



SheffieldResources
LIMITED

Thunderbird Mineral Sands Project

Public Environmental Review

EPA Assessment No. 2073

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THUNDERBIRD MINERAL SANDS PROJECT PUBLIC ENVIRONMENTAL REVIEW

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Invitation to Make a Submission

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal. Electronic submissions are preferred.

Sheffield Resources Limited proposes to develop the Thunderbird Mineral Sands Project. In accordance with the *Environmental Protection Act 1986 (EP Act)*, a Public Environmental Review (PER) has been prepared which describes this proposal and its likely effects on the environment. The PER is available for a public review period of 4 weeks from 16/01/2017 closing on 13/02/2017.

Comments from government agencies and from the public will help the EPA to prepare an assessment report in which it will make recommendations to government.

Where to get copies of this document

Electronic and hard copies may be obtained from:

Mr Bruce McFadzean
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Level 2, 41 - 47 Colin Street
West Perth WA 6005
Telephone: (08) 6424-8440
Email: info@sheffieldresources.com.au

Electronic copies may also be obtained through the proponent's website: www.sheffieldresources.com.au.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action – including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received by the EPA will be acknowledged. Submissions will be treated as public documents unless provided and received in confidence, subject to the requirements of the *Freedom of Information Act 1992 (FOI Act)*, and may be quoted in full or in part in the EPA's report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining a group interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the PER or the specific proposal. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal more environmentally acceptable.

When making comments on specific elements on the PER:

- Clearly state your point of view.
- Indicate the source of your information or argument if this is applicable.
- Suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- Attempt to list points so that issues raised are clear. A summary of your submission is helpful.
- Refer each point to the appropriate section, chapter or recommendation in the PER.
- If you discuss different sections of the PER, keep them distinct and separate, so that there is no confusion as to which section you are considering.
- Attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- Your name.
- Address.
- Date.
- Whether and the reason why you want your submission to be confidential.

Information on submissions will be deemed public information unless a request for confidentiality of the submission is made in writing and accepted by the EPA. As a result, a copy of each submission will be provided to the proponent but the identity of private individuals will remain confidential to the EPA.

The closing date for submissions is 13/02/2017.

The EPA prefers submissions on PER documents to be made electronically on its consultation hub at <https://consultation.epa.wa.gov.au>.

Alternatively, submissions can be:

- Posted to: Chairman, Environmental Protection Authority, Locked Bag 10, EAST PERTH WA 6892, Attention: Christopher Stanley.
- Delivered to the Environmental Protection Authority, Level 8, The Atrium, 168 St Georges Terrace, Perth, Attention: Christopher Stanley.

If you have any questions on how to make a submission, please ring the Office of the Environmental Protection Authority on 6145 0800.

PREFACE

Sheffield Resources acknowledges and respects the Traditional Owners, both past and present, for the lands where the Thunderbird Mineral Sands Project is to be located.

This Public Environmental Review document contains both scientific and technical information about the impacts and controls which are proposed to take place at Thunderbird.

Sheffield Resources will be respectful and mindful that the operations will also impact on the Traditional Owners, in particular their "Seasonal Calendar" and when they access country for their traditional foods and medicines. Sheffield Resources will place great importance in the preservation and education of this unique "Way of Life" and culture.

EXECUTIVE SUMMARY

Sheffield Resources Limited proposes to undertake mining of mineral sands for more than 40 years from the Thunderbird deposit; a greenfield site in the Kimberley region of Western Australia. The mineral sands products will be transported to the towns of Derby and Broome, and exported through their respective Ports.

This document is a Public Environmental Review (PER) of the impacts of the project, prepared in accordance with Part IV of the *Environmental Protection Act 1986 (WA) (EP Act)*. It also fulfils the impact assessment requirements of the *Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act)*, as it is being assessed under the Bilateral Agreement between the Commonwealth of Australia and the State of Western Australia, made under section 45 of that Act.

PROJECT OVERVIEW

The project will involve:

- Mining of heavy mineral sands for more than 40 years from the Thunderbird deposit.
- Onsite primary and secondary processing of ore to produce a range of saleable mineral sands products.
- Abstraction and reinjection of groundwater to allow mining and supply ore processing needs.
- Development of infrastructure to support the project.
- Upgrade and extension of an existing pastoral road to form a 30 km Site Access Road.
- Transport of mineral sands products to Derby and Broome Ports for storage prior to export.
- Export of bulk mineral sands products from Derby Port via King Sound and packaged mineral product from Port of Broome to international customers.

Construction of the project is scheduled to commence in Quarter 3 2017, with mining and production scheduled to commence in early 2019. The project will be fully operational in early 2019 with the first export of product anticipated by end of 2019.

JUSTIFICATION FOR THE PROJECT

The objective of the project is to establish an operating mineral sands mine and processing facilities with supporting infrastructure and services for production and export of heavy mineral sands products including ilmenite, primary zircon, zircon concentrate, titano-magnetite and HiTi88 Leucoxene. This is driven by worldwide need for ceramics, paint and other commonly used materials that contain these products.

The project represents an opportunity for Western Australia to benefit from the development of this resource, which will have a positive impact on the Kimberley region over an extended period. The project will create employment opportunities for local Indigenous and non-Indigenous people, and create opportunities for local Indigenous and non-Indigenous businesses. The project will also add to scientific knowledge through ongoing monitoring of the environment. The project will augment Western Australia's mineral sands exports which have begun to decline due to the maturing of mineral sands operations in the Perth Basin.

KEY CHARACTERISTICS

A summary of the key physical and operational characteristics of the project is presented below:

Summary of the Proposal		
Proposal Title	Thunderbird Mineral Sands Project	
Proponent Name	Sheffield Resources Limited	
Short Description	<p>The project is located approximately 95 km northeast of Broome and 75 km west of Derby in Western Australia. The project includes heavy mineral sands mining above and below the water table, dewatering within the Broome Sandstone Aquifer, onsite mineral processing, transport of bulk mineral sands products to Derby Port and transshipping via King Sound using new and existing infrastructure at Derby Port and transport of packaged products to the Port of Broome for export using existing infrastructure. The project includes:</p> <ul style="list-style-type: none"> • Mining up to a depth of approximately 100 m below ground level (near the end of mine life). • Processing of heavy mineral sands including use of a tailings storage facility. • Progressive backfilling of the mine pit and rehabilitation of backfilled areas. • Upgrade and extension of an existing road, and construction of a new road, to provide an approximately 30 km long Site Access Road linking the project to the Great Northern Highway. • Groundwater abstraction from the Broome Sandstone Aquifer. • Supporting infrastructure including internal roadways, accommodation village, power plant, workshops, offices and landfill. • Storage and export of bulk mineral sands products from Derby Port and export of packaged products from the Port of Broome. 	
Physical Aspects		
Aspect	Location	Proposed Extent Authorised
Mine Site Development Envelope		
Mining excavation	Figure 6	Progressive clearing and mining of no more than 1,635 ha within a 5,875 ha Development Envelope over a 40+ year timeframe. Approximately 200 ha of mine pit open at any one time, with progressive backfilling and rehabilitation.
Processing Infrastructure	Figure 12	Clearing of no more than 40 ha within a 5,875 ha Development Envelope.
Borefield	Figure 4	Clearing of no more than 15 ha within a 5,875 ha Development Envelope.
Tailing Storage Facility	Figure 4	Clearing of no more than 110 ha within a 5,875 ha Development Envelope.
Other Supporting Infrastructure	Figure 4	Clearing of no more than 320 ha within a 5,875 ha Development Envelope.
Site Access Road	Figure 4	Clearing of no more than 160 ha within a 5,875 ha Development Envelope.
Port Development Envelope		
Storage/Export Facility	Figure 15	Construction of port storage/export facility on existing disturbed port land.

Operational Aspects		
Element	Location	Proposed Extent
Mineral Sands Processing	Figure 12	<ul style="list-style-type: none"> 0 – 5 years: initial tailings deposition in tailings storage facility at 7.5 Mtpa. 1 year - 5 years: tailings deposition in mine pit at 7.5 Mtpa. 5 years - life of mine: waste and tailings backfilled to mine pit at 15 Mtpa.
Abstraction of Groundwater	Figure 4	<ul style="list-style-type: none"> Borefield abstraction up to 13 GL per annum for Mine Site use during commissioning. Mine Dewatering abstraction up to 33 GL per annum after commencement of mining below the watertable. Groundwater reinjection up to 22 GL per annum after commencement of mining below the watertable.
Power	Figure 4	<ul style="list-style-type: none"> 35 MW multifuel (gas and/or diesel) power plant.
Transport, Storage at Port and Shipping of Product	Figure 14 Figure 16	<ul style="list-style-type: none"> Bulk product transport by road train to Derby Port via Site Access Road and Great Northern Highway (approximately 145 km total). Storage of up to 50,000 t of mineral sands products in an enclosed facility at Derby Port. Transshipment of bulk mineral sands products via barges from Derby Port to ships anchored at existing sea transfer point at Point Torment. Possibility of using other commercial export options currently under consideration by third parties including use of a lock system. 20 – 40 sailings/annum from Derby Port depending on ship size. Storage of up to 10,000 t of packaged products at the Port of Broome. 20 – 30 sailings/annum from the Port of Broome depending on customer orders.

Stakeholder Consultation

Sheffield has, and will continue to, undertake a vigorous and proactive communication, engagement and consultation program with its stakeholders, government and the broader West Kimberley community. Sheffield engaged stakeholders early in the planning process, primarily in the interests of achieving a collaborative approach and to ensure that local knowledge is considered in the design and management of Thunderbird Mineral Sands Project.

