

## 9. ENVIRONMENTAL IMPACT ASSESSMENT - KEY ENVIRONMENTAL FACTORS - PORT DEVELOPMENT ENVELOPE

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

- Marine Environmental Quality.
- Amenity.

Potential impacts for the key environmental factors are detailed in Sections 9.1 and 9.2.

Potential impacts to the Town of Broome and the Port of Broome were screened out from further assessment (Section 7.4) as they were either assessed as not likely to occur or were unlikely to have any discernible consequence on any factor different to background levels:

| Stressor  | Justification for Exclusion  |
|---|--|
| Installation of mooring points affecting turbidity                            | No mooring points are required for the Port of Broome; vessels will use the existing Port of Broome wharf infrastructure.  |
| Product dust or spillage causing marine pollution                             | Packaged products to be transferred to ocean-going vessels will not be opened and thus the likelihood of spillage in the marine environment is considered rare and the consequences insignificant given the small volume of each package and inert nature of the products.   |
| Radiation impacting on the marine environment                                 | Products to be exported from the Port of Broome will be packaged. Specific activity concentrations will be above 1 Bq/g, but below 10 Bq/g meaning that they meet the definition of a radioactive substance, however are of insufficient specific activity that their transport requires regulation. The likelihood of spillage of packaged material into the marine environment is considered rare given the loading method and the consequences of short term spillage insignificant given the small volume of each package and the inert nature of the products. Any significant incidents of spillage of packaged materials will be recovered (e.g. suction dredging) for re-processing. |
| Hydrocarbon spill causing marine pollution                                    | Refuelling of vessels in the Port Area will not be required as ocean going vessels will refuel in their home port. This makes the likelihood of a hydrocarbon spill extremely unlikely.  |
| Dust or noise emissions causing a decrease in amenity for sensitive receptors | Products to be transported will be packaged minimising the likelihood of spillage or dust generation during transport.<br><br>Transport of product to the Port of Broome will be along the dedicated heavy vehicle bypass route (Gubinge Road and Port Drive). As transport vehicles will bypass the town of Broome, and will be on a dedicated heavy vehicle road that is currently under utilised compared to design criteria, significant additional impacts to amenity are considered unlikely.  |

### 9.1 MARINE ENVIRONMENTAL QUALITY

The EPA's objective in relation to marine environmental quality is *"to maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected"*.

### 9.1.1 Key Statutory Requirements, Environmental Policy and Guidance

The key legislation relating to managing impacts on marine environmental quality in Western Australia includes:

- *Environmental Protection Act 1986 (WA).*

In addition to State legislation, the following policy and guidance statements were considered in the impact assessment for marine environmental quality:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000).
- Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (ARPANSA 2005).
- Code of Practice for Safety Transport of Radioactive Material (ARPANSA 2008).
- Safety Guide, Safe Transport of Radioactive Material (ARPANSA 2008).
- Environmental Assessment Guideline 15. Protecting the Quality of Western Australia's Marine Environment (EPA 2015e).
- State Water Quality Management Strategy No. 6. Implementation Framework for Western Australia for the Australian and New Zealand Guidelines for Fresh and Marine Water Quality and Water Quality Monitoring and Reporting (Guidelines Nos. 4 & 7: National Water Quality Management Strategy). (DoW 2004).
- State Planning Policy 2.6 State Coastal Planning. (WAPC 2013).

### 9.1.2 Assessment of Potential Impact

Marine water quality in King Sound is characterised by naturally high levels of turbidity due to the discharge of the Fitzroy River and various other oceanographic processes (existing marine quality is described in Section 6.2.11.3). Indicative water sampling shows that turbidity in the area of the Derby Port Development Envelope is 62 NTU and suspended solids concentrations are also very high (89 mg/L). Other general parameters of salt content and salt composition are consistent with typical seawater.

This assessment focuses on impacts to marine water quality and sediment. Impacts to marine biota are assessed in Section 11.1 Benthic Habitats and Communities, and Section 11.2 Marine Fauna.

Potential impact pathways for marine water quality are:

- **Installation of mooring points increasing turbidity** - increase in turbidity through installation of mooring points with the Derby Port limits at the wharf mooring zone and the sea transfer point.
- **Product dust or spillage causing marine pollution** - dust or spillage of product from transfer and transshipment causing marine water and sediment pollution.
- **Hydrocarbon spill causing marine water and sediment pollution** - impact through spillage of hydrocarbons.
- **Radiation impacting the marine environment** – impact through spillage or dust of radioactive product entering marine environment.

