THUNDERBIRD MINERAL SANDS PROJECT ENVIRONMENTAL SCOPING DOCUMENT

PROPOSAL NAME:	**THUNDERBIRD MINERAL SANDS PROJECT**
ASSESSMENT NUMBER:	**2073**
LOCATION:	**KIMBERLEY**
LOCAL GOVERNMENT AREA:	**BROOME**
PROPONENT:	**SHEFFIELD RESOURCES LIMITED**
PUBLIC REVIEW PERIOD:	**4 WEEKS (PER)**
EPBC REFERENCE NO:	**EPBC 2016/7648**

1. Introduction

The above proposal is being assessed by the Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986* (EP Act) at the level of Public Environmental Review (PER). This Environmental Scoping Document (ESD) sets out the requirements for the environmental review of the proposal. Figure 1 shows the EPA PER process including the scoping phase. Figure 2 shows the DoE assessment and approval process including assessment and approval under a Bilateral Agreement.

The purpose of an ESD is to:

- provide proposal-specific guidelines to direct the proponent on the preliminary key environmental factors or issues that are to be addressed during the environmental review and preparation of the environmental review report;
- identify the required work that needs to be carried out; and
- document the timing of the environmental review.

This ESD has been prepared by Sheffield Resources Limited, the proponent, in consultation with the EPA, decision-making authorities and interested agencies consistent with EPA Environmental Assessment Guideline (EAG) 10 – *Scoping a proposal*.

Sheffield Resources Limited will conduct the environmental review in accordance with this ESD and then report this to the EPA in an environmental review report (PER document). As well as the proposal-specific requirements for the environmental review identified in this ESD, the PER document will also address any

generic information requirements listed in Section 10.2.4 of the EPA's Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures (2012) and Schedule 4 of the *Environmental Protection and Biodiversity Conservation Regulations (2000)*. When the EPA is satisfied that the PER document adequately addresses all these requirements, Sheffield Resources Limited will release the document for a public review period of four weeks.

Assessment under Bilateral Agreement

The Thunderbird Mineral Sands Project has been referred and determined to be a Controlled Action under the Environment Protection and Biodiversity Conservation Act (1999) and 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. The relevant matters of national environmental significance (MNES) for this proposal are:

- Listed threatened species*: Macrotis lagotis* (Greater Bilby), recorded in study area. (Determined to be a Controlled Action).

Other MNES which may have the potential to be impacted include:

- *Megaptera novaeangliae* (Humpback Whale) - Vulnerable.
- *Glyphis garricki* (Northern River Shark) - Endangered.
- *Pristis clavata* (Dwarf sawfish) – Vulnerable.
- *Pristis Pristis* (Largetooth Sawfish) – Vulnerable.
- *Pristis zijsron* (Green Sawfish) – Vulnerable.

To meet the requirements of the *Environment Protection and Biodiversity Conservation Act 1999*, the PER will also need to address the relevant requirements of Schedule 4 of the *Environmental Protection and Biodiversity Conservation Regulations 2000.*

This ESD is inclusive of work required to be carried out and reported on in the PER document in relation to MNES.

MNES that occur or have the potential to occur within the Thunderbird Mineral Sands Project will be identified and the potential impacts on these matters addressed within each relevant preliminary environmental factor as identified in Table 2. The PER document will include a separate section which summarises the potential impacts on MNES and describes, to the extent practicable, any feasible alternatives to the proposed action and possible mitigation measures. Proposed offsets to address significant residual impacts on MNES will also be discussed.

2. The Proposal

The subject of this ESD is Sheffield Resources Limited Thunderbird Mineral Sands Project (including Derby Port) in the west Kimberley region of Western Australia. The regional location of the proposal is shown in Figure 3. Photographs of the site location are shown in Figure 4.

The key characteristics of the proposal are set out in Table 1, in accordance with EAG 1 – *Defining the key characteristics of a proposal*. The development envelopes encompassing the physical elements of the proposal are delineated in Figure 5. The spatial data representing the proposal development envelope and activity footprint outlined in this ESD is enclosed on a CD in Appendix 1.

It should be noted that the key proposal characteristics may change as a result of implementation of the mitigation hierarchy by Sheffield Resources Limited on account of the findings of studies and investigations conducted as part of the environmental review.

Table 1 Key Proposal Characteristics

Summary of the proposal		
Proposal Title		Thunderbird Mineral Sands Project
Proponent Name		Sheffield Resources Limited
Short Description		The proposed Thunderbird Mineral Sands Project is located approximately 98 km northeast of Broome and 72 km west of Derby in Western Australia. The project includes heavy mineral sands mining above and below the water table, dewatering within the Broome aquifer, onsite mineral processing, transport of mineral products to Derby Port and transhipping via King Sound using new and existing infrastructure at Derby Port. The project includes: • Mining up to a depth of approximately 100 m below ground level. • Processing of heavy mineral sands including use of a tailings storage facility (TSF). • Progressive backfilling of the mine pit and rehabilitation of backfilled areas. • Upgrade and extension of an existing road to provide an approximately 32 km long site access road linking the project to the Great Northern Highway. • Groundwater abstraction from the Broome aquifer. • Supporting infrastructure including internal roadways, accommodation camp, power plant, workshops, offices and landfill. • Storage of mineral products and export from Derby Port.
Physical Elements		
Element	**Location**	**Proposed Extent**
Mine Development Envelope		
Mine Pit	Figure 5	Progressive clearing and mining of no more than 1,540 ha within a 5,875 ha development envelope over a 40^{+} year timeframe. Approximately 100 ha of mine pit open at any one time, with progressive backfilling and rehabilitation.
Processing Infrastructure	Figure 5	Clearing of no more than 35 ha within a 5,875 ha development envelope.
Borefield	Figure 5	Clearing of no more than 15 ha within a 5,875 ha development envelope.
Tailings Storage	Figure 5	Clearing of no more than 110 ha within a 5,875 ha development envelope.

Facility		
Other Supporting Infrastructure	Figure 5 / To be determined	Clearing of no more than 100 ha within a 5,875 ha development envelope.
Site Access Road	Figure 5	Clearing of no more than 230 ha within a 5,875 ha development envelope.
Port Development Envelope		
Storage/export Facility	Figure 5	Construction of port storage/export facility on existing disturbed port land.
Operational Elements		
Element	**Location**	**Proposed Extent**
Mineral Sands Processing	Figure 5	• 0 - 9 months: initial tailings deposition in TSF at 7.5 Mtpa. • 9 months - 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.
Dewatering/ Abstraction of Groundwater	Figure 5	Abstraction of groundwater at up to 13 GL per annum for the life of mine.
Power	Figure 5	16 MW multifuel (gas and/or diesel) power plant.
Transport, Storage at Port and Shipping of Product	Derby Port	• Product transport by road train to Derby Port via Site Access Road and Great Northern Highway (approximately 145 km total). • Storage of 50,000 to 60,000 t of mineral products in an enclosed shed at Derby Port. • Option to break bulk (bagging) at Derby Port. • Transhipment of mineral products via barge 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 depending on ship size.

3 Preliminary key environmental factors and scope of work

The key proposal characteristics in Table 1 have informed the identification of the preliminary key environmental factors for the proposal, in accordance with EAG 8 – *Environmental principles, factors and objectives*. The preliminary key environmental factors for the Thunderbird Mineral Sands Project and Derby Port operations are listed below:

Key Significant Environmental Factors for Thunderbird Mine and/or Derby Port		
Factor	**Mining Area**	**Derby Port**
Marine Environmental Quality	No	Yes
Flora and Vegetation	Yes	No
Terrestrial Fauna	Yes	No
Hydrological Processes	Yes	No
Inland Waters Environmental Quality	Yes	No
Amenity	No	Yes
Heritage	Yes	No
Offsets (Integrating Factor)	Yes	No
Rehabilitation and Decommissioning (Integrating Factor)	Yes	No

The EPA's objective for each of those factors is identified in Table 2.

To provide context to the preliminary key environmental factors, Table 2 also identifies the aspects of the proposal that cause the factors to be preliminary key environmental factors, and the potential impacts and risks likely to be relevant to the assessment. All of this in turn has informed the work required (or scope of work) to be conducted in the environmental review.

Finally, Table 2 identifies the policy documents that establish how the EPA expects the environmental factors to be addressed in the environmental review and the PER document that follows. Impacts associated with proposals will be considered at a local and regional scale, including evaluation of cumulative impacts, and provide details of proposed management/mitigation measures. This includes whether environmental offsets are required by application of the mitigation hierarchy, consistent with the WA Environmental Offsets Guidelines.

The EPA expects that the proponent will consider all relevant contemporary policy documents, including revisions or updates of the policy documents listed and any new, relevant policy that is published during development of the PER.

