group
Mowanjum Aboriginal Corporation
Radiological Council (WA)
Shire of Broome
Shire of Derby/West Kimberley
The Chamber of Minerals and Energy of Western Australia
The Wilderness Society WA
Walalakoo Aboriginal Corporation Registered Native Title Body Corporate
Yeeda Pastoral Company Pty Ltd

Individuals:

There were 17 private submitters.
Appendix 3

Consideration of principles
### EP Act Principle

<table>
<thead>
<tr>
<th>1. The precautionary principle</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>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.</strong></td>
</tr>
<tr>
<td><strong>In application of this precautionary principle, decisions should be guided by:</strong></td>
</tr>
<tr>
<td>a) <em>careful evaluation to avoid, where practicable, serious or irreversible damage to the environment</em>; and</td>
</tr>
<tr>
<td>b) <em>an assessment of the risk-weighted consequences of various options.</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. The principle of intergenerational equity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.</strong></td>
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</table>

<table>
<thead>
<tr>
<th>3. The principle of the conservation of biological diversity and ecological integrity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conservation of biological diversity and ecological integrity should be a fundamental consideration.</strong></td>
</tr>
</tbody>
</table>

### Consideration

<table>
<thead>
<tr>
<th>1. The precautionary principle</th>
</tr>
</thead>
<tbody>
<tr>
<td>In considering this principle, the EPA notes that Terrestrial Fauna, Flora and Vegetation, Social Surroundings, Hydrological Processes, Inland Waters Environmental Quality and Marine Environmental Quality could be significantly impacted by the Proposal. The assessment of these impacts is provided in this report.</td>
</tr>
<tr>
<td>Investigations into the biological and physical environmental that have been undertaken by the proponent have provided sufficient certainty to assess risks and identify measures to avoid or minimise impacts. The EPA has recommended conditions to ensure relevant measures are undertaken by the proponent.</td>
</tr>
<tr>
<td>The EPA has had regard to this principle during the assessment of the Proposal.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. The principle of intergenerational equity</th>
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<tbody>
<tr>
<td>In considering this principle, the EPA notes that the proponent has taken measures to avoid and minimise impacts. In assessing this Proposal the EPA has recommended conditions to manage impacts to the key environmental factors identified during the course of this assessment.</td>
</tr>
<tr>
<td>From its assessment of this Proposal the EPA has concluded that the environmental values will be protected and that the health, diversity and productivity of the environment will be maintained for the benefit of future generations.</td>
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</table>

<table>
<thead>
<tr>
<th>3. The principle of the conservation of biological diversity and ecological integrity</th>
</tr>
</thead>
<tbody>
<tr>
<td>This principle is a fundamental and relevant consideration for the EPA when assessing and considering the impacts of the Proposal on the environmental factors of flora and vegetation and terrestrial fauna.</td>
</tr>
<tr>
<td>The EPA notes that the proponent has identified measures to avoid or minimise impacts. The EPA has considered these measures during its assessment.</td>
</tr>
<tr>
<td>Through the assessment it was found that no conservation significant flora or vegetation communities are present in the Mine Site.</td>
</tr>
</tbody>
</table>
Development Envelope or surrounding area, except for a potential Groundwater Dependent Ecosystem (GDE) that could be impacted from groundwater abstraction.

For Terrestrial Fauna, the main concern was loss of habitat for the Greater bilby (a Threatened species) and the newly discovered Dampier Peninsula goanna. Given habitat for the Greater bilby (which is also likely habitat for the Dampier Peninsula goanna) extends beyond the development envelope. It is therefore considered unlikely that implementation of the Proposal will affect regional populations or viability of these species on the Dampier Peninsula.

The EPA has considered the extent to which potential impacts from the Proposal can be ameliorated by recommended conditions. The EPA has concluded that, given the nature of the impacts, the proposed conditions are likely to ameliorate the impacts of the loss of ecological integrity.

| 4. Principles relating to improved valuation, pricing and incentive mechanisms |
| 2) The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement. |
| In considering this principle, the EPA notes that the proponent would bear the cost relating to waste and pollution, including avoidance, containment, and rehabilitation. 

The EPA has had regard to this principle during the assessment of the Proposal. |

| 5. The principle of waste minimisation |
| All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment. |
| This principle is a fundamental and relevant consideration for the EPA when assessing and considering the impacts of the Proposal on the environmental factors of marine environmental quality, inland waters environmental quality and hydrology. 

In considering this principle, the EPA notes that the proponent proposes to use mining waste for construction purposes (e.g. road base) and will progressively backfill mine voids will overburden waste and tailings as part of its rehabilitation activities. The proponent has also committed to taking all reasonable and practicable measures to minimise the generation of waste on site. 

