Port of Broome

Licence Amendment Supporting Information

Kimberley Ports Authority

Prepared by:

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Revision Record

Revision	Date	Prepared By	Reviewed By	Authorised By
0.1	16 June 2025	AW/EH	AW	Draft
1.0	29 July 2025	AW	KPA/KMSB	AW
2.0	1 August 2025	AW	KPA/KMSB	AW/KPA

Basis of Report

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Kimberley Ports Authority (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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1.0 Introduction

Kimberley Ports Authority (KPA) is currently exporting bulk mineral sands under Licence L9445/2024/1 at the Port of Broome (the Port; the site) located at 549 Port Drive, Broome, in the Kimberley region of Western Australia (the site; Figure 1).

KPA provides an operational full-service multi-user port facility with the loading of bulk mineral sands via rotating containers resulting in the facility being a prescribed premises for the following category under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations):

- Category 58: Bulk material loading or unloading (premises on which clinker, coal, ore, ore concentrate, or any other bulk granular material is loaded onto or unloaded from vessels by an open materials loading system (>100 tonnes or more per day).

KPA proposes to amend the Licence to include the new Kimberley Marine Support Base (KMSB) wharf facility to the south of the existing KPA wharf (refer Figure 1).

The loading of bulk mineral sands and the export would continue to be primarily run by Kimberley Mineral Sands Pty Ltd (KMS; joint venture between Sheffield Resources Pty Ltd and YGH Australia Investments Pty Ltd [Yansteel]). The mineral sands product originates from the KMS Kimberley mining operation, Thunderbird Mineral Sands Project, which is the subject of Ministerial Statement 1080 and subsequent variation approved under section 45C(1)(a) of the *Environmental Protection Act 1986* (EP Act) to allow export of the product out of the Port of Broome.

2.0 Applicant Details

2.1 Attachment 1A: Proof of Occupier Status

KPA is the owner of the Port land and infrastructure within the site boundaries at Port of Broome, WA. All certificates of title were provided as part of the original Licence.

3.0 Premises Details

Figure 1 (Attachment 2) depicts the site location and proposed amended prescribed premises boundary for the Port of Broome, located at 549 Port Drive, Broome, Western Australia.

The Port of Broome (the Port) Prescribed Premises boundary is being extended to incorporate a new loading facility to the south, owned and operated by KMSB (**Plate 1**).

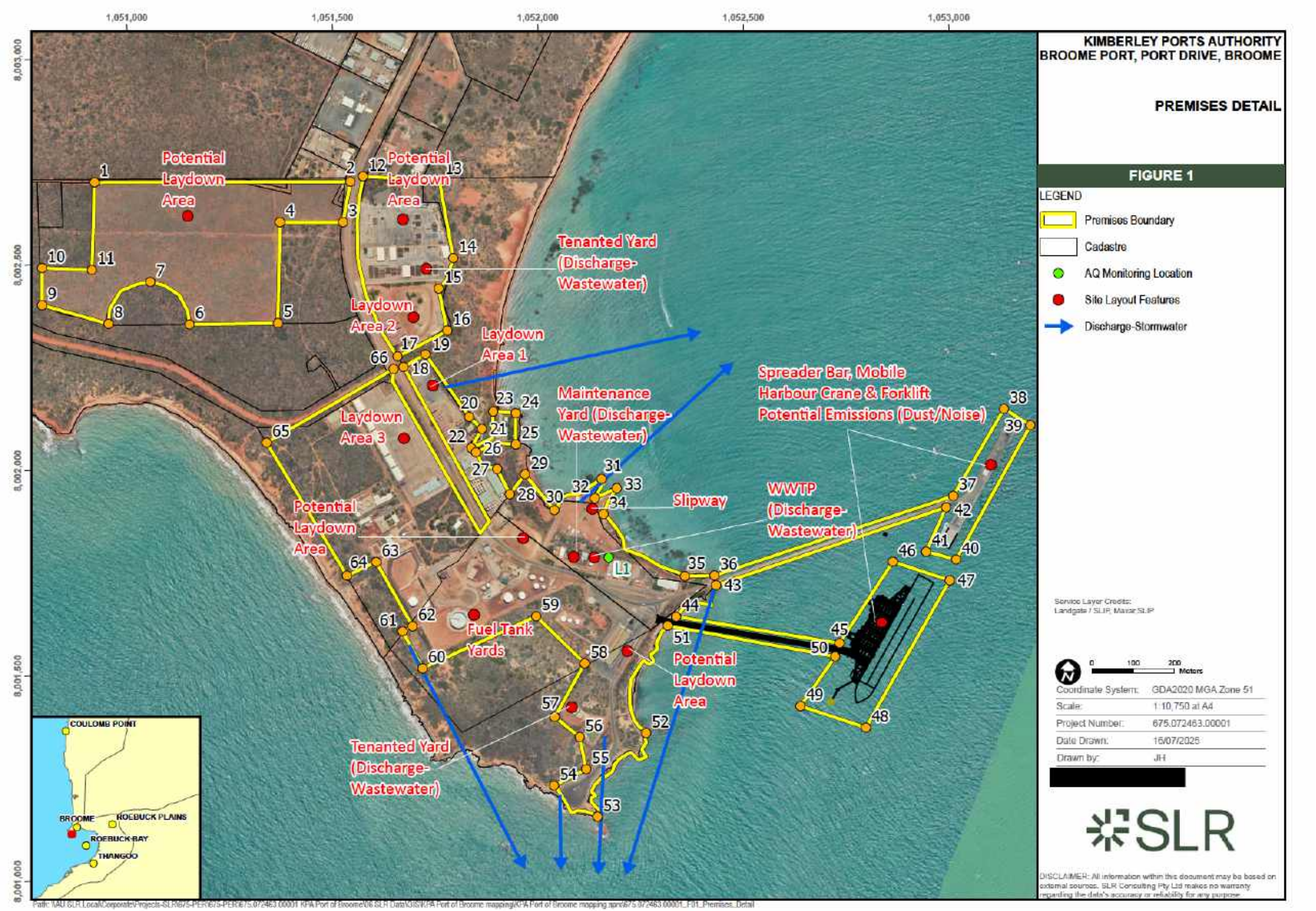
The KMSB is a new facility within the Port, designed specifically for Broome's unique environment and extreme tidal movements. KMSB holds a suite of long-term leases for land areas and portions of seabed within the Port of Broome, under which it is entitled to construct and operate a marine offloading facility and associated infrastructure. The new KMSB infrastructure incorporates a floating wharf linked to a fixed causeway and will allow safe and efficient 24/7 operations regardless of tide – driving advanced solutions, improving efficiencies, and reducing costs and carbon emissions. Key design elements include:

- natural deep berth pocket of -15 m chart datum
- 9,250 m^2 floating wharf (165m long, 50m wide),
- 12m wide, 400m long bi-directional causeway,
- 85m linkspan bridge with high load-bearing capability, and
- breasting and mooring dolphin structures to accommodate vessels up to 348 m overall length.

The innovative floating wharf design is intended to alleviate congestion and capacity constraints experienced with the Port's existing infrastructure.

KPA is charged with the role of overall management of the Port. This involves financial aspects, strategic planning, forecasting and development. In addition, most day-to-day port activities (such as pilotage, stevedoring, security, navigation aid maintenance, anchorages, moorings, communications, channel maintenance, towage, cargo handling) are conducted inhouse or otherwise arranged by KPA. KPA has a range of plant and equipment including forklifts, cranage and rigging equipment. KPA is also responsible for strategically planning and coordinating the optimum overall development of the Port of Broome.

Plate 1: Port of Broome KPA (existing, left) and KMSB (new, right) wharf facilities



KIMBERLEY PORTS AUTHORITY
BROOME PORT, PORT DRIVE, BROOME

PREMISES DETAIL

FIGURE 1

LEGEND

- Premises Boundary
- Cadastre
- AQ Monitoring Location
- Site Layout Features
- Discharge-Stormwater

Service Layer Credits: Landgate / SLIP, Maxar SLIP

0 100 200 Meters

Coordinate System:	GDA2020 MGA Zone 51
Scale:	1:10,750 at A4
Project Number:	675.072463.00001
Date Drawn:	16/07/2025
Drawn by:	JH

[redacted]

SLR

4.0 Proposed Activities (Attachment 3B)

The Port is proposing to amend the Licence to incorporate the newly constructed KMSB loading facility immediately to the south of the existing KPA wharf to support the export of up to 1.6 M tonnes per annum of bulk mineral sands from the KMS Thunderbird mine.

The Port infrastructure and equipment related specifically to the activity includes:

- Mobile harbour crane (MHC) and spreader bar
- Ship's crane (as required)
- Ship's grab (as required)
- Reach stacker (laydown area)
- Forklift
- Mechanical sweeping device
- Air quality monitor.

4.1 Construction

The construction of the new loading facility is near completion; facility is expected to be fully constructed by August 2025.

4.2 Operations

As per the existing Licence, the mineral sands product is loaded into enclosed rotating containers at the mine/source location, transported via road to a laydown area (currently one of three options on port land – refer Figure 1). The product will then be transported by truck to either the existing KPA Port wharf or new KSMB loading facility for export to market.

4.2.1 Product Information

4.2.1.1 Mineral Sands

There is no proposed change to the suite of product to be exported, which consists of product from the KMS mine; magnetic concentrates, non-magnetic concentrates, and para-magnetic concentrates.

The product has limited potential dust generation as they have a high specific gravity, are granular in nature, contain limited fines, and has an approximate 5% moisture content. They do not contain contaminants such as hydrocarbons, or acids, and by their mineral nature are highly insoluble.

4.2.1.1.1 Radiation

Radiation Safety (Transport of Radioactive Substances) Regulations 2002 (the Regulations) and the ARPANSA Safe Transport of Radioactive Material Code of Practice 2019 (the Code) apply only to natural materials containing natural radionuclides where the activity concentration of the material exceeds 10 Bq/g.

As the typical sum of natural thorium and uranium in the KMS products is expected to be less than 10 Bq/g, the Regulations and the Code are therefore not applicable. Furthermore, the product will not require placarding as a radioactive substance for transport (10 Bq/g) under the Code (ARPANSA 2019).

Being above 1 Bq/g, the material is subject to management under the *Radiation Safety Act 1975* and the *Mines Safety and Inspection Act 1994* in accordance with the KMS Radiation Management Plan.

KPA will not receive mineral sands for export from any other proponent where these criteria are not met, or the product is classified as a Dangerous Good.

4.2.1.1.2 Chemical Composition

The composition of the magnetic, non-magnetic and paramagnetic KMS mineral sands products is described in **Table 1**. The product is not classified as hazardous or a Dangerous Good and has low toxicity.

Table 1: Product Composition

Product	TiO_2	Fe_2O_3	SiO_2	Al_2O_3	ZrO_2	U (ppm)	Th (ppm)	CeO_2
Magnetic concentrate	35-40%	45-57%	0-10%	0.8-1%	0-1%	45-60	400-600	0.2-0.3%
Non-magnetic concentrate	15-20%	<2%	20-30%	<1.5%	40-55%	300-375	900-1,150	0.2-0.4%
Para-magnetic concentrate	10-15%	15-20%	5-10%	<2%	3-10%	100-140	1,500-1,900	0.5-1.5%

4.2.1.2 Other Products

The Port is an active and operational facility that imports and exports a variety of products for both the domestic and international markets, including:

- Live Cattle (no feed lots within the Port)
- Fodder (chaff and sawdust)
- Fuel (diesel, unleaded, Jet-A 1)
- Vessel stores and provisions (including waste)
- Water
- Fishing and pearling related cargoes
- Passenger baggage
- General Cargo:
  - Containerised product
  - Cement, barite, ammonium nitrate and bentonite
  - Bulk product, including synthetic based muds (SBM), brine, barite and bentonite
  - Project Cargo including casing, oil and gas industry subsea equipment.

All products currently exported/imported through the existing KPA facility may also be loaded via the new KMSB facility. KMSB will utilise the KPA stevedores and the process will be the same as for the KPA wharf. The only deviation is that the KMSB facility may be able to accommodate longer trucks (e.g. triple mineral sands trailers).

4.2.2 Product Loading Procedure

The mineral sands product is loaded into enclosed rotating containers at the mine, or source location. Once each container is filled it will be secured and checked for remnant product before being transported to the laydown area by truck.

4.2.3 Port Laydown Areas

The laydown area(s) will be utilised by proponents to temporarily store containerised product prior to loading on trucks for transport to the Port wharf.

The product is trucked from the mine site and stored in the containers at the laydown area awaiting transport to the KPA or KMSB wharf by truck for loading into vessels. All roads leading to laydown areas are bitumen; all laydown areas are either existing hardstand areas or will be newly formed hardstand areas, all within the Port Prescribed Premises boundary. At the laydown areas, it is anticipated that the containers will be handled using reach stackers and typically stacked 4-7 containers high.

4.2.4 Port Wharf Loading Procedure

4.2.4.1 Mineral Sands

As per the existing KPA operations, the product will be loaded directly into a vessel by the MHC, or ship crane as a contingency option, which has Lidar sensing for product placement within the hold of the vessel.

The rotating tipping frame fitted to the crane is lowered onto the container and locked in place. The container is lifted, slewed, and lowered into the hold of the ship, as the container is lowered into the hold the lid is lifted, and the container rotates 180 degrees to empty the contents. Once empty the container is rotated upright again inside the hold, lid lowered back into place and then lifted out of the hold. The ship's grab may be utilised within the vessel hold to evenly distribute the product during loading. Following completion of ship loading, the hatch is closed in readiness for transport to market.

Empty containers are placed on the wharf. A mechanical sweeping device will be available to collect any residue material on the wharf, though residue is not expected under normal operating conditions. A forklift or the harbour crane will be used to load the containers back onto the truck. Empty containers will be returned to the laydown area for transport back to the mine.

The product will be loaded in approximately 40,000 tonne lots via vessels at the KPA or KMSB wharf. The total annual throughput remains unchanged at 1.6 million tonnes. The total number of shipping movements related to mineral sands export will not change due to the addition of the KMSB facility to the existing Licence.

4.2.5 Operational Environmental Management Plan

The KPA Mineral Sands Operational Environmental Management Plan (OEMP; Appendix A) applies to all staff and contractors, who undertake activities at the Broome Port or who execute work for or on behalf of KPA onsite. The OEMP now incorporates the KMSB facility.

Prepared in accordance with the international management system standards ISO14001:2015, ISO9001:2015 and ISO45001:2018; the OEMP includes roles, responsibilities, and details controls to mitigate potential risks such as truck/container hygiene, wharf inspections, and operational weather (wind and rain) limitations.

The OEMP also includes a comprehensive environmental risk assessment, specifically targeted to the mineral sands export activities.

4.2.5.1 Spill Response

Any spillage of mineral sands from the ship loading process is likely to occur on sealed ground (wharf deck) and will be recovered, contained, and returned to the mine site for reprocessing or placed in the vessel's hold for export. Material recovery will be via mechanical sweeping. As per the material safety data sheet (SDS), a vacuum will also be available for spill cleanup, with the product dampened if required. If dampening is required, runoff to the marine environment will be prevented using a temporary bund, or similar.

The mineral sand products are dense in nature, are inert and are insoluble in water. Specific gravity is circa 4.3-4.6 and bulk density in 2,400-2,700 kg/m^3. If there is a spill in the marine environment, the product is unlikely to float so booms will not be a useful recovery tool. The likelihood of spillage to the marine environment using the container or bulk bag loading methods is low and consequences of small, infrequent spillage of mineral sands products are also considered to be minimal given the inert and insoluble nature of the product.

If there is a significant spill (i.e. container fails or empties all contents) directly to the marine environment, KPA will ensure a marine survey is undertaken to determine the extent of the impact and consult with DWER, or other appropriate regulatory body, to determine the best approach for managing or recovering the material, which may involve dredging if deemed required.

Given the use of enclosed containers, the likelihood of a spill on land or to the marine environment is much lower than if utilising other methods, such as conveyors.