Table 2 Preliminary key environmental factors and required work

Marine Environmental Quality	
EPA objective	To maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected.
Environmental aspects	**Mining Area:** N/A **Derby Port:** • Product loading to ships/barges. • Construction activities. • Drainage from export facility.
Potential impacts and risks	**Mining Area:** N/A **Derby Port:** • Pollution of water, sediment or biota due to product spillages during barge loading or transfer. • Impacts on water and sediment quality during construction of new port infrastructure. • Pollution of water or sediments due to uncontrolled drainage from the export facility.
Required work (scope of work)	**Mining Area:** N/A **Derby Port:** 1. Characterise Derby Port marine environment quality via baseline contamination and acid sulfate soil assessment. 2. Undertake a radiological assessment of the products to be loaded and transported via Derby Port and King Sound. o A preliminary radiological assessment of mineral products from the Thunderbird Mineral Sands Project has been carried out by SGS (2014). It found the mineral products do not require transportation as radioactive substances. o Undertake detailed radiological assessment (in progress). 3. Assess impacts of loading, barging and transhipment of mineral products, including impacts from radiation, on the marine environment quality. Radiation impacts will be assessed as part of an overall radiation assessment for the proposal. 4. Detail management and mitigation measures and further monitoring to achieve proposed outcomes and ensure residual impacts are not greater than anticipated. 5. Undertake export activities in accordance with a Radiation Management Plan.
Relevant policy and guidance documents and legislation	EPA. 2009. Protection of Benthic Primary Producer Habitat in Western Australia's Marine Environment, Environmental Assessment Guideline 3 (EAG 3). EPA 2009. EPA. 2011. Environmental Assessment Guideline for Marine Dredging Proposals (EAG 7). EPA September 2011. ANZECC. 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Canberra, ACT.

	Australian Radiation Protection and Nuclear Safety Agency. 2005. *Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing.* Barton, ACT. Australian Radiation Protection and Nuclear Safety Agency. 2008. *Code of Practice for Safety Transport of Radioactive Material.* Barton, ACT. Australian Radiation Protection and Nuclear Safety Agency. 2008. *Safety Guide, Safe Transport of Radioactive Material*. Barton, ACT. Barging and ship loading of product will be managed under Part 16 of the *Mines Safety and Inspection Regulations (1995)* and the *Radiation Safety Act (1975)*. Radiation can be effectively managed under this legislation jointly by Department of Mines and Petroleum (DMP) and Radiological Council. Barging and transhipment operations will be carried out under a Works Approval and Environmental Licence issued under Part 5 of the *Environmental Protection Act (1986).* DoE. 2015. *Protecting the Quality of Western Australia's Marine Environment*. Environmental Assessment Guideline 15. Canberra, ACT.
Flora and Vegetation	
EPA objective	To maintain representation, diversity, viability and ecological function at the species, population and community level.
Environmental aspects	**Mining Area**: • Clearing of native vegetation. • Groundwater abstraction. • Modification of surface and subsurface water flows. • Altered fire regimes. **Derby Port**: N/A

Potential impacts and risks	**Mining Area**:
	
	• Direct loss of flora and vegetation from clearing.
	• Indirect impact on flora and vegetation from:
	  o Dust from mining operations.
	  o Potential spills and leaks.
	  o Groundwater abstraction.
	  o Alteration to surface water flows.
	  o Flooding (overtopping water storages/ponding).
	  o Vehicle movements.
	  o Introduction and spread of weeds.
	
	Derby Port:
	
	N/A

Required work (scope of work)	**Mining Area:**
	
	6. Identify and characterise flora and vegetation within the Mining Area through Flora and Vegetation Survey in accordance with *EPA Guidance Statement 51*. The survey area should take into account vegetation that may be indirectly impacted and within the Mining Lease and Miscellaneous Licence boundaries to assist in determination of local and regional impacts. Flora and vegetation surveys have been completed:
	
	  o Level 1 Flora and Fauna Assessment (Ecologia 2012).
	  o Level 2 Flora and Vegetation Survey (Ecologia 2014a).

	○ Haul Road and Accommodation Camp Flora and Fauna Assessment (Ecologia 2015a). 7. Conduct a detailed analysis of vegetation communities to establish local and regional conservation significance of each vegetation community: ○ Identify those communities which are likely to be groundwater dependent ecosystems (GDE). Provide details of the methodology used in the identification and mapping of vegetation community. ○ Provide a detailed description with figures clearly showing vegetation communities including the potential Priority Ecological Community MaMvEtCpCc and the area to be cleared and indirectly impacted as defined in *EPA Guidance Statement 51*. 8. Conduct a technical peer review to ensure that surveys are relevant, representative of the development envelope, provide suitably current information on populations and locations of flora of conservation significance, and condition of vegetation units and have been carried out using methods consistent with EPA guidance. 9. Should further or supplementary surveys be undertaken they will be consistent with the EPA/DPaW Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment (2015). 10. Identify conservation significant species and communities present in the development envelope: ○ A Level 2 Flora and Vegetation Survey did not identify any declared rare flora (DRF) or *EPBC Act* listed species within 50 km of the study area. Three Priority 3 species were identified in the development envelope during the surveys. Of these, two were located in the proposed disturbance area. ○ Conduct a targeted flora survey for conservation significant species (CS) in accordance with *EPA Guidance Statement 51 and EPA and DPaW Technical Guide – Flora and Vegetation Surveys for EIA*. ○ Provide a detailed description with figures clearly showing Priority flora, range extension species and vegetation communities including the potential Priority Ecological Community (PEC) MaMvEtCpCc and the area to be cleared and indirectly impacted as defined in EPA *Guidance Statement 51*. 11. Predict the residual impacts from the proposal on flora and vegetation, both direct and indirect, after considering and applying avoidance and minimisation measures: ○ Quantify impacts on Priority flora species and range extension species, including the number of plants in the affected populations, the percentage of plants in the affected populations, the number of plants and populations to be impacted in a 'worst case scenario'. ○ Provide information on the representation of Priority and range extension species on the remaining, unmined survey areas and other known occurrences/populations. ○ Quantify the extent and duration of impacts on the different vegetation communities including MaMvEtCpCc which is similar to the Lolly Well Springs PEC and is associated with an ephemeral spring (potential GDE). ○ Provide information on the representation of vegetation communities on the remaining, unmined survey areas. Analysis will include local and regional distribution of vegetation communities. ○ Assess the impacts of altered surface hydrology and groundwater extraction on vegetation communities. 12. Identify management and mitigation measures for flora and vegetation to ensure residual impacts are not greater than predicted. 13. Summarise residual impacts, after considering avoidance and minimisation

	impacts are not greater than predicted. 14. Demonstrate and document in the PER how the EPA's objective for this factor can be met. 15. Complete the EPA Checklist for documents submitted for Environmental Impact Assessment on terrestrial biodiversity. **Derby Port:** N/A
Relevant policy and guidance documents and legislation	EPA. 2000. *Environmental Protection of Native Vegetation in Western Australia.* Position Statement No. 2. Perth, Western Australia. EPA. 2002. *Terrestrial Biological Surveys as an Element of Biodiversity Protection.* Position Statement No. 3. Perth, Western Australia. EPA. 2004. *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51.* Guidance for the Assessment of Environmental Factors. Perth, Western Australia. EPA. 2006. *Rehabilitation of Terrestrial Ecosystems.* Guidance for the Assessment of Environmental Factors No. 6. Perth, Western Australia. EPA. 2013. *Protection of Naturally Vegetated Areas Through Planning and Development.* Environmental Protection Bulletin No. 20. Perth, Western Australia. EPA Checklist for documents submitted for Environmental Impact Assessment on marine and terrestrial biodiversity. Environmental Protection Authority and Department of Parks and Wildlife (2015) *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment.*
Terrestrial Fauna	
EPA objective	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.
Environmental aspects	**Mining Area:** • Clearing of habitat. • Mining activities. • Construction and use of linear site access road. • Waste disposal. **Derby Port:** N/A
Potential impacts and risks	**Mining Area:** • Death or displacement of fauna species, including Greater Bilby. • Decline of Greater Bilby population numbers from direct and indirect impacts. • Direct (clearing) or indirect (weeds, introduced species) loss or fragmentation of habitat. • Attraction of fauna to areas used for storage of water or food wastes. • Impact on fauna from noise and light. • Impacts of altered fire regimes. **Derby Port:** N/A
Required work (scope of work)	**Mining Area:** 16. Conduct terrestrial fauna surveys of direct and indirect impacted area and

	surrounds in accordance with *EPA Guidance Statement Number 56*. Conduct Targeted surveys of conservation significant fauna identified during fauna surveys that are significant. Fauna surveys and a Targeted Greater Bilby survey in accordance with *EPA Guidance Note 56* have been conducted as follows: o Level 1 Flora and Fauna Assessment (Ecologia 2012). o Level 2 Terrestrial and Subterranean Fauna Assessment (Ecologia 2014a). o Haul Road and Accommodation Camp Flora and Fauna Assessment (Ecologia 2015a). o Targeted Greater Bilby Assessment (Draft) (Ecologia 2015b). 17. Conduct a technical peer review of the Targeted Bilby Survey Report to ensure consistent with guidance and appropriate for the scale of impacts. 18. Conduct a literature review and provide justification that completed fauna surveys are relevant, representative of the development envelope, provide suitably current information on populations and locations of fauna of conservation significance and have been carried out using methods consistent with EPA guidance. 19. Assess direct and indirect impacts on fauna, conservation significant fauna and fauna habitats. Provide figures showing the likely extent of loss of habitat types and the extent of habitat areas expected to recover from both direct and indirect impacts. As part of the assessment, prepare a comprehensive list of all terrestrial fauna species likely to occur in habitats to be directly or indirectly impacted. 20. Assess the likelihood of the habitats to support short range endemic (SRE) invertebrate species. Provide figures clearly showing impacts to SREs. 21. Identify management and mitigation measures to ensure residual impacts are not greater than predicted. The PER is to include a Greater Bilby Management Plan including environmental outcomes/objectives; other key regulatory requirements; management actions; monitoring (including methodology, frequency, location and rationale); trigger criteria; contingency actions; review, reporting and consultation. 22. Demonstrate and document in the PER how the EPA's objective for this factor can be met. **Derby Port:** N/A
Relevant policy and guidance documents and legislation	Department of Sustainability, Environment, Water, Population and communities (DSEWPaC). 2011. *Survey Guidelines for Australia's Threatened Mammals*. Canberra, ACT. EPA. 2002. *Terrestrial Biological Surveys as an Element of Biodiversity Protection.* EPA Position Statement No. 3. Perth, Western Australia. EPA. 2004. *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia.* Guidance for the Assessment of Environmental Factors, Statement No. 56. Perth, Western Australia. EPA. 2009. *Sampling of Short range endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia.* Guidance for the Assessment of Environmental Factors, Statement No. 20. Perth, Western Australia. EPA and Department of Environment and Conservation (DEC). 2010. *Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment.* Technical Guide. Perth, Western Australia.