Other potential impacts were screened out from further assessment (Section 7.4) as they were either assessed as not likely to occur or were unlikely to have any discernible consequence on any factor different to background levels:

| Stressor                               | Justification for Exclusion  |
|--|--|
| Uncontrolled drainage from the Product | Marine pollution will not be caused through uncontrolled drainage from the product export facility, which will either be a fully enclosed, concrete floored and internally |

| Stressor         | Justification for Exclusion  |
|------------------|--|
| Storage Facility | <p>draining shed or silo facilities. Drainage within the shed will be directed to sumps. Materials collected in the sumps will be periodically removed as needed and returned to the Mine Site for reprocessing. Shed doors will only open to allow entry and exit of road trains.</p> <p>Mineral sands products to be stored at Derby Port are insoluble and considered environmentally benign. No impact to marine water quality is expected from this stressor and no monitoring is considered necessary.</p> |

The assessed likelihood, consequence and residual impact (as per Section 7.3), is provided below for each potential impact.

#### 9.1.2.1 Installation of Mooring Point Affecting Turbidity

Several mooring points are required for the project; these will be located at the wharf mooring zone (for tug boats and transshipment vessels) and near Point Torment for ocean-going vessels (the sea transfer point). These moorings will be located in the same general area as existing mooring facilities used by the former Lennard Shelf Pty Ltd operation. Information from DoT indicates some or all of these moorings need to be upgraded or replaced.

The upgrade process is expected to cause minor localised increase in turbidity as the moorings are installed. Some ongoing additional turbidity is expected as the mooring lines will drag on the seafloor in low tides. Although it is possible that benthic invertebrate and burrowing organism habitat could be present in the area, there are no known seagrasses or corals within the Port limits (Section 4.3.13.2). Any benthic communities in the area would be naturally adapted to extremely high and fluctuating levels of turbidity and any additional turbidity will be localised to the immediate vicinity of the moorings. The disturbance caused by this upgrade is expected to be negligible.

Additional turbidity is considered 'Likely' to be generated within the Port limits from the installation of new moorings, however it will be short term, localised and the large tidal exchange will ensure water quality remains close to normal levels. The potential residual impact of the installation of mooring points on marine environmental quality, after implementation of management measures, is assessed as 'Low'.

| Impact  | Consequence | Likelihood | Residual Impact |
|---|-------------|------------|-----------------|
| Installation of mooring point affecting turbidity | Incidental  | Likely     | Low             |

#### 9.1.2.2 Product Dust or Spillage Causing Marine Pollution

The mineral sands products to be exported have limited potential for dust generation as they have a high specific gravity, are granular in nature, and contain limited fines. They do not contain contaminants such as heavy metals, hydrocarbons or acids. While being slightly radioactive, their low levels of radiation do not require regulation under the *Radiation Safety Act 1975* for the purpose of transport, storage and export.

The product storage facility to be constructed at the Derby Port will store up to 50,000 to 60,000 tonnes of mineral sands products. It will be purpose designed and may be either a shed structure or silos. The shed would be fully enclosed to prevent dust escaping and will accommodate all unloading and storage activities. Road trains will drive through the shed and tip into a specific product drop area.

During transshipment vessel (barge) loading operations, a front end loader will feed a hopper connected to a conveyor system running the length of the storage facility. From there, the mineral sands products are fed into the existing transshipment vessel loading conveyor. This conveyor system is covered to minimise loss or spillage of product, and has been used successfully in the past by Lennard Shelf Pty Ltd. The loading conveyor will be

retained, and prior to commencing operations the head chute, conveyor belt and various other key components will be replaced, ensuring optimum working order of this existing infrastructure.

Once on the transshipment vessel, side skirts will minimise any loss of dust. After loading to the ship, the mineral sands products will be fully enclosed in readiness for transport to international markets.

Although the spillage of product or product dust is considered 'Likely', it is also 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 are environmentally benign and would not cause contamination in the event of a spill. The potential residual impact from product dust or spillage on marine environmental quality, after implementation of management measures, is assessed as 'Low'.

| Impact  | Consequence | Likelihood | Residual Impact |
|---|-------------|------------|-----------------|
| Product dust or spillage causing marine pollution | Incidental  | Likely     | Low             |

### 9.1.2.3 Hydrocarbon Spill Causing Marine Pollution

The ocean-going vessel will be refuelled in its home port with no need to refuel in Western Australian waters. All ships greater than 400 Gross Tonnes are required to have their own Ship Oil Pollution Emergency Plan and basic oil spill equipment, as per Regulation 37 of MARPOL Annex I.

The Sheffield tugs will operate on diesel fuel, as would motorised transshipment vessels should these be used. No refuelling infrastructure is permanently sited on the wharf, and refuelling of tugs will take place via mobile refuelling trucks. This is the standard methods employed at Derby Port and meets the accepted criteria of the Department of Transport (DoT) and other government departments. This method has been used historically for the operation of the Derby Port without incident and the expected risk is low. The mobile refuelling infrastructure is equipped with an emergency shutdown valve and the process will be monitored by experienced personnel at all times.