4.2.6 Weather Monitoring

KPA utilise the nearest Bureau of Meteorology (BoM) weather station at the Broome airport, which is located approximately 6 km from the Port, to inform the operations team of weather and potential adverse conditions forecasted so that operations (loading) can be managed accordingly as per the procedures outlined in the OEMP (Appendix A).

4.2.7 Environmental Quality Monitoring

4.2.7.1 Marine

A water, sediment, and benthic monitoring program is currently undertaken by the Port and will continue for the life of the operations. The existing Licence marine monitoring will be extended to include new monitoring locations adjacent the new KMSB facility.

4.2.7.1.1 Licence Condition Amendment

KPA requests minor amendments to Condition 12 to align with the marine monitoring, with the proposed wording as follows:

The licence holder must complete ambient marine monitoring that assesses environmental impacts associated with mineral sands loading activities at the premises. The assessment must include:

> (a) Biannual (twice a year) water quality sampling at a minimum three (3) locations displayed in Figure 2 that includes measurement of the following parameters: Turbidity (NTU), dissolved oxygen (mg/L), temperature (°C), electrical conductivity (mS/cm), pH and metals (including aluminium, arsenic, barium, cadmium, chromium[2], cobalt, copper, lead, nickel, zinc, iron and mercury);
>
> (b) Annual intertidal benthic community habitat monitoring at the five (5) intertidal locations within small bay west displayed on Figure 3 that includes a mangrove health assessment;

(c) Annual subtidal benthic community habitat monitoring at ten (10) designated tow video locations displayed in Figure 3 that includes an annual assessment of benthic community habitat associations and health, with more detailed five yearly habitat mapping program for assessment of benthic community habitat associations and percentage cover within the mapping boundary;

(d) Five yearly (once every five years) benthic infauna monitoring at a minimum of six (6) locations displayed in Figure 2 that includes collection of sediment samples for identification of macroinvertebrates to Family taxonomic level and analysis and reporting of the following species diversity indices: Margalef's index (d), Shannon's index (H), Evenness index (EH) and Dominance (D); and

(e) Five yearly (once every five years) sediment sampling at a minimum eleven (11) locations displayed in Figure 2 that includes measurement of the following parameters: metals (including aluminium, arsenic, barium, cadmium, chromium[3], cobalt, copper, lead, nickel, zinc, iron and mercury).

Updated versions of 'Figure 2' (MEQ and Benthic Infauna Sites) and 'Figure 3' (benthic community habitat monitoring) are provided in Appendix B.

4.2.7.2 Terrestrial

4.2.7.2.1 Groundwater

A biannual groundwater monitoring program is currently undertaken across a network of six (6) wells by the Port and will continue for the life of the operations. The monitoring includes a comprehensive suite of metals and hydrocarbons.

4.2.7.2.2 Air Quality

Continuous PM_{10} air quality monitoring is undertaken at the Port at L1 (refer Figure 1) using an Australian Standard monitor with a meteorological station. To date, there have been no exceedances attributable to mineral sands loading. Air quality monitoring is proposed to continue at the same location and will cover potential impacts from the new KMSB facility given the location of the wharf and identified receptors.

4.2.8 Fuel Storage and Management

The fuel storage and management related to KPA operations is as per the existing Licence.

The KMSB wharf facility will be equipped with dedicated marine fuel bunkering infrastructure to support a wide range of vessel refuelling needs. High-flow bunkering is available via 4-inch nozzles at three locations on its outer facing wharf, delivering flow rates of up to 3,300 L/min, while low-flow dispensing is facilitated through reel cabinets at two locations on the wharf rated up to 400 L/min.

All bunkering nozzles and hose reel cabinets will be housed in fully sealed, weatherproof, and bunded enclosures, designed to prevent water ingress and contain any potential hydrocarbon spills. These systems are subject to a weekly inspection and maintenance regime conducted by an independent third party to ensure continued compliance and operational integrity.

Each bunkering point will be equipped with clearly marked Emergency Stop (E-Stop) stations and adjacent spill response kits. Bunkering operations are conducted using dedicated transfer skids and vessel-based interfaces, with all personnel required to follow strict procedural guidelines and receive site-specific training to ensure safe and compliant fuel transfers.

This system will be purpose-built for safety, environmental compliance, and efficient risk-managed refuelling approach for marine bunkering.

4.2.9 Waste Management

The Port is not a licenced waste facility and relies on licensed waste contractors to dispose of any waste unloaded from vessels at the wharf. A range of vessel related waste is transferred from the vessel across the KPA wharf, and soon to be the KMSB wharf, for disposal by a licenced waste contractor (e.g. cardboard and plastic / glass recycling). Biosecurity approvals are obtained where required.

5.0 Approvals and Consultation (Attachment 5)

It is not expected that the Port operations will have a significant impact on the objectives of any of the EPA environmental factors and hence a referral for environmental impact assessment under Part IV of the EP Act is not considered to be required. However, the KMS export will be undertaken in accordance with MS1080, as amended, which underwent a full detailed environmental impact assessment on all key factors. The formal environmental impact assessment under the EP Act considered all relevant key factors and concluded that the transport and loading of the mineral sands product could be undertaken through the Port of Broome while meeting the environmental objectives of the key factors assessed.

Furthermore, it is not expected that the proposal will have a significant impact on any matters of national environmental significance (MNES) and hence a Commonwealth referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is not required. However, the KMS Project holds a valid approval under the EPBC Act, and all Project activities will also be undertaken in accordance with EPBC/2016-7648.

Table 2 provides an overview of the project approvals related to environment and planning and **Table 3** provides an overview of stakeholder consultation.

Table 2: Project Approvals

Regulator / Stakeholder	Approval	Timing
Department of Water and Environmental Regulation (DWER)	Licence amendment under Part V of the EP Act to incorporate the new KMSB wharf	Prior to commencement of mineral sands export from the KMSB facility
DWER, Native Vegetation Branch	NVCP x 2 (CPS9109/2 and CPS7451/1)	Current

Table 3: Stakeholder Consultation

Regulator / Stakeholder	Comment	Outcome
Department of Water and Environmental Regulation (DWER)	A scoping meeting was held on 10 June 2025 to discuss inclusion of a new KMSB wharf in the KPA Licence	KPA proposed to include the newly constructed KMSB wharf to the Licence to allow the export of mineral sands. No concerns were noted, and it was communicated to consider stormwater, dust and noise in the submission.
Port of Broome Community Consultation Committee (CCC)	KMS presented a project overview including mine operations, product information, bulk export, and trucking, to the CCC in April 2023	There was general discussion, but no concerns were noted.

Regulator / Stakeholder	Comment	Outcome
Various	Traffic impact assessment which included engagement through stakeholder interviews, survey and focus groups	Various impacts and concerned raised by stakeholders were discussed (Creating Communities 2023)

6.0 Emissions and Discharges (Attachment 6A)

Table 4 details the potential emissions and discharges from the operational activities and proposed controls that will be implemented to minimise the risk of environmental impact resulting from the operations of the site.

The remaining sections discuss the sources of the potential emissions and discharges in more detail, including:

- Dust (transport, loading operations)
- Noise (vehicles, machinery, loading operations)
- Potentially contaminated stormwater.

Table 4: Emissions and Discharges Assessment

		Emission risks from prescribed premises				
		Potential Receptors	**Pathway Type**	**Pathway Assessment**	**Potential Impact**	**Controls**
Potential Emission or Discharge Type	**Emissions to Air – Dust** (materials handled via rotating container unloading system)	• Residences • Recreational users • Port industrial area • Marine Environment	Air (wind borne)	Pathway through prevailing winds. **Residence:** known residences within the Port boundary **Recreational Users:** The boat club, public access to wharf, fishing **Industry:** adjacent wharf	**Amenity Impacts:** Visual dust emissions shall be significantly reduced using rotating container technology. **Public Health Effects:** The product is not classified as hazardous according to Safe Work Australia criteria.	• Loading via rotating containers • Stevedore Safe Operations Procedure • Container housekeeping at mine and laydown area • Site inspections and audit programs • Complaints and Incident Reporting Processes • Environmental Monitoring (Air Quality)
	Noise (machinery operations and truck movements)	• Residence • Industrial neighbours	Air (wind dispersion). Noise associated with truck movements; minimal off-site impacts associated with crane and container unloading.		**Amenity Impacts** • Minimal impact to residential and recreational users. • Increase in truck traffic into the Port.	• Minimal handling method chosen. • Routine site inspections and audit programs • Complaints and Incident Reporting Processes • Multiple containers per truck to reduce truck movements.
	Discharge to Waters (stormwater runoff)	• Marine Environment • Aquaculture	• Spillage - Incident related. • Air - wind dispersed dust.	Dust settling in or spillage may enter the marine environment during Ship loading. Pearling leases in Port waters and adjacent Roebuck Bay	**Ecosystem Health:** MSC is considered insoluble and non-toxic. Potential impact on the marine environment include; • Temporary and localised increase in suspended solids; and • MSC contamination of marine sediments. **Ecotoxicity:** MSC is not considered a Marine Pollutant.	• Loading method via rotating containers to prevent spillage. • Environmental Monitoring (Marine water and sediments) • Procedures for product handling to avoid spillage • Regular housekeeping to remove spillage • Sealed hardstand (wharf deck)
		• Stormwater	• Spillage – if not adequately recovered could result in contamination of Berth and stormwater.	Stormwater discharging directly to Marine Environment. MSC dust mobilised during rainfall washing through to drains or direct to ocean.		• Good housekeeping • Emergency management procedures, including prompt cleanup of spills and disposal • No loading during heavy rainfall (refer OEMP; Appendix A)

6.1 Noise

6.1.1 Vessel Loading

The Port is a multi-user facility with crane and vessel operations operating 24/7 with no reported noise complaints. The loading of mineral sands does not exacerbate the other noise emissions from the Port and noise emissions are compliant with the requirements of the *Environmental Protection (Noise) Regulations 1997*.

An acoustic assessment was completed to incorporate the new KMSB wharf facility and associated mineral sands loading, combined with the existing operations at KPA. The assessment concluded that the cumulative impacts from the addition of mineral sands loading at the KMSB facility would be compliant with the *Environmental Protection (Noise) Regulations 1997.*

Refer to Appendix C for the acoustic assessment related to the KMSB wharf operations.

6.1.2 Laydown

The current Licence permits 24/7 operations except for operations at Laydown Area 3 which are limited to 0700-2200 Monday to Saturday and 0900-2200 Sunday and public holidays.

An acoustic assessment was undertaken with the intention of having this condition removed from the Licence. The assessment concluded that with appropriate operational controls for night noise emissions, the operations will comply with the *Environmental Protection (Noise) Regulations 1997.*

Refer to Appendix D for the acoustic assessment related to the laydown operations.

6.1.2.1 Licence Condition Amendment

Further to the outcomes of the laydown area acoustic assessment (Appendix D) it is requested that the time limiting condition related to Laydown Area 3 is removed and replaced with a condition related to compliance being ensured through implementation of appropriate controls (i.e. stacked containers) during night period operations where a resident is occupying a relevant residence.

6.1.3 Transport

There is no change proposed to the trucking movements to/from and within the Port. Currently, there are up to 50 quad truck round trips per day from the mine to the laydown areas, and approximately 160 truck movements per day from the laydown areas to the wharf to load the mineral sands.

6.2 Dust

All dust management measures relevant to the existing Licence will remain applicable to the new KMSB wharf facility. The location of the KMSB wharf is such that the prevailing winds and receptors are commensurate with the existing KPA wharf and hence the air quality monitor that is currently in place can be utilised to determine any dust related impacts from loading/unloading at the new KMSB facility.

There have been seven reported exceedances of the 24-hour average PM_{10} criteria (50 µg/m³) since monitoring began in March 2024 until 30 June 2025; 20/3/24, 21/12/24, 12/3/25, 2/6/25, 10/6/25, 19/6/25, and 22/6/25 (refer Graph 1). KMS vessels were alongside the KPA berth during four of the seven exceedances (20/3/24, 2/6/25, 10/6/25, and 19/6/25). However, following an investigation on each occasion it was concluded that the prescribed activity (i.e. mineral sands handling and/or vessel loading) was not the source of the dust

emission. Further, dust was not observed outside the Prescribed Premises Boundary on any occasion, in accordance with conditions of the Licence.

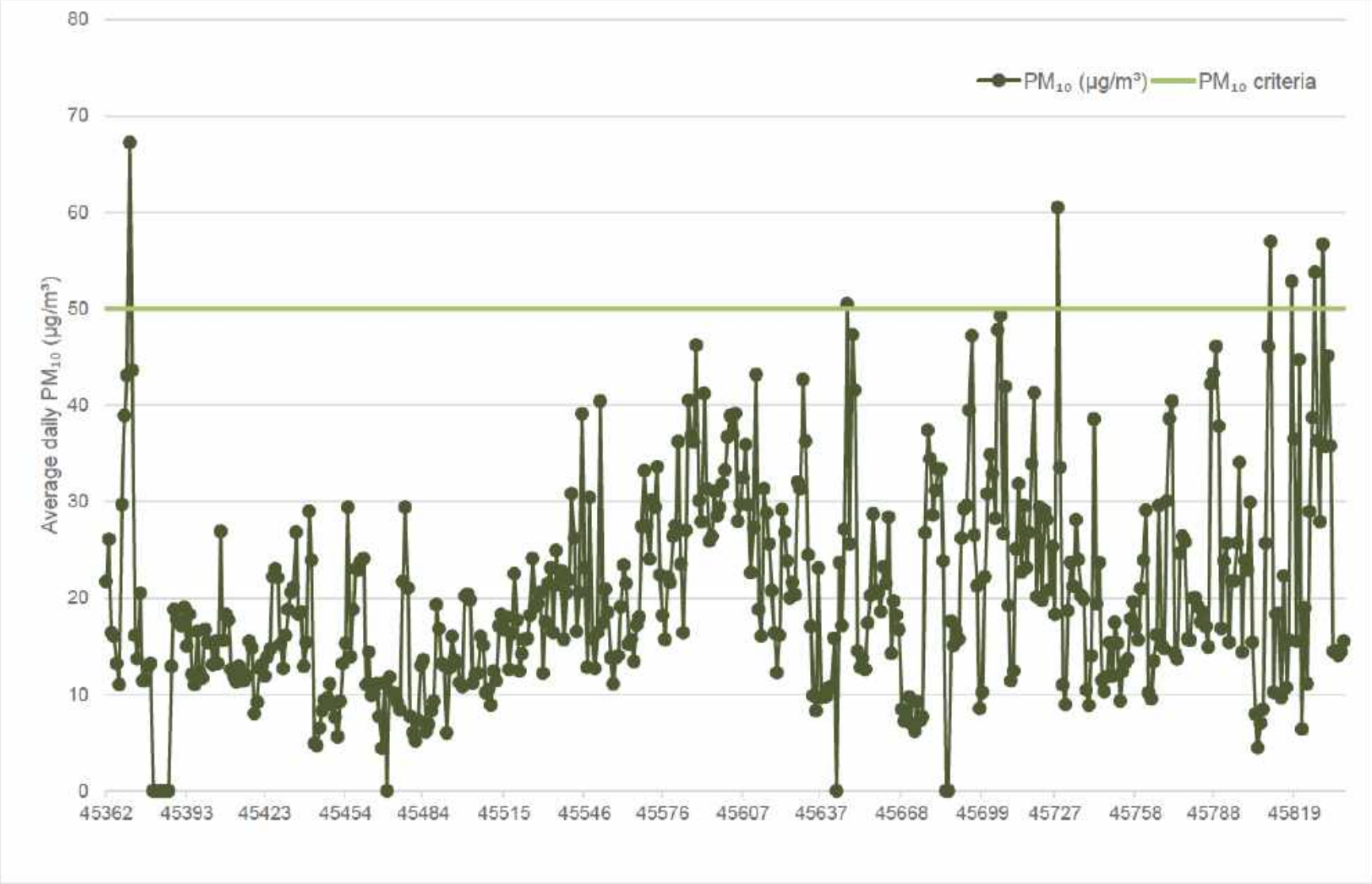
The annual average PM_{10} for the year 1 July 2024 to 30 June 2025 is compliant at 22 µg/m³ compared to the criteria of 25 µg/m³.