Hydrological Processes	
EPA objective	To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.
Environmental aspects	**Mining Area:** • Groundwater abstraction (borefield). • Mine dewatering. • Water course crossings and or diversions. **Derby Port:** • Tides and flooding.
Potential impacts and risks	**Mining Area:** • Lowering of groundwater levels and/or potentiometric heads in a sedimentary aquifer with potential to impact on: o Surface water bodies with groundwater dependent ecosystems. o Other water users (e.g. pastoral). o Impacts to Broome aquifer quality and supply (PDWSA). o Loss of habitat for subterranean fauna. • Possible impact of mine infrastructure on surface drainage flow within the head waters of the Fraser River South and North tributaries. • Altered flow regimes and potential flood management issues. **Derby Port:** • Flooding and subsequent release of poor quality water back to King Sound.
Required work (scope of work)	**Mining Area:** 23. Characterise the baseline hydrological and hydrogeological regimes and water quality, both in a local and regional context, including, but not limited to, water levels, water chemistry, stream flows, flood patterns, and water quantity and quality. This is to include a detailed description of the geological framework within the zone to be impacted by groundwater abstraction and any interdependence between surface and groundwater features/bodies. 24. Identify borefield locations and design requirements to meet project needs (water supply and mine pit dewatering), expected abstraction over life of project, and sustainability of borefields. 25. Assess nature, extent and duration of potential impacts of groundwater abstraction with a focus on possible impacts on creeks, soaks/wetlands, groundwater dependent ecosystems and quality. 26. Establish potential impacts and consequences that proposed mine infrastructure could have on existing surface drainage. 27. Identify any mine waste water discharges in the site water circuit (balance) and establish possible impacts these may have on the environment and mitigation measures. 28. The impact assessment will take climate change and cumulative effects into consideration. Aspects and impacts related to subterranean fauna and groundwater are addressed under 'Other Factor: Subterranean Fauna'. **Derby Port:** 29. Characterise hydrological properties for the port area including tides, flood levels and drainage.

	30. Describe proposed management, monitoring and mitigation methods to be implemented.
Relevant policy and guidance documents and legislation	Department of Water (DoW). 2013. *Western Australia Water in Mining Guideline. Water licensing delivery report series.* Report No. 12. Perth, Western Australia. EPA. 2004. *Environmental Protection of Wetlands.* Position Statement No. 4. Perth, Western Australia. *Rights in Water and Irrigation Act (1914).* DoW. 2009. *Hydrogeological Reporting Associated with a Groundwater Well Licence. Operational Policy 5.12.* Perth, WA. Barnett et al. 2012. *Australian Groundwater Modelling Guidelines. Waterlines Report.* National Water Commission. Canberra, ACT.
Inland Waters Environmental Quality	
EPA objective	To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.
Environmental aspects	**Mining Area:** • Construction and operation of proposal. • Development and operation of a TSF. • Development and operation of waste facilities (landfill, sewage treatment plant). • Disposal of mine and process wastes in mine pit void. • Discharge of excess water. **Derby Port:** N/A
Potential impacts and risks	**Mining Area:** • Contamination of groundwater as a result of: o Excess abstraction causes saline intrusion to aquifer. o Seepage from mine and process waste disposal areas including backfill of mine waste to mine pit void and/or TSF. o Groundwater abstraction/dewatering causing oxidation of sulfides potentially present in aquifer sediments. o Disposal of poor quality effluent from wastewater treatment plant (WWTP). • Reduction in surface water quality as a result of: o Poor containment of potentially contaminated stormwater runoff from active mining areas, ore processing facilities and site access road. o Poor containment of sediment during project construction. **Derby Port:** N/A
Required work (scope of work)	**Mining Area:** 31. Undertake an investigation to characterise hydrogeological processes within the Mining Area and determine what effect the proposal will have on groundwater quality and quantity. This will include: o Hydrogeological conceptual model and numerical groundwater model of groundwater systems. o Site water balance.

	○ Geochemical characterisation of aquifer sediments. ○ Potential for the aquifer to transport contaminants. ○ Potential impacts on sensitive receptors. 32. Undertake an investigation to characterise hydrological processes within the Mining Area and determine what effect the proposal will have on surface water quality and quantity. 33. Assess impacts of backfilling mine waste in mine pit void and TSF. Characterisation of mine waste backfill is addressed under 'Other Factor: Terrestrial Environmental Quality'. 34. Detail management measures to ensure residual impacts on inland water quality are not greater than predicted. **Derby Port:** N/A
Relevant policy and guidance documents and legislation	ANZECC. 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Canberra, ACT. Barnett et al. 2012. *Australian Groundwater Modelling Guidelines. Waterlines Report.* National Water Commission. Canberra, ACT. DoW. 2013. *Western Australia Water in Mining Guideline. Water licensing delivery report series.* Report No. 12. Perth, Western Australia. Government of WA. 2004. *State Water Quality Management Strategy Document No. 6.* Perth, Western Australia. *Rights in Water and Irrigation Act (1914).*
Amenity	
EPA objective	To ensure that impacts to amenity are reduced as low as reasonably practicable.
Environmental aspects	**Mining Area:** N/A **Derby Port:** • Transport of mineral products from the Mining Area to Derby Port: ○ Noise and dust from truck movements through the town of Derby. • Construction and operation of mineral product export facility: ○ Noise impacts from storage and export operations on the town of Derby. ○ Fugitive dust impacts on the town of Derby.
Potential impacts and risks	**Mining Area:** N/A **Derby Port:** • Noise and dust emissions associated with construction and operation of mineral product storage infrastructure adjacent to existing port infrastructure. • Noise emissions associated with transport of mineral products through Derby to the export facility. • Particulate and noise emissions from mineral product loading affect amenity of existing or future residents of Derby and other users of the Derby Port facilities.
Required work (scope of work)	**Mining Area:** N/A

	Derby Port and Transport Route: 35. Characterise noise impacts on sensitive receptors along the transport route and Derby Township via a noise assessment in accordance with *EPA Environmental Assessment Guideline 13*. Demonstrate that noise can be managed such that it complies with the *Environmental Protection (Noise) Regulations 1997* at sensitive receptor locations. 36. Provide noise predictions for noise-sensitive premises in relation to the proposed transport route, storage area and loading facilities including duration and severity of impacts. 37. Characterise air quality impacts on sensitive receptors along the transport route and at the Derby townsite. 38. Demonstrate that the proposal has been designed as far as practicable to avoid and minimise impacts. 39. Identify and document in the PER management, monitoring, trigger and contingency actions, within environmental management plans, to ensure residual impacts (direct and indirect) are not greater than predicted. 40. Demonstrate and document in the PER how the EPA's objective for this factor can be met.
Relevant policy and guidance documents and legislation	DEC. 2006. *Air Quality and Air Pollution Modelling.* Guidance Notes. Perth, Western Australia. DEC. 2011. *A Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and Other Related Activities.* Perth, Western Australia. Department of Environment (DoE). 2006. *Air Quality Modelling.* Guidance Notes. Canberra, ACT. EPA. 2014. *Environmental Assessment Guideline 13 for Consideration of Environmental Impacts from Noise.* Perth, Western Australia. EPA. 2005. - Separation Distance between Industrial and Sensitive Land Uses Guidance Statement 3 (GS3). EPA June 2005. *Environmental Protection (Noise) Regulations (1997).* *Environmental Protection Act* (1986). Port operations will be carried out under a Works Approval and Environmental Licence issued under Part 5 of the *Environmental Protection Act (1986)*. *National Environmental Protection (Ambient Air Quality) Measure (2003).* Western Australian Planning Commission (WAPC). 2009. *Road and Rail Transport Noise and Freight Considerations in Landuse Planning.* State Planning Policy 5.4. Perth, Western Australia.
Heritage	
EPA objective	To ensure that historical and cultural associations, and natural heritage, are not adversely affected.
Environmental aspects	**Mining Area:** • Land clearing. • Prevention or change to access to a site. • Alterations to hydrological processes. **Derby Port:** Increase in ship movements in King Sound (National Heritage Place).