All Sheffield owned or operated tug boats will be maintained to high standards as required by DoT (the company operating the ocean-going vessel will be responsible for appropriate and regular maintenance checks of that vessel).

Should a minor spill of diesel occur, this is unlikely to pose significant risk to the environment. When spilt into the warm tropical and subtropical marine environments, diesel spreads rapidly and forms a very thin slick, with most of the more volatile components typically evaporating in less than a day. Of the remaining unevaporated volume, a large proportion may partition into the water column. Typically, less than 50% of the slick volume, and potentially far less, will remain on the water surface after 24 to 48 hours. The Port of Derby has spill equipment on standby should a spill occur, and Sheffield will liaise with the Port of Derby to ensure the spill equipment is in working order before commencement of operations. In addition, an appropriately sized and stocked marine spill kit will be located on each Sheffield owned or operated tug boat to allow management of small scale spillages. Any spills of oil, fuel or other hydrocarbons to water will be immediately reported to DoT for advice.

Any used oil or oil-soaked absorbents will be securely stored and then properly disposed of at an appropriate licensed facility to reduce the chance of oil, fuel or any oily wastes being discharged into the marine environment. Management of hydrocarbons and potential spills is addressed in the Port Environmental Management Plan.

The spillage of hydrocarbons is considered 'Possible' during refuelling operations, however volumes will be minimal due to the management measures proposed, and will not result in any discernible changes to the quality of water, sediment or biota in King Sound or adjacent waters. The potential residual impact from the spillage of hydrocarbons on marine environmental quality, after implementation of management measures, is assessed as 'Low'.

| Impact                                     | Consequence | Likelihood | Residual Impact |
|--|-------------|------------|-----------------|
| Hydrocarbon spill causing marine pollution | Incidental  | Possible   | Low             |

#### 9.1.2.4 Radiation Impacting the Marine Environment

The radioactivity levels of naturally occurring radioactive materials (NORMs) in the majority of exported products is less than 10 Bq/g with the primary product by volume (ilmenite) having an activity of less than 1 Bq/g (0.59 Bq/g Radiation Professionals 2016, Appendix 21). The HiTi88 product has a marginally higher radioactivity at 1.52 Bq/g. Both of these products are below screening values of any potential modelling that may be required in the future. Zircon concentrate has the highest level of radiation at 9.10 Bq/g, but represents only 14.22% of the material exported (8,227 tpa in Stage II).

In accordance with Australian Radiation Protection and Nuclear Safety Agency (ARPANSA 2005) and International Atomic Energy Agency Safety Guide RS-G-1.7 (IAEA 2004), materials containing NORMs are excluded from regulations and considered inherently safe if the specific activity concentrations are below 1 Bq/g (ARPANSA 2005). Concentrations of NORM up to 10 Bq/g are generally considered exempt in relation to transport restrictions due to the nature of the materials and form of radiation primarily emitted (alpha rather than gamma). The potential impact to the marine environment from naturally occurring radioactive materials is therefore extremely small and will not require special consideration and management.

Minor spillages of low radioactivity ilmenite or HiTi88 would be of negligible impact to the marine environment of King Sound. In the unlikely event of a major spill, recovery of the product by suction dredging and return of the material to the Mine Site for re-processing is considered adequate.

There is potential for minor impact to the marine environment from significant spillage without appropriate cleanup of the zircon products, in particular the zircon concentrate. Due to the small volume nature and transport requirements of the zircon products, these materials will be packaged (likely bulka bags) and hence not subject to dusting potential. If a bag is split or lost over the side of a vessel or wharf, recovery of the zircon with a suction dredge and return to the Mine Site for re-processing is considered an appropriate response in conjunction with validation testing of remaining sediment to ensure levels of radiation have returned to established background levels. Short term exposure of marine organisms within a very limited spatial area during this process to low levels of activity is not considered to be of significant impact. All products have a specific gravity higher than 4.7 and are therefore denser than the silty or quartz based sediment (ca. 2.6). As such, they will not disperse readily with water even in the high tidal range and any spillage would be localised and tend to sink down through the sediment profile away from where marine biota might be exposed to them.

A Radiation Monitoring Program will be implemented in accordance with the Radiation Management Plan (RMP) in consultation with Radiological Council and Department of Mines and Petroleum. 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.

The products have very low to insignificant levels of natural radiation and are considered 'Unlikely' to result in impacts to marine water, sediment or biota. The potential residual impact from radiation on marine environmental quality, after implementation of management measures, is assessed as 'Low'.

| Impact                                     | Consequence | Likelihood | Residual Impact |
|--|-------------|------------|-----------------|
| Radiation impacting the marine environment | Incidental  | Unlikely   | Low             |

### 9.1.3 Management Measures

A summary of key measures to address potential impacts on marine environmental quality is shown in Table 65.