6.2.1 Licence Condition Amendments

1. As per the existing operations, following each shipment, the wharf will be inspected and swept if there is any remaining product on the wharf deck. In accordance with recent correspondence with DWER, we request that Table 1, Item 3, Operational Requirement 5 be amended to read as follows:

   Following each shipment of mineral sands, areas where mineral sand was loaded and transported including, but not limited to, the wharf and the trafficable route in and out of that wharf, must be inspected and swept if product remains.

2. As per the conditions of the Works Approval (W6852/2023/1) an air quality monitor was installed at the agreed location. The unit was fitted with a meteorological station to ensure location specific weather conditions could be referenced in the assessment of data; however, this was not a requirement of the Works Approval, which refers to using the Broome BoM station. The Licence now includes an infrastructure requirement for a meteorological station that complies with AS/NZS 3580.14 (Table 1, Item 2) which is a new requirement that is impractical and unsafe during common site conditions, like cyclones. Hence, it is requested that the requirement for the weather station to be compliant with AS/NZS 3580.14 is removed from the Licence.



Graph 1: Climate Statistics for Broome Airport (Station No. 003003; BoM, 2025))

6.3 Potentially Contaminated Stormwater

6.3.1 Stormwater

There is no change to the management of stormwater, but the below detail is included for completeness. KPA will ensure that all practicable measures to prevent stormwater run-off becoming contaminated by the activities and operations is undertaken at the premises.

New developments are designed in line with the Shire of Broome Local Planning Policy 5.22 – Shire of Broome Structure Plan and Subdivision Standards. Stormwater is managed using compensation basins and open drainage swales. Weirs and vegetated swales are used to manage water velocity and quality. The drainage system and all associated structures including compensating basins are to be designed to collect and convey an Average Recurrence Interval (ARI) storm event of one in 100-year.

For the rest of port lands, notably the wharf deck, stormwater conveys directly into the ocean. To mitigate the risk of potentially contaminated stormwater entering the marine environment, the following procedures and controls are implemented:

- Full containers are loaded from the wharf or truck directly into the vessel cargo hold
- Empty containers temporarily placed on the wharf deck, then loaded back onto the truck for transport back to the laydown area and then mine
- Loading will continue during light showers however, during heavy showers loading will be suspended and the hatches closed (refer OEMP)
- Operational procedures will include housekeeping and spill clean up to ensure minimal product remains on the wharf
- For landing containers on the wharf there are spill kits available, brooms & shovels and a designated waste bin. There will be a mechanical sweeping device on hand for larger spills and to clean the wharf after each shipment, which is consistent with other Port operations.

The mineral sands products are inert and insoluble, meaning that if any product is to enter the marine environment, either via a spill or entrained in stormwater, no components will become bioavailable to marine fauna (MBS Environmental 2021).

7.0 Siting and Location (Attachment 7)

Figure 2 (Attachment 7) depicts the site location and nearest sensitive receptors.

7.1 Sensitive Land Uses

Under the EPA's *Guidance Statement No. 3: Separation Distances between Industrial and Sensitive Land Uses* (2005), all new industries, infrastructure, and estates in the vicinity of proposed/existing sensitive land uses, and vice versa, require a suitable separation distance.

Sensitive land uses are defined by the EPA as; residential developments, hospitals, hotels, motels, hostels, caravan parks, schools, nursing home, childcare facilities, institutions, and shopping centres (EPA, 2005). This Guidance Statement outlines the generic buffer distances between sensitive and industrial land uses in the absence of site-specific technical investigations, which is 1,000 – 2,000 m for Port operations.

There are three sensitive receptors (Port Heritage residences) within the Port boundary. **Table 5** details the receptors within the defined generic buffer distances and provides their direction and distance from the location of ship loading at the new KMSB wharf. **Figure 2** depicts receptors with 1 km and 2 km buffers from the premises boundary.

Table 5: Sensitive receptors within 2 km radius of the KMSB wharf

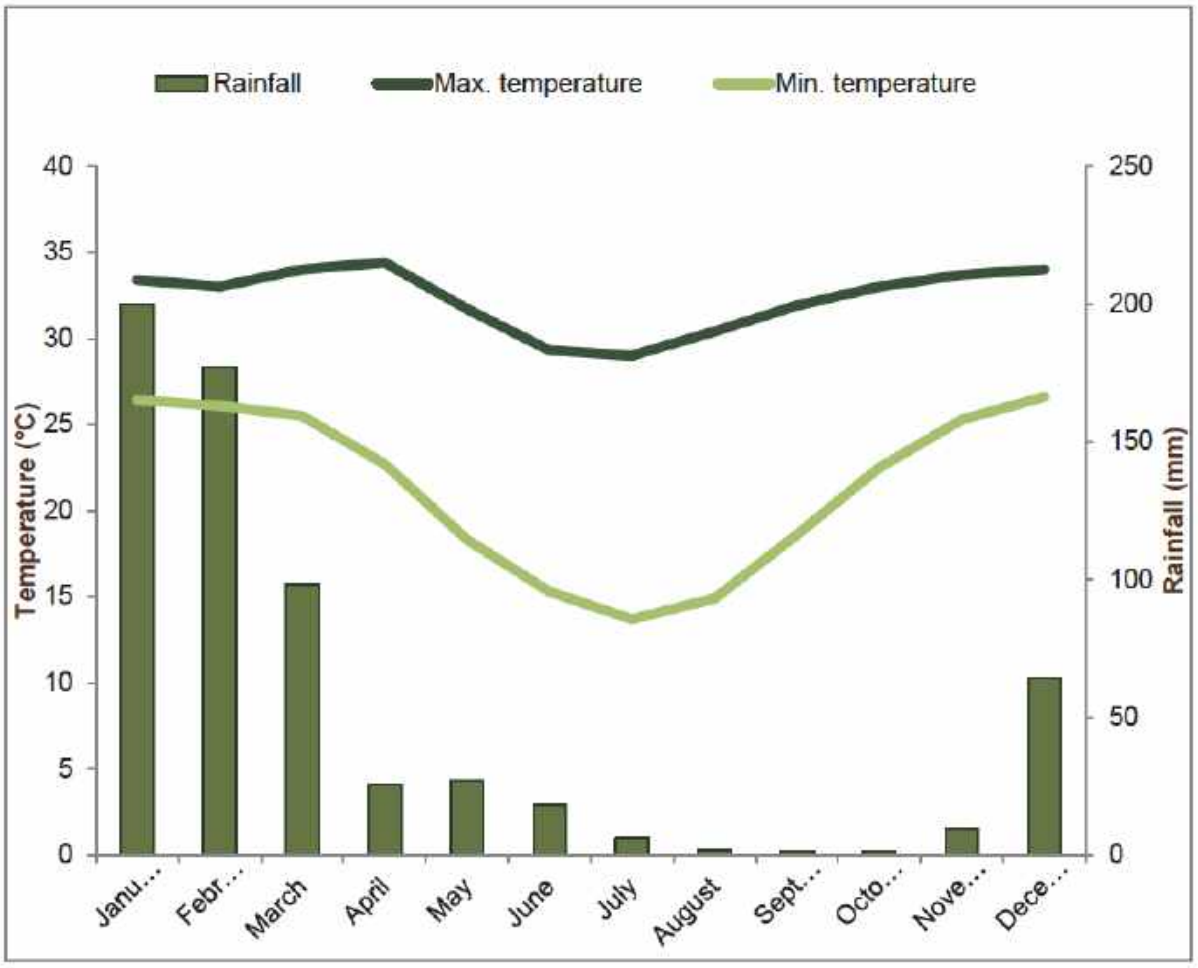
Sensitive Land Use	Direction and Distance
Broome Fishing Club	700 m southwest
Port Houses (Caretaker residence)	1,000 m west
Broome Dinosaur Adventures	1,000 m northwest
Kimberley Ports Authority Office	1,000 m west-northwest
Broome Volunteer Sea Rescue Group	700 m southwest
Port Jetty Public Toilets	550 m west
Broome Pistol Club and Overflow Caravan Park	1,800 m northwest

7.2 Climate

Ambient weather conditions impact the dispersion, deposition, removal and transformation of potential pollutants to surrounding environmental values and sensitive receptors. Monitoring of meteorological components is essential for the effectiveness of operations to mitigate and control potential impacts to environmental values and sensitive receptors located within 2 km of the site. The following section provides analysis for rainfall, wind direction and speed.

7.2.1 Rainfall

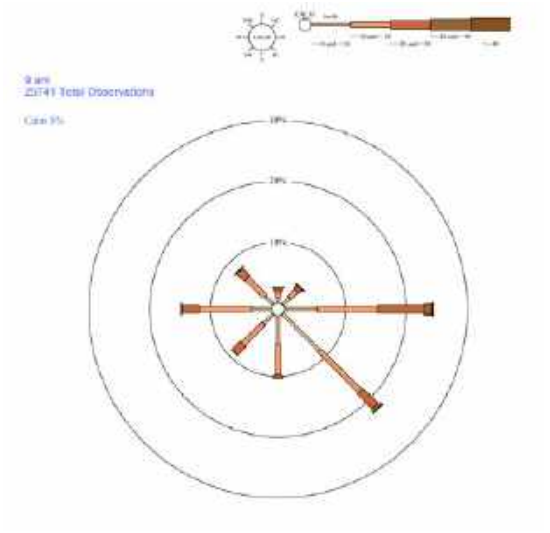
The nearest Bureau of Meteorology (BoM) weather station to the Project is Broome Airport (Station No. 003003) located approximately 2.7 km southeast from the Project. Data statistics have been collected from 1939 to 2025. The long-term mean minimum temperature for Broome Airport Station ranges from 13.7°C (July) to 26.6°C (December). The long-term mean maximum temperature ranges from 29°C (July) to 34.4°C (April) (BoM, 2025). Broome receives rainfall on an average of 35.3 days annually with an average annual mean rain of 631.6 mm (Graph 2).



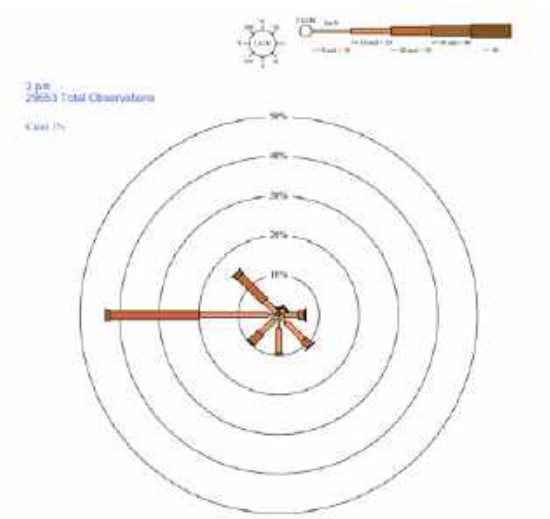
Graph 2: Climate Statistics for Broome Airport (Station No. 003003; BoM, 2025).

7.2.2 Wind Speed and Direction

The wind speed direction for Broome Airport (Station 003003) which is the nearest weather station to the site are available from 1939 to 2025. Available wind speed records were taken at 9 AM and 3 PM provided in Graphs 3 and 4, respectively. The annual mean wind speed is 13.6 $kmhr^{-1}$ during the morning and 18.2 $kmhr^{-1}$ in the afternoon and the prevailing wind direction is east/south-easterly at 9 AM, and westerly at 3 PM (BoM 2025).



Graph 3: 9am Wind Speed and Direction for Broome Airport (Station No. 003003; BoM 2025).



Graph 4: 3pm Wind Speed and Direction for Broome Airport (Station No. 003003; BoM 2025).

7.3 Topography

The site elevation ranges from approximately 15 m Australian Height Datum (AHD) along Port Drive, Broome and approximately 6 m AHD to the east where the Port of Broome Jetty is located (Google Earth Pro, 2018).

7.4 Geology and Soils

The site is within the Dampier Peninsula Sandplain Zone. The regional geology and soils consist of sandplains and dunes (with some sandy plateaux and coastal mudflats) on sedimentary rocks of the Canning Basin with red deep sands and some yellow sandy earths and tidal soils (DPIRD, 2022a). The Carpentaria soil landscape system (355Cr) consists of coastal plains, extensive bare mud flats, associated sandy margins and minor dunes, saline sands and muds with supporting paperbark thickets, samphire shrublands and fringing mangrove forests (DPIRD, 2022b).

7.5 Acid Sulfate Soils

The Department of Water Environment and Regulation database search of Acid Sulfate Soil (ASS) Risk Mapping captured at a scale of 1:100,000, identified no risk of ASS within the site. The nearest location of ASS is located approximately 4.5 km northeast comprising high to moderate risk of ASS occurring within 3m of natural soil surface (DWER, 2017).

7.6 Contamination Status

The Contaminated sites database (DWER, 2023) indicates the site has four registered Lots capturing two areas of contamination:

- Lot 621 on Plan 70861 classed as ‘Remediated for restricted use’ (ID 57973) comprising hydrocarbons (such as from diesel or oil), organochlorine pesticides and asbestos-containing materials present in fill material, contained beneath a capping layer of compacted gravel cover.

- Lot 698 on Plan 209491 classed as ‘Remediated for restricted use’ (ID 57974) comprising hydrocarbons (such as from diesel or oil), organochlorine pesticides and asbestos-containing materials present in fill material, contained beneath a capping layer of compacted gravel cover.
- Lot 621 on Deposited Plan 70861 classed as ‘Contaminated – remediation required’ (ID 78923) comprising hydrocarbon-impacted soil which remains in-situ beneath the location of a former diesel fuel dispensing unit. Hydrocarbons (such as from diesel fuel) are present in groundwater beneath the site.
- Lot 623 on Deposited Plan 70861 classed as ‘Contaminated – remediation required’ (ID 78924) comprising hydrocarbon-impacted soil which remains in-situ beneath the location of a former diesel fuel dispensing unit. Hydrocarbons (such as from diesel fuel) are present in groundwater beneath the site.

The two ‘Contaminated – remediation required’ lots have been remediated and documentation submitted to DWER to progress the reclassification to ‘Remediated for restricted use’. Note that Lot 623 (DP70861) is not part of the Port premises.

7.7 Hydrology

7.7.1 Groundwater

The Broome Sandstone Aquifer is the primary groundwater resource within the region. It is a layered aquifer comprising coarse sandstone and conglomerate and is around 250 m thick beneath Broome. Groundwater within the Broome Sandstone is recharged by direct rainfall infiltration, with fresh to slightly brackish groundwater overlying a saltwater wedge. The groundwater total dissolved solids (TDS) values range less than 500 mg/L (DWER, 2018). During normal seasonal conditions, groundwater elevation fluctuates approximately at 0.5 m (AECOM, 2023). However, the seasonal influence of monsoonal recharge of the aquifer has been measured to cause groundwater fluctuations between 2.5 m to 3.0 m following significant rainfall events (AECOM, 2023).

The site does not overlap any Public Drinking Water Sources Areas (PDWSA). The closest source for PDWSA is the Priority P1 Broome Water Reserve, mapped approximately 15 km northeast from the site.

7.7.2 Surface Water

The site is located within and directly adjacent to the Indian Ocean. The site is located within the mapped area of a Directory of Important Wetland, Roebuck Bay (WA Wetlands Reference Code: 20). The Roebuck Bay wetland comprises an area of 65,203 ha and follows the Indian Ocean coastline. The site is located within the Cape Leveque Coast Surface Water Management Area (DWER, 2018).

7.8 Heritage

There is one place comprised of three residences within the Port boundary listed on the Heritage Council Heritage List; Broome Quarantine Station Buildings (fmr) (Place Number: 01093) (Govt. WA, 2023).

Eight Aboriginal Cultural Heritage sites comprising five Registered Sites and three Stored Data/Not a Site are identified as intersecting the site (DPLH, 2023).