Potential impacts and risks	**Mining Area:** • Loss/disturbance to Aboriginal heritage sites. • Disturbance to cultural associations within the area. • Temporary and/or permanent constraint on traditional cultural activities. **Derby Port:** Impacts to Derby Port and King Sound are addressed under 'Other Factors – Marine Environment Quality, Hydrological Processes (tides), Air Quality, Atmospheric Gases, Amenity (dust and noise) and Human Health (radiation).
Required work (scope of work)	**Mining Area:** 41. Characterise the heritage and cultural values of the Mining Area and any other areas that may be indirectly impacted to identify sites of significance and their relevance within a wider regional context. o Conduct Aboriginal heritage surveys to identify Aboriginal sites of significance and identify concerns in regard to impacts from proposed mining operations. 42. Provide a detailed description of the heritage values of the Mining Area and provide a figure(s) of the heritage locations and proposed disturbance. 43. Assess the impacts of the proposal on heritage sites and/or cultural associations as a result of implementation of the proposal, including those arising from changes to the environment which may impact on ethnographic and archaeological heritage significance. This assessment will be conducted in accordance with *EPA Guidance Statement 41*. 44. Predict the residual impacts on heritage, for direct, indirect and cumulative impacts after considering avoidance and minimisation measures. 45. Outline the outcomes/objectives, management, monitoring, trigger and contingency actions to ensure impacts to heritage (direct and indirect) are not greater than predicted. **Derby Port:** N/A
Relevant policy and guidance documents and legislation	*Aboriginal Heritage Act (1972).* Department of Aboriginal Affairs and Department of Premier and Cabinet (DAA & DPC). 2013. *Aboriginal Heritage - Due Diligence Guidelines, Version 3.0.* Perth, Western Australia. EPA. 2004. *Assessment of Aboriginal Heritage.* Guidance for the Assessment of Environmental Factors No. 41. Perth, Western Australia.
Offsets (Integrating Factor)	
EPA objective	To counterbalance any significant residual environmental impacts or uncertainty through the application of offsets.
Environmental aspects	**Mining Area:** • Land clearing for permanent infrastructure only. • Groundwater abstraction. **Derby Port:** N/A
Potential impacts and	**Mining Area:**

risks	• Potential residual significant environmental impacts on flora, vegetation and fauna habitat. **Derby Port:** N/A
Required work (scope of work)	**Mining Area:** 46. Describe the residual impacts for the proposal and analyse these impacts to identify and detail any that are significant. 47. If the proposal is likely to have any significant residual environmental impacts, identify environmental offsets, consistent with the requirements in the: o WA Environmental Offsets Guidelines, which includes the use of the WA Environmental Offsets Calculation Spreadsheet and EPA Environmental Protection Bulletin No.1: Environmental Offsets. o DoE Environmental Offset Policy including the DoE Offsets calculation spreadsheet. **Derby Port:** N/A
Relevant policy and guidance documents and legislation	DoE. 2012. *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy.* Canberra, ACT. DoE. *How to Use the Offsets Assessment Guide*: http://www.environment.gov.au/system/files/resources/12630bb4-2c10-4c8e-815f-2d7862bf87e7/files/offsets-how-use.pdf DoE. *Offset Calculation Excel spreadsheet with embedded formulae*: http://www.environment.gov.au/epbc/publications/environmental-offsets-policy.html. EPA. 2014. *Environmental Protection Bulletin No. 1: Environmental Offsets.* Perth, Western Australia. Government of Western Australia. 2011. *WA Environmental Offsets Policy.* Perth, Western Australia. Government of Western Australia. 2014. *WA Environmental Offsets Guidelines.* Perth, Western Australia.
Rehabilitation and Decommissioning (Integrating Factor)	
EPA objective	To ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner.
Environmental aspects	**Mining Area:** • Clearing of vegetation. • Mining, mine pit void backfilling and progressive rehabilitation. • TSF. • Mine infrastructure and accommodation camp areas. • Site access road. **Derby Port:** N/A
Potential impacts and risks	**Mining Area:** • Permanent impacts to landforms and associated natural hydrology, flora and fauna. • Residual soil or groundwater contamination. • Acid and/or metalliferous drainage.

	• Impacts to soil structure and integrity from compaction and erosion. • Unsuccessful rehabilitation of flora and vegetation in cleared/developed areas. • Impediment of rehabilitation success from other threatening processes (e.g. invasive species, livestock, fire risk, flooding). **Derby Port:** N/A
Required work (scope of work)	**Mining Area:** 48. Provide an assessment on the physical and chemical characteristics of rehabilitation materials, including soil, mine and process wastes. 49. Prepare a Mine Closure Plan consistent with DMP and EPA *Guidelines for Preparing Mine Closure Plans* (2015). 50. Describe the proposed rehabilitation methodology, including but not limited to: o Topsoil management. o Retention or reuse of cleared vegetation material. o Return of species and communities (where feasible) consistent with the pre-existing composition of the affected area. o Timeframes for rehabilitation, including sequencing of mining, backfilling and progressive rehabilitation. **Derby Port:** N/A
Relevant policy and guidance documents and legislation	DMP. 2015. *Guide to the Preparation of a Design Report for Tailings Storage Facilities (TSFs)*. Perth, Western Australia.DMP. 2013. *Tailings Storage Facilities in Western Australia – Code of Practice.* Perth, Western Australia. DMP and EPA. 2015. *Guidelines for Preparing Mine Closure Plans.* Perth, Western Australia. EPA. 2006. *Rehabilitation of Terrestrial Ecosystems.* Guidance Statement No.6. Perth, Western Australia. EPA. 2013. *EPA Involvement in Mine Closure.* Environmental Protection Bulletin No 19. Perth, Western Australia. Department of Environment Regulation (DER). 2014. *Assessment and Management of Contaminated Sites.* Perth, Western Australia.

4 Other Factors or Matters

During assessment of proposals, other factors or matters will be identified as relevant to the proposal, but not of significance to warrant further assessment by the EPA, or impacts can be regulated by other statutory processes to meet the EPA's objectives.

These factors do not require further work as part of the environmental review, or detailed discussion and evaluation in the PER document, although they must be included in the PER document in a summarised, tabular format noting that the PER document will be subject to public review.

In some circumstances other factors, while not being considered as preliminary key environmental factors, may require greater emphasis in the PER document. This

may be due to high public interest or at the request of another stakeholder, so that the potential impacts and management measures associated with the other factor are sufficiently articulated for the public review.

For this assessment, the following environmental factor/s that are considered "other factors or matters" need to be addressed in the PER in a table showing the factor/matter, EPA objective, existing environment, potential impact and assessment of significance, management and mitigation, relevant decision making process and outcome. Other factors for the Thunderbird Mine Site and Derby Port are listed below:

Other Factors for Thunderbird Mine Site and Derby Port		
Factor	**Mining Area**	**Derby Port**
Benthic Communities and Habitat	No	Yes
Marine Fauna	Yes	Yes
Landforms	Yes	No
Subterranean Fauna	Yes	No
Terrestrial Environmental Quality	Yes	Yes
Air Quality and Atmospheric Gases	Yes	No
Human Health	Yes	Yes

No impacts on Coastal Processes are expected as a result of the Thunderbird Minerals Sands Project. This factor will not be considered in the PER.

Table 3 Other factors or matters and required work

Benthic Communities and Habitat	
EPA objective	To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales.
Environmental aspects	**Mining Area:** • N/A **Derby Port:** • Installation of new moorings (if required). • Minor dredging works around Derby Port (if required).
Potential impacts and risks	**Mining Area:** • N/A **Derby Port:** • Direct loss of benthic communities • Indirect loss of benthic communities from potential decrease in water quality from disturbance of sediments.
Required work (scope of work)	51. Characterise the benthic environment at Derby Port and mooring location through desktop assessment. 52. Assess the impact of minor dredging and installation works on the benthic communities and habitats. 53. Provide a summary of residual impacts of proposed works. 54. Document management and mitigation measures to ensure risk is not greater than predicted.
Relevant policy and guidance documents and legislation	EPA 2001. *Guidance Statement for Protection of Tropical Arid Zone Mangroves Along the Pilbara Coastline (GS 1)*, *April 2001.* Perth, Western Australia. EPA 2003. *Protection of Benthic Primary Producer Habitat in Western Australia's Marine Environment*, *EPA 2003*. Environmental Assessment Guideline 3. Perth, Western Australia. EPA 2007. *Marine Dredging Proposals, EPA September 2007*. Environmental Assessment Guideline 7. Perth, Western Australia
Marine Fauna	
EPA Objective	To maintain the diversity, geographic distribution and viability of fauna at the species and population levels.
Environmental Aspects	**Mining Area:** • Abstraction of groundwater. **Derby Port:** • Export operations off the Kimberley coast.
Potential Impacts and Risks	**Mining Area:** • Impacts of water abstraction on species such as the Northern River Shark, Dwarf, Largetooth and Green Sawfishes.