Stakeholder consultation commenced in 2014 with the introduction of the project to the Traditional Owner groups. This consultation was enhanced throughout the exploration phase of the project; the function was strengthened with the appointment of a Community Relations Advisor and remains an integral part of the current project development phase.

Key Preliminary Environmental Factors

Key environmental factors for the Mine Site Development Envelope comprise the following:

- Flora and Vegetation.
- Terrestrial Fauna.
- Hydrological Processes.
- Inland Waters Environmental Quality.
- Heritage.

Key environmental factors for the Port Development Envelope comprise the following:

- Marine Environmental Quality.
- Amenity.

Other Preliminary Environmental Factors

Other relevant environmental factors for the Mine Site Development Envelope comprise the following:

- Landforms.
- Subterranean Fauna.
- Terrestrial Environmental Quality.
- Air Quality and Atmospheric Gases.
- Human Health.

Other relevant environmental factors for the Derby Port Development Envelope comprise the following:

- Benthic Communities and Habitat.
- Marine Fauna.
- Terrestrial Environmental Quality.
- Human Health.
- Hydrological Processes.

Integrating Environmental Factors

Integrating environmental factors for the Mine Site Development Envelope comprise the following:

- Rehabilitation and Decommissioning.
- Offsets.

Sheffield has completed a range of environmental investigations in order to establish baseline conditions as a basis to characterise the potential environmental impacts of the project.

Impact Assessment

The approach used to assess potential impacts from the project is based on determining the likelihood and consequence following exposure to stressor/s. A number of aspects were considered in determining the consequence of each potential impact, including:

- Type of impact (direct or indirect).
- Geographic extent, size and scale.
- Duration, frequency, reversibility of the potential impact.
- Whether the potential impacts are from planned or unplanned events.
- Sensitivity of the receptor/resource and the value of the receptor/resource and whether impacts are likely to be from planned or unplanned events.

Likelihood is the probability of a stressor impacting on an environmental factor, after the application of mitigation and management measures. Where practicable, likelihood was quantified based on quantitative information or data.

The residual impacts were determined by assessing the likelihood and consequence when mitigation and management measures are applied.

Each of the potential impacts has been assessed, and assigned a residual impact based on the consequences and likelihood of occurrence of the impact. Mitigation and management measures have been developed following a hierarchy of controls:

- **Avoidance:** Significant avoidance and minimisation measures have been incorporated into decision making and Mine Site design.
- **Minimisation:** Measures that minimise an impact (for example by storing hydrocarbons in impermeable storage areas).
- **Reduction:** Measures that reduce or eliminate the impact of an activity (for example implementing measures to reduce dust emissions from vehicle travel on unsealed roads).
- **Correction:** Measures that correct or rectify an impact (for example via restoration, repair or rehabilitation).
- **Compensation:** Measures to compensate for impacts from project activities (for example by replacing lost or damaged environmental components in kind or with agreed substitute resources).

Offsets

After application of the mitigation hierarchy, Sheffield considers that the project will have a significant residual impact on only one Key Environmental Factor – Terrestrial Fauna. Specifically the residual impacts are to the Greater Bilby, which is also a Matter of National Environmental Significance. The Greater Bilby is listed as Vulnerable under the *WC Act* and the *EPBC Act*.

Sheffield proposes an offsets package to mitigate the residual impacts of clearing 639.6 ha of Greater Bilby habitat through establishment of the Kimberley Greater Bilby Trust to facilitate research into and conservation programs for the benefit of the Greater Bilby as well as providing direct logistical support for people undertaking research programs relevant to the Greater Bilby.

ENVIRONMENTAL ACCEPTABILITY

This PER provides an assessment of the potential impacts to the environment from the project. Sheffield is confident that the project can be undertaken in such a way as to meet the Environmental Protection Authority objectives for Key Environmental Factors, Other Environmental Factors, and Integrating Factors. Mitigation and management measures have been applied to minimise the residual environmental impact of the project, and an offset strategy has been proposed to provide additional mitigation to project residual impacts.

Sheffield considers that the potential impacts to the environment will be able to be adequately managed such that the EPA environmental objectives will be met, and that the residual impacts are therefore acceptable.

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Key Environmental Factors – Mine Site Development Envelope					
Flora and Vegetation	<i>To maintain representation, diversity, viability and ecological function at the species, population and community level.</i>	<p>A total of 255 vascular plant taxa, representative of 129 genera and 44 families were recorded in the survey area (the survey area was larger than the Mine Site Development Envelope).</p> <p>No Threatened flora pursuant to Schedule 1 of the <i>Wildlife Conservation Act 1950</i> or <i>Environment Protection and Biodiversity Conservation Act 1999</i> were recorded within the Mine Site Development Envelope.</p> <p>Two Priority taxa were recorded within the flora survey area by Matiske, <i>Triodia caelestialis</i> (P3) and <i>Pterocaulon intermedium</i> (P3).</p> <p>A total of 15 vegetation communities were defined and mapped. Two of the pindan vegetation communities accounted for approximately 86% of the surveyed area and were considered the most representative of the Mine Site Development Envelope. The other main communities mapped were associated with the drainage channels and rocky hills.</p> <p>Potential GDEs have been inferred within the project area and wider region. (Matiske 2016b; Rockwater 2016)</p>	<p>Direct clearing impacts:</p> <ul style="list-style-type: none"> Loss of native vegetation communities Loss of conservation significant flora. <p>Indirect impacts:</p> <ul style="list-style-type: none"> Dust generated from mining activities resulting in reduced vegetation health and condition Increased presence and health of weeds resulting in reduced native vegetation cover and diversity. Modification of surface water flows resulting in loss, or reduced health and condition, of native vegetation. Groundwater abstraction resulting in loss or reduced health and condition of groundwater dependent ecosystems. Altered fire regime resulting in loss, or reduced health and condition, of native vegetation. <p><i>Note: groundwater dependent ecosystems are discussed in the groundwater impacts section.</i></p>	<ul style="list-style-type: none"> Land disturbance will be kept to the minimum necessary for development of the project. Existing disturbed areas will be used wherever possible to minimise total ground disturbance. Land clearing will be undertaken progressively with the amount of active disturbance minimised. Ground disturbance procedures and a permitting system will be implemented. Progressive rehabilitation will be undertaken on disturbed areas as they become available. Monitoring of analogue and rehabilitated areas will be undertaken to ensure short, medium and long-term rehabilitation objectives are achieved. Monitoring will be carried out on a regular basis to assess the success of revegetation in rehabilitated areas. Ongoing development of monitoring methodology and rehabilitation techniques will occur during the life of the project. Further assessments over time will plot the development of rehabilitated areas against analogue sites and progression towards completion targets. Topsoil and vegetation (including woody debris) will be respread over rehabilitated areas to act as a seed source and to protect the soil from erosion. Local provenance seed and propagated material will be used, if required, to rehabilitate disturbed areas The site induction program will provide information on protection of vegetation and ground disturbance authorisation procedures. Vehicles and mining equipment will keep to designated roads. Dust suppression will be carried out during construction, operation and closure. A weed hygiene system will be developed and implemented in consultation with the pastoralist. Weed inspections will be conducted following significant rainfall, and depending on results, appropriate management actions will be implemented if required. Firefighting equipment will be located on site and emergency personnel will be trained in fire response Lightning protection equipment will be installed as part of project design where necessary. Vehicles will not be permitted to leave access tracks or cleared areas. A Hot Work Permit system will be developed and implemented. All machinery and vehicles undertaking clearing activities will be fitted with firefighting equipment. Sheffield will work with the pastoralist, Traditional Owners and DFES to undertake prescribed burns and install and maintain firebreaks if required so that potential environmental damage from extreme and out of control wildfires is minimised and infrastructure and the community are protected throughout the life of the project. The project site induction will include information on the prevention and management of fires. Rehabilitated areas will be monitored to ensure radiation levels are within environmental screening criteria (10 µGy/h) or established pre-mining background levels. 	<p>Clearing will result in the loss of vegetation however the majority of clearing (86%) is of communities that are common and widespread and all vegetation communities are represented outside the clearing footprint. Furthermore, the main clearing area is for the Mine Site Area, which will be progressively cleared and rehabilitated, therefore maintaining representation and diversity in the wider area as impacts will be short to medium term.</p> <p>It is recognised that individuals of Priority listed species <i>Triodia caelestialis</i> (P3) and <i>Pterocaulon intermedium</i> (P3) will be impacted as a result of the proposal, however these taxa are considered to be widespread within the wider environment and are not restricted to the Mine Site Development Envelope. Whilst the Priority flora that Ecologia have recorded could not be substantiated by Matiske, impacts are not expected to be significant.</p> <p>Dust, increased presence of weeds, modification of surface water flows, fire regimes and radiation exposure may affect flora and vegetation; however these impacts will result in localised and incidental effects on the health, abundance and structure of vegetation communities, all of which are well represented in the region.</p> <p>Sheffield considers that the potential impacts to flora and vegetation will be able to be adequately managed such that the environmental objective for flora and vegetation will be met.</p>