- Registered Site: Lintapitjin/Lot 2065 Port Drive (Land ID 12410) – artefacts, scatter, ceremonial, midden, mythological. No gender restrictions apply.
- Registered Site: Entrance Point/Yinara (Land ID 12873) – artefacts, scatter, midden, mythological, camp. No gender restrictions apply.

- Registered Site: Beacon Hill (Land ID 14444) – artefacts, scatter, midden. No gender restrictions apply.
- Registered Site: Gantheaume Point 2 (Land ID 12872) – artefacts, scatter, camp and midden. No gender restrictions apply.
- Registered Site: Gantheaume Point 1 (Land ID 12924) – artefacts, scatter, creation, dreaming narrative, midden, other. No gender restrictions apply.
- Stored Data/Not a Site: Broome Jetty (Land ID 14558). No gender restrictions apply.
- Stored Data/Not a Site: LSC11 (Land ID 30274) – artefacts, scatter, ceremonial, fish trap, midden, mythological, quarry, skeletal matter, burial, camp, arch deposit, ochre, plan resource, shell, water source. No gender restrictions apply.
- Stored Data/Not a Site: Gurrjungu SA-0111 (Land ID 32839) – fish trap. No gender restrictions apply.

The site is located within the Rubibi Community Native Title Determination area (Landgate 2023).

7.9 Environmentally Sensitive Receptors

There are no gazetted areas of environmental significance that specifically fall within the Port of Broome operations area; however, it is recognised that there are areas of environmental significance proximate, but separate to the Port operations area, these include:

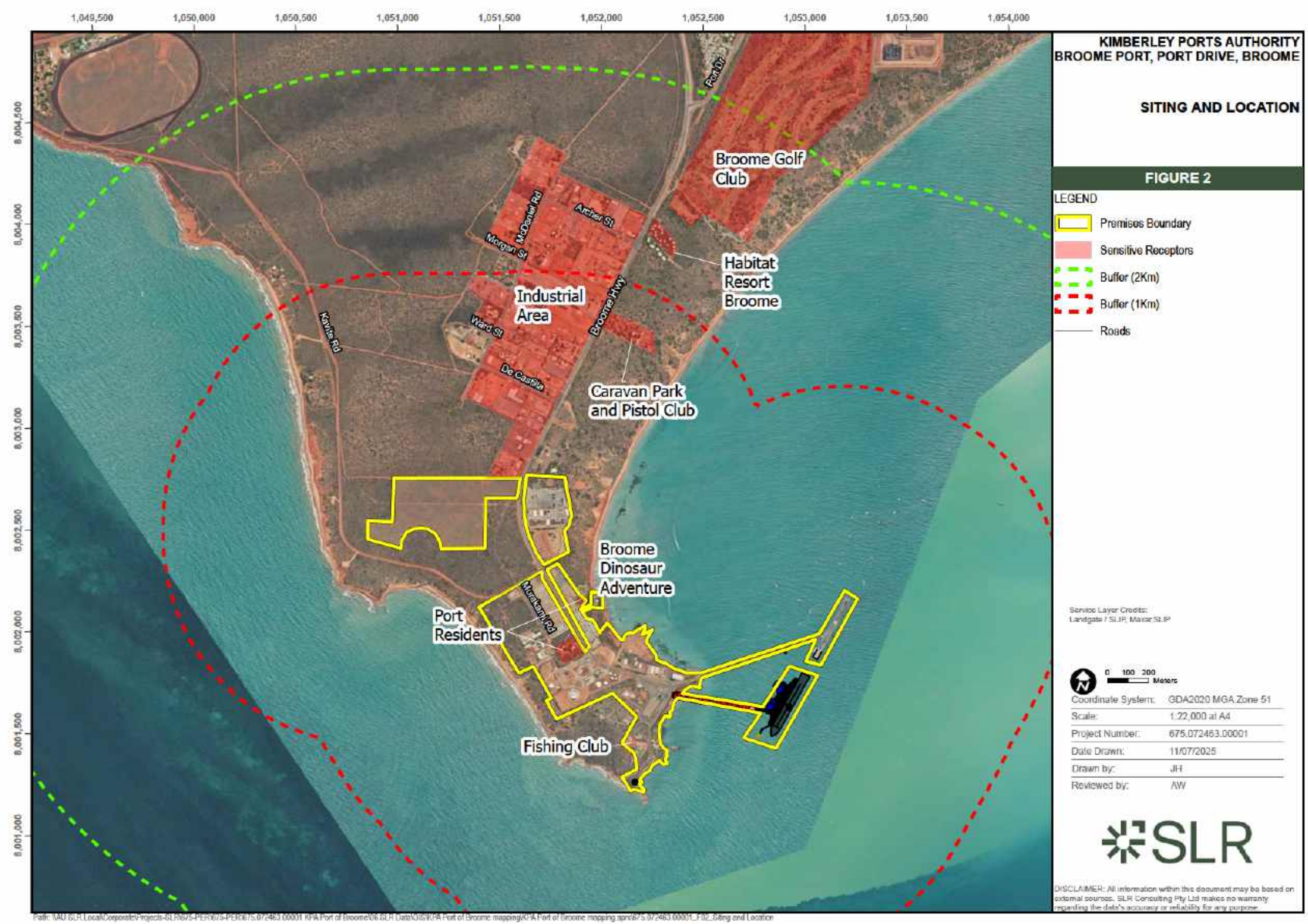
- Roebuck Bay RAMSAR Wetland located approximately 10 km northeast of the Port.
- Roebuck Commonwealth Marine Reserve (CMR) located approximately 5 nautical miles west of the Port.
- Yawuru Nagulagun / Roebuck Bay Marine Park which surrounds the Port on all sides. This is jointly managed by the Department of Biodiversity, Conservation and Attractions (DBCA) and Nyamba Buru Yawuru Ltd.
- West Kimberley National Heritage Place.

Table 6 details an assessment of the environmentally sensitive receptors relevant to the Port.

Table 6 Environmentally Sensitive Receptors

Type	Description	Distance from Site Boundary	Proposed Controls
Environmentally Sensitive Areas (ESA)	The site is located within an ESA identified as a Threatened Ecological Community (TEC) (DWER, 2021).	Within the site	Port operations to avoid TEC, where applicable.
Threatened Ecological Communities	The Protected Matters Search Tool (PMST) identified one Threatened Ecological Community, *Monsoon Vine Thickets on the coastal sand dunes of Dampier Peninsula* as potentially occurring within a 10 km radius of the site.	Within 10 km	No impacts (clearing/ disturbance) to MVT within Port boundary.

Type	Description	Distance from Site Boundary	Proposed Controls
Threatened and/or priority flora and fauna	The PSMT shows that there are 48 threatened species and 68 migratory species potentially occurring within a 10 km radius of the site.	Within 10 km	Vehicle speed restrictions. Vessel operations procedures to address control of impacts to marine fauna. No impacts (clearing/ disturbance) to conservation significant flora within Port boundary.
Aboriginal and other heritage sites	There are five registered Aboriginal sites identified as occurring within the Port and a National Heritage Listed site identified as *The West Kimberley* (Place ID 106063) is located within a 10 km radius of the site. Three residences of state heritage significance are within Port boundary.	<10 km	Unexpected finds procedure for the discovery of artefacts. WA Police notification for the discovery of remains.
Public drinking water source areas (groundwater)	The site is not within a Public Drinking Water Source Area. The nearest site is located approximately 15 km north identified as Broome Water Reserve, a Priority 1 groundwater resource (DWER, 2023).	>10 km nearest protection area P1	No specific controls are required.
Rivers, lakes, oceans, and other bodies of surface water	The Indian Ocean is the nearest water body located directly within the site.	Directly adjacent	Ensure good housekeeping on wharf to avoid discharge of materials and/or potentially contaminated stormwater.
Acid sulfate soils	Aerial database imagery identified an extremely low probability/low occurrence of acid sulfate risks to the site (ASRIS, 2023).	-	No specific controls are required.



KIMBERLEY PORTS AUTHORITY
BROOME PORT, PORT DRIVE, BROOME

SITING AND LOCATION

FIGURE 2

LEGEND

- Premises Boundary
- Sensitive Receptors
- Buffer (2Km)
- Buffer (1Km)
- Roads

Service Layer Credits:
Landgate / SLIP, Maxar SLIP

0 100 200 Meters

Coordinate System:	GDA2020 MGA Zone 51
Scale:	1:22,000 at A4
Project Number:	675.072463.00001
Date Drawn:	11/07/2025
Drawn by:	JH
Reviewed by:	AW

SLR

Path: \\AU SLR Local\Corporate\Projects-SLR\675-PER\675-PER\675.072463.00001 KPA Port of Broome\06 SLR Data\GIS\KPA Port of Broome mapping\KPA Port of Broome mapping.aprx\675.072463.00001_F02_Siting and Location

8.0 Fee Calculation

The amendment fee is $6,800.00. This fee was calculated using the DWER online calculator; Category 58 up to 5,000 tonnes per day and reflects 500 units at $13.60 per unit.

9.0 References

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Appendix A Operational Environmental Management Plan

Port of Broome

Licence Amendment Supporting Information

Kimberley Ports Authority

SLR Project No.: 675.072463.00010

1 August 2025

KIMBERLEY PORTS AUTHORITY

Port of Broome

Mineral Sands Export

Operational Environmental Management Plan

CONTENTS

VARIATION RECORD

Version No.	Version Date	Brief Description of Change
1.0	August 2023	Development of plan
1.1	October 2023	Updated plan to remove emergency contingency procedure and confirm bulk bags and ships crane are included in the operating procedures.
2.0	June 2025	Inclusion of KMSB wharf into the OEMP. Minor updates to include KPA's licence requirements.

ABBREVIATIONS

Abbreviation	Meaning
FEL	Front End Loader
KPA	Kimberley Ports Authority
KMS	Kimberley Mineral Sands
KMSB	Kimberley Marine Support Base
OEMP	Operational Environment Management Plan
MHC	Mobile Harbour Crane
WHS	Work Health and Safety

1. INTRODUCTION

1.1. General

This operational environment management plan (OEMP) outlines the environmental controls for exporting mineral sands at the Port of Broome at both the KPA wharf and the Kimberley Marine Support Base (KMSB).

1.2. Scope

The scope of this OEMP covers the activities relating to mineral sands occurring at the Port of Broome at the KPA Wharf and KMSB including:

- Stevedoring activities and operations on the KPA wharf and KMSB; and
- Traffic management on port lands and at the KPA wharf and KMSB.

The export of mineral sands at the KPA wharf and KMSB is part of the logistics chain from the mine to the Port of Broome. KPA, Kimberley Mineral Sands (KMS; the mine operator), KMSB and Campbell Transport (the logistics provider) work closely together to ensure environmental compliance, industry and community standards are met. As such, where required the OEMP references activities at the mine, KMSB and container laydown areas, however, KPA is not responsible for the environmental management at these locations. If port land is leased for mineral sands operations, including container storage, KPA will specify specific requirements, including environmental obligations, under the lease.

As per the *Environmental Protection Regulations 1987*, KPA has a Part V licence for the Port of Broome to export mineral sands. This plan has been developed to support the application for a part V licence. It is highlighted that some elements of the export process are still being finalised and aspects of this plan may need to be updated or modified to remain current and accurate.

1.3. Objectives

The primary objectives of this OEMP are to:

- define the environmental requirements relevant to the loading of mineral sands at the KPA wharf and KMSB; and
- describe the environmental management controls that are in place for loading mineral sands at the KPA wharf and KMSB.

1.4. References

Legislation:

- *Port Authorities Act 1999*
- *Western Australia Environmental Protection Act 1986*
- *Western Australia Environmental Protection Regulations 1987*
- *Environmental Protection (Noise) Regulations 1997*

Safety Data Sheets (SDS):

- Magnetic concentrate SDS;
- Non-magnetic concentrate SDS; and
- Paramagnetic concentrate SDS.

KPA documents:

- Environmental Management Plan 2023 REC202242;
- Hazard and Incident Reporting Procedure (REC145904;
- KPA Emergency Response Procedure REC203349; and
- Work Health and Safety procedures for mineral sands loading (development in progress).

KMSB documents:

- KMSBMS-03-PRO14 Incident Notification, Investigation, and Recording Procedure.
- KMSBMS-02-PL5 Emergency Response Plan

2. LEADERSHIP & RESPONSIBILITY

2.1. Commitment & Leadership

KPA recognises the importance of environmental protection and is committed to acting in an environmentally responsible and sustainable manner. Under the *Port Authorities Act 1999*, KPA has a duty to protect the port environment and minimise impacts of port activities on that environment.

KPA is committed to delivering its services and activities in an environmentally sustainable and responsible manner. All KPA workers under the direct control of KPA have a general duty under the *Environmental Protection Act 1986* (WA) to:

- Not cause or allow serious environmental harm or material environmental harm; or
- Intentionally or otherwise, cause pollution or an unreasonable emission from any premises.

The minimum responsibilities and accountabilities for KPA workers are outlined in KPA's port induction. In addition, specific roles will have additional responsibilities detailed in their position descriptions, including to implement operational controls, risk treatment plans, programs, or other administrative controls.

3. PROJECT AND PRODUCT INFORMATION

The KMS Thunderbird Project is located on the Dampier Peninsula within the west Kimberley region of Western Australia approximately 75 km west southwest of Derby and 95 km northeast of Broome. The Thunderbird project area spans both the Shires of Derby-West Kimberley and Broome local government areas. Mineral Sands products will be transported by road to the Port of Derby and Port of Broome for export.

The Project involves the mining and concentration of heavy mineral sands, and the separation of the heavy mineral concentrate into the individual minerals concentrates. Thunderbird will generate a high-quality suite of mineral sands products. These products include zircon and ilmenite products, suitable for manufacturing titanium dioxide pigment or smelting into chloride slag.

KMS received approval from the Environmental Protection Authority (EPA) for the project which is the subject of Ministerial Statement 1080 and subsequent variation approved under section 45C(1)(a) of the *Environmental Protection Act 1986.*

3.1. Product Information

KMS will be exporting up to 1.6Mtpa of mineral sands including the following product types:

- Magnetic concentrate;
- Non-magnetic concentrate; and
- Paramagnetic concentrate.

The product has a low small particle size content, is dense, and has an approximate 5% moisture content and therefore is expected to result in minimal dust emission.

The containers and bags will be loaded with product at the mine, trucked to a laydown, then trucked to KPA Wharf or KMSB for loading directly into the vessel hold.

3.2. Radiation

Radiation Safety (Transport of Radioactive Substances) Regulations 2002 (the Regulations) and the ARPANSA Safe Transport of Radioactive Material Code of Practice 2019 (the Code) apply only to natural materials containing natural radionuclides where the activity concentration of the material exceeds 10 Bq/g.

As the typical sum of natural thorium and uranium in the KMS products is expected to be less than 10 Bq/g, the Regulations and the Code are therefore not expected to be applicable. Furthermore, the product will not require placarding as a radioactive substance for transport (10 Bq/g) under the Code (ARPANSA 2019).

Being above 1 Bq/g, the material will be subject to management under the *Radiation Safety Act 1975* and the *Mines Safety and Inspection Act 1994*.

KMS has strict quality controls in place, including product inspection and radio frequency identification (RFID) tags on each container.

KPA will request confirmation from KMS on an ongoing basis to ensure that their products continue to comply with these specifications. Neither KPA or KMSB will receive mineral sands for export from any other proponent where these criteria are not met, or the product is classified as a Dangerous Good.

3.3. Laydown

Currently KMS has laydowns on KPA port lands, within the prescribed premises boundary. At the laydown containers are handled using reach stackers. The containers could be stacked up to 4-5 high in the laydown area. The product will be trucked from the mine site and stored in the containers at the laydown area awaiting ocean going vessels at either the KPA wharf or KMSB.

3.4. Equipment

KMS expects to have 2,500-3,000 rotating containers in the fleet with empties heading to site whilst full containers are trucked to the laydown area.

The rotating containers are totally sealed with the lids in place, and they have been chosen specifically for the purpose of dust mitigation. The containers are all lidded and will be sealed throughout the duration of transit from mine all the way through to when they are over the ships hold.