**Table 65: Proposed Management Measures for Protection of Marine Environmental Quality**

| Potential Impact Requiring Management              | Measure   |
|--|---|
| Installation of mooring points affecting turbidity | <ul style="list-style-type: none"> <li>Sheffield will either upgrade or replace existing moorings installed at transshipment vessel and ship loading points within Derby Port limits.</li> </ul>  |
| Product dust or spillage causing marine pollution  | <ul style="list-style-type: none"> <li>The Product Storage Facility will include a drive through enclosed unloading area to ensure product is contained within facility during unloading activities.</li> <li>Transfer of product to the barge will be via a covered conveyor to minimise escape of dust or spillage.</li> </ul>  |
| Hydrocarbon spill causing marine pollution         | <ul style="list-style-type: none"> <li>Refuelling of marine vessels will be consistent with Port of Derby requirements.</li> <li>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.</li> <li>Refuelling equipment will include emergency shutdown valve and be monitored at all times.</li> <li>Spills of oil, fuel or other hydrocarbons to water will be immediately reported to DoT for advice.</li> <li>A spill kit located at Derby Port will be maintained in working order.</li> <li>An appropriately sized and stocked marine spill kit will be located on each Sheffield owned or operated tug boat to address small scale spillages.</li> <li>Management of hydrocarbons and potential spills is addressed in the Port Environmental Management Plan.</li> </ul> |
| Radiation impacting the marine environment         | <ul style="list-style-type: none"> <li>Background radiation levels in soil, sediments and airborne dust will be measured prior to construction commencing.</li> <li>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.</li> </ul>  |

### 9.1.4 Predicted Outcome

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.

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.

The spillage of hydrocarbons is possible during refuelling operations; however volumes will be minimal due to the mitigation measures proposed.

The mineral sands products have very low to insignificant levels of natural radiation. Spillage of the products into the marine environment is not considered 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.

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 (Section 9.1) will be met, and that the residual impacts are therefore acceptable.

## 9.2 AMENITY

The EPA's objective in relation to amenity is "to ensure that impacts to amenity are reduced as low as reasonably practicable".

### 9.2.1 Key Statutory Requirements, Environmental Policy and Guidance

The key legislation relating to managing amenity impacts in Western Australia includes:

- *Environmental Protection Act 1986 (WA)*.
- *Environmental Protection (Noise) Regulations 1997 (WA)*.

In addition to State legislation, the following policy and guidance statements were considered in the impact assessment for amenity:

- A Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and Other Related Activities (DEC 2011).
- EPA Guidance Statement No. 3, Separation Distances between Industrial and Sensitive Land Uses (EPA 2005).
- EPA Guidance Statement No. 13, Consideration of Environmental Impacts from Noise (EPA 2014a).
- Derby Town Planning Scheme No. 5 Amendment No. 5 (SDWK 2001)
- AS4282-1997 Control of the obtrusive effects of outdoor lighting.
- Air Quality and Air Pollution Modelling. Guidance Notes. Perth, Western Australia. (DEC 2006).
- National Environmental Protection (Ambient Air Quality) Measure (2003).
- Western Australian Planning Commission (WAPC) State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning (WAPC Criteria).
- Implementation Guidelines for State Planning Policy 5.4 (WAPC 2014).

### 9.2.2 Assessment of Potential Impact

Transport of mineral sands products from the Mine Site through the town of Derby to the Derby Port and loading of product at the Port for export has the potential to impact amenity as a result of noise and dust from truck movements. The following impacts on amenity may occur as a result of road transport of product, construction, and operation of export facilities, and loading of product:

- **Dust emissions causing a decrease in amenity for sensitive receptors.**
- **Noise emissions causing a decrease in amenity for sensitive receptors.**

The Derby Port is an operational port and is zoned for port industrial use under the Derby Town Planning Scheme No. 5 Amendment No. 5 (SDWK 2001). The Derby Port Development Envelope is located approximately 2 km northwest of the Derby townsite, and the two are separated by low mud flats (Figure 38). The majority of the transport route from the Mine Site to the Port has no sensitive receptors due to its remote location, however, sensitive receptors within the town of Derby include residents and businesses located on or near Loch Street (see Section 4.3.3; Figure 38).

### 9.2.2.1 Dust Emissions Causing a Decrease in Amenity for Sensitive Receptors

There is potential for an increase in airborne dust loadings from activities associated with the project, such as product transport and loading/unloading operations at Derby Port. Airborne particles can cause amenity impacts by settling on surfaces (such as washing hung out to dry, cars, roofs) causing soiling and discolouration (DEC 2011).