	Derby Port: • Shipping movements resulting in Humpback whale collisions. • Shipping related noise impacts on Humpback whales.
Required Work	55. Assess the likely impacts to Humpback whales in their breeding and calving grounds off the Kimberley coast arising from shipping movements servicing the mine or exporting products from the mine. 56. Assess the consequential impacts of water abstraction for flow volumes in waterways, and indirect impacts on species such as the Norther River Shark and sawfish dependant on those waterways. 57. If appropriate, identify management and mitigations measures to ensure residual impacts are not greater than predicted. If warranted, the PER is to include a Humpback whale management plan including environmental outcomes/objectives; other key regulatory requirements; management actions; monitoring (including methodology, frequency, location and rationale); trigger criteria; contingency actions; review, reporting and consultation. 58. Demonstrate and document how the Commonwealth's objectives for this factor can be met.
Relevant Policy	Threatened Species Scientific Committee Approved Conservation Advice for *Megaptera novaeangliae* (humpback whale) 2015. DSEWPaC Marine Bioregional Plan for the North-West Marine Region 2012. DEWHA Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Marine Life 2009. Threatened Species Scientific Committee Approved Conservation Advice for *Glyphis garricki* (northern river shark) 2014. Threatened Species Scientific Committee Approved Commonwealth Conservation Advice on *Pristis clavata* (Dwarf sawfish) 2009. Threatened Species Scientific Committee Approved Commonwealth Conservation Advice on *Pristis Pristis* (Largetooth sawfish) 2014. Threatened Species Scientific Committee Approved Commonwealth Conservation Advice on *Pristis zijsron* (Green sawfish) 2008. Department of the Environment Sawfish and River Sharks Multispecies Recovery Plan 2015.
Landforms	
EPA objective	To maintain the variety, integrity, ecological functions and environmental values of landforms.
Environmental aspects	**Mining Area:** • Mining excavation and earthworks. • TSF. • Rehabilitation. **Derby Port:** N/A
Potential impacts and risks	• Temporary or permanent structural alteration of landforms. • Impacts to the ecological function of landforms. • Impacts to the environmental values of the landforms.
Required work	59. Characterise affected landforms:

	○ Describe the geology, soils and morphology of affected landforms. ○ Determine the spatial extent of the landform and local assessment unit likely to be impacted. ○ Compare and contrast the character and condition of the landform with others of the same type on a local and regional scale. ○ Describe whether the landform is robust and less sensitive to damage or degradation from human activities, or whether it is easily disturbed or damaged. ○ Assess the integrity of the landform, including the local assessment unit, and the degree to which the landform has been previously disturbed and fragmented. 60. Identify any ecological functions supported by the landform. Assess how the proposal will affect the role of the landform in maintaining these ecological functions. 61. Identify any significant scientific or evolutionary values associated with the landform. 62. Estimate the cumulative impacts on the landform and local assessment unit from reasonably foreseeable future development.
Relevant policy	EPA. 2015. *Environmental Assessment Guideline for Environmental Principles, Factors and Objectives, (EAG 8).* Perth, Western Australia. EPA. 2015. *Guidance on the EPA Landforms Factor.* Environmental Protection Bulletin Number 23. Perth, Western Australia.
Subterranean Fauna	
EPA objective	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.
Environmental aspects	**Mining Area:** • Excavation of mineral sands below the water table. • Abstraction of groundwater. • Changes in water quality. **Derby Port:** N/A
Potential impacts and risks	**Mining Area:** • Direct loss of subterranean fauna individuals, species and habitat. • Pollution of groundwater causing indirect impacts on individuals, species or habitat. **Derby Port:** N/A
Required work (scope of work)	**Mining Area:** 63. Characterise the subterranean fauna environment in the Mining Area and surrounds. Undertake a subterranean fauna assessment in accordance with *Guidance Statement 54a*, of the direct and indirect impact areas (groundwater abstraction) including stygofauna and troglofauna. ○ A Level 2 subterranean fauna survey has been completed (Ecologia 2014b) and identified no conservation significant species of stygofauna or troglofauna. ○ The survey found that the potential impact area is unlikely to contain a diverse or significant troglofauna community and as such no further sampling is required.

	○ It is unlikely that a significant or diverse stygofauna community exists within the study area. 64. Predict the severity, duration and extent of the impacts: ○ Assess the impacts of groundwater abstraction and water quality changes on subterranean fauna and their habitat as identified in Ecologia (2014b). ○ Provide a summary of the findings of the impact assessment and Level 2 survey and supporting figures as required. 65. Detail management measures to ensure residual impacts are not greater than predicted. **Derby Port:** N/A.
Relevant policy and guidance documents and legislation	EPA. 2007. *Sampling Methods and Survey Considerations for Subterranean Fauna in WA.* Guidance Statement 54a. Perth, Western Australia. EPA. 2013. *Consideration of subterranean fauna in environmental impact assessment in Western Australia.* Environmental Assessment Guideline 12. Perth, Western Australia.
Terrestrial Environmental Quality	
EPA objective	To maintain the quality of land and soils so that the environment values, both ecological and social, are protected.
Environmental aspects	**Mining Area:** • Construction and operation of a TSF. • Disposal of mine and processing waste within the mine pit void. • Development and operation of a landfill. • Development and operation of sewage treatment facilities. • Storage of hydrocarbons and process reagents. **Derby Port and Transport Route:** • Transport of mineral products along site access road and public roads to Derby Port. • Storage of mineral products prior to ship loading.
Potential impacts and risks	**Mining Area:** • Land disturbance during mining. • Dust emissions from exposed surfaces. • Erosion of disturbed areas. • Flooding and/or overtopping of water storage facilities. • Contamination of soil through: ○ Accidental spills and leaks of process water, hydrocarbons or process reagents. ○ Placement of waste within mine pit. ○ Seepage from TSF. ○ Seepage from chemical storage facilities. ○ Inadequately treated sewage effluent. ○ Poorly designed or operated landfill. **Derby Port and Transport Route:** Indirect impact from dust and radiation of mineral products on surrounding landscape on transport route and during storage/loading at Derby Port.
Required work	**Mining Area:**

(scope of work)	66. Characterise mine and process waste materials with potential to affect terrestrial environment quality: o Carry out materials characterisation of soils, mine and process waste materials. Materials characterisation will include geotechnical and geochemical characterisation of process residues. Characterisation will take into account all material types to be encountered throughout the mine life. o Carry out radiation assessment on waste to be placed within the mine pit. A preliminary radiation assessment has been carried out and determined the waste for mine pit backfilling, once blended with other waste, to be low level. A detailed assessment will be undertaken (in progress). o Carry out geotechnical assessment of the soil profile at key locations including the TSF to ensure stability and suitability of area for permanent waste disposal. 67. Identify aspects of the proposal which may impact terrestrial environment and predict severity and duration of impacts. 68. Identify management measures, outcomes/objectives to ensure residual impacts are not greater than predicted: o Impacts associated with materials management can be effectively managed under processes as defined in the *Mining Act (1978)* administered by DMP. o Design, construction, management and closure of the TSF can be effectively managed under Mining Proposal and Mine Closure Plan in accordance with the *Mining Act (1978)*. **Derby Port:** • Radiation aspects of product handling addressed under 'Other Factor - Human Health'. • Noise and Dust aspects of transport, storage, and ship loading covered under 'Key Preliminary Environmental Factor – Amenity'.
Relevant policy and guidance documents and legislation	*Dangerous Goods Safety Act (2004)* and associated regulations. DMP. 2015. *Guide to Departmental Requirements for the Management and Closure of Tailings Storage Facilities (TSFs).* Perth, Western Australia. *Environmental Protection (Rural Landfill) Regulations (2002)*. *EPA. 2006. Guidance for the Assessment of Environmental Factors - Rehabilitation of Terrestrial Ecosystem (GS 6).* EPA June 2006. *Mines Safety and Inspection Act (1994)* and associated regulations. *Mining Act (1978)* and associated regulations.
Air Quality and Atmospheric Gases	
EPA objective	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.
Environmental aspects	**Mining Area:** • Particulate emissions during project construction and mining. • Particulate emissions from secondary processing plant and power generation plant. • Greenhouse gas emissions from secondary processing plant and power generation plant. **Derby Port and Transport Route:** Dust during transport and storage at Derby Port is addressed in 'Key Preliminary

	Environmental Factor - Amenity'.
Potential impacts and risks	**Mining Area:** • Health and amenity impacts on people. • Indirect impact on vegetation health. • Health impact on livestock on adjoining pastoral land. **Derby Port and Transport Route:** N/A
Required work (scope of work)	**Mining Area:** 69. Characterise baseline air quality in the Mining Area. 70. Describe expected impacts on air quality from the implementation of the proposal including direct and indirect diffuse and point emission sources. 71. Predict impacts from reduced air quality, particularly from point sources such as the secondary processing facility and power plant. 72. Estimate potential greenhouse gas emissions associated with construction and operation of the mine and associated infrastructure. 73. Document the proposed management, monitoring and mitigation methods. 74. Outline the objectives, management, monitoring, trigger and contingency actions within environmental management plans to ensure impacts are not greater than predicted. **Derby Port and Transport Route:** N/A
Relevant policy and guidance documents and legislation	DEC. 2006. *Air Quality and Air Pollution Modelling.* Guidance Notes. Perth, Western Australia. DEC. 2011. *A Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and Other Related Activities.* Perth, Western Australia. DoE. 2006. *Air Quality Modelling Guidance Notes.* Canberra, ACT. EPA. 2005. *Separation Distances Between Industrial and Sensitive Land Uses.* Guidance Statement Number 3. Perth, Western Australia. EPA. 2015. *Greenhouse Gas Emissions and Consideration of Projected Climate Change Impacts in the EIA Process.* Environmental Protection Bulletin Number 24. Perth, Western Australia. *National Environmental Protection (Ambient Air Quality) Measure (2003).*
Human Health	
EPA objective	To ensure that human health is not adversely affected.
Environmental aspects	**Mining Area:** • Public access to areas where dangerous activities are being undertaken. • Emissions from mining and ore processing. • Mine and process waste disposal. **Derby Port and Transport Route:** • Transport of mineral products on public roads. • Public access to areas where dangerous activities are being undertaken.