Lidar sensors will allow the dump height within the vessel to be adjusted as appropriate, to minimise dust emissions. There will be indicator lights on the rotating spreader to show the height of the stockpile in the hold.

3.5. KMS Operational Plans

KMS will implement the relevant procedures for management of the containers at the mine site and laydown and for transporting.

There will be an inspection process at the mine site to determine if the trailers require washing to comply with load and restraint guidelines / main roads at the mine. Specifically, the loaded containers will be inspected prior to leaving the mine site to ensure that there is no visible product on the outside of the container.

3.6. Proposed Timeframes

KMS anticipate the first shipment of mineral sands to be exported from the Port of Broome in December 2023. The first shipments are planned to be break bulk bags. After this first shipment it is anticipated that the containers will be used for export.

4. PROCESS OVERVIEW

Trucks will transport mineral sands in sealed rotating containers or bulk bags from the mine to the laydown area near the port. The specific area for the laydown is yet to be confirmed.

During vessel visits, trucks will travel between the laydown area and the KPA wharf and KMSB. Truck numbers will be dependent on ship volume e.g. 20,000-60,000 tonnes.

On the KPA wharf, trucks will be doubles (two trailers with one container each) carrying 60 tonnes per trip.

On the KMSB facility, KMSB will look to pre-stage up to 30 rotating containers at the wharf along with trucks travelling between the laydown area and KMSB's wharf. Trucks will be triples to quads (three to four trailers with one container each) carrying 90-120 tonnes per trip.

Containers will be specific rotating containers, lifted by a rotating spreader. The lid will remain closed until the rotating container is directly over the hold, then it will rotate/open, and material contents be discharged into the bulk vessel hold. Once emptied the container will rotate upright and the lid will be closed and the container lowered back onto the truck/wharf.

In summary, the steps involved to load mineral sands from the truck to the vessel include:

- Container to be lifted off the truck using either KPA's or KMSB's MHC;
- The rotating spreader frame fitted to the crane will be lowered onto the container and locked in place;
- The container will be lifted, slewed and lowered into the hold of the ship;
- As the container is lowered into the hold the lid is lifted and the container rotates 180 degrees to empty the contents into the hold;
- Once empty, the container will be rotated upright again inside the hold, lid lowered back into place and then lifted out of the hold; and
- Empty containers are placed on the wharf or directly back onto the truck trailer using the crane or forklift.

For bulk bags, similar to the process with containers, the bags would be loaded at the mine, trucked to the laydown then trucked to the KPA wharf or KMSB. KPA's or KMSB's MHC or ships crane and spreader will be used to lift the bags and load them onto the vessel.

5. ENVIRONMENTAL RISK ASSESSMENT

The identified risks and controls to reduce risks to an acceptable level are listed in the risk register (refer to Table 1). A source-receptor- pathway analysis has also been undertaken (see Table 2).

Table 1: Environment Risk Register for mineral sands export at the Port of Broome

Risk Description	Cause	Resulting In	Consequence Category	Inherent Risk			Controls to be implemented	Residual Risk		
				C	L	R		C	L	R
Release of contaminants in contravention of environmental law	Human error Technical failures Adverse weather	Mineral sands entering the terrestrial or marine environment	-E/H -R&S -R&LC	3	2	6	• Containers / bags will be checked prior to leaving the laydown for integrity and cleanliness • Good housekeeping practices will be maintained on the wharf • Brooms and brushes available on the wharf • Sweeping device to be used for spills and during the loading process to minimise dust • KPA will have dust monitors installed on port lands to monitor dust during loading operations, and to also provide baseline information for the port. • All KPA and KMSB operational employees will be trained in the mineral sands loading process, including the controls outlined in this plan • Rotating containers have lidar sensors and an interlock to prevent accidental release of product	3	1	3
Causing pollution	Human error Technical failures	Pollution entering the marine or terrestrial environment	-E/H -R&S -R&LC	3	2	6	• Good housekeeping • Waste management and minimisation • Rotating containers have lidar sensors and an interlock to prevent accidental release of product • All trucks will be new and are 'Euro 5' rate or higher	3	1	3
Noise	Human error Technical failures Adverse weather	Excessive noise for receptors	-I -E/H -R&S -R&LC	3	2	6	• KPA will monitor noise for 6 months at key locations on port lands from the commencement of the mineral sands project to ascertain if noise regulations are exceeded at receptors • KPA will have a noise monitoring procedure, which includes incident management, complaint management, noise management and plant safety management • Logistics provider using PBS trucks which have lower noise emissions	3	1	3
Contaminated stormwater runoff	Human error Technical failures Adverse weather	Mineral sands entering the marine environment	-E/H -R&S -R&LC	3	2	6	• Good housekeeping practices, including sweeping of any spilled material on the wharf at each load • Containers and bags will be inspected for cleanliness prior to leaving the mine and the laydown yard • Operations will cease during heavy rainfall (see section below on detailed weather procedures) • Rotating containers ensure that there is minimal opportunity for product spillage	3	1	3
Dust	Moisture content of product Human error Equipment failure	Mineral sands emission to air	-E/H -R&S -R&LC	3	2	6	• The product does not have a high small particle content, therefore it is expected to have minimal dust. • Vessel manifest confirmation of moisture content • KPA will have dust monitors installed on port lands to monitor dust during loading operations, and to also provide baseline information for the port.	3	1	3
Waste	Human error Equipment failure	Mineral sands entering the marine environment	-E/H -R&S -R&LC	2	2	4	• There should be minimal waste associated with export, however, in the event of a spill the waste will be collected and appropriately disposed • KPA oversight of port operations to ensure any waste produced is minimised and disposed of appropriately.	2	1	2

Legend: E/H: Environmental / Heritage R&S: Regulatory and Stakeholder impact R&LC Regulatory and legislative compliance I: Injury/Ill health impact

Table 2 Source-Pathway-Receptor Analysis

		Emission risks from prescribed premises				
		Potential Receptors	**Pathway Type**	**Pathway Assessment**	**Potential Impact**	**Controls**
Potential Emission or Discharge Type	**Noise** (from machinery operations and truck movements	• Two residents on port lands • Port Industrial neighbours	Air (wind dispersion). Noise associated with truck movements Noise associated with crane and container unloading at port	Pathway through prevailing winds. Distance to nearest sensitive receptors: Residence: two port residents on port lands approx 1km from the wharf Port Industrial area: port industrial area commences at start of wharf neck approx 600m west from wharf. Marine Environment and Recreational Areas: The Port Beach and Entrance Point foreshore is located at the start of the wharf neck approx 600m from the wharf	Amenity Impacts: • Acoustic modelling has indicated that the mineral sands operation will not result in noise at receptors above the levels specified in the noise regulations • Increase in truck movements during loading resulting in increased noise	• Traffic management plan • PBS trucks used by KMS • Undertake noise monitoring for 6 months once mineral sands commence operations to check the modelling
	Emissions to Air – Dust (from materials handled via rotating container box system	• Two residents on port lands • Fishing Club and Broome Sea Rescue • Port industrial area • Recreational Areas • Marine Environment	Air (wind borne)		Amenity Impacts: Visual dust emissions will be minimal using rotating container technology. Public Health Effects: The product is not classified as hazardous	• Loading via rotating containers • WHS loading procedures for stevedores • Site inspections and audits • Container checking regime at mine and laydown • Hazard and Incident Reporting Procedures • Dust monitors to be installed on port lands
	Discharge to Waters (from contaminated stormwater runoff)	• Marine Environment • Aquaculture	Spillage - Incident related. Air - wind dispersed dust.	Dust settling in or a spill may result in a discharge to the marine environment during Ship loading. Marine environmental values include: Port waters and surrounds: marine environment around the wharf, Roebuck Bay and Yawuru Nagulagun Roebuck Bay Marine Park Seagrass communities: in Roebuck Bay, near slipway approx 600m from wharf Aquaculture: pearling leases in Port Waters and Roebuck bay	Mineral sands is considered insoluble and non-toxic. Potential impact on the marine environment includes: • Temporary and localised increase in suspended solids • Introduction / contamination of mineral sands to marine sediments	• Use of rotating containers for loading • Port of Broome Marine monitoring program which includes water and sediment sampling • Stevedore operational procedures to include response during wet weather • Good housekeeping practices to minimise dust on wharf
		• Stormwater	Spillage –could result in contamination of Berth and stormwater.	Stormwater from wharf entering port waters and the marine environment Mineral sands dust washing off roads and port lands during rainfall and entering marine environment		• Good housekeeping practices on the wharf and clean up include brooms and brushes • Inspection at mine and laydown to ensure containers are clean prior to entering the port
	Discharge to Land (from seepage of contaminated stormwater	• Soil • Groundwater	Product spillage during transport of containers on port lands Dispersed dust from truck transport or accident	Soil contamination is possible as a result of a transport incident or unclean container. Spillage may result in contaminated stormwater discharging to unsealed areas. Seepage to groundwater is considered an unlikely occurrence as mineral sands is insoluble.	Spillage causing introduction / contamination of mineral sands to marine sediments	• Traffic management plan • Trained and competent truck drivers • Hazard and incident response procedures • Containers to be checked prior to leaving mine and laydown area
	Odour	• Workers and community	Proximity to receptors Direct through atmosphere	See sensitive receptors above: residence, fishing club and Broome sea rescue, port industrial area and marine environment.	Amenity Impacts: Product is not anticipated to have a distinct odour	• Container system will minimise time product is exposed to the air • Stevedores will monitor product for odour • Complaints and hazard and incident reporting process

5.1. Weather procedures

Weather conditions are continuously monitored at the Port of Broome. KPA has a subscription to WeatherZone and regularly reviews the Bureau of Meteorology website for weather advice and updates.

Generally wet weather conditions occur during the wet season November – April, however, rain events can occur outside this period.

In the event of wet weather during loading of mineral sands, the following guidelines are in place:

- loading will continue during light showers (off-white to light blue 2.5 mL);
- loading will be suspended during heavy showers (blue and above >4 mL); and
- hatches closed where required during rain events, as advised by the vessel Master.

Table 3: Rainfall Rates (from Bureau of Meteorology)

Level	Colour Description	Approx Rainfall Intensity (mm/hr)
0	Not visible	Under 0.2
1	Off white	0.5
2	Sky blue	1.5
3	Light blue	2.5

Table 4: Radar rainfall colour chart (from Bureau of Meteorology)

Level	Colour		Approx. Rainfall Intensity (mm/hr)
0	clear	Not visible	Under 0.2
1		Off-white	0.5
2		Sky-blue	1.5
3		Light Blue	2.5
4		Blue	4
5		Light Cyan	6
6		Cyan	10
7		Dark Cyan	15
8		Yellow	20
9		Yellow-orange	35
10		Orange	50
11		Orange-red	80
12		Red	120
13		Dark Red	200
14		Maroon	300
15		Dark Brown	over 360

KPA also has procedures for wind and lightning. KPA's operational working limit at the Port of Broome is 25 knots for wind. If 25 knots of wind is reached during mineral sands loading, operations will cease until the wind is below 25 knots. KPA has a lightning alert system that includes working cessation when certain proximity triggers are met.

KPA has a cyclone emergency procedure which includes port closure by the Harbourmaster. In the event a cyclone has developed and is tracking towards Port of Broome, all vessel movements will be monitored and vessels will be directed as required.

5.2. Emergency Response Procedures

KPA has the following procedures related to response and management of incidents and emergencies on the wharf:

- Hazard and Incident Reporting Procedure (REC145904); and
- KPA Emergency Response Procedure (REC203349).

KMSB has the following procedures related to response and management of incidents and emergencies on the KMSB wharf:

- KMSBMS-03-PRO14 Incident Notification, Investigation, and Recording Procedure.
- KMSBMS-02-PL5 Emergency Response Plan

Emergency equipment available on the KPA wharf and KMSB includes:

- KPA has fire hoses and extinguishers;
- first aid equipment including a defibrillator and oxyviva;
- emergency eyewash and showers;
- emergency stretcher and rescue cage;
- spill kits, kitty litter and spill boom; and
- KPA Harbourmaster vessel and KPA port tender.

Potential emergency response scenarios arising from the transport and loading of mineral sands include:

- traffic incident eg truck or forklift collision
    - o controls include a traffic management plan, inducted drivers;
- injured worker eg heat exposure on vessel, hazardous manual task injury
    - o controls include trained and competent employees, fatigue and heat management plan, emergency drill training, PPE, task rotation, work health and safety (WHS) procedures;
- fire eg a truck engine or crane fire
    - o controls include availability of fire equipment on the wharf and truck maintenance, there is a fire suppression system on KPA's MHC; and
- spill eg a fuel spill from equipment or mineral sands spill
    - o controls include brushes and brooms, access to a sweeping device, spill kits and spill boom. Specific procedures relating to a mineral sands spill are detailed below.

5.2.1. Mineral Sands Spill Response

The mineral sand products are dense/heavy in nature, are inert and are insoluble in water. Specific gravity is circa 4-3 to 4.6 and bulk density in 2,400 -2,700 kg/m^3. If there is a spill in the marine environment, the mineral sands is unlikely to float. The rotating container system means that the likelihood of spill on land or the marine environment is much lower than is using conveyors.

If the mineral sands is spilled on the wharf then it will be swept up with brooms and brushes and a mechanical sweeping device if required. As per the safety data sheet, for spill clean up a vacuum will also be available and the product dampened if required.

If there is a significant spill directly to the marine environment, (i.e. a full container falls or empties its contents), KPA will undertake a marine survey to determine the extent of the impact and consult with DWER, or other appropriate regulatory body, to determine the best approach for recovering the material.

5.3. Trained & Competent Operator

KPA will undertake the stevedoring activities for the mineral sands activities at the Port.

KPA is an experienced stevedoring provider with trained and competent workers. Extensive training will be undertaken and relevant WHS procedures developed for the export of mineral sands. Environmental controls and considerations will be incorporated into this training and procedures where required.

KPA stevedores will be overseeing the loading process and will report any environmental concerns such as dust or spills to management.

KMSB intends to utilise the KPA's stevedores for its operations. The stevedores will be overseeing the loading process and will report any environmental concerns such as dust or spills to KMSB.

5.4. Equipment

The rotating container loading methodology will minimise the emissions risk associated with these activities. The containers will be sealed until they are unloaded into the vessel.

The spreader and the rotating containers will have lidar sensing technology that will inform the spreader of when and where to tip.

Mineral sands will be loaded into the containers at the mine and remain in the container until unloaded at the wharf which minimises the risk of dust, and potentially contaminated stormwater run-off.

At times, break bulk bags may be used rather than containers. KPA's bulk bag spreader will be used to lift the bags onto the vessel. The bags will be maximum 2.1 tonnes per bag.

6. ENVIRONMENTAL MONITORING

6.1. Dust Monitoring

KPA has an E-Bam Plus monitor installed on port lands to monitor dust during loading operations, and to also provide continuous PM10 monitoring data to the port.

6.2. Acoustic Monitoring

KPA has completed a cumulative acoustic model of noise on port lands as part of the Part V application process. The acoustic assessment was undertaken for existing port activities as well as the additional services relating to the loading of mineral sands. The assessment concluded that the mineral sands operations did not result in any triggers of the *Environmental Protection (Noise) Regulations 1997*.

6.3. Marine monitoring

KPA undertakes marine monitoring, including water and sediment monitoring as part of its operations. As per KPA's monitoring and incident response process, in the event a trigger above a reporting level was detected, the incident would be investigated to ascertain the source of the trigger. Once the source was identified, appropriate actions would be taken, including implementing additional controls or undertaken remediation or mitigation strategies as required.

KPA's marine monitoring program will be updated to include the KMSB wharf.

6.4. Weather monitoring

Meteorological monitoring of parameters as described in section 5.1 is conducted on a continuous basis at the port.

7. AUDIT AND REVIEW

KPA and KMSB will undertake regular reviews of the respective mineral sands operations at each wharf and update this OEMP if any activities change significantly, or to bring procedures in line with any future approvals.

In addition, an internal audit will be conducted during the first three shipments to ensure that environmental obligations are met and controls are in place. Following this, an internal audit of the operations will be conducted annually.