The EPA has had regard to this principle during the assessment of the Proposal. |
Appendix 4

Evaluation of other environmental factors
<table>
<thead>
<tr>
<th>Environmental factor</th>
<th>Description of the proposal’s likely impacts on the environmental factor</th>
<th>Government agency and public comments</th>
<th>Evaluation of why the factor is not a key environmental factor</th>
</tr>
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<tbody>
<tr>
<td>Sea</td>
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</table>
| Benthic Communities and Habitats | • Installation of mooring points and anchoring of vessels causing physical disturbance of benthic habitats.  
• Spillage of product causing smothering of benthic habitats.  
• Proposal does not involve any dredging for port operations. | No comments were received on this factor | Benthic Communities and Habitats was identified as ‘Other factors or matters’ in the ESD.  
Mangrove communities provide benthic habitat within King Sound. No mangrove communities are proposed to be disturbed for the Proposal.  
Given the high turbidity in the port area and associated lack of light penetration, seagrass communities are not expected to establish in this area.  
Having regard to:  
• there being no disturbance of mangrove communities;  
• the lack of seagrass habitat in the port area;  
• the limited scale of potential impacts, including that no dredging is proposed;  
• Environmental Factor Guideline – *Benthic Communities and Habitats*;  
• Technical Guidance – *Protection of Benthic Communities and Habitats*; and |
<table>
<thead>
<tr>
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</tr>
</thead>
</table>
| Marine Fauna         | - Operations at the Derby Port impacting on Sawfish species and Northern River Shark.  
|                      | - Additional ship movements causing vessel strikes or noise and light impacts.  
|                      | Agency comments  
|                      | - Four species of fish listed as Totally Protected Fish under the *Fish Resources Management Act 1994* should be considered in the assessment of Marine Fauna.  
|                      | - The reference to the Short-Nosed Sea Snake is outdated.  
|                      | Public comments  
|                      | - There is a Flatback Turtle rookery on Point Torment. There is no reference to it in the Sheffield Resources EPA Referral. The transfer anchorage mooring point should be located far enough away from the Point  
|                      | Marine Fauna was identified as ‘Other factors or matters’ in the ESD.  
|                      | In 2014/2015 a total of 1,515 vessels were known to berth in the Kimberley Ports of Derby, Broome and Wyndham. The predicted additional ship movements (40-70 per year) associated with the Proposal represents a small increase in the total vessel movements in the Kimberley.  
|                      | The Sea Transfer Point will be 17.3 nautical miles offshore from Point Torment. No activities on land will occur at Point Torment. |
Tortment Flatback turtle rookery to avoid disturbance to nesting behaviour.
- Assessment has focussed on conservation significant marine fauna species, impacts to other species, including from marine pests, should be addressed.

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<thead>
<tr>
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<tr>
<td></td>
<td></td>
<td>No dredging or marine construction works at Derby Port that could impact on marine fauna are proposed. In addition the existing port is a trellised structure that does not block the movement of marine fauna through the port area, including sawfish species. Coral reefs that are known to support Totally Protected Fish species are not found within the Derby Port area and therefore not expected to be impacted by the Thunderbird Proposal. Having regard to: the relatively small number of vessel movements; the limited scale of activities and impacts on the marine environment; the general absence of significant marine fauna habitat types; Environmental Factor Guideline – Marine Fauna; and the significance considerations in the Statement of Environmental Principles, Factors and Objectives, the EPA considers that it is unlikely that the Proposal would have a significant</td>
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<tr>
<td>Environmental factor</td>
<td>Description of the proposal’s likely impacts on the environmental factor</td>
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<tr>
<td>Landforms</td>
<td>• Changes to profile of the land as a result of landforms created post-mining.</td>
<td><strong>Agency comments</strong>&lt;br&gt;- Detailed Tailing Storage Facility (TSF) construction and proposed closure designs and embankment construction material analysis will be required to be submitted to DMIRS with the Mining Proposal for this mine site, as required under the <em>Mining Act 1978</em>.</td>
<td><strong>Landforms</strong> was identified as ‘Other factors or matters’ in the ESD.&lt;br&gt;&lt;br&gt;Disturbance is limited to areas of low relief. Distinctive landforms in region, including Mt Jowlaenga, will not be impacted by the Proposal.&lt;br&gt;&lt;br&gt;Mine closure can be managed by the DMIRS in accordance with the EPA/Department of Mines and Petroleum <em>Guidelines for preparing mine closure plans</em>.</td>
</tr>
</tbody>
</table>

*Accordingly, the EPA did not consider Marine Fauna to be a key environmental factor* at the conclusion of its assessment. In addition, there are a number of State and Federal legislative requirements that relate to biosecurity that ships associated with the Proposal will be required to comply with to prevent impacts from introduced pests.
<table>
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<tr>
<th>Environmental factor</th>
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</thead>
</table>
| Subterranean Fauna   | • Changes in hydrological regimes, particularly groundwater drawdown, potentially impacting on stygofauna habitat.  
                      | • Disturbance of troglofauna habitat for mining activities.             | Public comments  
                      | • The Thunderbird Mineral Sands Project Public Environmental Review concluded that there was no threat to stygofauna because no stygofauna were located at the proposed mine site. However, their representation of the research that was conducted is misleading and the research was inadequate.  
                      | Subterranean Fauna was identified as ‘Other factors or matters’ in the ESD.  
                      | A Level 2 subterranean fauna survey was undertaken in 2014.  
                      | Sampling failed to identify any species of stygofauna within the mine site development envelope. |

Having regard to:  
- the prediction of no impacts to regional landforms;  
- the requirements of the Guidelines for preparing mine closure plans;  
- Environmental Factor Guideline – Landforms; and  
- the significance considerations in the Statement of Environmental Principles, Factors and Objectives,  
the EPA considers that it is unlikely that the Proposal would have a significant impact on Landforms and that the impacts to this factor are manageable.  