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Terrestrial Fauna	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	<p>Fauna surveys recorded a total of 20 mammals, 118 birds, 44 reptiles and 8 amphibians occurring within the Mine Site Development Envelope or surrounding areas. Of note was an approximate 80 km range extension of <i>Lerista apoda</i> (Dampier Land Limbless Slider) from coastal areas of the west coast of the Dampier Peninsula.</p> <p>Nine conservation significant fauna species were recorded within the wider survey area, however, only three were recorded within the Mine Site Development. These were the Greater Bilby, the Short-tailed Mouse, and the Rainbow Bee-eater. (Ecologia 2012a, 2014a, 2015)</p>	<ul style="list-style-type: none"> Fragmentation of vertebrate fauna habitat resulting in displacement of fauna. Habitat clearing causing disturbance of conservation significant fauna species. Loss of SRE fauna habitat resulting in loss of SRE. Vehicle strike causing injury or death of native fauna. Increase in pest species impacting native fauna. Altered fire regime impacting native fauna. Light and noise pollution disrupting native fauna. Fauna entrapment leading to injury or death. 	<ul style="list-style-type: none"> Clearing activities will be managed to ensure clearing is strictly limited to that necessary for operations. Land clearing will be undertaken progressively with the amount of active disturbance minimised. Disturbed areas will be rehabilitated as they become available. Topsoil and vegetation will be respread over rehabilitated areas to act as a seed source and mulch to protect the soil from erosion and provide habitat for fauna. Significant trees (especially those with hollows) will be retained where practicable. Speed limits will be implemented for operational areas and the Site Access Road in order to minimise the risk of fauna injury or mortality from vehicle strike. Personnel will be required to adhere to speed limits and drive to road/weather conditions to minimise risks of fauna injuries or death due to vehicle traffic The Site Access Road will be constructed with a 5 m buffer of cleared area on each side with topsoil stockpiles located up to 20 m away from the trafficable surface. Travel between dusk and dawn on the Site Access Road and village access road will be limited to essential travel with driving speed limits set to reduce the potential for road strikes. The site induction program will provide information on fauna of conservation significance, including their appearance and habitats. Sheffield will undertake pest animal control in co-operation with regional control programs. Domestic waste facilities will be fenced and putrescible wastes will be regularly covered. Borrow pits will be designed and constructed to minimise surface water ponding after rehabilitation. Firefighting equipment will be located on site and emergency personnel will be trained in fire response. Lightning protection equipment will be installed as part of project design where necessary. Vehicles will not be permitted to leave access tracks or cleared areas. A Hot Work Permit system will be developed and implemented. All machinery and vehicles undertaking clearing activities will be fitted with firefighting equipment. Sheffield will work with the pastoralist, Traditional Owners and DFES to undertake prescribed burns and install and maintain firebreaks if required so that potential environmental damage from extreme and out of control wildfires is minimised and infrastructure and the community are protected throughout the life of the project. The project site induction will include information on the prevention and management of fires. Lights will be strategically placed and designed to shine towards plant operations and minimise light spill to the environment. Equipment design will be specified to be within Australian standard noise limits. Artificial water sources will have egress points installed. Open holes, trenches, the refuse impoundment, and any water holding facilities will be inspected regularly for fauna. Domestic waste facilities will be fenced and putrescible wastes will be regularly covered. 	<p>It is likely that clearing associated with the project will result in some habitat fragmentation, but the impacts on terrestrial vertebrate fauna (including conservation significant species) and SREs are likely to be incidental due to availability of habitat outside the Mine Site Development Envelope and the progressive nature of the majority of land clearing.</p> <p>The presence of pest species, light, noise, and radiation may affect fauna, however these impacts are not considered likely to cause fauna injury or mortality. Fauna injury or mortality due to vehicle strikes, fire, or entrapment may occur, however are not considered likely to impact native fauna population viability or diversity. These impacts are able to be adequately managed by mitigation and management measures.</p> <p>Sheffield considers that the potential impacts to terrestrial fauna will be able to be adequately managed such that the environmental objective for terrestrial fauna will be met, and that the residual impacts are therefore acceptable.</p>

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Hydrological Processes	<i>To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.</i>	<p>The water table on the Dampier Peninsula is deep inland and becomes progressively shallower on the coastal plain where discharge occurs at coastal springs in the mud flats around Broome. The Baskerville anticline divides groundwater flows, with water flowing northward north of the anticline and south to southwest in areas south of the anticline.</p> <p>The Mine Site Development Envelope is located on sandy soils with low runoff generation and there are no defined watercourses within the main mine development areas. The nearest watercourses are the Fraser River South, which has a visible channel from approximately 10.5 km downstream of the mineral deposit area. There are no year round surface water bodies within the Mine Development Envelope. The nearest ephemeral pools are approximately 25 km downstream on Fraser River South. (Laws 1991; MBS 2016a).</p>	<ul style="list-style-type: none"> • Groundwater abstraction and dewatering causing localised lowering of groundwater levels causing vegetation decline in groundwater dependent ecosystems. • Infrastructure causing localised reduction in surface water volumes. • Infrastructure changing local drainage patterns and increasing flood risk. • Surface water management structures causing localised erosion and sedimentation 	<ul style="list-style-type: none"> • Recycling of water within the process water circuit will be implemented to minimise abstraction needs and water waste. • Monitoring bores will be established to assess potential groundwater drawdown and mounding impacts. This will include monitoring bores in the shallow strata of Fraser River South and Soak areas. • All groundwater abstraction, monitoring and reporting activities will be conducted in accordance with relevant permits and licences. • Only the volume of water required for ore processing and safe mining operations will be abstracted. • Flow meters will be fitted to groundwater abstraction bores to enable monitoring of abstraction volumes. • Process water storage facilities will be designed to minimise seepage. • Roads and access tracks will be constructed with appropriate surface water drainage structures to minimise impacts on surface water flows. • Diversion bunds will be constructed around active mine pit areas to prevent surface water runoff from entering active mining areas. • Where necessary, suitable floodways, drains and culverts will be installed to transfer flow past infrastructure and return it to its natural flow path. • Pipelines will be buried when crossing watercourses to prevent impediment of flow. • Appropriately engineered surface water management structures will be constructed to redistribute flow downstream where no suitable natural channels are present. 	<p>Drawdown of the groundwater table resulting from mine dewatering and abstraction from a water supply borefield is predicted to be contained largely within the mining lease and it is anticipated that any impact to nearby ecosystems, if this occurs, will be gradual and minimal. Monitoring bores are proposed as a precautionary measure, with trigger levels and mitigation measures implemented to maintain water levels should this area be shown to be impacted by groundwater drawdown. Part of the reinjection borefield could be relocated to maintain water levels in this area if required.</p> <p>The nearest licensed users and nearest registered Aboriginal heritage sites are unlikely to be affected as they are at least 30 km from the project, outside the modelled drawdown. There are no other major developments taking place surrounding the project and there will be no cumulative impacts on hydrological processes.</p> <p>Any impacts to surface water flows from project infrastructure are likely to be minor and localised, and any associated erosion or sedimentation is expected to be highly localised.</p> <p>Sheffield considers that the potential impacts of the project to hydrological processes will be able to be adequately managed such that the environmental objective for hydrological processes will be met, and that the residual impacts are therefore acceptable.</p>

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Inland Waters Environmental Quality	<i>To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.</i>	<p>Groundwater in the Broome Sandstone Aquifer is predominantly of sodium – chloride type, with elevated levels of bicarbonate in some areas. Silica levels are high, with reported values of 18 to 119 mg/L. Nitrate levels are frequently over 40 mg/L, probably as a result of nitrate fixation by native acacias and termite activity. A saltwater interface occurs within the Broome Sandstone aquifer along the coastline.</p> <p>No surface water quality monitoring data is available for the Mine Site Development Envelope or elsewhere on the Dampier Peninsula. Given the lack of industry and other sources of potential contamination, surface runoff is expected to be of good quality suitable for livestock and agricultural use. (Laws 1991)</p>	<ul style="list-style-type: none"> Exposure of contaminating materials causing contamination of surface water and groundwater. Accidental spills causing contamination of surface water and groundwater. Poor waste management causing contamination of surface water and groundwater. Release of poor quality water causing contamination of surface water and groundwater. 	<ul style="list-style-type: none"> Prior to commencement of mining below the water table, additional acid sulfate soils (ASS) sampling and analysis of potentially sulfidic material at depth within the mine deposit area will be undertaken. If additional sampling indicates potential issues with ASS, a Management Plan will be developed and implemented. Conduct groundwater monitoring for groundwater levels and quality within the Mine Site Development Envelope. Water collecting in the mining excavation will be directed into holding sumps and used for dust suppression or ore processing. Refuelling and fuel delivery inlets will be located on concrete or HDPE-lined pads to contain any drips and spills. The pads will drain to a sump to allow removal of collected material. A bunded and sealed assembly area for hazardous chemicals (containerised) prior to offsite treatment/disposal will be established. Transformer stations will be in bunded areas which meet the requirements of Australia Standards AS1940, AS 2067 and AS 3007. The power station day tank, waste oil tank and lubricants will be located in a bund that complies with Australian Standards AS1940 and AS1692. All hydrocarbon and chemical storages will be designed and constructed in accordance with Australian Standards AS1940 and AS1692. Equipment and vehicles including surface mobile equipment shall be subject to a regular maintenance program to reduce the likelihood of spills and leakages occurring. Heavy, light vehicle and maintenance workshop facilities will be located on concrete pads and hydrocarbon spillages and leakages captured and appropriately managed through the use of hydrocarbon absorbent materials. Hydrocarbon wastes will be segregated from other wastes and collected for offsite disposal by a licensed contractor. The transport, storage or use of any designated Dangerous Good or substance will be conducted in accordance with Dangerous Goods permits as required and in accordance with Dangerous Goods Safety Act 2004, Dangerous Goods Safety (Road and Rail Transport of Non-Explosives) Regulations 2007 and Dangerous Goods Safety (Explosives) Regulations 2007. Monitoring and assessment program for surface and groundwater will be implemented as required and will include environmental quality analysis for parameters agreed with by regulatory authorities. Spill kits will be located at strategic locations throughout the project area and employees trained in their use. Spills will be contained, remediated, investigated and reported to the relevant authorities as required. WWTP will be constructed, operated and maintained in accordance with the Department of Environment Regulation (DER) Works Approval, Environmental Licence and local government and Department of Health regulations and permitting requirements as issued by the Shire of Broome. Effluent produced by the WWTPs will either be irrigated to the environment or reused for dust suppression. The WWTP will be fitted with alarms and be able to be shut down the plant should a failure occur. WWTPs will be regularly inspected and discharge suspended if it is discovered they are operating below the required standard. The WWTP will have contingency storage capacity for up to two days of normal flow if discharge is suspended while any problems are addressed. Effluent discharge from the WWTP will be managed to allow effluent to infiltrate or evaporate and prevent surface ponding or runoff from the irrigation area. Domestic wastes will be disposed of into a purpose built onsite landfill. The landfill will have a boundary fence to prevent fauna access (specifically feral animals) and to create a wind barrier. An entrance/exit gate within the boundary fence will be kept closed other than when waste is being deposited. Recyclable wastes will be collected in a laydown area and transported offsite for recycling. A lined Process Water Dam will be constructed in order to store water from mine dewatering operations and process water from the borefield. 	<p>The potential to generate environmentally harmful acidic runoff through excavation or dewatering ASS is not considered a risk for the majority of the project materials. However, samples of material found at depth within the mine deposit area were considered potentially acid forming (PAF) and may be reached in the final years of the proposed 40+ year mine life. These materials will be further defined and managed through developed management plans at a suitable point in the life of the mine.</p> <p>Any contaminated flow leaving the Mine Site Development Envelope will be rapidly diluted by inflow from other catchments, effectively ameliorating impacts on some water quality parameters. Additionally, there are no defined water course channels within the mine deposit and ore processing plant areas, where environmentally hazardous materials and processes will be predominantly stored and used. Groundwater within the underlying strata is deep ($\geq 20\text{m}$), and localised surface contamination is unlikely to seep to groundwater in any significant concentrations.</p> <p>There are no other major developments taking place surrounding the project, hence there will be no cumulative impacts on inland water quality.</p> <p>Sheffield considers that the potential impacts to inland water quality will be able to be adequately managed such that the environmental objective for inland environmental quality will be met, and that the residual impacts are therefore acceptable.</p>