Appendix B Marine Monitoring

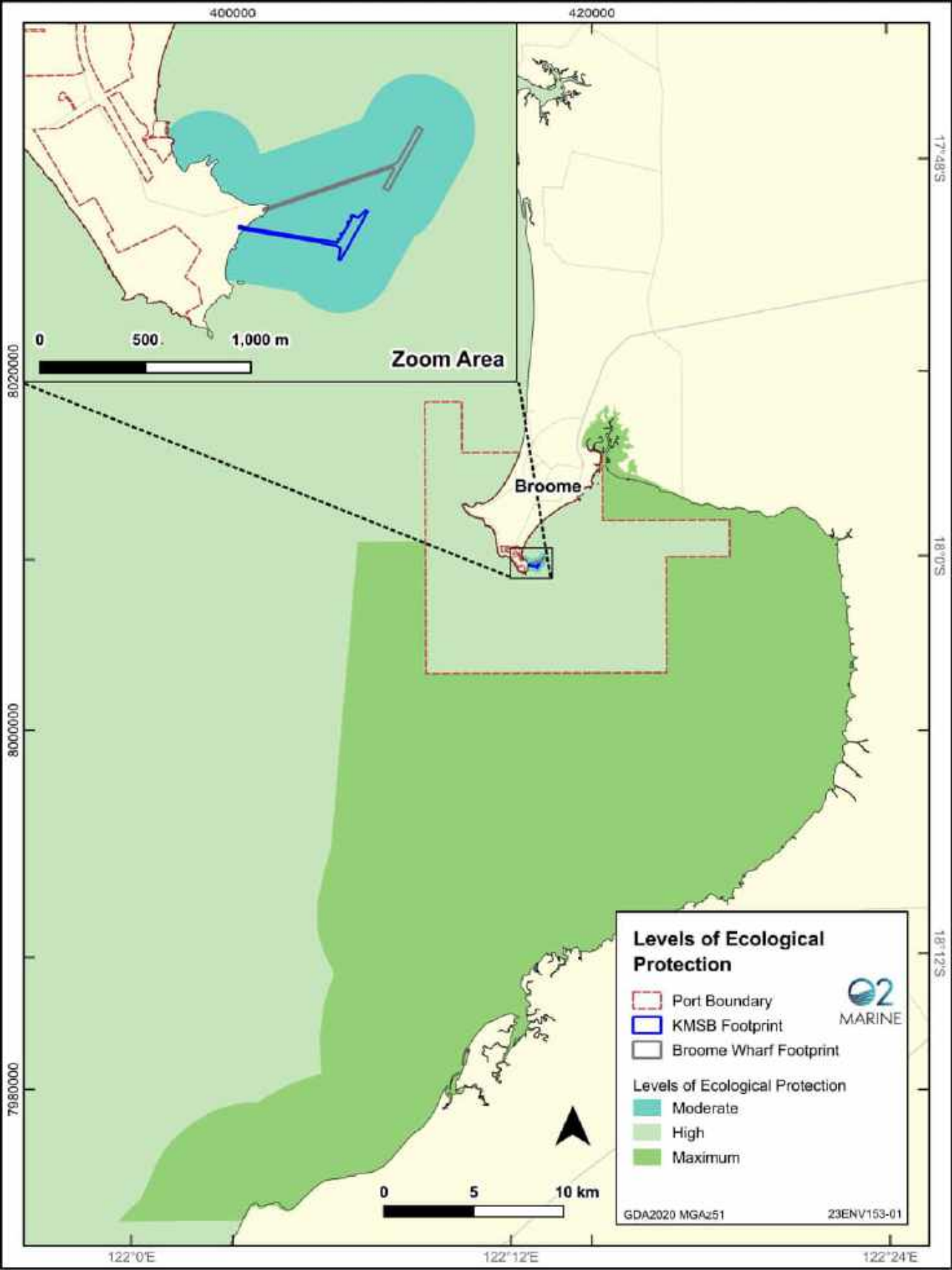
Port of Broome

Licence Amendment Supporting Information

Kimberley Ports Authority

SLR Project No.: 675.072463.00010

1 August 2025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Levels of Ecological Protection
Port Boundary
KMSB Footprint
Broome Wharf Footprint
Levels of Ecological Protection
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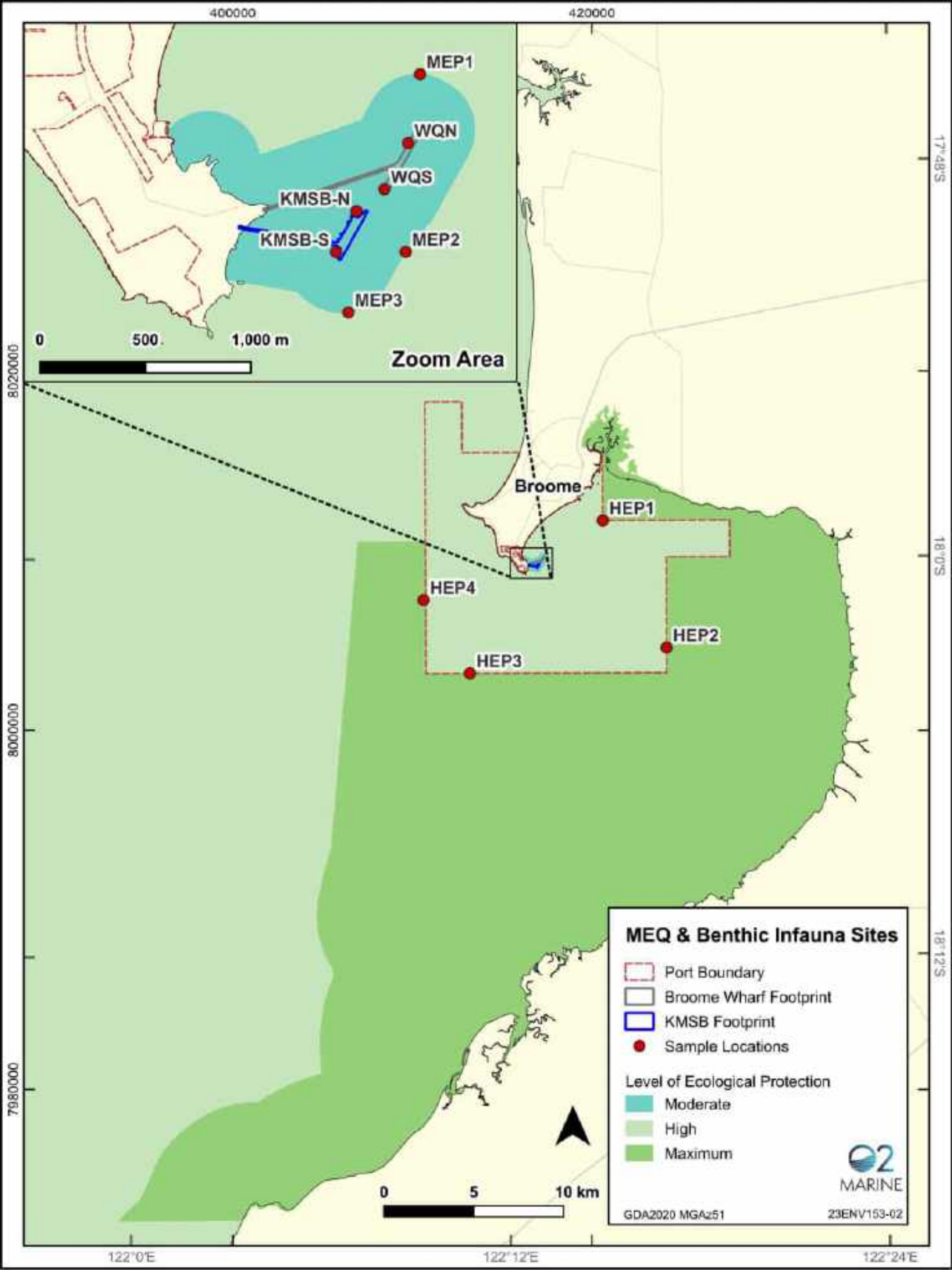
23ENV153-01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18°12'S
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122°12'E
122°24'E
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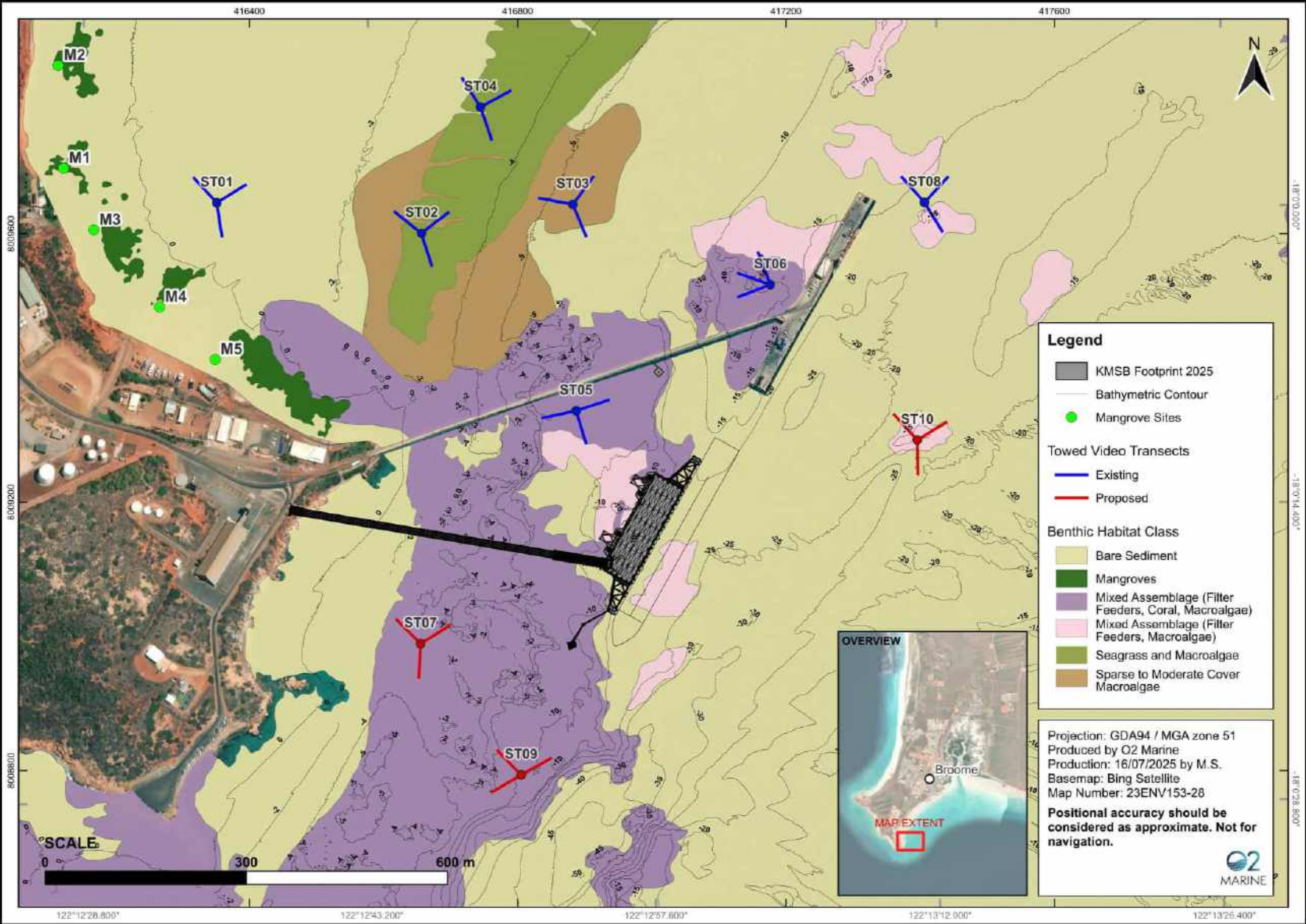
5
10 km
MEQ & Benthic Infauna Sites
Port Boundary
Broome Wharf Footprint
KMSB Footprint
Sample Locations
Level of Ecological Protection
Moderate
High
Maximum
MARINE
GDA2020 MGAz51
23ENV153-02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M3
M4
M5
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ST02
ST03
ST04
ST05
ST06
ST07
ST08
ST09
ST10
Legend
KMSB Footprint 2025
Bathymetric Contour
Mangrove Sites
Towed Video Transects
Existing
Proposed
Benthic Habitat Class
Bare Sediment
Mangroves
Mixed Assemblage (Filter Feeders, Coral, Macroalgae)
Mixed Assemblage (Filter Feeders, Macroalgae)
Seagrass and Macroalgae
Sparse to Moderate Cover Macroalgae
OVERVIEW
Broome
MAP EXTENT
SCALE
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600 m
Projection: GDA94 / MGA zone 51
Produced by O2 Marine
Production: 16/07/2025 by M.S.
Basemap: Bing Satellite
Map Number: 23ENV153-28
Positional accuracy should be considered as approximate. Not for navigation.
O2 MARINE
122°12'28.800"
122°12'43.200"
122°12'57.600"
122°13'12.000"
122°13'26.400"

Appendix C KMSB Acoustic Assessment

Port of Broome

Licence Amendment Supporting Information

Kimberley Ports Authority

SLR Project No.: 675.072463.00010

1 August 2025

Acoustic Assessment

Broome Port – KMSB Wharf

Kimberly Ports Authority

549 Port Drive, Broome WA 6725

Prepared by:

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Level 1, 500 Hay Street, Subiaco WA 6008,
Australia

SLR Report 675.072463.00011-R02

31 July 2025

Revision: 03

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
03	31 July 2025	Paul Drew	A.Woodward	Paul Drew
02	29 July 2025	Paul Drew	A.Woodward	Paul Drew
01	28 July 2025	Paul Drew	A.Woodward	Paul Drew
0	16 July 2025	Paul Drew	Luke Zoontjens	Draft

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Kimberly Ports Authority (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Executive Summary

SLR Consulting Australia Pty Ltd was commissioned by Kimberley Ports Authority to undertake an acoustic assessment of the addition of a new wharf, cumulative with Broome Port operations. This includes authorised mineral sands ship loading in accordance with Works Approval W6852/2023/1.

Site measurement of port operations including ship loading were previously undertaken to capture the significant noise generating activities associated with the port operations, including loading of mineral sands rotainers. Fodder loading was also assessed as this is a significant noise emitting activity and there may be some scenarios of simultaneous operations.

The assessment concludes that based on the monitored operations, noise emissions for all port operations are compliant with the requirements of the *Environmental Protection (Noise) Regulations 1997*.

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Tables

Figures

1.0 Introduction

SLR Consulting Australia Pty Ltd was commissioned by Kimberley Ports Authority to undertake an acoustic assessment of the addition of a new Kimberley marine Support Base (KMSB) wharf, cumulative with Broome Port operations. This includes authorised mineral sands ship loading in accordance with Works Approval W6852/2023/1.

Site measurement of port operations including ship loading were previously undertaken to capture the significant noise generating activities associated with the port operations, including loading of mineral sands rotainers. Fodder loading was also assessed as this is a significant noise emitting activity and there may be some scenarios of simultaneous operations.

2.0 Criteria

2.1 Noise Regulations

The site noise emissions are required to achieve compliance with the *Environmental Protection (Noise) Regulations 1997* (the "Regulations"). Under the Regulations, noise levels at nearby residential areas from development operations must not exceed defined limits (assigned levels). The 'assigned levels' vary with time of day and standard workdays vs holiday periods.

The most critical receptors are termed 'noise sensitive premises' in the Regulations. For the Port of Broome, these are residential receptors, for which the 'assigned levels' are determined from a 'base level' with adjustments for proximity to industrial and commercial land uses, and roads with high traffic flows.

The relevant parameter for assessment of mining noise is the L_{A10} statistical noise level, which is the noise level exceeded for more than 10% of the representative time period. For these receptors, the 'assigned levels' are presented in **Table A**.