Potential impacts and risks	**Mining Area:** • Release of particulates into the environment. • Contamination of drinking water supplies (human and livestock). • Exposure to radiation from long term mine and process waste disposal in mine void/TSF. • Noise emissions exceed assigned levels at nearby receptors. **Derby Port and Transport Route:** • Exposure to radiation during transport, barging and ship loading operations. • Particulate emissions during transport, barging and ship loading operations. • Noise emissions during transport, barging and ship loading operations.
Required work (scope of work)	**Mining Area:** 75. Characterise radiation and environment including sensitive receptors and predict the extent and severity of the impact. This will include consideration to exposure of long term mine and process waste disposal in the mine void and TSF, including the potential for tailings to become airborne and disperse as a result of dust from tailings. Identify measures, outcomes/objectives to ensure residual impacts are not greater than expected: o Undertake radiation assessment of ore, process streams, waste streams and final product and potential exposure pathways. o Radiation assessment of ore, process streams, waste streams and final product has been carried out by SGS (2014). Assessment found that the proposal will be considered a radiation practice requiring compliance with applicable regulations. o Further assessment is underway by SGS. Non radiation health aspects and impacts for the Mining Area are addressed under 'Other Factor: Air Quality and Atmospheric Gases' **Derby Port and Transport Route:** 76. Characterise radiation aspects including the extent and severity of impacts on sensitive receptors. Identify measures, outcomes/objectives to ensure residual impacts are not greater than expected: o Undertake radiation assessment of mineral products to be transported and stored at Derby Port for ship loading. o Radiation assessment of product to be transported to Derby Port has been carried out by SGS (2014) and found the material to be below the threshold for transport as a radioactive substance. o Final products are below 10 Bq/g^{-1} but typically exceed 1 Bq/g^{-1} and consequently will be considered a radiation practice requiring compliance with applicable regulations. 77. Radiation impacts 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. Noise and dust aspects and impacts associated with the transport route and Derby Port are addressed under Preliminary Key Environmental Factor 'Amenity' for Derby Port.
Relevant policy and guidance documents and legislation	*Contaminated Sites Act (2003).* EPA. 2005*. Separation Distances Between Industrial and Sensitive Land Uses.* Guidance Statement Number 3. Perth, Western Australia. EPA. 2014. *Environmental Assessment Guideline for Consideration of Environmental Impacts from Noise.* Environmental Assessment Guidelines 13. Perth, Western Australia. Department of Health (DoH). 2007. *Health Impact Assessment in Western*

	Australia. Discussion Paper and Summary Document. Perth, Western Australia. *Health Act (1911).* *Mines Safety and Inspection Act (1995).* *Radiation Safety Act (1975).* 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.

Sheffield Resources Limited is aware that other factors or matters may be identified during the course of the environmental review that were not apparent at the time that this ESD was prepared. If this situation arises, Sheffield Resources Limited will consult with the EPA to determine whether these emerging issues are to be addressed in the PER document or further investigated, and if so, to what extent.

5. Stakeholder Consultation

Sheffield Resources Limited will consult with stakeholders who are interested in, or affected by, the proposal. This includes decision-making authorities (DMAs), other relevant State government departments and local government authorities, environmental non-government organisations and the local community.

Sheffield Resources Limited will document the stakeholder consultation undertaken and the outcomes, including any adjustments to the proposal and any future plans for consultation. This is to be addressed in a specific section of the PER document and, in addition, key outcomes of consultation will be reported against the preliminary key environmental factors as relevant.

It is expected that as a part of the consultation with DMA's there will be discussion around each agency's specific regulatory approvals, and a demonstration that other factors can be managed by another regulatory body.

6. Agreed Assessment Timeline

Table 4 sets out the timeline for the assessment of the proposal agreed between the EPA and Sheffield Resources Limited. Sheffield Resources Limited expects to meet the agreed timeline, and in doing so, provide adequate, quality information to inform the assessment.

Sheffield Resources Limited has referred to the EPA's *Environmental Assessment Guideline for Timelines for environmental impact assessment of proposals* (EAG 6) for information regarding the responsibilities of proponents and the EPA for achieving timely and effective assessment of proposals.

Sheffield Resources Limited may seek authorisation to undertake minor or preliminary works prior to receipt of the EPA Assessment Report. This process would be completed in accordance with Environmental Protection Bulletin No. 16 – Minor or Preliminary Works and Investigation Work (EPA 2011). The

Commonwealth's *EPBC Act 1999* does not allow activities covered in the referral to occur prior to an approval being granted.

If any stage in the agreed timeline is not met or inadequate information is submitted by Sheffield Resources Limited, the timing for the completion of subsequent stages of the process will be revised. Equally, where the EPA is unable to meet an agreed completion date in the timeline, Sheffield Resources Limited will be advised and the timeline revised.

Table 4 Assessment Timeline

Key Stages of Assessment	Agreed Completion Date
EPA approval of ESD	23 June 2016
Proponent carries out the environmental review and submits first adequate draft PER document	3 October 2016
Office of the Environmental Protection Authority (OEPA) provides comment on first adequate draft PER document	14 November 2016 (6 weeks)
Proponent submits adequate revised draft PER document	28 November 2016
EPA authorises release of PER document for public review	12 December 2016 (2 weeks)
Proponent releases authorised PER document for public review	12 December 2016
Public review of PER document closes	23 January 2017 (4 weeks + 2 weeks for Christmas Holiday Period)
EPA provides summary of pertinent issues, submissions and OEPA comments on PER	13 February 2017 (3 weeks)
Proponent provides adequate Response to Submissions	20 February 2017
OEPA reviews the Response to Submissions	20 March 2017 (4 weeks)
OEPA assesses proposal for consideration by EPA	8 May 2017 (7 weeks)
Preparation and finalisation of EPA assessment report (including two weeks consultation on draft conditions with	26 June 2017

Key Stages of Assessment	Agreed Completion Date
proponent and key Government agencies)	
Assessment by DoE based on EPA Report (30 business days)	7 August 2017

8. Decision-making Authorities

At this stage, the EPA has identified the decision-making authorities (DMAs) listed in Table 5 as DMAs for the proposal. Additional DMAs may be identified during the course of the assessment.

Table 5 Decision-making authorities

Decision-making Authority (DMA)	Relevant Legislation
Department of the Environment (Commonwealth)	*EBPC Act (1999)* • Listed threatened species and communities (Sections 18 & 18A).
Department of Mines and Petroleum (Lead Agency)	*Mining Act (1978)* Approval of Mining Proposal and Mine Closure Plan *Dangerous Goods Safety Act (2004)* Storage and Handling of hazardous materials *Radiation Safety Act (1975)* Radiation Management Plan *Mines Safety and Inspection Act (1994)*
Department of Water	*Rights in Water and Irrigation Act (1914)* Groundwater Licence
Department of Parks and Wildlife	Large scale clearing, impacts to Conservation Significant flora and fauna, specifically: • Greater Bilby populations. • Priority flora species. • Potential PEC.
Department of Environment Regulation	*Environmental Protection Act (1986)* Works Approval and Licence
Department of Health	*Health Act (1911)*
Shire of Derby/West	*Local Government Building Permits*

Decision-making Authority (DMA)	Relevant Legislation
Kimberley	Transport and shipping, amenity and public safety, Derby Port and installation of moorings in King George Sound
Minister for Aboriginal Affairs	*Aboriginal Heritage Act 1972*
Minister for Environment	*Wildlife Conservation Act 1950*
Minister for Lands	*Land Administration Act 1997*
Minister for Water	*Rights in Water and Irrigation Act 1914*

9. Parallel Processing

The *Environmental Protection Act 1986* constrains DMAs from making any decision that could have the effect of causing or allowing the proposal to be implemented. However, the proponent is encouraged to pursue other approvals in parallel with the EPA's assessment noting that the constraint only relates to making an approval decision.

As stated under "Stakeholder Consultation", Sheffield Resources Limited will undertake discussions with DMAs listed in Table 5 around each agency's specific regulatory approvals.

10. Public Environmental Review (PER) Document

Once this ESD has been accepted and approved by the EPA, Sheffield Resources Limited will carry out the environmental review based on the ESD.

On completion of the environmental review Sheffield Resources Limited will submit an adequate Public Environmental Review (PER) document to the EPA. Sheffield Resources Limited will ensure all identified work and elements in this ESD will be documented and adequately addressed in the PER.

When the EPA is satisfied with the standard of the PER document it will provide written authorisation for the release of the document for public review. Sheffield Resources Limited will refer to the EPA's *Environmental Assessment Guideline for Timelines for environmental impact assessment of proposals (EAG 6)* for information on the standards required in the PER and *Guidelines for Preparing a Public Environmental Review,* as amended from time to time. Sheffield Resources Limited will not release the PER document for public review until this authorisation is provided.