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
				<ul style="list-style-type: none"> All HDPE-lined ponds shall be designed to have a controlled release point to prevent over topping. Sufficient freeboard will be maintained in water storages to allow capture of rainfall from a one in one hundred year 72 hour ARI event. Water in the Process Water Dam will be reused within the WCP. Detailed TSF design compliant with the Code of Practice for Tailings Storage Facilities in Western Australia (DMP 2013) and ANCOLD Guidelines on Tailings Dam Planning, Design, Construction, Operation and Closure (ANCOLD 2012). A biodegradable flocculent will be used to assist in settling of suspended clay/silt material from process water. 	
Heritage	<i>To ensure that historical and cultural associations, and natural heritage, are not adversely affected.</i>	<p>No registered Aboriginal sites or other heritage places of significance are located within the Mine Site Development Envelope.</p> <p>Aboriginal heritage surveys to support exploration activities have been undertaken in consultation with Traditional Owners annually since 2012. The outcomes of the surveys were:</p> <ul style="list-style-type: none"> The project area has been extensively and comprehensively surveyed, and all areas considered sensitive to Aboriginal cultural values in the Mine Site Development Envelope and surrounds have been covered. Aboriginal sites and areas of Aboriginal cultural value have been identified and mapped. Avoidance buffer zones have been determined by Native Title claimants (AHA 2016). 	<ul style="list-style-type: none"> Ground disturbance causing impacts to known Aboriginal heritage sites and landscape cultural values. Ground disturbance causing impacts to unknown Aboriginal heritage sites. Project activities causing impacts to groundwater and groundwater dependent ecosystems. 	<ul style="list-style-type: none"> Development and implementation of Aboriginal Heritage Management Operations Framework and Cultural Heritage Management Plan. Maintain buffer zones around important Aboriginal sites and areas with Aboriginal heritage values in the Mine Site footprint and surrounds. Maintain consultation with Traditional Owners. Disturbance of Aboriginal heritage sites to be consistent with agreements with Native Title claimants and Aboriginal Heritage Act 1972. Develop and implement procedures for discovery of new Aboriginal heritage cultural materials (Aboriginal Heritage Management Operations Framework). Conduct additional surveys in consultation with Traditional Owners where required. Sheffield is seeking a Mining Agreement with the Native Title claimant. 	<p>Database searches found no Aboriginal heritage or other heritage places on the Register of Aboriginal sites (Section 4.2.12.1) within the Development Envelope. The Mine Site Development Envelope has been surveyed by Traditional Owners, and all (unregistered) culturally important areas have been identified and mapped. Buffer zones have been defined to protect known heritage sites or culturally important areas within the Mine Site Development Envelope.</p> <p>There is a possibility that unknown archaeological heritage sites or ancestral remains within the Mine Site Development Envelope may be found, however, Sheffield are effectively managing this through implementation of the Heritage Management Framework (Appendix 26) and a Heritage Management Plan to be developed with Traditional Owners. It is anticipated that this will eliminate the prospect of any inadvertent damage to these findings.</p> <p>Any impact to known Aboriginal heritage will only occur in accordance with agreements reached with the Native Title claimants and the <i>Aboriginal Heritage Act 1972</i>.</p> <p>Sheffield considers that the potential impacts to heritage will be adequately managed such that the objective for heritage will be met, and that the residual impacts are therefore acceptable</p>

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Key Environmental Factors – Derby Port Development Envelope					
Marine Environmental Quality	<i>To maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected.</i>	<p>Estuarine tidal water sampled at the public boat ramp located to the immediate west of the proposed storage facility indicate no results above the ANZECC and ARMCANZ Ecological Investigation Levels trigger values. Concentrations of dissolved metals and metalloids were mostly below laboratory limits of reporting (including for lead, zinc, copper and nickel). As expected for the silt laden waters of this estuary area, the turbidity (62 nephelometric turbidity units) and suspended solids (89 mg/L) were very high. Other general parameters of salt content and salt composition are consistent with typical seawater. Dissolved uranium was observed at a concentration of 0.0035 mg/L, which is consistent with the value reported by Miyake et al. of 0.0033 mg/L for seawaters of the western north Pacific.</p> <p>The upper reaches of King Sound are naturally high in turbidity, primarily as a result of Fitzroy River discharge, with suspended solids concentrations reaching 3 kg/m³.</p> <p>(ANZECC and ARMCANZ 2000; MBS 2016b)</p>	<ul style="list-style-type: none"> • Installation of mooring points increasing turbidity • Product dust or spillage causing marine pollution • Hydrocarbon spill causing marine water and sediment pollution • Radiation impacting the marine environment 	<ul style="list-style-type: none"> • Sheffield will either upgrade or replace existing moorings installed at transshipment vessel and ship loading points within Derby Port limits. • The Product Storage Facility will include a drive through enclosed unloading area to ensure product is contained within facility during unloading activities. • Transfer of product to the barge will be via a covered conveyor to minimise escape of dust or spillage. • Refuelling of marine vessels will be consistent with Port of Derby requirements. • Used oil or oil-soaked absorbents will be securely stored and disposed of at a licensed facility to reduce the chance of oil, fuel or any oily wastes being discharged into the marine environment. • Refuelling equipment will include an emergency shutdown valve and will be monitored at all times. • Spills of oil, fuel or other hydrocarbons to water will be immediately reported to DoT for advice. • A spill kit located at Derby Port will be maintained in working order. • An appropriately sized and stocked marine spill kit will be located on each Sheffield owned or operated tug boat to address small scale spillages. • Management of hydrocarbons and potential spills is addressed in the Port Environmental Management Plan. • Background radiation levels in soil, sediments and airborne dust will be measured prior to construction commencing. • Spillages of product on land will be cleaned up as required. Spilt product will either be returned to the Product Storage Facility or returned to the Mine Site for reprocessing or disposal. 	<p>King Sound is a highly dynamic environment with very high turbidity which occurs naturally as a result of the Fitzroy River and other oceanographic processes. Any additional turbidity generated from the installation of new moorings will be short term, localised and the large tidal exchange will ensure water quality remains close to baseline levels.</p> <p>Some minor generation of dust or spillage of product is likely throughout the life of the project; however, it is considered that it will not result in any discernible changes to the quality of water, sediment or biota in King Sound or adjacent waters. Mineral sands products occur naturally in King Sound and are environmentally benign.</p> <p>Spillage of hydrocarbons is possible during refuelling operations; however volumes will be minimal due to the mitigation measures proposed.</p> <p>The mineral sands products have very low to insignificant levels of natural radiation. Spillage of products into the marine environment is not expected to result in significant impacts to the marine environment and will not result in any discernible changes to the quality of water, sediment or biota in King Sound or adjacent waters.</p> <p>Sheffield considers that the potential impacts to marine environmental quality will be able to be adequately managed such that the environmental objective for marine environmental quality will be met, and that the residual impacts are therefore acceptable.</p>