Table A: EPNR Table 1 'Assigned Levels'

Type of premises receiving noise	Time of day	Assigned level (dB)		
		$L_{A\ 10}$	$L_{A\ 1}$	$L_{A\ max}$
Noise sensitive premises: highly sensitive area	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80

Type of premises receiving noise	Time of day	Assigned level (dB)		
		$L_{A\,10}$	$L_{A\,1}$	$L_{A\,max}$
Commercial premises	All hours	60	75	80
Industrial and utility premises other than those in the Kwinana Industrial Area	All hours	65	80	90
Industrial and utility premises in the Kwinana Industrial Area	All hours	75	85	90

2.2 Adjustment for Intrusive or Dominant Noise Characteristics

Table B summarises applicable adjustments for intrusive or annoying characteristics.

Table B: Adjustment for Intrusive or Dominant Noise Characteristics

Adjustment where noise emission is not music.			Adjustment where noise emission is music	
Where tonality is present	Where modulation is present	Where impulsiveness is present	Where impulsiveness is not present	Where impulsiveness is present
+5 dB	+5 dB	+10 dB	+10 dB	+15 dB

These adjustments are cumulative to a maximum of 15 dB.

2.3 Exclusions

Regulation 3 of the *Environmental Protection (Noise) Regulations 1997* states that:

> *3.* Regulations do not apply to certain noise emissions
>
> *(1)* *Nothing in these regulations applies to the following noise emissions —*
>
> *(a)* *noise emissions from the propulsion and braking systems of motor vehicles operating on a road;*
>
> *(b)noise emissions from a safety warning device, other than a reversing alarm, fitted to a motor vehicle operating on a road;*
>
> *[..]*
>
> *(i)* *noise emissions from an engine, equipment, machinery or plant on a vessel while the vessel is in a port.*

Regulation 3 (1) (a) excludes the noise from road traffic using gazetted or public accessible roads. Therefore truck movements on these roads are not assessed against the noise regulation 'Assigned Levels'.

Regulation 3 (1) (i) excludes the noise generated by the vessels and cranes mounted on the vessels, including any ventilation fans on livestock vessels.

2.4 Key receptors

Representative residential receptors have been determined for the Port of Broome operations. These receptors are shown in **Figure A**.

Figure A: Residential receptor locations

Additionally, there are several commercial premises throughout the port-controlled area and surrounds. Key commercial / recreational facilities identified in the vicinity of the port are shown in **Figure B**. Receptors R1, R2 and R3 are within port land and are owned by KPA.

A previous acoustic assessment of the Port of Broome operations (675.X5830.00001-R02 Broome Port Acoustic Assessment – 20230807) had identified receptor R1, R2 and R3 as a 'Noise sensitive premises: highly sensitive area'. Since that study, all residents have vacated the houses and R3 has a caretaker in the house. As the caretaker is not employed by KPA, DWER consider R3 a residential use, not a caretaker role as defined in Schedule 1 of the regulations. Receptors R1 & R2 are currently vacant.

Receptors R1, R2 and R3 are heritage buildings on Port of Broome land. The three heritage buildings are expected to be occupied to preserve the buildings and avoid uninvited occupancy. As the occupants could be either employees of KPA or unrelated residents, this assessment considers both scenarios.

It has been confirmed by the Shire of Broome that Receptor R4 is approved as a caretaker dwelling on an industrial lot.

In accordance with Section 8 of Schedule 1 of the regulations, a caretaker's residence has a classification "Industrial and utility premises". Accordingly, the applicable Assigned Level is under this classification in accordance with Table 1 (of the regulations).

The key noise sensitive residential receptors are described in **Table C**.

Table C: Key residential receptors

Sensitive receivers	Description
R1	Heritage residence located within port zoned land.
R2	Heritage occupied residence located within port zoned land
R3	Heritage residence located within port zoned land
R4	Caretaker residence within industrial area
R5	Gun club overflow caravan park (in frequent use)

Figure B: Key commercial / recreational receptor locations

The key commercial receptors surrounding the port are described in **Table D**.

Table D: Key commercial receptors

Sensitive receivers	Description
C1	Fishing Club. Adjacent is also the marine rescue / surf club.
C2	Pearl House. Department of Fisheries and other tenants
C3	Border Force
C4	Tourism and Function Centre
C5	Public lookout / picnic area (not on port land)
C6	Kimberley Training Institute Aquaculture Training and Research Facility
C7	Golf Club buildings

2.5 Receptor assigned levels

The assigned noise levels determined for sensitive receivers adjacent to the site are detailed in **Table E**.

The assigned levels include the influencing factor (IF) derived from the proximity of the receivers to industrial zoned areas. These areas have been identified from the Shire of Broome Local Planning Scheme No. 6.

The Shire of Broome Local Planning Scheme 6 extracted land use zoning is shown in **Figure C**. The grey areas are designated 'Port'. Public use roads have been excluded in the determination of 'influencing factor' as described in Schedule 3 of the Regulations.

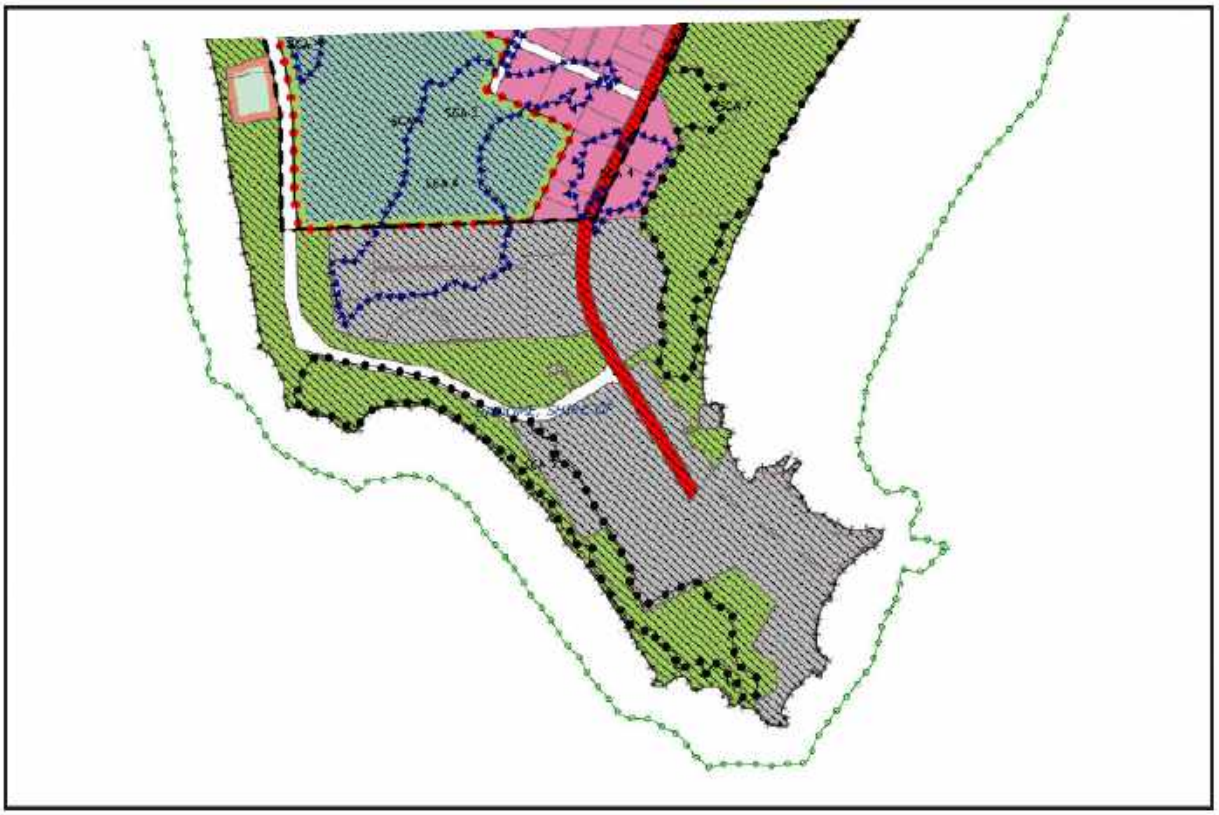
The 'red' major road is also identified as a major road within the PlanWA web site, State Planning Policy 5.4. This categorization means that the road has been assessed for heavy vehicle traffic to the port. Unless the road is 'modified' there is no requirement under State Planning Policy 5.4 to undertake a road traffic noise assessment as the road has been assessed for future traffic flow. New developments within 300m of the roadway already have a requirement to assess and design to mitigate the existing and future road traffic noise.

The roads that lead to the commercial receptors, including the Fishing Club and Pearl House are used by the public and road traffic noise from vehicles using these roads is not assessed against regulation 'Assigned Levels' in accordance with regulation 3.

Road is defined in the 'Road Traffic (Administration) Act 2008', section 4:

> ***road*** *means any highway, road or street open to, or used by, the public and includes every carriageway, footway, reservation, median strip and traffic island on it;*

Figure C: Broome Port LPS6 land use zoning



The key receptors have determined influencing factors shown in **Table E**.

Table E: Assigned levels – key receptors

Sensitive receivers	Influencing Factor, dB	Assigned Levels, L_{A10} dBA		
		Day	Evening	Night
R1 - caretaker	11	56	51	46
R2 (future caretaker)	13	58	53	48
R3 *future caretaker)	13	58	53	48
R1, R2 & R3 – KPA caretaker role	Not applicable as own premises, however Industrial Classification adopted.	65	65	65
R4	11	56	51	46
R5 – Gun Club overflow accommodation	3	48	43	38
R6 – Habitat Resort	3	48	43	38
All commercial	Not applicable	60	60	60

3.0 Methodology

3.1 Measurement

Operational and equipment noise levels were measured on site over the period 17 – 20th March 2024. The site visit was arranged to include a range of wharf activities including livestock and fodder loading (17th) and rig tender and mineral sands rotainer loading (20th).

The noise measurement method included:

- The environmental noise measurements were taken using a calibrated Class 1 sound level meter that met the requirements of Australian Standard *AS/NZS IEC 61672.1:2019 – Electroacoustics – Sound level meter specifications*
- To estimate equipment and operation sound power levels for acoustic modelling, measurements were undertaken at known distances from the noise source over a representative period of operation. Where other equipment was operating in the vicinity, locations were selected to minimise the influence of those noise emissions on the measurement.
- Far-field noise measurements were undertaken and observations made near key receptor locations to ensure that all significant noise sources were identified and included in the assessment. The alignment of shipping schedules limited the opportunity to undertake measurements based on forecast wind conditions.

3.2 Modelling

Modelling of noise from fixed plant and vehicles was undertaken as follows:

- The location of the site was reviewed to identify the nearest noise sensitive receivers from aerial imagery and land-use information. The adopted noise sensitive receivers are detailed in the location maps detailed in Section 2.4 of this report.
- The primary sources of noise were identified from a noise emission survey of current operations at Broome Port.
- Noise prediction models for each site were developed utilising the SoundPLAN noise prediction software (version 8.2). The noise models applied geospatial datasets for existing terrain, buildings and structures and design drawings for the existing and proposed infrastructure at the port.
- Meteorological conditions in line with DWER guidelines, were modelled for downwind propagation of noise. CONCAWE methods for calculating other noise attenuation effects were applied.
- Given the typical terrain covering and to align with local measurements / calibrations, ground was conservatively modelled as 60% hard reflective, with water modelled as 100% hard reflective.
- Environmental noise levels for the existing operations and future operations with the new and upgraded infrastructure were predicted at the identified sensitive receivers.
- The predicted noise levels were assessed against the noise assessment criteria detailed in Section 0.

Sound propagation to the far-field can be increased during the night period in response to thermal gradients in the lower 300m of the air column. The climate of Broome is warmer than the south-west of Western Australia where temperature inversions can be expected. Therefore, temperature inversions and the associated higher sound propagation conditions are less frequent in Broome. However, to be conservative, a Pasquil stability class has been used for acoustic modelling as per DWER guidelines.

Due to night operations being the same activities as during the day, the night ‘worst case’ conditions have been used to model the various scenarios, with the predicted emissions assumed to apply to either day or night. Compliance with the night climatic conditions means that the day situation will also be compliant.

4.0 Measured Noise Sources

Noise levels were measured for a representative range of equipment items and port activities were undertaken during the shiploading operations over the period 17 – 20 March 2024. The measurements captured noise emissions from operational rotainer ship loading activities and additionally, the operation of the wharf fodder loading.

Measurements of the mineral sands laydown area operations were undertaken at a moderate distance (nominal 50m) and the L_{A10} of the measured noise level for an unloading / loading cycle used for assessment. Measurements were also undertaken at 135 m distance, with the calculated sound power derived from each of these measurements being in agreement.

A list of the noise sources and representative sound power levels is provided in **Table F**.

Table F: Noise source representative sound power levels

Item or Operation	Sound Power Level, dBA
Mobile Harbour crane – mineral sands loading	106
Forklift loading empty rotainers onto truck	105
Reach stacker unloading empty rotainers and loading full rotainers, L_{A10} for B-double truck	105
Bulk (liquid) truck travelling on wharf (20 km/hr)	102
Cattle truck/rotainer truck travelling on wharf (accelerating)	106
Walinga Agrivac transporting fodder mix onto ship – line of sight	116
Walinga Agrivac transporting fodder mix onto ship – alignment towards port buildings / residences. Fodder truck body acting as a partial barrier (normal operation).	112

Measurements of the fodder loader at 180 m, taken from an accessible location on the causeway demonstrated a noticeable reduction in tonal characteristic compared to measurements close to the fodder loader. Predicted fodder loading noise emissions at key receptors do not exhibit noise characteristics requiring adjustment under regulation (9).

5.0 Impact Assessment

The Port of Broome operates on a 24-hour 7-day basis, with wharf activity dependent on vessel schedules and for some operations the tidal movements.

5.1 Modelled Scenarios

Acoustic modelling can be used to predict noise emissions for the 'worst case' adverse winds toward receptors. The operating scenarios for the fodder loading and for mineral sands loading were modelled to predict the noise emissions during maximum propagation wind conditions.

The acoustic assessment scenarios are described in **Table G**.

Table G: Port operation scenarios – winds from source to receptor (worst case)

Ref	Scenario	Description
SC1	Bulk mineral sands loading (rotainer) at KMSB Jetty. Rig Tender on KPA wharf.	KMSB Jetty mineral sands loading via Mobile Harbour Crane via rotainers, large forklift loading empty rotainers back on trucks. Rig Tender loading bulk liquid at KPA Jetty. Reach Stacker operating, unloading empty rotainers and loading filled rotainers onto B-double trucks at Laydown 1 & 3. Simultaneous receival of rotainers in Laydown Area 2.
SC2	Bulk mineral sands loading (rotainer) and Rig Tender on KPA wharf. Bulk mineral sands loading on KMSB Jetty.	Wharf mineral sands loading via Mobile Harbour Crane via rotainers, large forklift loading empty rotainers back on trucks. Rig Tender loading bulk liquid. Reach Stacker operating, unloading empty rotainers and loading filled rotainers onto B-double trucks at Laydown 1 & 3. Simultaneous receival of rotainers in Laydown Area 2. KMSB Jetty mineral sands loading via Mobile Harbour Crane via rotainers, large forklift loading empty rotainers back on trucks.
SC3	KPA wharf fodder loading and Rig Tender. Mineral sands loading on KMSB Jetty.	Livestock ship fodder loading on KPA wharf. Rig Tender loading with Mobile Harbour Crane. Loading mineral sands (rotainers) on KMSB Jetty from Laydown Areas 1 & 3.
SC4	KMSB Jetty fodder loading. KPA wharf Rig Tender and mineral sands loading.	Livestock ship fodder loading on KMSB Jetty. Rig Tender loading with Mobile Harbour Crane on KPA wharf, as well as loading mineral sands (rotainers) from Laydown Areas 1 & 3.

The scenario with Laydown Areas 1 & 2 moving rotainers results in less noise emission to key receptors R1-R3 than Scenarios 3 and 4, so has not been modelled to simplify this assessment.