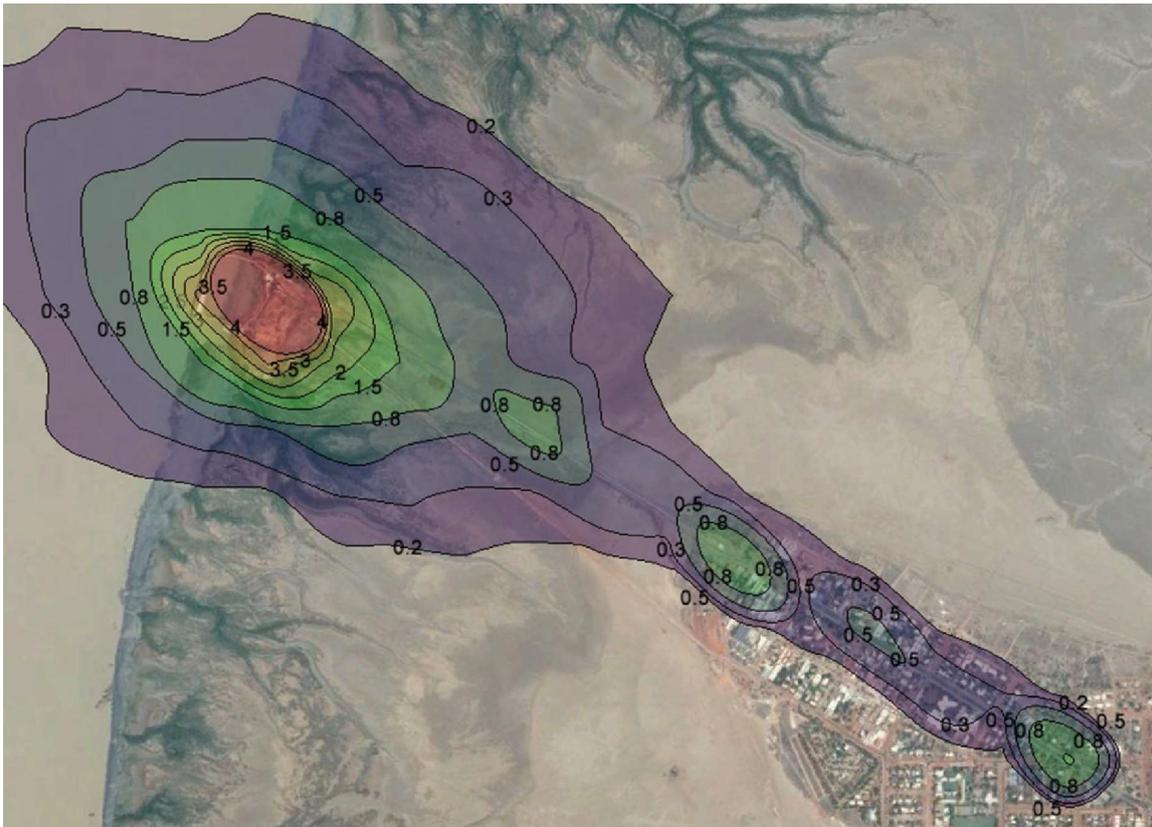
The export products have limited potential for dust generation as they are granular, contain few fines and have high specific gravities. Mineral sands products will be unloaded and stored within the Product Storage Facility, which will be negatively pressured to further minimise dust emissions. The site where the Product Storage Facility is to be constructed is already levelled, so minimal disturbance of soils is expected other than for installation of services and foundation works as required.

There will be an average of 20 road train movements (10 return trips) along the transport route per 24 hour period during the operational phase of the project. Other than the Site Access Road within the Mine Site Development Envelope, the transportation route is entirely on sealed roads, vastly decreasing the amount of dust generated when compared to unsealed roads.

Modelled ambient particulate levels as total suspended particles (TSP) and monthly dust deposition for the Derby Port Development Envelope and the transport route (including Derby town centre) are shown in Figure 49 and 50.



Figure 49: Derby Port Maximum Ambient TSP Concentrations, Annual Average ( $\mu\text{g}/\text{m}^3$ )



**Figure 50: Derby Port Maximum Monthly Dust Deposition Contours (g/m<sup>2</sup>/month)**

Modelling emissions factors were derived from the National Pollutant Inventory Emissions Estimation Handbook for Mining Factors and Mineral Sands. In the absence of specific detailed inputs for the model, the modelling has adopted these standard emissions and is therefore considered conservative. Modelled TSP and dust deposition are below commonly accepted levels based on NSW guidance levels (NSW DEC 2005) in the absence of National Environmental Protection Measures [NEPM] criteria) (Table 66).