Accordingly, the EPA did not consider Landforms to be a key environmental factor at the conclusion of its assessment.
<table>
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<tr>
<th>Environmental factor</th>
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<th>Evaluation of why the factor is not a key environmental factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrestrial Environmental Quality</td>
<td>• Erosion and sedimentation from loss of topsoil and disturbed soils.</td>
<td>Agency comments</td>
<td>Terrestrial Environmental Quality was identified as ‘Other factors or matters’ in the ESD.</td>
</tr>
<tr>
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<td></td>
<td>• A number of agencies made comments that additional information is required on geochemical characterisation and</td>
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</table>

The sandy substrate found within the mine site development envelope is considered to provide little to no habitat for troglobiota. Having regard to:

- the results of subterranean fauna surveys;
- the limited suitable troglobiota habitat occurring within the mine site development envelope;
- Environmental Factor Guideline – Subterranean Fauna; and
- the significance considerations in the Statement of Environmental Principles, Factors and Objectives,

the EPA considers that it is unlikely that the Proposal would have a significant impact on Subterranean Fauna and that the impacts to this factor are manageable. Accordingly, the **EPA did not consider Subterranean Fauna to be a key environmental factor** at the conclusion of its assessment.
<table>
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<tr>
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<tbody>
<tr>
<td></td>
<td>• Accidental spills or loss of hydrocarbons and other chemicals.</td>
<td>management of the tailings storage facilities.</td>
<td>Sheetflow is typical across the area and management of stormwater to prevent excessive erosion is a standard requirement of mine projects in Western Australia.</td>
</tr>
<tr>
<td></td>
<td>• Exposure of potentially acid forming materials causing contamination.</td>
<td>Public comments</td>
<td>Licensing of discharges and emissions by the DWER under Part V of the EP Act would be required.</td>
</tr>
<tr>
<td></td>
<td>• Poor mine closure practices leading to acid mine drainage or leaching from the tailings storage facility.</td>
<td>• The quality of the soil and its suitability for agricultural purposes will be retained by Sheffield, given the nature of mining. The submitter understands that scientific analysis has demonstrated the materials that are returned to the void, (as part of the progressive rehabilitation process), are environmentally benign, in both the short and long term.</td>
<td>As for Inland Waters Environmental Quality, the likelihood of a large scale contamination event from spills of hydrocarbons and other chemicals is low</td>
</tr>
</tbody>
</table>

Mine closure managed by the DMIRS in accordance with the Mining Act 1978 and the EPA/Department of Mines and Petroleum Guidelines for preparing mine closure plans. This includes ensuring geochemical testing is undertaken.

Having regard to:
- the limited potential impacts from erosion;
- the legislative requirements for managing hydrocarbons, chemicals and wastewater;
<table>
<thead>
<tr>
<th>Environmental factor</th>
<th>Description of the proposal’s likely impacts on the environmental factor</th>
<th>Government agency and public comments</th>
<th>Evaluation of why the factor is not a key environmental factor</th>
</tr>
</thead>
</table>
| Air                  | Emissions of particulates, principally dust, from mining activities.  
                       | Emissions from combustion for power generation; processing of mineral products and vehicles and equipment. | Agency comments  
                       | the then Department of Environmental Regulation made a number of comments on the air quality modelling.  
                       | Public comments  
                       | Impacts on air quality in Derby from transport of product through the town has not been addressed. | Air Quality was identified as ‘Other factors or matters’ in the ESD.  
                       | Impacts from dust, including on Derby, have been addressed under the social surrounds factor.  
                       | Modelling indicates that emissions from dust will not exceed National Environmental Protection Measures air quality standards at the nearest sensitive site. |
| Terrestrial Environmental Quality |  
| Groundwater Quality |  
| Marine Environmental Quality |  
| Noise |  
| Radiological |  
| Other |  