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Amenity	<i>To ensure that impacts to amenity are reduced as low as reasonably practicable.</i>	<p>Historically, the Great Northern Highway, Derby Highway, Loch Street and Jetty Road have been used to transport lead and zinc metal concentrates from the Lennard Shelf Operations, located east of Fitzroy Crossing, to Derby Port. While the Lennard Shelf Lead and Zinc Operations were operational (1997 - 2008), up to 500,000 tonnes per annum of lead and zinc concentrates were transported along the transport route from east of Fitzroy Crossing to Derby Port.</p> <p>With respect to visual amenity at the Derby Port, there are several buildings of single storey currently existing. The site is zoned for industry and includes the wharf, conveyor and existing buildings on the wharf. (MBS 2009)</p>	<ul style="list-style-type: none"> Dust emissions causing a decrease in amenity for sensitive receptors Noise emissions causing a decrease in amenity for sensitive receptors 	<ul style="list-style-type: none"> Bulk products will be transported to the Derby Port Development Envelope in covered containers. Bulk product will be stored in a purpose built Product Storage Facility. This will include a drive through enclosed unloading area to ensure product is contained. Transfer of product to barges will be via a covered conveyor. Spillages of product on land will be cleaned up as required. Spilt product will either be returned to the Product Storage Facility or returned to the Mine Site for reprocessing or disposal. Road trains will be maintained in good mechanical condition to minimise noise associated with their operation. The use of engine brakes within the built-up area of Derby will only be permitted for emergency breaking. Road train speed limits through the town of Derby will be determined in consultation with the Shire of Derby/West Kimberley, Main Roads WA and other stakeholders. Sheffield will develop and implement a community feedback and complaints mechanism. 	<p>Derby Port is currently a functioning industrial site within a zoned industrial area.</p> <p>Ambient concentrations for dust at the Port boundary and along the transport route will be within accepted limits and will not impact on sensitive receptors in Derby.</p> <p>Modelled noise levels as a result of the project are below DER 1 hr LAeq noise limits as defined in the <i>Environmental Protection (Noise) Regulations 1997</i> for receptors.</p> <p>Noise impacts on sensitive receptors in the town of Derby are unlikely to cause loss of amenity for Derby residents and Port users.</p> <p>Sheffield considers that the potential impacts to amenity will be able to be adequately managed such that the environmental objective for amenity will be met, and that the residual impacts are therefore acceptable.</p>
Other Environmental Factors – Mine Site Development Envelope					
Landforms	<i>To maintain the variety, integrity, ecological functions and environmental values of landforms.</i>	<p>From an initial review of regional contours surrounding the Mine Site Development Envelope (up to 30 km away), the most distinctive landforms in relation to the Mine Site Development Envelope are a north-west to south-east trending band of low hills parallel to the Mine Site Development Envelope associated with the Reeves Land System. The distinctive landform features within the band are Reeves Hill, Dampier Hill, Mt Jowlaenga and several unnamed smaller hills to the east and north of the Mine Site Development Envelope. None of these landforms will be impacted by the project.</p>	<ul style="list-style-type: none"> Post-mining landforms are inconsistent with the surroundings. Post-mining landforms are unstable. 	Management measures for constructed landforms are detailed in the preliminary MCP ().	<p>Two constructed landforms will remain at closure of the project - the mineral deposit area and the initial TSF. The mineral deposit area will be progressively backfilled and rehabilitated and will not be significantly distinguishable from the surrounding area. The initial TSF surface at the end of mine life will potentially be elevated in excess of 10 m above the surrounding landscape and hence will be more pronounced. This will be shaped and rehabilitated to match surrounding landforms as outlined in the preliminary MCP.</p> <p>Due to the lack of impact on existing landforms from project activities, Sheffield considers that the environmental objective for landforms will be met.</p>

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Subterranean Fauna	<i>To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.</i>	<p>Survey results identified a low diversity and abundance of subterranean fauna with no stygofauna being recorded during the survey.</p> <p>Similarly to stygofauna, there appears to be a low diversity and abundance of troglifauna present, this is potentially due to the habitat being dominated by Pindan sand plains which have little or no cavernous or vuggy habitat space. Only a single specimen (Staphylinidae sp. Indet) was recorded within the Mine Site Development Envelope. (Ecologia 2014a)</p>	<ul style="list-style-type: none"> No impacts expected 	No management measures are required for subterranean fauna.	Due to the lack of subterranean fauna being recorded within the Mine Site Development Envelope and immediate surroundings, the project will not result in loss to the representation, diversity, viability or ecological function of subterranean fauna species, population and assemblages. Sheffield considers that the environmental objective for subterranean fauna will be met.
Terrestrial Environmental Quality	<i>To maintain the quality of land and soils so that the environment values, both ecological and social, are protected.</i>	<p>Soils in the Mine Site Development Envelope are dominated by red sands (Pindan) of aeolian origin, which are widespread throughout the Dampier Peninsula. Soil profiles are typically deep (greater than 1 m), although relatively shallow profiles were recorded at several locations where Cretaceous sandstone sedimentary rocks or silcrete hardpan were present within 1 m of the natural soil surface. Minor soil types included deep yellow sand and shallow bleached sand over clay or loam, usually associated with drainage lines or depressions.</p> <p>The Mine Site Development Envelope is characterised in the Australian Soil Resources Information System Acid Sulfate Soil mapping as having 'Extremely Low' probability (low confidence) of occurrence within 2 m of the natural soil surface.</p>	<ul style="list-style-type: none"> Erosion and sedimentation causing loss of topsoil. Erosion and sedimentation causing loss of soil material from disturbed areas. Disposal of mine and processing wastes causing contamination of the environment Accidental spills and leaks causing contamination of the environment Discharge of inadequately treated sewage effluent causing contamination of the environment. Poorly designed and operated landfill causing contamination of the environment. 	<ul style="list-style-type: none"> Dust will be managed by watering unsealed roads with a water cart or with fixed sprays as required. Vehicle traffic will be confined to defined roads and tracks. During high winds, topsoil and overburden stripping and spreading activities will be restricted if dust cannot be adequately controlled. Vehicles will be required to travel at safe operating speeds on unsealed roads and will be restricted from accessing rehabilitated surfaces except for management purposes. Spilt ore and materials outside of the ore processing areas will be regularly cleaned up. Bulk products will be transported in covered containers. Rehabilitated areas will be monitored to ensure radiation levels are within environmental screening criteria (10 µGy/h) or established pre-mining background levels. <p>No further specific management measures for terrestrial environmental quality are required as management measures detailed in Section 8.1.2 for flora and vegetation, Section 8.4.3 inland water quality and Section 12 rehabilitation and decommissioning adequately mitigate impacts to terrestrial environmental quality.</p>	<p>Mine wastes are expected to be benign apart from sulfidic material measured at extreme depth, with monitoring and management measures to be developed and implemented before this material is disturbed.</p> <p>Sheffield considers that the potential impacts on terrestrial environmental quality will be able to be adequately managed such that the objective will be met, and that the residual impacts are therefore acceptable.</p>

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Air Quality and Atmospheric Gases	<i>To maintain air quality for the protection of the environment and human health and amenity, and to minimise the emission of greenhouse and other atmospheric gases through the application of best practice.</i>	<p>There are no significant emissions sources in the vicinity of the Mine Site and due to the remote location, it is presumed that air quality will typically be very good. The main contributors to dust levels are ambient wind-borne dust (dust storms, cattle and vehicle movements) and smoke from dry season bush fires. Background and cumulative emissions from other industrial activities are expected to be negligible and naturally occurring background particulate concentrations are expected to be minor.</p> <p>During project design, in order to be conservative, the average ambient dust concentrations found in northwest Western Australia have been used to ensure the worst-case scenario is considered (40 µg/m³ for TSP, 20 µg/m³ for PM₁₀ and 7 µg/m³ for PM_{2.5}). These concentrations are based on a number of studies of ambient monitoring in the Kimberley and Pilbara areas, which both experience a higher level of activity than the Mine Site Development Envelope and as such are seen to be a conservative choice in lieu of local data.</p> <p>(Atmospheric Solutions 2016a)</p>	<ul style="list-style-type: none"> • Dust emissions affecting air quality from: <ul style="list-style-type: none"> – Mining activities – Fixed stacks associated with the mineral processing plant. – Handling and transport of mined material, process material and final product. – Stored mine wastes • Combustion emissions affecting air quality: <ul style="list-style-type: none"> – Oxides of nitrogen. – Carbon monoxide. – Sulfur dioxide. • Greenhouse gas emissions 	<ul style="list-style-type: none"> • During high winds, topsoil stripping and spreading activities will be restricted if dust cannot be adequately controlled. • Vehicles and mining equipment will keep to designated roads. • Vehicles will be required to travel at safe operating speeds on unsealed roads and will be restricted from accessing rehabilitated surfaces except for management purposes. • Clearing will be undertaken progressively and kept to the minimum requirement. • Progressive rehabilitation will be undertaken on disturbed areas as they become available. • Dust suppression will be carried out during construction, operation and closure. • Sheffield will maintain equipment in accordance with manufacturers' specifications to minimise particulate and gaseous emissions. • Vehicles and plant will undergo regular preventative maintenance and, as needed, corrective maintenance. • Euro V standard vehicles and equipment (post 2009) or appropriate quality diesel fuel will be used to minimise NO_x and particulate emissions. • Energy efficiency has been considered in the selection and design of equipment and plant. • Sheffield will specify preference for use of low emission producing equipment in equipment supply contracts. 	<p>The results of modelling indicate that all pollutants, both dust (TSP, PM₁₀, PM_{2.5} and dust deposition) and combustion products (NO_x, CO, SO₂), will be well within the assessment levels at appropriate distances from the activity and nearby receptors such as the accommodation village. No residential receptors outside the Mine Site Development Envelope will be impacted by pollutants.</p> <p>Potential air quality impacts from the project may occur as a result of dust generated by the construction, mining, processing, handling and transport of the mined material, as well as low levels of gaseous combustion emissions from onsite power generation and process heat requirements. Dust generation is the primary contributor to potential air quality impacts for the project, however use of dust suppression along the Site Access Road around the Mine Site will adequately control dust emissions.</p> <p>The project is not expected to result in any adverse air quality impacts in the region (Appendix 12).</p> <p>Sheffield considers that the potential impacts to air quality will be able to be adequately managed such that the environmental objective for air quality will be met, and that the residual impacts are therefore acceptable.</p>