**Table 66: Modelled Ambient Air Emissions for Port and Transport Activities**

| Particulate     | Unit of Measure                    | Guideline Limit | Modelled Maximum Project Level |                 |                |
|-----------------|------------------------------------|-----------------|--------------------------------|-----------------|----------------|
|                 |                                    |                 | Port Boundary                  | Transport Route | Derby Townsite |
| Ambient TSP     | µg/m <sup>3</sup> (annual average) | 90 <sup>1</sup> | 50                             | 41              | 41             |
| Dust Deposition | g/m <sup>2</sup> /month            | 4 <sup>2</sup>  | 3.5                            | 0.8             | 0.5-0.8        |

<sup>1</sup> TSP (NSW DEC 2005); <sup>2</sup> Commonly used limit for dust deposition in absence of formal criteria.

As shown in Figure 49, the maximum average ambient TSP concentration in the Derby Port Development Envelope is less than the 90 µg/m<sup>3</sup> guideline level, rapidly decreasing to 50 µg/m<sup>3</sup> at the Port boundary. No exceedances of the TSP or dust deposition limits are expected at sensitive receptors in the Derby town site. Dust deposition values for the commercial property (café) located north of the proposed Product Storage Facility is on the selected limit (in the absence of any formal criteria). Given that the emissions factors used in the model are considered conservative, it is expected that this value will be within the selected criteria.

Product transport and port activities are 'Likely' to result in only minor, short-term and infrequent loss of amenity along the transport route through the Derby town site and in the Port area. The potential residual impact of dust on amenity of sensitive receptors, after implementation of management measures, is assessed as 'Low'.

| Impact   | Consequence | Likelihood | Residual Impact |
|--|-------------|------------|-----------------|
| Dust emissions causing a decrease in amenity for sensitive receptors | Incidental  | Likely     | Low             |

### 9.2.2.2 Noise Causing a Decrease in Amenity for Sensitive Receptors

Noise emissions from transport and export operations have the potential to impact the amenity of Derby residents and visitors. Sheffield commissioned a study to quantify existing noise at receptor locations and to predict impacts on those receptors (WSP Parsons Brinkerhoff 2016a; Appendix 18).

The main sources and impacts associated with noise were identified as:

- Decreased amenity for sensitive receptors due to environmental noise caused by operations in the Derby Port Development Envelope.
- Decreased amenity for sensitive receptors due to traffic noise, caused by road train movements through the town of Derby.

Sensitive receptors identified in the study are residences and businesses located along Loch street and Derby Highway, with those most likely to be impacted located closest to the port (i.e. Elder Street, approximately 2 km from the Port; Figure 38). The Jetty Café located in the vicinity of the Port is identified as a receptor however it is not considered sensitive given its commercial nature and location within an established industrial area.

### Environmental Noise

The *Environmental Protection (Noise) Regulations 1997* (Noise Regulations) require that noise emitted from any premises must comply with 'assigned noise levels' when received at any other premises, and be free of the intrusive characteristics of tonality, modulation and impulsiveness. Assigned levels differ between noise sensitive, commercial and industrial premises, and vary depending on the time of day.

Assigned noise levels for the Derby Port Development Envelope and transport route are presented in Table 67. These are site specific levels developed by WSP (Appendix 18) using measured background noise levels and the methodology provided in the Noise Regulations.

**Table 67: Specific Noise Criteria**

| Time of Day                            | Receptor     | Assigned Level (dB)           |                              |                                |
|--|--------------|-------------------------------|------------------------------|--------------------------------|
|  |              | L <sub>A10</sub> <sup>1</sup> | L <sub>A1</sub> <sup>2</sup> | L <sub>Amax</sub> <sup>3</sup> |
| Night time<br>Noise Sensitive Premises | Elder Street | 40                            | 50                           | 60                             |
| Day time<br>Noise Sensitive Premises   |              | 50                            | 60                           | 70                             |
| Evening<br>Noise Sensitive Premises    |              | 45                            | 55                           | 60                             |
| Commercial Premises                    | Jetty Café   | 60                            | 75                           | 80                             |

<sup>1</sup> L<sub>A10</sub> is the noise level exceeded for 10% of the measurement period.

<sup>2</sup> L<sub>A1</sub> is the noise level exceeded for 1% of the measurement period.

<sup>3</sup> L<sub>Amax</sub> is the maximum noise level recorded in the measurement period.

Environmental noise impacts were modelled at residences in Elder Street and at the Jetty Café. Night time criteria were used for the assessment as these are more stringent and therefore conservative. The noise contour map showing the predicted  $L_{A10}$  noise levels from the port operations is shown in Figure 51. The predicted noise levels at the nearest sensitive receiver compared against the relevant (night time) criteria are below specified criteria (Table 68) for the  $L_{A10}$  and for the  $L_{Amax}$  noise levels.