Sheffield Resources Limited is responsible for advertising the release and availability of the PER document in accordance with instructions that will be issued by the EPA. The EPA will be consulted on the timing and details for advertising.

11. References

Department of Mines and Petroleum and Environmental Protection Agency (DMP and EPA). 2015. *Guidelines for Preparing Mine Closure Plans.*

Ecologia Environment (Ecologia) 2012. *Thunderbird Dampier Peninsula Project Level 1 Flora and Fauna Assessment.* Unpublished report prepared for Sheffield Resources Limited. November 2012.

Ecologia Environment (Ecologia) 2014a. *Thunderbird Project Level 2 Flora and Vegetation Report.* Unpublished report prepared for Sheffield Resources Limited. March 2014.

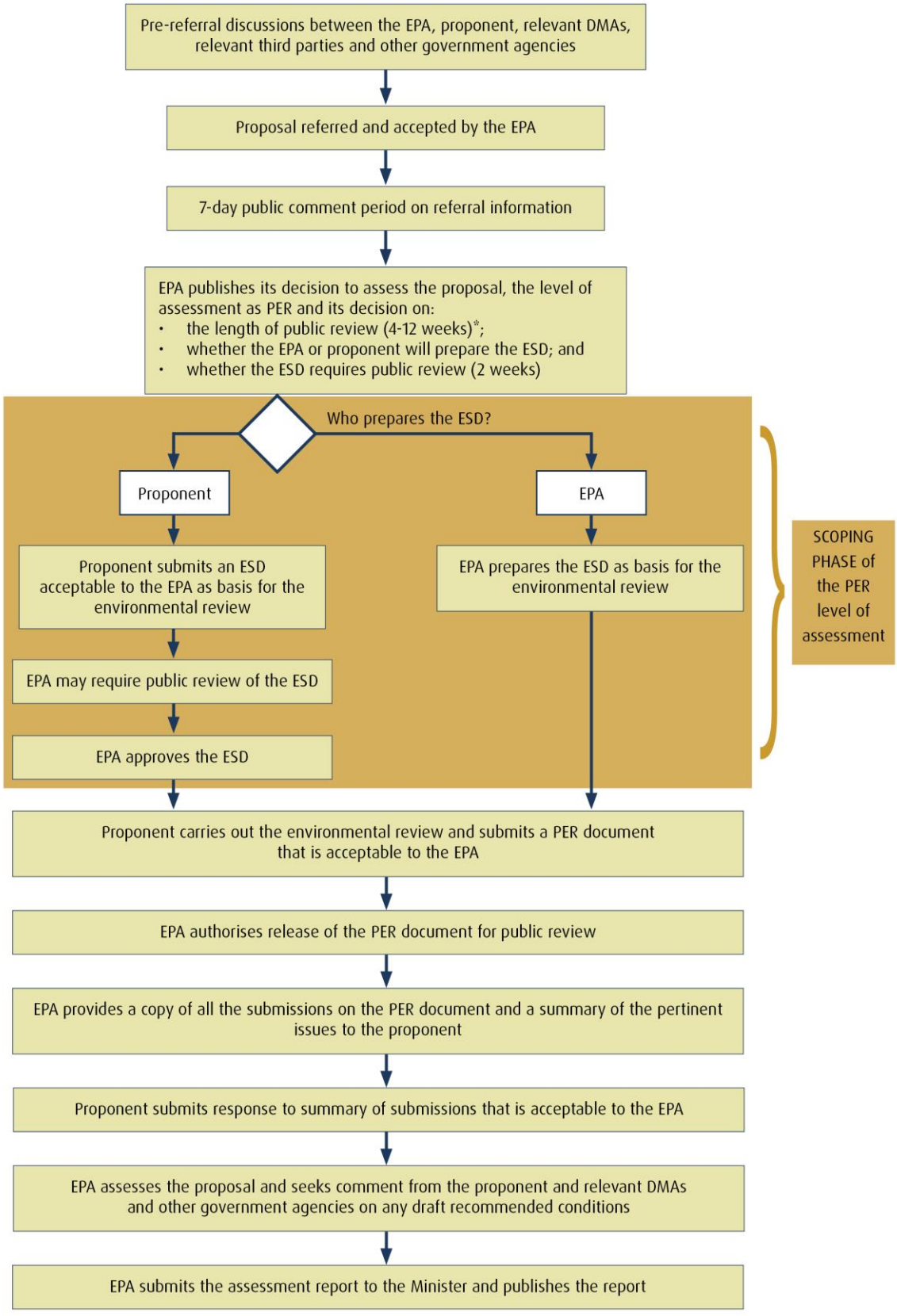
Ecologia Environment (Ecologia) 2014b. *Thunderbird Project Level 2 Terrestrial and Subterranean Fauna Assessment.* Unpublished report prepared for Sheffield Resources Limited. March 2014.

Ecologia Environment (Ecologia) 2015a. *Thunderbird Project Haul Road and Accommodation Camp Flora and Fauna Assessment.* Unpublished report prepared for Sheffield Resources Limited. July 2015.

Ecologia Environment (Ecologia) 2015b in draft. *Thunderbird Project Targeted Greater Bilby Assessment.* Unpublished report prepared for Sheffield Resources Limited.

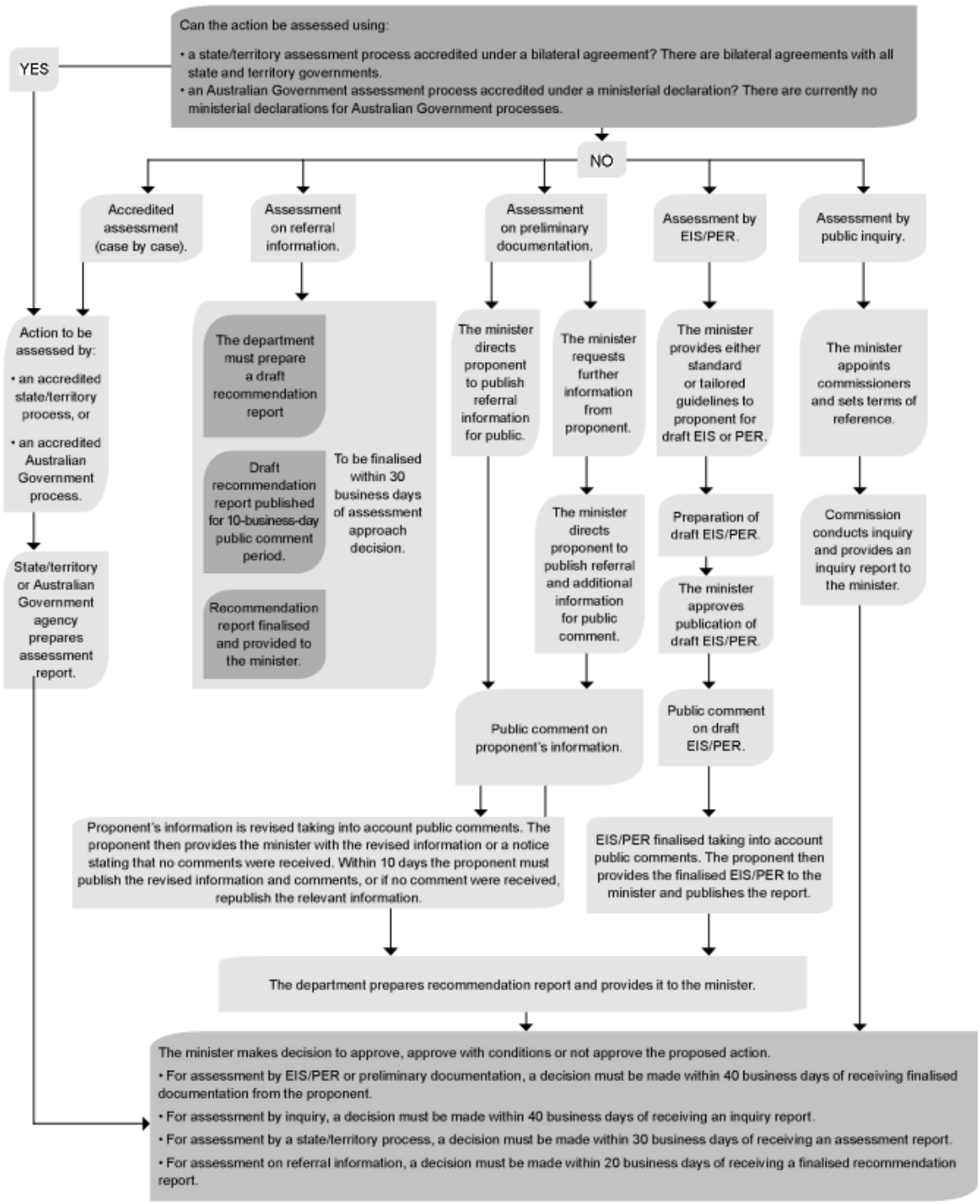
SGS 2014. *Thunderbird Heavy Mineral Sand Project – Preliminary Radiological Assessment*. Report prepared for Sheffield Resources, June 2014.