The EPA considers that it is unlikely that the Proposal would have a significant impact on Terrestrial Environmental Quality and that the impacts to this factor are manageable. Accordingly, the EPA did not consider Terrestrial Environmental Quality to be a key environmental factor at the conclusion of its assessment.
<table>
<thead>
<tr>
<th>Environmental factor</th>
<th>Description of the proposal’s likely impacts on the environmental factor</th>
<th>Government agency and public comments</th>
<th>Evaluation of why the factor is not a key environmental factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse gas emissions</td>
<td>- Greenhouse gas emissions of 239,002 tonnes of CO$_2$ equivalent per annum.</td>
<td>- The PER identifies there is a genuine risk to local people due to the high levels of airborne radiation in the dust that would be created transport and loading of the ore. The PER attempts to dismiss the significance of the risk to the public by adding little comments saying there are no receptors or residents in the area.</td>
<td>receptor (which is the accommodation camp for the Proposal). Compared against the State’s greenhouse gas emissions 86.5 million tonnes of CO$_2$ equivalent in 2015, the emissions from the Proposal are not so significant that assessment and conditioning of greenhouse gas emissions is required. In addition the proponent is undertaking measures to reduce greenhouse gas emissions. There will be progressive clearing which will also coincide with progressive revegetation of mined areas, such that greenhouse gas emissions would be less than if all vegetation was cleared in one stage. The proponent has also considered energy efficiency in the selection and design of equipment and plant. Having regard to: - the assessment of dust impacts under Social Surroundings; - the scale of greenhouse gas emissions and proposed management measures; - Environmental Factor Guideline – Air Quality; and</td>
</tr>
<tr>
<td>Environmental factor</td>
<td>Description of the proposal’s likely impacts on the environmental factor</td>
<td>Government agency and public comments</td>
<td>Evaluation of why the factor is not a key environmental factor</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>---------------------------------------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>People</td>
<td></td>
<td></td>
<td>• the significance considerations in the Statement of Environmental Principles, Factors and Objectives, the EPA considers that it is unlikely that the Proposal would have a significant impact on Air Quality and that the impacts to this factor are manageable. Accordingly, the <strong>EPA did not consider Air Quality to be a key environmental factor</strong> at the conclusion of its assessment.</td>
</tr>
</tbody>
</table>

**Human Health**

- Exposure to naturally occurring radioactive materials associated with heavy mineral sands.

**Agency comments**

- The Radiological Council noted that in several areas, the PER document refers to Sheffield Resources appointing "a Radiation Safety Officer (RSO) to implement a Radiation Management Plan (RMP) and the Radiation Waste Management Plan (RWMP) on behalf of Sheffield". The RMP and RWMP must be implemented by Sheffield at all levels (management and employees) to control the risks from radiation. This cannot simply be implemented on behalf of Sheffield.
- The Radiological Council provided comments that indicated that the context for a number of references may be erroneous.

**Human Health** was identified as 'Other factors or matters' in the ESD.

At the time of preparing the ESD, radiation assessment of the mineral products to be produced and transported had to be finalised. Since this time, testing has indicated that bulk products to be transported through Derby will not be classified as radioactive substances as their radiation concentrations will be less than 1 Bq/g. The estimated public exposure is detailed in the PER document and the total exposure is 0.8% of the Australian Radiation Protection and Nuclear Safety Agency exposure guideline.
<table>
<thead>
<tr>
<th>Environmental factor</th>
<th>Description of the proposal’s likely impacts on the environmental factor</th>
<th>Government agency and public comments</th>
<th>Evaluation of why the factor is not a key environmental factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>and that clarification from the proponent is needed.</td>
<td></td>
<td>Packaged products to be transported through will be classified as radioactive substances as their radiation concentration will exceed 1 Bq/g. However the products will have a specific activity concentration below 10 Bq/g and as such will not be required to have their transport regulated under the <em>Radiation Safety Act 1975</em>.</td>
</tr>
<tr>
<td></td>
<td><strong>Public comments</strong></td>
<td></td>
<td>Having regard to:</td>
</tr>
<tr>
<td></td>
<td>• It is noted that radiation hazards are dealt with in the PER. As the levels are much lower than world standards demand, there would appear to be no reason for this to be of concern.</td>
<td></td>
<td>• bulk products not meeting criteria to be considered radioactive;</td>
</tr>
<tr>
<td></td>
<td>• Mineral sands, like many substances, can contain naturally occurring radioactive material. The exposure and risk to workers and to the public from radiation from the various stages of production of the mineral sands product are minimal and well below established dose rate limits. Therefore the risk to the public and environment from radiation from the Project is negligible and acceptable.</td>
<td></td>
<td>• packaged products having a radiation concentration low enough that regulation of transport is not required;</td>
</tr>
<tr>
<td></td>
<td>• The PER claim that the exposure to radiation ‘Low’ does not take into account the local Indigenous and broader community use of the Port area. Mining company notoriously underestimate risk assessments, given the PER has identified there is a genuine risk, the EPA needs to appreciate the real risk is more than ‘Low’ and needs to be considered a serious threat to human health and safety.</td>
<td></td>
<td>• the predicted public exposure being 0.8% of guideline values;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Environmental Factor Guideline – Human Health; and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• the significance considerations in the Statement of Environmental Principles, Factors and Objectives, the EPA considers that it is unlikely that the Proposal would have a significant impact on Human Health and that the impacts to this factor are manageable.</td>
</tr>
<tr>
<td>Environmental factor</td>
<td>Description of the proposal's likely impacts on the environmental factor</td>
<td>Government agency and public comments</td>
<td>Evaluation of why the factor is not a key environmental factor</td>
</tr>
<tr>
<td>----------------------</td>
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<td>--------------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Human Health</td>
<td></td>
<td></td>
<td>Accordingly, the <strong>EPA did not consider Human Health to be a key environmental factor</strong> at the conclusion of its assessment.</td>
</tr>
</tbody>
</table>
Appendix 5

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:

<table>
<thead>
<tr>
<th>Decision-making Authority</th>
<th>Legislation (and Approval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Minister for Water</td>
<td>Rights in Water and Irrigation Act 1914 (Water abstraction licence)</td>
</tr>
<tr>
<td>3. Minister for Aboriginal Affairs</td>
<td>Aboriginal Heritage Act 1972 (Section 18 clearances)</td>
</tr>
<tr>
<td>5. Minister for Lands</td>
<td>Land Administration Act 1950</td>
</tr>
<tr>
<td>7. Department of Health</td>
<td>Health Act 1911</td>
</tr>
<tr>
<td>8. Department of Water and Environmental Regulation</td>
<td>Environmental Protection Act 1986 (Works Approval and Licence)</td>
</tr>
<tr>
<td>10. Department of Transport</td>
<td>Marine and Harbours Act 1981</td>
</tr>
<tr>
<td>12. Kimberley Ports Authority</td>
<td>Port Authorities Act 1999</td>
</tr>
<tr>
<td>13. Shire of Derby/West Kimberley</td>
<td>(Planning approval)</td>
</tr>
</tbody>
</table>

Note: In this instance, agreement is only required with DMA 1, 2, 3, 4, 5 and 6 as these DMAs are Ministers.
Statement No. xxx

RECOMMENDED ENVIRONMENTAL CONDITIONS

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

THUNDERBIRD MINERAL SANDS PROJECT

Proposal: To construct and operate heavy mineral sands mining operation on the Dampier Peninsula, approximately 95 kilometres north east of Broome and 75 kilometres west of Derby and transport the products produced to the ports of Broome and Derby for export.

Proponent: Sheffield Resources Limited
Australian Company Number 125 811 083

Proponent Address: Level 2, 41 - 47 Colin Street,
West Perth, Western Australia, 6005

Assessment Number: 2073

Report of the Environmental Protection Authority: 1606

Pursuant to section 45 of the Environmental Protection Act 1986 it has been agreed that the proposal described and documented in 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 shall not exceed the authorised extent of the proposal as defined in Table 2 in 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 shall 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 shall not commence implementation of the proposal after five (5) years from the date on this Statement, and any commencement, prior to this date, must be substantial.

3-2 Any commencement of implementation of the proposal, on or before five (5) years from the date of this Statement, must be demonstrated as substantial by providing the CEO with written evidence, on or before the expiration of five (5) years from the date of this Statement.

4 Compliance Reporting

4-1 The proponent shall 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 shall 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 shall assess compliance with conditions in accordance with the Compliance Assessment Plan required by condition 4-1.

4-4 The proponent shall retain reports of all compliance assessments described in the Compliance Assessment Plan required by condition 4-1 and shall make those reports available when requested by the CEO.

4-5 The proponent shall advise the CEO of any potential non-compliance within seven (7) days of that non-compliance being known.

4-6 The proponent shall 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 shall:

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 shall 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)) 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 shall provide the CEO with an explanation and reasons why the data should not be made publicly available.

6 Terrestrial Fauna Environmental Management Plan

6-1 The proponent shall prepare and submit an Environmental Management Plan (the Plan), on the advice of the Department of Biodiversity, Conservation and Attractions, that demonstrates how the proponent will achieve the following environmental objectives:
(1) Minimise impacts to the Greater bilby within the mine site development envelope as defined in Figure 2 of Schedule 1.

(2) No material harm to the Greater bilby population outside of the mine site development envelope as defined in Figure 2 of Schedule 1.

(3) No material harm to the Dampier Peninsula goanna population outside of the mine site development envelope as defined in Figure 2 of Schedule 1.

6-2 The Plan shall specify environmental objective/s (specified above), management actions, management targets, monitoring and reporting to demonstrate that the objective of Condition 6-1 will be met.

6-3 The Plan shall be prepared in accordance with the Environmental Protection Authority’s Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans.

6-4 The proponent shall submit the Plan to the CEO prior to the commencement of ground disturbing activities.

6-5 The proponent shall not commence ground disturbing activities until the CEO has confirmed in writing that the Plan satisfies the requirements of Condition 6-1.

6-6 The proponent shall implement the most recent version of the Plan approved by the CEO.

6-7 In the event of failure to implement management actions, the proponent shall meet the requirements in Condition 4 (Compliance Reporting) and shall implement the measures outlined in the Plan, including, but not limited to, actions and investigations to be undertaken, and reporting to the CEO.

6-8 Any changes to management targets, management actions, monitoring and reporting in the Plan must be approved by the CEO in writing.

7 Aboriginal Heritage

7-1 The proponent shall not undertake any clearing, mining operations, or other ground disturbance activities, other than for the purpose of undertaking surveys or other activities required under law, within the Heritage Exclusion Zones as defined in Figure 4 of Schedule 1 and delineated by the coordinates in Schedule 2 unless authorised to do so under the Aboriginal Heritage Act 1972.

7-2 The proponent shall ensure that the Claypan Mining Exclusion Zone as defined in Figure 4 of Schedule 1 and delineated by the coordinates in Schedule 2 remains connected by way of a native vegetation corridor to the surrounding landscape for the life of the proposal. The native vegetation corridor:
shall be no narrower than 300 metres;

may move over the life of the proposal;

may include areas of undisturbed or rehabilitated areas; and

must be accessible to Traditional Owners subject to mining safety and operational requirements,

unless the proponent is authorised under the Aboriginal Heritage Act 1972 to disturb the Claypan Mining Exclusion Zone.