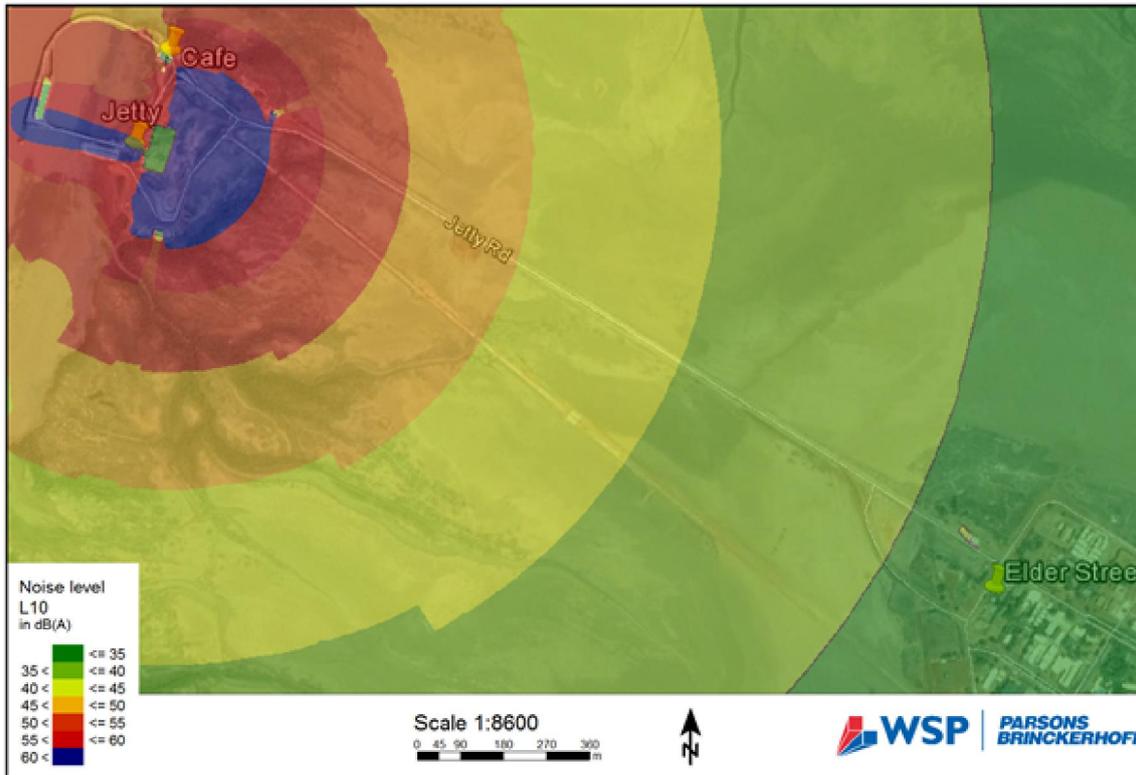


Figure 51: Night Time  $L_{A10}$  Noise Contours for Derby Port

Table 68: Assessment of Port Environmental Noise

| Receiver                 | Specific Criteria $L_{A10}$ (dB) <sup>1</sup> | Predicted $L_{A10}$ (dB) <sup>2</sup> | Compliant with Specific Criteria |
|--------------------------|---|---------------------------------------|----------------------------------|
| <b>Port</b>              |   |                                       |                                  |
| Elder Street Residential | 40  | 38                                    | Yes                              |
| Jetty Café Commercial    | 60  | 58                                    | Yes                              |
| <b>Road Trains</b>       |   |                                       |                                  |
| Elder Street Residential | 60  | 38                                    | Yes                              |
| Jetty Café Commercial    | 80  | 71                                    | Yes                              |

<sup>1</sup> Environmental Protection (Noise) Regulations 1997; <sup>2</sup> With +5 dB tonality adjustment

The predicted noise levels do not exceed the 1 hr  $L_{Aeq}$  as specified in the Noise Regulations at the identified nearest residential and commercial receivers. The potential residual impact of environmental noise on the amenity of sensitive receptors, after implementation of management measures, is assessed as 'Low'.

| Impact  | Consequence | Likelihood | Residual Impact |
|---|-------------|------------|-----------------|
| Environmental noise causing a decrease in amenity for sensitive receptors | Incidental  | Likely     | Low             |

### Traffic Noise

The most appropriate criteria to assess the impact of road trains on the public roads within the town of Derby is contained within the Western Australian Planning Commission (WAPC) State Planning Policy 5.4 "Road and Rail Transport Noise and Freight Considerations in Land Use Planning" (WAPC Criteria, WAPC 2009). This policy sets out the outdoor noise criteria that apply for noise sensitive developments next to road or rail transport corridors. WSP undertook predictive modelling of project related traffic noise (Appendix 18). The predicted traffic noise levels including the additional road train movements as a result of the transport operations compared against the WAPC criteria are shown in Table 69. These levels are based on a modelled 20 return road train movements per day (40 movements total). This is approximately double the volume of road train traffic proposed by Sheffield (refer to Section 3.7) and the assessment is therefore considered highly conservative.