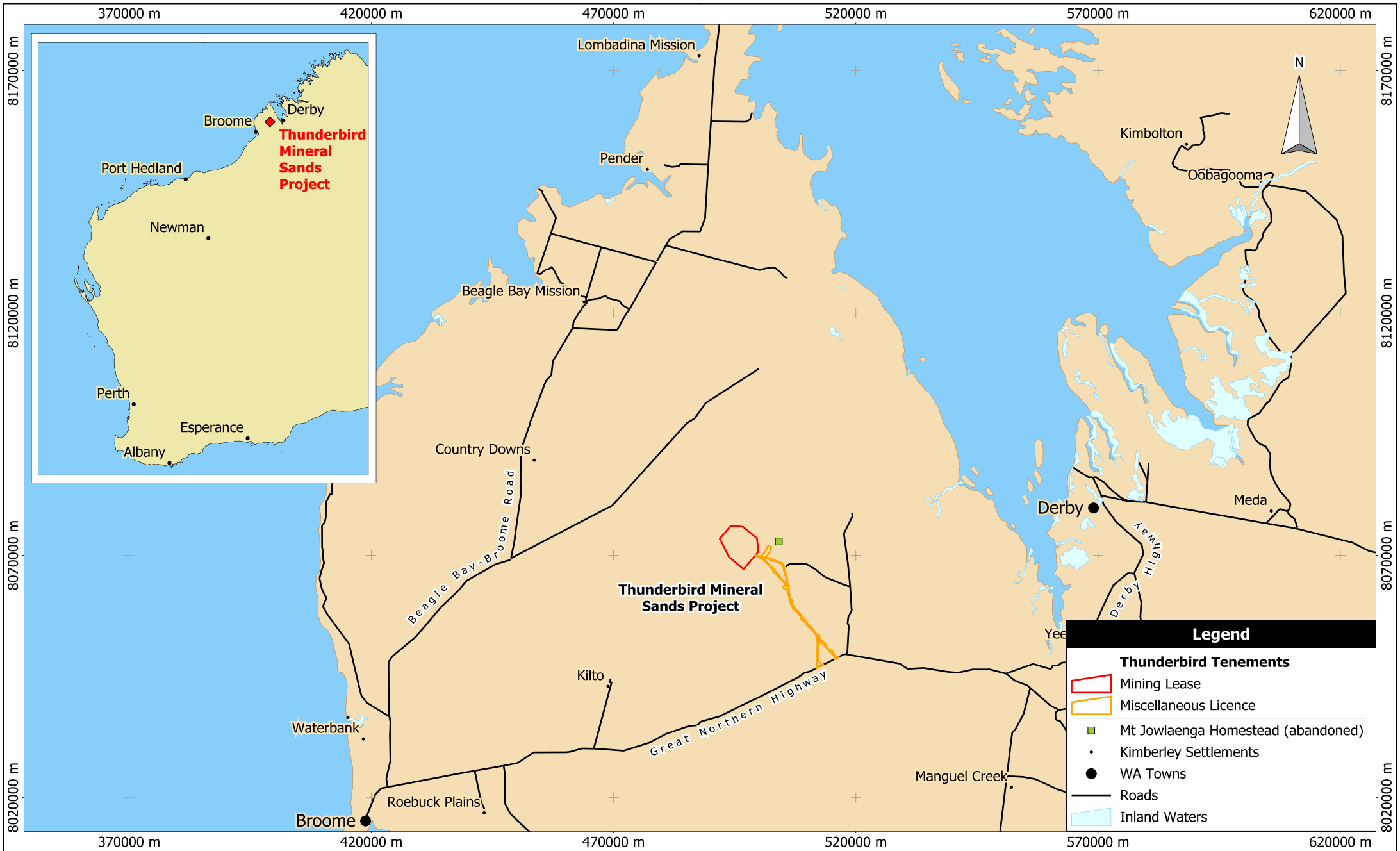
Figure 1 Procedure for Public Environmental Review showing the scoping phase in the process.



* The public review period may be varied by the EPA depending on the complexity of the proposal and the level of public interest.

Figure 2 EPBC Act Environment Assessment Process (Including Assessment by State Under Bilateral Agreement)





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Sheffield Resources Limited
Thunderbird Mineral Sands Project

Figure 3

Regional Location

4 Cook St
West Perth WA 6005
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info@mbsenvironmental.com.au
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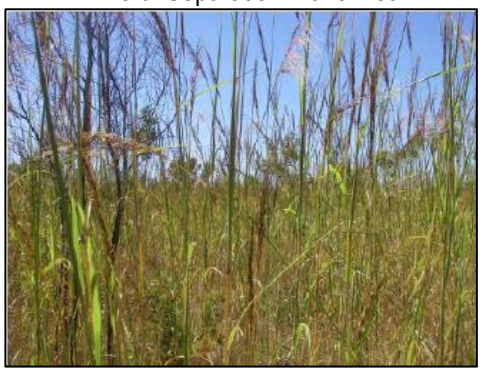
MBS ENVIRONMENTAL

\\mbsserver\working\Sheffield Resources\Environmental Scoping Document\Drawings\ESD Location Plan.map 16/06/2016 F3 Location Plan Layout

Figure 4 Photographs of the Site Location

Pit Area (Northeast)

Mineral Separation Plant Area



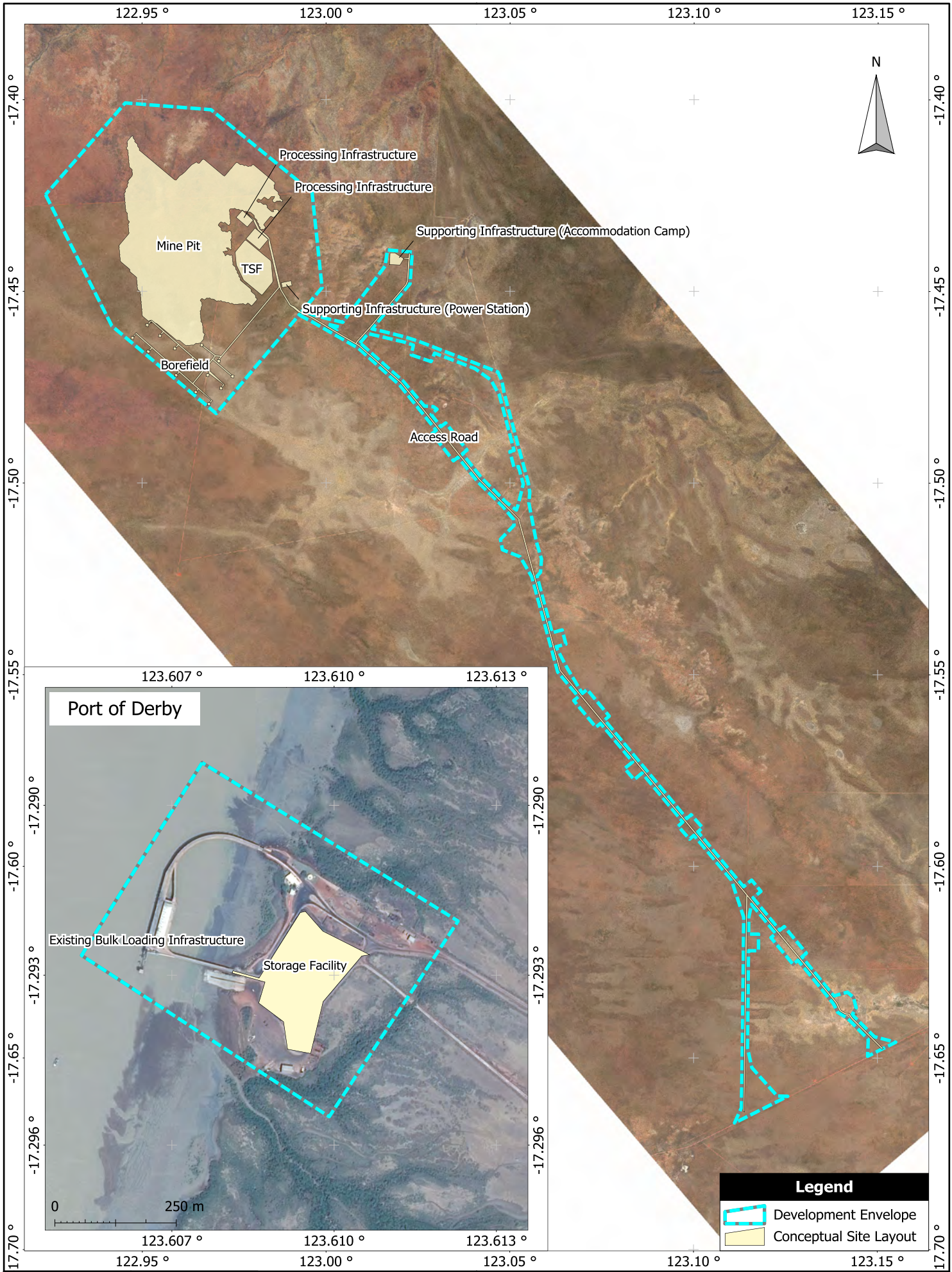
Pit Area (Southwest)

Camp Area

Tailings Storage Facility Area

Borefield Area

Site Access Road Area



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Air Photo Date: 2015
Grid: Latitude / Longitude

0 4 km

Sheffield Resources Limited
Thunderbird Mineral Sands Project

Figure 5

Development Envelope

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MBS ENVIRONMENTAL

Appendix 1 Spatial data representing the proposal development envelope and activity footprint attached on a CD.