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Human Health	<i>To ensure that human health is not adversely affected.</i>	N/A	<ul style="list-style-type: none"> Radiation exposure affecting the health of mine workers Radiation exposure affecting the health of process plant workers Radiation exposure affecting the health of members of the public 	<ul style="list-style-type: none"> The mine will be registered under the RSA with the Radiological Council and DMP and Sheffield will appoint a Radiation Safety Officer (RSO) to implement a Radiation Management Plan (RMP) and the Radiation Waste Management Plan (RWMP) on behalf of Sheffield. Provision and maintenance of equipment and facilities for controlling radiation sources, including housekeeping, dust suppression and surface contamination control to maintain a duty of care to employees and the public. A radiation monitoring program will be developed and implemented in consultation with Radiological Council and DMP. This will include monitoring of personal exposure for mine and process plant workers, hand held gamma monitoring and monitoring of airborne dust scintillation counting (Bq/m³) and radon. Processing and mining wastes will be blended prior to final disposal as backfill within the mining excavation in accordance with a prepared RWMP. Rehabilitated areas will be monitored to ensure radiation levels are within environmental screening criteria (10 µGy/h) or established pre-mining background levels. 	<p>The predicted dose to mine workers and process plant workers was estimated to be 2.15 mSv/year and 3 mSv/year respectively, which is well below the dose rate limit for radiation workers of 20 mSv/year. The predicted dose to a member of the public was considered to be negligible and below assessable levels.</p> <p>All activities at the Mine Site associated with the project will be undertaken in accordance with the Radiation Safety Act. Sheffield will engage a Radiation Safety Officer (RSO) upon the implementation of a Radiation Management Plan (RMP) and a Radiation Waste Management Plan (RWMP), to implement periodic personal and environmental monitoring of radiation levels for formal reporting to the Radiological Council and the DMP.</p> <p>Implementation of these arrangements will ensure that any potential radiation doses to workers, the public and the environment will be monitored, controlled and minimised to ensure that all legal requirements are met and that radiation doses are below regulatory limits.</p> <p>Sheffield considers that the potential impacts of radiation to human health will be able to be adequately managed such that the objective will be met, and that the residual impacts are therefore acceptable.</p>
Other Environmental Factors – Derby Port Development Envelope					
Benthic Communities and Habitat	<i>To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales.</i>	<p>Mangrove communities (mangals) in the Kimberley region display a very high degree of intactness. Mangrove forests are the most important benthic primary producers in the wider Derby Port area.</p> <p>At Derby Port, vegetation surrounding the proposed storage facility is dominated by mangals that lie in a 500 m wide band between the open water of King Sound and extensive saline mudflats.</p> <p>Inshore areas of King Sound are not likely to support seagrasses, as it is an area of extremely high turbidity levels and large tidal movements. (EPA 2009; Semeniuk 1980)</p>	<ul style="list-style-type: none"> Installation of mooring points disturbing benthic communities and habitats Anchoring disturbing benthic communities and habitats 	<ul style="list-style-type: none"> Sheffield will either upgrade or replace existing moorings installed at transshipment vessel and ship loading points within Derby Port limits. Dropping anchor by ocean-going vessels outside King Sound to collect the pilot will be confined to the pilot boarding area approved by the relevant Port authority in order to minimise damage to benthic communities and habitats. 	<p>Installation of new moorings may cause direct disturbance within the mooring zones, however this is unlikely to impact the overall function of any benthic communities or habitats within King Sound. Dropping of anchor by the ocean-going vessel at the pilot boarding point may cause localised damage to any benthic communities and habitats, but due to the low benthic light levels which are characteristic of deeper waters, it is considered that there will not be any change to the structure, function, diversity, distribution and viability of benthic communities and habitats.</p> <p>Sheffield considers that the potential impacts of mooring point installation and anchoring on benthic communities and habitats will be able to be adequately managed such that the objective will be met, and that the residual impacts are therefore acceptable.</p>

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Marine Fauna	<i>To maintain the diversity, geographic distribution and viability of fauna at the species and population levels.</i>	<p>For the marine and migratory species, a total of 40 birds, 32 fish (including sharks and rays), 16 mammals and 22 reptile species were identified during the database searches. Most of the species are common and well represented in the region.</p> <p>There are 36 species of migratory birds protected under international agreements that may overfly the Derby Port area.</p> <p>The Humpback Whale is known to occur in significant numbers in the Kimberley region.</p> <p>Three species of dolphin of conservation significance that may occur: Australian Humpback Dolphin, Snubfin Dolphin and Indo-Pacific Bottlenose Dolphin.</p> <p>While it is possible for Whale Sharks to occur in King Sound, the species is considered an oceanic species preferring clear water.</p> <p>Six of the seven species of sea turtle worldwide have the potential to occur: the Flatback Turtle, Green Turtle, Hawksbill Turtle, Leatherback Turtle, Loggerhead Turtle, and the Olive Ridley Turtle.</p> <p>Sawfish are known to occur in the King Sound area: Dwarf Sawfish, Green Sawfish, and Largetooth Sawfish. The Northern River Shark is known from King Sound. (DoE 2016; DPaW 2016a)</p>	<ul style="list-style-type: none"> • Noise from construction and operational activities at Derby Port impacting birds or terrestrial fauna • Light from construction and operational activities at Derby Port impacting birds or terrestrial fauna • Changes in hydrological regimes at the Mine Site Development Envelope impacting Sawfish species or Northern River Shark. • Additional shipping and transshipment impacting marine fauna – these could be direct or indirect through: <ul style="list-style-type: none"> – Vessel strike. – Noise. – Light. – Hydrocarbon spill. • Solid waste/marine debris. 	<ul style="list-style-type: none"> • Lighting design will consider minimisation of attraction of wildlife. • Operators of the ocean-going vessel will be made aware of potential lighting impacts to marine fauna and the advice of Environmental Assessment Guideline No. 5, Protecting Marine Turtles from Light Impacts (EPA 2010). • Culverts will be constructed at the channel of the Fraser River South where it crosses the Site Access Road to facilitate wet season surface water flows and allow the passage of juvenile Sawfish. • If crew of Sheffield operated vessels sight cetaceans or sea turtles, these will be reported to other vessels to ensure they are informed and can take precautions in the area. • Captains of ocean-going vessels will be informed to take extra care during the Humpback Whale migration season (July to November), adjust vessel speeds and have crew on watch as needed. • Sheffield operated vessels will reduce speed below 8 knots if whale sightings are within vessel movement areas. • Any wildlife strikes by Sheffield operated vessels will be reported through an incident reporting system and adaptive management practices implemented if necessary. • All Sheffield marine vessels will be maintained to high standards as required by DoT. Refuelling of marine vessels will be consistent with Port of Derby criteria. • Refuelling equipment will include emergency shutdown valves and be monitored at all times. • Used oil or oil-soaked absorbents will be securely stored and disposed of at a licensed facility. • Spills of oil, fuel or other hydrocarbons to water will be immediately reported to DoT. • A spill kit located at Derby Port will be maintained in working order. • An appropriately sized and stocked marine spill kit will be located on each Sheffield owned or operated tug boat to address small scale spillages. • Employees and contractors operating Sheffield transshipment vessel and tug boat teams will be made aware of the importance of preventing the escape of solid waste. • Solid waste will be disposed of in appropriately covered receptacles at Derby Port and transferred to a licensed disposal facility. • The Captain of the ocean-going vessel will be provided with information on the legal obligations of preventing the escape of solid waste. 	<p>Derby Port is an existing facility and the transshipment and shipping routes have been used historically. The increase in shipping movements is minimal, representing an additional 2.6% per year (based on the year 2014/15). This minimal increase in vessel movements will result in negligible increases in noise and light emissions or solid waste impacts. Therefore, it is not anticipated that these minimal increases will result in any loss of conservation significant fauna habitat or individuals of a conservation significant species, or change to breeding patterns or behaviour of marine fauna.</p> <p>Whilst hydrocarbon spills and vessel strikes could result in the death of an individual animal of conservation significance, it is unlikely that such an event would occur and it is not anticipated that this would affect the ability of the population of that species to survive in King Sound or the vicinity.</p> <p>Sheffield considers that the potential impacts of the project on marine fauna will be able to be adequately managed such that the objective will be met, and that the residual impacts are therefore acceptable.</p>