**Table 69: Assessment of Traffic Noise Levels**

| Location      | Assessment Period        | Existing Noise Level | WAPC Target Criteria | WAPC Limit Criteria | Predicted future* (dB) | Compliant with Limit Criteria |
|---------------|--------------------------|----------------------|----------------------|---------------------|------------------------|-------------------------------|
| Derby Highway | L <sub>Aeq</sub> (Day)   | 50.7                 | 55                   | 60                  | 53.5                   | Yes                           |
|               | L <sub>Aeq</sub> (Night) | 43.4                 | 50                   | 55                  | 48.1                   | Yes                           |
| Loch Street   | L <sub>Aeq</sub> (Day)   | 53.2                 | 55                   | 60                  | 56.1                   | Yes                           |
|               | L <sub>Aeq</sub> (Night) | 41.2                 | 50                   | 55                  | 48.7                   | Yes                           |

\*With +2.5 dB façade correction

The predicted traffic noise levels for receptors along Derby Highway are within the WAPC target criteria for the day and night time periods. The predicted traffic noise levels for receptors along Loch Street are within the WAPC target criteria for the night time period. The predicted day time traffic WAPC noise target is exceeded by 1.1 dB but is within the WAPC limit criteria. Background traffic noise, when façade adjusted to account for noise reflections from nearby buildings, already exceed the WAPC target criteria (WSP Parsons Brinckerhoff 2016).

The predicted increase to current traffic noise as a result of the road train movements on Loch Street and Derby Highway are outlined in Table 70. The increase in overall traffic noise levels as a result of the road trains is negligible during the daytime period. The more significant increases are during the night time period when overall traffic counts are lower, as an increase of up to 3 dB has been predicted. Subjectively, the human reaction to an increase in noise of 3 dB or lower is normally unnoticed to tolerable (WSP Parsons Brinckerhoff 2016a).

**Table 70: Predicted Traffic Noise Increase**

| Location      | Assessment Period        | Predicted Increase (dB) |
|---------------|--------------------------|-------------------------|
| Derby Highway | L <sub>Aeq</sub> (Day)   | 0.3                     |
|               | L <sub>Aeq</sub> (Night) | 2.2                     |
| Loch Street   | L <sub>Aeq</sub> (Day)   | 0.4                     |
|               | L <sub>Aeq</sub> (Night) | 3.3                     |

The project related noise emissions are expected to have no adverse amenity impacts on sensitive receptors located in Derby or receptors at the Port. Noise emissions will not exceed the 1 hr L<sub>Aeq</sub> Noise Guidelines as

recommended by the Noise Regulations. The potential residual impact of traffic noise on the amenity of sensitive receptors, after implementation of management measures, is assessed as 'Low'.

| Impact  | Consequence | Likelihood | Residual Impact |
|---|-------------|------------|-----------------|
| Traffic noise causing a decrease in amenity for sensitive receptors | Incidental  | Unlikely   | Low             |

### 9.2.3 Management Measures

A summary of key measures to address potential impacts on amenity is shown in Table 71.

**Table 71: Proposed Management Measures for Protection of Amenity for the Derby Port Development Envelope**

| Potential Impact Requiring Management                                 | Measure   |
|---|---|
| Dust emissions causing a decrease in amenity for sensitive receptors  | <ul style="list-style-type: none"> <li>Bulk products will be transported to the Derby Port Development Envelope in covered containers.</li> <li>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.</li> <li>Transfer of product to barges will be via a covered conveyor.</li> <li>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.</li> </ul> |
| Noise emissions causing a decrease in amenity for sensitive receptors | <ul style="list-style-type: none"> <li>Road trains will be maintained in good mechanical condition to minimise noise associated with their operation.</li> <li>The use of engine brakes within the built-up area of Derby will only be permitted for emergency breaking.</li> <li>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.</li> <li>Sheffield will develop and implement a community feedback and complaints mechanism.</li> </ul>  |

### 9.2.4 Predicted Outcome

Derby Port is currently a functioning industrial site within a zoned industrial area.

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.

Modelled noise levels as a result of the project are below DER 1 hr  $L_{Aeq}$  noise limits as defined in the *Environmental Protection (Noise) Regulations 1997* for receptors.

Noise impacts on sensitive receptors in the town of Derby are unlikely to cause loss of amenity for Derby residents and Port users.

Sheffield considers that the potential impacts to amenity will be able to be adequately managed such that the environmental objective (Section 9.2) for amenity will be met, and that the residual impacts are therefore acceptable.