8  Groundwater drawdown restrictions

8-1  The proponent shall ensure that groundwater drawdown associated with the proposal does not result in the spatial extent of the drawdown exceeding the two metre groundwater drawdown contour defined in Figure 5 of Schedule 1 and delineated by the coordinates in Schedule 2.

9  Greater bilby habitat rehabilitation plan and performance report

9-1  The proponent shall prepare and submit a Greater Bilby Habitat Rehabilitation Plan (Rehabilitation Plan) to the CEO, on the advice of the Department of Biodiversity, Conservation and Attractions, to demonstrate that the following environmental outcome will be met:

(1)  progressive rehabilitation for the proposal will be undertaken in a manner that will result in habitat suitable for use, including foraging and burrowing, by the Greater bilby.

9-2  The Rehabilitation Plan shall include the following provisions:

(1)  completion criteria, based on specific attributes of pre-disturbance Greater bilby habitat in the proposal area, that will be used to evaluate the success of Greater bilby habitat rehabilitation;

(2)  details of the methods that will be used to undertake rehabilitation of Greater bilby habitat;

(3)  details of a monitoring regime to be implemented in areas of rehabilitated Greater bilby habitat, to detect the presence and activity patterns of the Greater bilby should this species return to rehabilitated areas; and

(4)  specify significant residual environmental impact trigger criteria for areas to be progressively rehabilitated.

9-3  The proponent shall submit the Rehabilitation Plan to the CEO within twelve (12) months before commencement of rehabilitation.
9-4 The proponent shall not commence rehabilitation until the CEO has confirmed in writing that the Rehabilitation Plan satisfies the requirements of Condition 9-1 to 9-2.

9-5 The proponent shall implement the most recent version of the Rehabilitation Plan approved by the CEO unless and until the CEO confirms by notice in writing that the proponent has demonstrated the outcome specified in condition 9-1 has been met and will continue to be met and therefore the implementation of the Rehabilitation Plan is no longer required.

9-6 The proponent may review and revise the Greater Bilby Habitat Rehabilitation Plan or any subsequently approved revisions.

9-7 Any review and revision of the Greater Bilby Habitat Rehabilitation Plan may be informed by the research projects undertaken pursuant to condition 10.

9-8 Within ten (10) years of receiving the written notice from the CEO referred to in condition 9-4, the proponent shall prepare and submit a Greater Bilby Habitat Rehabilitation Performance Report to the CEO.

9-9 The Greater Bilby Habitat Rehabilitation Performance Report shall include the following elements:

(1) the area in hectares that has been rehabilitated;

(2) evidence that the rehabilitation meets the completion criteria required by condition 9-2(1);

(3) results of the monitoring regime required by condition 9-2(3);

(4) a determination as to whether the significant residual environmental impact criteria required by condition 9-2(4) have been triggered; and

(5) evidence, confirmed in writing by an independent expert, that rehabilitated areas are habitat suitable for use, including foraging and burrowing, by the Greater bilby.

10 Offset – Greater bilby habitat (processing and support infrastructure)

10-1 The proponent shall fund and undertake an offset to counterbalance the significant residual impact caused by the loss of habitat for the Greater bilby. The amount of funding required shall be based on an initial rate of $2,500 (excluding GST) plus CPI per hectare (offset rate) of Greater bilby habitat cleared for Processing and Supporting Infrastructure as defined in Table 2 of Schedule 1 and delineated by Figure 2 of Schedule 1.

10-2 Within twelve (12) months of the date of this statement, or as otherwise agreed with the CEO, the proponent shall prepare and submit to the CEO a Greater
Bilby Research and Conservation Plan which identifies research projects and on-ground conservation projects to be undertaken which offset the significant residual impact identified in condition 10-1 and contribute to lasting conservation outcomes for the Greater bilby on the Dampier Peninsula.

10-3 The Greater Bilby Research and Conservation Plan shall:

(1) outline the methodology to identify the area of Greater bilby habitat cleared annually for Processing and Supporting Infrastructure;

(2) include the methodology to determine the amount of funding to be spent on research projects and on-ground conservation projects based on the offset rate for each hectare of Greater bilby habitat cleared;

(3) propose discrete research projects and on-ground conservation projects which align with the Greater Bilby Recovery Plan and relevant Threat Abatement Plans for the Greater bilby, or any subsequent revisions of these plans;

(4) demonstrate how the proposed research projects contribute to a long term conservation outcome for the Greater bilby on the Dampier Peninsula and are aligned with published research priorities for this species, as defined in *A conceptual framework for habitat use and research priorities for the greater bilby (Macrotis lagotis) in the north of Western Australia* (Cramer et al 2016) or other research priorities agreed with the Department of Biodiversity, Conservation and Attractions;

(5) demonstrate how the proposed on-ground conservation projects contribute to a long-term conservation outcome for the Greater bilby on the Dampier Peninsula;

(6) provide details of the stakeholder consultation undertaken regarding the projects;

(7) outline the objectives and intended outcomes, and details of completion criteria for each project;

(8) provide an implementation schedule for each project including an outline of key activities, stages of implementation, and milestones towards completion;

(9) outline the agreed governance arrangements – including stakeholder responsibilities for implementing the projects, and any contractual arrangements for third parties involved and legal obligations;

(10) detail the financial and financial auditing arrangements including project budget and recipients of funds if projects are being undertaken by any third parties;
(11) outline any potential risks involved for the projects and appropriate contingency measures;

(12) identify monitoring activities to assess progress with project implementation and for compliance purposes; and

(13) include schedules and means for reporting details of impact reconciliation and project implementation, including outcomes.