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Terrestrial Environmental Quality	<i>To maintain the quality of land and soils so that the environment values, both ecological and social, are protected.</i>	The soils of the Derby region belong to the Dampier Sandplain zone, comprising sandplains, dunes and coastal mudflats overlying the sedimentary rocks of the Canning Basin. Locally, the dunes and sandplains belong to the Yeeda system. The soils are referred to as 'Pindan'. They are usually red-brown sands to sandy earths and are believed to be of aeolian origin. Soils from the dunes tend to have a higher sand content than those of the associated swales. (MBS 2009)	<ul style="list-style-type: none"> • Dust generation or spillage of product affecting the terrestrial environment • Radiation exposure affecting the terrestrial environment • Disturbance of contaminated or acid sulfate soils affecting the terrestrial environment 	<ul style="list-style-type: none"> • Bulk products will be transported in covered containers. • Bulk product will be stored in a purpose built Product Storage Facility. This will include a drive through enclosed unloading area to ensure product is contained within warehouse during unloading activities. • Product storage and loading onto the conveyor will be conducted within the shed. • Transfer of product to barges will be via covered conveyor. • The RMP will define the requirements for periodic monitoring for both personal and environmental monitoring of radiation levels. This will include establishment prior to operations of background soil, sediment and airborne dust samples. • Products spills along the transport route or Derby Port will be subject to clean up such that residual levels of radiation are returned to established background levels. Material collected from any such spills or accidental release will be returned to the Mine Site for re-processing or disposal. • Background radiation levels in soil, sediments and airborne dust will be measured prior to construction commencing. 	<p>The potential for impacts to terrestrial environmental quality as a result of transport, storage and export of product within the Derby Port Development Envelope is minimal. All transport of product is via covered road trains on sealed roads. These unload in an enclosed facility and product is loaded onto a conveyor within a bunded area. The product itself is granular, has a high specific gravity, and is not prone to producing dust, although some minor generation of dust may occur throughout the life of the project. The product is naturally occurring with a low level of radiation and is environmentally benign.</p> <p>Soils at the site are not potentially ASS and the project will not result in any significant disturbance to soils or marine sediment within the Derby Port Development Envelope. The project will not result in loss of soil resources or associated environmental values.</p> <p>Sheffield considers that the potential impacts of dust, radiation, and contaminated soils on terrestrial environmental quality will be able to be adequately managed such that the environmental objective will be met, and that the residual impacts are therefore acceptable.</p>

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Human Health	To ensure that human health is not adversely affected.	N/A	<ul style="list-style-type: none"> Radiation exposure affecting the health of transport drivers Radiation exposure affecting the health of workers Radiation exposure affecting the health of members of the public Dust emissions affecting the health of workers or members of the public Diesel particulate and gaseous vehicle emissions exposure affecting the health of members of the public 	<ul style="list-style-type: none"> Provision and maintenance of equipment and facilities for controlling radiation sources, including housekeeping, dust suppression and surface contamination control to maintain a duty of care to employees and the public. The facility will be registered under the RSA with the Radiological Council and DMP and Sheffield will appoint a Radiation Safety Officer (RSO) to implement a Radiation Management Plan (RMP) on behalf of Sheffield. A radiation monitoring program will be implemented at the Port in consultation with the Radiological Council and DMP which will define the requirements of monitoring for both personal (and environmental radiation levels. This may include background, operational and post-closure radiation monitoring for personal exposure of Port workers as well as soil, sediment and air samples. The product transport activities from the Mine Site to Derby Port and Port of Broome will be registered with the Radiological Council and Sheffield will appoint a Radiation Safety Officer (RSO) to implement a Radiation Transport Management Plan (RTMP). Personal dose monitoring for transport workers (in particular drivers) will be undertaken in accordance with a RTMP by the Radiological Council. Radiation monitoring of transport trucks leaving the Mine Site and Port facility for external radiation levels using hand held gamma radiation and alpha radiation wipe tests will be conducted in accordance with the RTMP. Products spills along the transport route or Derby Port will be cleaned up such that residual levels of radiation are returned to established background levels. Material collected from any such spills or accidental release will be returned to the Mine Site for re-processing or disposal. Bulk Product will be transported in sealed containers. Bulk product will be stored in a purpose built Product Storage Facility with enclosed drive through unloading area to minimise dust emissions and then loaded onto transshipment vessels using a closed conveyor and/or sealed bags. Dust monitoring will be conducted in accordance with DMP CONTAM and DER requirements. Road trains used for the project will employ modern Euro V (post 2009) diesel engines which are maintained according to a regular maintenance schedule. 	<p>Radiation can be effectively managed under the Mines Safety and Inspection Act 1995 and Radiation Safety Act 1975 jointly by DMP and Radiological Council of WA.</p> <p>The predicted dose to Derby Port workers was conservatively estimated to be 1.62 mSv/year which is well below the dose rate limit for radiation workers of 20 mSv/year. The predicted dose to transport works was conservatively estimated to be less than 0.5 mSv/year which is below the public limit of 1 mSv/year. The predicted dose to a member of the public was conservatively estimated to be 0.008 mSv/year which is well below the public limit of 1 mSv/year.</p> <p>All activities for transport and handling of product at the Derby Port Facility associated with the project will be undertaken in accordance with the Radiation Safety Act 1975 and Radiation Safety (Transport of Radioactive Substances) Regulations 2012. The facility will be registered under the RSA and the proponent will engage a Radiation Safety Officer on the implementation of a RMP and a RTMP, to implement periodic personal and environmental monitoring of radiation levels for formal reporting to the Radiological Council and DMP. Implementation of these arrangements will ensure that any potential radiation doses to workers, the public and the environment will be monitored, controlled and minimised to ensure that all legal requirements are met and that radiation doses are below regulatory limits.</p> <p>Sheffield considers that the potential impacts of radiation, DPM, and gaseous vehicle emissions to human health will be able to be adequately managed such that the objective will be met, and that the residual impacts are therefore acceptable.</p>

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Hydrological Processes	<i>to maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected</i>	<p>Derby Port and the proposed Product Storage Facility are situated on a raised section of reclaimed land. King Sound is located to the immediate northwest and its associated saline mudflats are situated to the immediate east. Stormwater runoff from the reclaimed section of land drains directly to either King Sound or the mudflats.</p> <p>Tidal movements in King Sound are extreme, with a highest recorded tide of 11.8 m. Inundation of the mudflats is rare, but can occur following a high rainfall event or during a spring high tide. The reclaimed land where the proposed Product Storage Facility will be constructed has been raised above the highest recorded tide level.</p>	<ul style="list-style-type: none"> The proposed Product Storage Facility will not impact exiting hydrological processes within the Port Development Envelope. 	<ul style="list-style-type: none"> No management measures are required. 	

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Integrating Factor – Rehabilitation and Decommissioning					
Rehabilitation and Decommissioning	<i>To ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner.</i>	N/A	<ul style="list-style-type: none"> • Closure obligations prove impractical, and cannot be met. • Premature closure of the mine, potentially leading to exposed tailings material in the TSF and mine pits that remains unrehabilitated. • Injury caused to a member of the public, from accessing unsafe or unstable decommissioned infrastructure, landforms, or voids. • Stormwater ponding or runoff on any remaining mine waste landforms such as the TSF or mineral deposit area, leading to instability and/or erosion and sediment transport. • Insufficient mine waste material to backfill final mine void resulting in the potential formation of a pit lake with increasing salinity trends. • Underestimation of material swell factor resulting in excessive consolidation of backfilled material within mine pits and formation of local depressions and seasonal surface water ponding. • Failure to stockpile sufficient topsoil and growth medium to support revegetation objectives. • A legacy of contaminated sites, accumulated from spills or leaks over the life of mine. 	<p>The preliminary MCP has been developed in order to address potential impacts related to rehabilitation and closure (Appendix 4). The preliminary MCP details the following:</p> <ul style="list-style-type: none"> • Closure obligations and commitments. • Stakeholder identification and engagement. • Post mining land use and closure objectives. • Development of completion criteria. • Closure data. • Identification and management of closure risks. • Closure implementation (including the development of closure domains). • Closure monitoring and maintenance. • Financial provision for closure. 	<p>Through the development of the preliminary and detailed MCP, Sheffield considers that potential residual impacts during decommissioning and closure on the environment will be able to be adequately managed such that the environmental objective for rehabilitation and closure will be met, and that the residual impacts are therefore acceptable.</p>