10-4 Within six (6) months of receiving notice in writing from the CEO that the Greater Bilby Research and Conservation Plan satisfies the requirements of conditions 10-1 to 10-3(13), the proponent shall:

(1) commence the implementation of the projects in accordance with the requirements of the approved Greater Bilby Research and Conservation Plan; and

(2) continue to implement the approved Greater Bilby Offset Research and Conservation Plan until the CEO has confirmed by notice in writing that it has been demonstrated that the completion criteria in the Greater Bilby Offset Research and Conservation Plan have been met and therefore the implementation of the actions is no longer required.

10-5 Any changes to the Greater Bilby Research and Conservation Plan must be approved by the CEO in writing.

10-6 The proponent shall implement the latest revision of the Greater Bilby Research and Conservation Plan, which the CEO has confirmed by notice in writing, satisfies the requirements of condition 10-1 to 10-3(13).

10-7 The proponent may commission an independent review, to be undertaken by a suitably qualified expert, of the appropriateness of the offset rate after five years from the date of commencement of clearing.

10-8 The review must consider the sufficiency of the offset rate, including the real cost of counterbalancing the significant residual impact caused by the loss of habitat for the Greater bilby. If the review indicates that the offset rate is not appropriate the proponent may request a change to the offset condition.

11 Offset – Greater bilby habitat (mine pits)

11-1 If, after receiving the Greater Bilby Habitat Rehabilitation Plan Performance Report required by condition 9-8, the CEO determines that the proposal has resulted in an additional significant residual impact to habitat for the Greater bilby, and notifies the proponent in writing, the proponent shall fund at the offset rate referred to in condition 10-1, or any amended offset rate, and undertake an additional offset to counterbalance the significant residual impact from the loss of habitat for the Greater bilby (*Macrotis lagotis*) on the Dampier Peninsula, as
a result of clearing for Mine Pits as defined in Table 2 of Schedule 1 and delineated by Figure 2 in Schedule 1.

11-2 Within twelve (12) months of receiving notice in writing that an additional offset is required under condition 11-1, the proponent shall

(1) apply the methodology required by 10-3(1) to identify the area of Greater bilby habitat cleared annually for mine pits; and

(2) update the Greater Bilby Research and Conservation Plan, as required by condition 10-5, to include additional discrete research and on-ground conservation projects and the details of those projects in accordance with the requirements specified in condition 10-3.

11-3 The proponent shall implement the latest revision of the Greater Bilby Research and Conservation Plan, which the CEO has confirmed by notice in writing satisfies the requirements of conditions 10 and 11.
Table 1: Summary of the Proposal

<table>
<thead>
<tr>
<th>Proposal Title</th>
<th>Thunderbird Mineral Sands Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Description</td>
<td>The Thunderbird Mineral Sands Project is a heavy mineral sands operation located approximately 95 kilometres (km) northeast of Broome and 75 km west of Derby on the Dampier Peninsula in Western Australia. It includes the mining, processing and export of mineral sands over approximately 42 years. The project includes the following: • Heavy mineral sands mining above and below the water table. • Groundwater abstraction from the Broome aquifer to provide processing water and access to mineral sands below the water table. • Processing of heavy mineral sands. • Tailings storage facility. • Export of bulk mineral sand products from the mine site via Derby Port, including storage facilities at Derby Port. • Export of packaged mineral sand products via Broome Port, including use of existing storage facilities at Broome Port. • Progressive backfilling of the mine pit to above the water table and rehabilitation of backfilled areas. • Upgrade and extension of an existing road to provide an approximately 32 km long site access road linking the project to the Great Northern Highway. • Supporting infrastructure including internal roadways, accommodation village, power plant, workshops, offices, wastewater treatment plant and a landfill.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Element</th>
<th>Location</th>
<th>Proposed Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical elements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine pits</td>
<td>Figure 2</td>
<td>Clearing and mining of no more than 1,635 ha within the 5,648 ha mine site development envelope. No more than 200 ha of active mine pit will be open at any one time excluding areas being clearing in preparation of mining or areas being rehabilitated post-mining.</td>
</tr>
<tr>
<td>Element</td>
<td>Location</td>
<td>Proposed Extent</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Processing and supporting infrastructure, including the tailing storage facility, site access road, borefield, accommodation, and other mine site supporting infrastructure</td>
<td>Figure 2</td>
<td>Clearing of no more than 326.1 ha within a 5,648 ha mine site development envelope.</td>
</tr>
<tr>
<td>Derby Port Storage and Export Facility</td>
<td>Figure 3</td>
<td>Construction and operation of storage/export facility on previously disturbed land on Derby Port land.</td>
</tr>
<tr>
<td><strong>Operational elements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tailings storage facility (TSF)</td>
<td>Figure 2</td>
<td>TSF with a design capacity of no more than 45 Mt.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TSF operating for approximately five years from the commencement of mining operations.</td>
</tr>
<tr>
<td>Overburden waste and tailings disposal and management (backfilling mine voids)</td>
<td>Figure 2</td>
<td>Overburden waste and tailings co-disposed into mine voids.</td>
</tr>
<tr>
<td>Groundwater abstraction</td>
<td>Figure 5</td>
<td>Up to 13 GL abstraction per annum during commissioning.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Up to 33 GL abstraction per annum during mining.</td>
</tr>
<tr>
<td>Groundwater reinjection</td>
<td>Figure 5</td>
<td>Up to 22 GL reinjection per annum during mining.</td>
</tr>
<tr>
<td>Transport and storage of bulk mineral sand products – Derby Port</td>
<td>Figure 3</td>
<td>Enclosed storage of up to 50,000 tonnes of bulk mineral sand products at Derby Port at any one time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Up to 20 return journeys (40 truck movements) per day between the mine site and Derby Port operating 24 hours per day.</td>
</tr>
<tr>
<td>Transport and storage of bulk mineral sand products – Broome Port</td>
<td>N/A</td>
<td>Storage of up to 10,000 tonnes of packaged mineral sand products at Broome Port at any one time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Up to 7 return journeys (14 truck movements) per day between the Mine Site and Broome Port operating 24 hours per day.</td>
</tr>
<tr>
<td>Element</td>
<td>Location</td>
<td>Proposed Extent</td>
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<td>--------------------------------------------------------------</td>
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</tr>
<tr>
<td>Transhipment of bulk mineral sands from Derby Port</td>
<td>Figure 3</td>
<td>Bulk mineral sand products to be loaded into barges via an enclosed loading system, transported by barge to a sea transfer site at Point Torment in King Sound, and then loaded into ships.</td>
</tr>
<tr>
<td>Shipping for export (Derby Port)</td>
<td>Figure 3</td>
<td>Up to 40 sailings per annum for the export of bulk mineral sand products from Derby Port.</td>
</tr>
<tr>
<td>Shipping for export (Broome Port)</td>
<td>N/A</td>
<td>Up to 30 sailings per annum for the export of packaged mineral sand products from Broome Port.</td>
</tr>
</tbody>
</table>
### Table 3: Abbreviations and Definitions

<table>
<thead>
<tr>
<th>Acronym or Abbreviation</th>
<th>Definition or Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO</td>
<td>The Chief Executive Officer of the Department of the Public Service of the State responsible for the administration of section 48 of the <em>Environmental Protection Act 1986</em>, or his delegate.</td>
</tr>
<tr>
<td>CPI</td>
<td>The real value of offset expenditure described in condition 10-3(2) will be maintained throughout the life of the proposal through indexation to the financial year annual Perth Consumer Price Index rate from the date of this Statement, with the first adjustment to be applied to the first amount and each subsequent amount to be calculated from the previous year’s amount.</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Authority</td>
</tr>
<tr>
<td>EP Act</td>
<td><em>Environmental Protection Act 1986</em></td>
</tr>
<tr>
<td>DWER</td>
<td>Department of Water and Environmental Regulation</td>
</tr>
<tr>
<td>GL</td>
<td>Gigalitres</td>
</tr>
<tr>
<td>ha</td>
<td>Hectare</td>
</tr>
<tr>
<td>Mt</td>
<td>Mega Tonnes</td>
</tr>
<tr>
<td>Management actions</td>
<td>Risk-based actions to be implemented to meet the environmental objective.</td>
</tr>
<tr>
<td>Management targets</td>
<td>Targets to determine the effectiveness of the management actions.</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Monitoring to measure the effectiveness of management actions.</td>
</tr>
<tr>
<td>Process for revision of management actions</td>
<td>Process for revision of management actions and changes to proposal activities, in the event that the management targets are not achieved. The process shall include an investigation to determine the cause of the management target/s being exceeded.</td>
</tr>
<tr>
<td>Reporting</td>
<td>Reporting of implementation of management actions and reporting on the effectiveness of management actions to demonstrate that the objective/s have been met.</td>
</tr>
</tbody>
</table>

### Figures (attached)

- **Figure 1** Regional map
- **Figure 2** Mine site development envelope and conceptual mine layout
- **Figure 3** Derby Port development envelope
- **Figure 4** Aboriginal Heritage exclusion zones
- **Figure 5** Groundwater drawdown contours
Figure 1: Regional map
Figure 2: Mine site development envelope and conceptual mine layout
Figure 3: Derby Port development envelope
Figure 4: Aboriginal Heritage exclusion zones
Figure 5: Groundwater drawdown contours
Schedule 2

Coordinates defining the regional location, mine site development envelope, Derby Port development envelope, Heritage exclusion zones and groundwater drawdown contours in Figures 1 to 5 are held by the Department of Water and Environmental Regulation, Document Reference Number 2017-1504678381308.