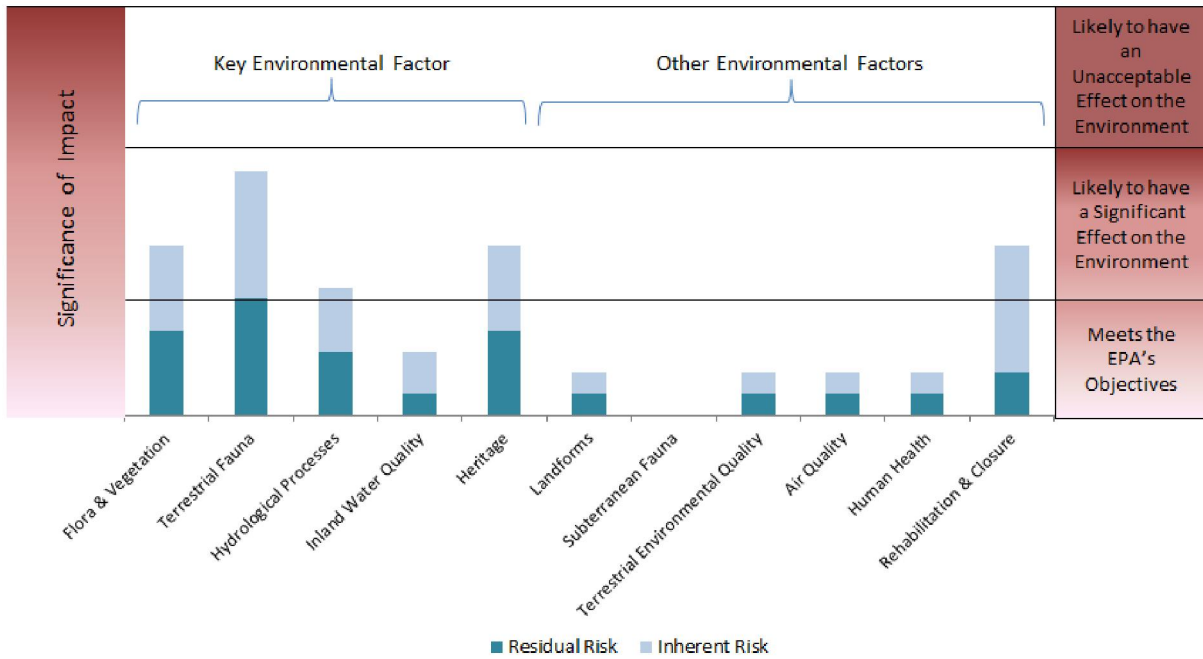
Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
Matters of National Environmental Significance					
The Greater Bilby	N/A	The Greater Bilby (or evidence of the species) was identified during the surveys undertaken for the Mine Site Development Envelope. (Ecologia 2014a, 2016)	<ul style="list-style-type: none"> Fragmentation of habitat resulting in displacement. Clearing activities causing injury or death. Vehicle strike causing injury or death. Increased predation causing injury or death. Altered fire regime causing injury or death or loss of habitat. Light and noise pollution disrupting nocturnal activities. Entrapment leading to injury or death 	<ul style="list-style-type: none"> Clearing activities will be managed to ensure clearing is strictly limited to that necessary for operations. Land clearing will be undertaken progressively with the amount of active disturbance minimised. Disturbed areas will be rehabilitated as they become available. Topsoil and vegetation will be respread over rehabilitated areas to act as a seed source and mulch to protect the soil from erosion and provide habitat for fauna. Pre-clearance surveys will be undertaken no more than one month ahead of planned land clearing. As Bilbies are highly mobile, utilisation of burrows can vary nightly. To ensure pre-clearance surveys are accurate and information is current, the following protocols will be implemented: <ul style="list-style-type: none"> The time between pre-clearance surveys and clearing will be minimised as far as practicable. Locations of burrows previously identified in the clearing area (both active and non-active burrows) will be inspected. The areas surrounding these locations will also be searched to identify any new burrows in the vicinity. All burrows present will be assessed to determine if they were recently active (evidenced by 'fresh' spoil, tracks, diggings and scats). Motion sensor cameras will be used to monitor active Bilby burrows and confirm if Bilbies are present immediately prior to clearing. In the week preceding entry of large scale mechanised equipment used for land clearing, Bilby burrows determined by pre clearance surveys to be not currently in use will be collapsed to minimise potential for use prior to land clearing, If pre-clearance surveys indicate active burrows are within the area to be cleared, a Greater Bilby capture and relocation program will be developed and implemented by a suitably qualified environmental professional. A suitably qualified person (fauna spotter) will be on site during land clearing. The fauna spotter will meet the following requirements: <ul style="list-style-type: none"> Have appropriate training in fauna handling techniques. Will hold a permit to handle and move significant fauna under Regulation 15 of the WC Act 1950. Have suitable equipment to administer emergency care to injured and or displaced fauna. Have access to a care facility that can be used to rehabilitate injured fauna. Speed limits will be implemented for operational areas and the Site Access Road. Personnel will be required to adhere to speed limits and drive to road/weather conditions to minimise risks of fauna injuries or death due to vehicle traffic The Site Access Road will be constructed with a 5 m buffer of cleared area on each side with topsoil stockpiles located up to 20 m away from the trafficable surface. Travel between dusk and dawn on the Site Access Road and village access road will be limited to essential travel with driving speed limits set to reduce the potential for road strikes. The site induction program will provide information on the Greater Bilby and the importance of minimising impacts on the species. Sheffield will undertake pest animal control within the Mine Site Development Envelope in co-operation with regional control programs. Domestic waste facilities will be fenced and putrescible wastes will be regularly covered. Borrow pits will be designed and constructed to minimise permanent water ponding after rehabilitation. Firefighting equipment will be located on site and emergency personnel will be trained in fire response Lightning protection equipment will be installed as part of project design where necessary. Vehicles will not be permitted to leave access tracks or cleared areas. A Hot Work Permit system will be developed and implemented. All machinery and vehicles undertaking clearing activities will be fitted with firefighting equipment. 	<p>The Mine Site Development Envelope is known to support Greater Bilbies. Consistent with other areas of the Dampier Peninsula, the Development Envelope will support Greater Bilbies in low densities with significant difference in population numbers at any point in time given the highly mobile nature of the species.</p> <p>It is almost certain that clearing associated with the project will result in loss of some Greater Bilby habitat, as well as habitat fragmentation and displacement of individuals. Habitat loss given the nature of the mining process will be progressive and is not expected to be permanent apart from expansion of the existing Mt Jowlaenga Road to form the Site Access Road. Progressive rehabilitation of mined areas to the current land use (grazing of native pasture) will minimise long term habitat loss. Extensive habitat is available in the areas surrounding the Mine Site Development Envelope and thus it is considered feasible for individual Greater Bilbies to move away from the impact area and colonise this habitat during the duration of the project.</p> <p>Clearing activities are also almost certain to result in the injury or death of some individual Greater Bilbies. Likewise, vehicle strike is almost certain to cause injury or mortality of some individuals. However, these injuries and mortalities are not expected to impact the ability of the Greater Bilby population to survive at the local or regional level.</p> <p>Light and noise pollution are likely to disrupt the nocturnal activities of the Greater Bilby, but affected individuals are expected to move away from noise and light sources. Fauna injury or mortality due to increased predation, changes to the fire regime, or entrapment may occur, however are not considered likely to impact population viability or diversity.</p> <p>Based on an assessment of the potential impacts on the Greater Bilby in accordance with the <i>EPBC Act</i> significant impacts guidelines it can be summarised that the project is not expected to:</p> <ul style="list-style-type: none"> Lead to a long term decrease in the size of an important population of the species. Significantly reduce the area of occupancy of an important population. Fragment an existing population into two or more populations. Adversely affect habitat critical to the survival of a species. Disrupt the breeding cycle of an important population.

Factor	EPA Objective	Existing Environment	Potential Impact	Management Measures	Predicted Outcomes
				<ul style="list-style-type: none"> Sheffield will work with the pastoralist, Traditional Owners and DFES to undertake prescribed burns and install and maintain firebreaks if required so that potential environmental damage from extreme and out of control wildfires is minimised and infrastructure and the community are protected throughout the life of the project. The project site induction will include information on the prevention and management of fires. Travel between dusk and dawn on the Site Access Road and village access road will be limited to essential travel. Lights will be strategically placed and designed to shine towards plant operations and minimise light spill to the environment. Equipment design will specify compliance with Australian Standard noise limits. Artificial water sources will have egress points installed. Open holes, trenches, landfill, and any water holding facilities will be inspected regularly for fauna. Domestic waste facilities will be fenced and putrescible wastes will be regularly covered. Rehabilitated areas will be monitored to ensure radiation levels are consistent with measured pre-mining background levels. 	<ul style="list-style-type: none"> Modify, destroy, remove, isolate or decrease the availability or quality of habitats to the extent that the species is likely to decline. Result in invasive species that are harmful to the Greater Bilby becoming established. Introduce disease that may cause the species to decline. Interfere substantially with the recovery of the species. <p>Sheffield is committed to managing the project such that the species would not be significantly affected. In recognition of the conservation status of the species and potential impacts on it, an offset package to mitigate impact is proposed. This is detailed in Section 14.</p>
Integrating Factor – Offsets					
Offsets	To counterbalance any significant residual environmental impacts or uncertainty through the application of offsets.	N/A	N/A	<p>Specifically, in order to offset significant residual impacts of the Greater Bilby, Sheffield proposes to:</p> <ul style="list-style-type: none"> Establish the Kimberley Greater Bilby Trust. The purpose of this Trust will be to administer funds for research into the Greater Bilby. Sheffield will commit a total of \$750,000 over the life of the project with 60% of Sheffield funds to be allocated for completion of projects by the end of Year 20. Work collaboratively with other interested stakeholders to develop and implement a WA Bilby Record Database and fund administration for 10 years. Estimated costs are \$40,000 for establishment in the first year and \$5,000 per year for 9 years for a total of \$85,000. Provide logistical support for people undertaking relevant research projects (flights to site, accommodation, and field work assistance) for research projects. Estimated costs are \$10,000 per person per project per year for a total of \$90,000 based on three research projects for three year's duration each. Feral animal control within the Mine Site Development Envelope. It is recognised the project may result in increased predator populations. Sheffield will allocate \$5,000 per year for 45 years for a total of \$225,000. The offsets package proposed totals \$1,150,000 over the life of the project which will generate significant positive outcomes for the Greater Bilby in the Kimberley. 	<p>The proposed offset package is designed to counterbalance the loss of Greater Bilby habitat which has the potential to occur through permanent modification of habitat characteristics in the Mine Site Development Envelope. This will be achieved by reducing threats to the Greater Bilby, potentially improving habitat condition, and increasing numbers across the broader Dampier Peninsula.</p> <p>Sheffield considers that the potential significant residual impacts to the Greater Bilby will be able to be counterbalanced by the proposed offsets package such that the environmental objective for offsets will be met.</p>

APPLICATION OF A SIGNIFICANCE FRAMEWORK

The Environmental Protection Authority applies a significance framework to the assessment of Public Environmental Reviews (EPA 2015a). An assessment of the residual and inherent potential impacts to each factor under assessment is presented below, in line with the Environmental Protection Authority approach (EPA 2015b).

Mine Site Development Envelope



Derby Port Development Envelope