Designated barriers (Appendix A) are incorporated to ensure compliance with the 'Assigned Levels' for the Regulation 'night-time' period for operation of a reach stacker in Laydown Areas 1 and 3. The barriers are not required for operations during the weekday and evening periods if R2/R3 are occupied. This allows for barriers constructed of stacked rotainers to be fully removed or replaced during periods other than the Regulation 'night-time' period. If R1 is occupied then the barriers designated 'Barriers A' should be in place during occupancy during the night-time period, and 'Base Barriers' in place during the day and evening. No specific barriers are required for Laydown Area 3 general cargo unloading or loading activity with trucks and forklift. Refer to Table H and Table I for detail on what barriers are required, dependent on operating scenario and R1 – R3 occupancy status.

The designated barrier for Laydown Area 3 should be on the southern side of any (future) mineral sands rotainer stacking area, allowing for either full or partial use of Laydown Area 3, the remainder could be used for general cargo. The designated barriers are based on rotainers stacked vertically (nominal 2m height per rotainer level, acting as an acoustic barrier).

Normal operations are likely to have more significant stacks of rotainers (typically six high), the worst-case scenarios have been modelled; larger barriers can be expected to reduce noise emissions to some receptors.

Noise propagation at distance can be strongly dependent on wind and temperature, with wind directivity controlling that maximum noise emissions usually only impact receptors in each direction at one time. The acoustic modelling / assessment covers 'worst case'

situations, it can be expected that noise emissions to receptors will be lower for significant periods of time.

The livestock and mineral sands utilise the same berth and wharf turn around space, therefore these will not be concurrent activities on the same wharf or jetty, however the loading of rig tenders may occur at the same time.

5.2 Predicted Emissions

The predicted noise emissions for the modelling scenarios described in **Section 5.1** are shown in **Table H**.

Table H: Predicted noise emissions, Night worst case winds, dBA

Receptor	Night AL	Operational Scenario			
		SC1 –KMSB Mineral Sands 1	SC2 – Mineral Sands KMSB & KPA	SC3 – Mineral Sands KMSB / Fodder Loading KPA	SC4 – Mineral Sands KPA / Fodder Loading KMSB
R1 – Caretaker, base barrier scenario	65	50	50	51	50
R2 – Caretaker, base barrier scenario	65	51	51	51	51
R3 – Caretaker, base barrier scenario	65	50	50	50	50
R1 – No barriers	65	59	59	59	59
R1 – Barrier A	46	45	46	46	46
R2- Barrier C	48	45	45	45	44
R3 – Barrier C	48	47	48	47	46
R4 – Caretaker	65	46	46	43	43
R5 – Gun Club	38	37	39	37	38
R6 – Habitat Resort	38	34	36	35	36
C1 – Fishing Club	60	47	49	50	51
C2 – Border Force	60	50	51	52	52
C3 – Pearl House	60	56	60	58	60
C4 – Function	60	47	49	49	49
C5 – Lookout	60	57	57	57	57
C6 – Aqua Tafe	60	48	48	48	48
C7 – Golf Club	60	32	36	35	38

During the Regulation weekday and evening periods, predicted noise emissions without any designated barriers for Laydown Areas 1 & 3 are shown to be compliant with the 'Assigned Levels' at receptors R2-3. This is demonstrated in Table I.

Table I: Predicted noise emissions, Evening, worst case winds, dBA

Receptor	Night AL	Operational Scenario			
		SC1 –KMSB Minderal Sands 1	SC2 – Mineral Sands KMSB & KPA	SC3 – Mineral Sands KMSB / Fodder Loading KPA	SC4 – Mineral Sands KPA / Fodder Loading KMSB
R1 – Caretaker, base barrier scenario	65	50	50	51	50
R2 – Caretaker, base barrier scenario	65	51	51	51	51
R3 – Caretaker, base barrier scenario	65	50	50	50	50
R1 – No barriers	65	59	59	59	59
R1 – Barrier A & C	51	45	46	46	46
R2 – Barrier C	53	45	45	45	44
R3 – Barrier C	53	47	48	47	46
R4 – Caretaker	65	46	46	43	43
R5 – Gun Club	43	37	39	37	38
R6 – Habit Resort	43	34	36	35	36
C1 – Fishing Club	60	47	49	50	51
C2 – Border Force	60	50	51	52	52
C3 – Pearl House	60	56	60	58	60
C4 – Function	60	47	49	49	49
C5 – Lookout	60	57	57	57	57
C6 – Aqua Tafe	60	50	50	50	50
C7 – Golf Club	60	32	36	35	38

5.3 Discussion

The nighttime noise emissions are the most critical for the port operations, due to lower 'assigned levels' during this time period for residential receptors.

Acoustic modelling based on measured operational noise emissions has been used for assessment, due to the difficulty in finding 'worst case' wind conditions which align with the ship loading schedule.

Noise emissions from the laydown areas are most significant during ship loading due to the rate of loading. The noise sources are B-double trucks moving at low speed within the laydown area, which stop at idle to be loaded by the Reach Stacker. The Reach Stacker noise is the dominant noise source; it was generally observed to be stationary during truck movement on site.

Compliant noise emissions for the Regulation 'night-time' period for operation of a reach stacker in either or both Laydown Areas 1 and 3 is achieved providing specific acoustic barriers are in place. The extent of the required acoustic barriers are detailed in Appendix A. These are based a single row of rotainers stacked vertically (nominally, 2 m per rotainer). No barrier is required for normal general cargo operations within Laydown Area 3.

The noise emissions for each of the Laydown areas are shown in **Appendix A** and in **Table H**. The noise emissions are compliant with the regulation 'Assigned Levels' at all times.

Base Barrier and Barrier A are for mitigation of noise to receptor R1. Barrier B also contributes to control of noise to R1 from Laydown Area 3. Barrier B and Barrier C options are to control noise to receptors R2 / R3 if occupied by a resident, as per scenarios outlined in Table H.

In summary, the barriers required for compliance are:

- R1 – Caretake under regulations – Base Barrier recommended.
- R1 – residential use with reach stacker on Laydown 1 (or 3) at night – Barrier A (Base Barrier weekday / evening)
- R2 &/or R3 – residential use with reach stacker Laydown 1 at night – Barrier B
- R2 &/or R3 – residential use with reach stacker Laydown 1 & 3 at night – Barrier C

The difference between the R1 Base Barrier and Barrier A is an increased height of barriers and closure of gap on the western side.

6.0 Conclusion

Assessment of noise emissions for the Port of Broome operations, including mineral sands ship loading concurrent at both the KMSB Jetty and the KPA wharf and scenarios including fodder loading was undertaken. This covers the potential highest noise emission scenarios. Regulation 'night-time' operation of reach stackers within Laydown Areas 1 & 3 are assessed with specified noise barriers in place, as detailed in this Appendix A of this report.

The predicted emissions are shown to be compliant with the requirements of the *Environmental Protection (Noise) Regulations 1997*.

Appendix A Designated Barriers

Acoustic Assessment

Broome Port – KMSB Wharf

Kimberly Ports Authority

SLR Report 675.072463.00011-R02

31 July 2025

Figure D: Designated Base Barriers (3 rotainers high, 6m) for Noise Mitigation Day / Evening – R1

Reach Stacker on Laydown Area 1, General Cargo on Laydown Area 3

Figure E: Designated Barriers A: (4/5 rotainers high,8/10m) for Noise Mitigation at Night to R1

Reach Stacker on Laydown Area 1– General Cargo on Laydown Area 3

Figure F: Designated Barriers B: (3 rotainers high, 6m) for Noise Mitigation at Night to R2 / R3

Reach Stacker on Laydown Area 1, General Cargo on Laydown Area 3

Appendix B Noise Contours

Acoustic Assessment

Broome Port – KMSB Wharf

Kimberly Ports Authority

SLR Report 675.072463.00011-R02

31 July 2025

Figure G: Scenario SC1 noise contours – KMSB Mineral Sands Loading: Barriers C

Figure H: Scenario SC1 noise contours – KMSB Mineral Sands Loading (Key Receptor Area): Barriers C

Figure I: Scenario SC2 noise contours – KMSB and KPA Mineral Sands Loading: Barriers C

Figure J: Scenario SC1 noise contours – KMSB and KPA Mineral Sands Loading (Key Receptor Area): Barriers C

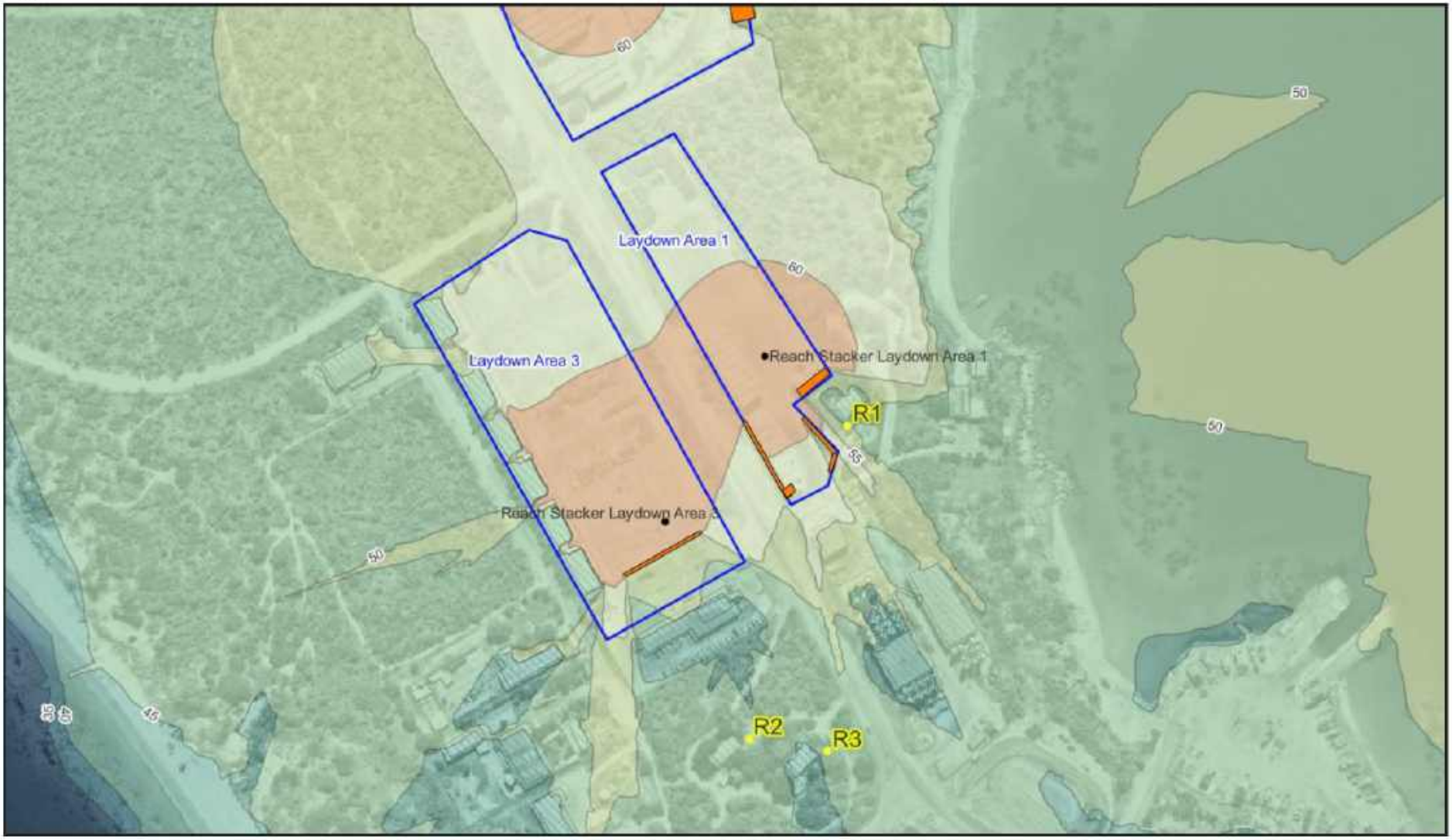


Figure K: Scenario SC3 noise contours – KMSB Mineral Sands Loading / KPA Fodder Loading: Barriers C

Figure L: Scenario SC3 noise contours – KMSB Mineral Sands Loading / KPA Fodder Loading (Key Receptor Area): Barriers C

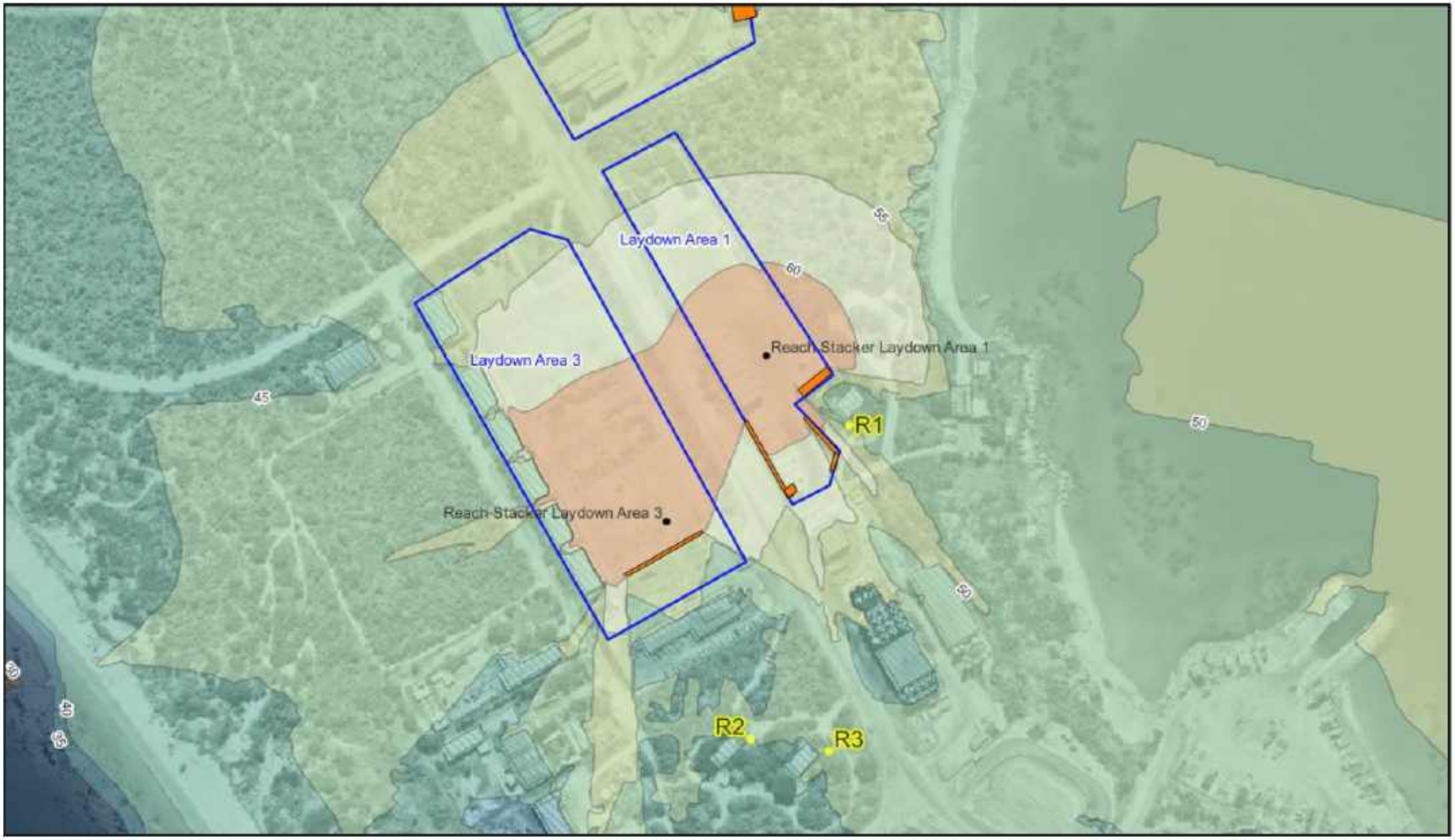
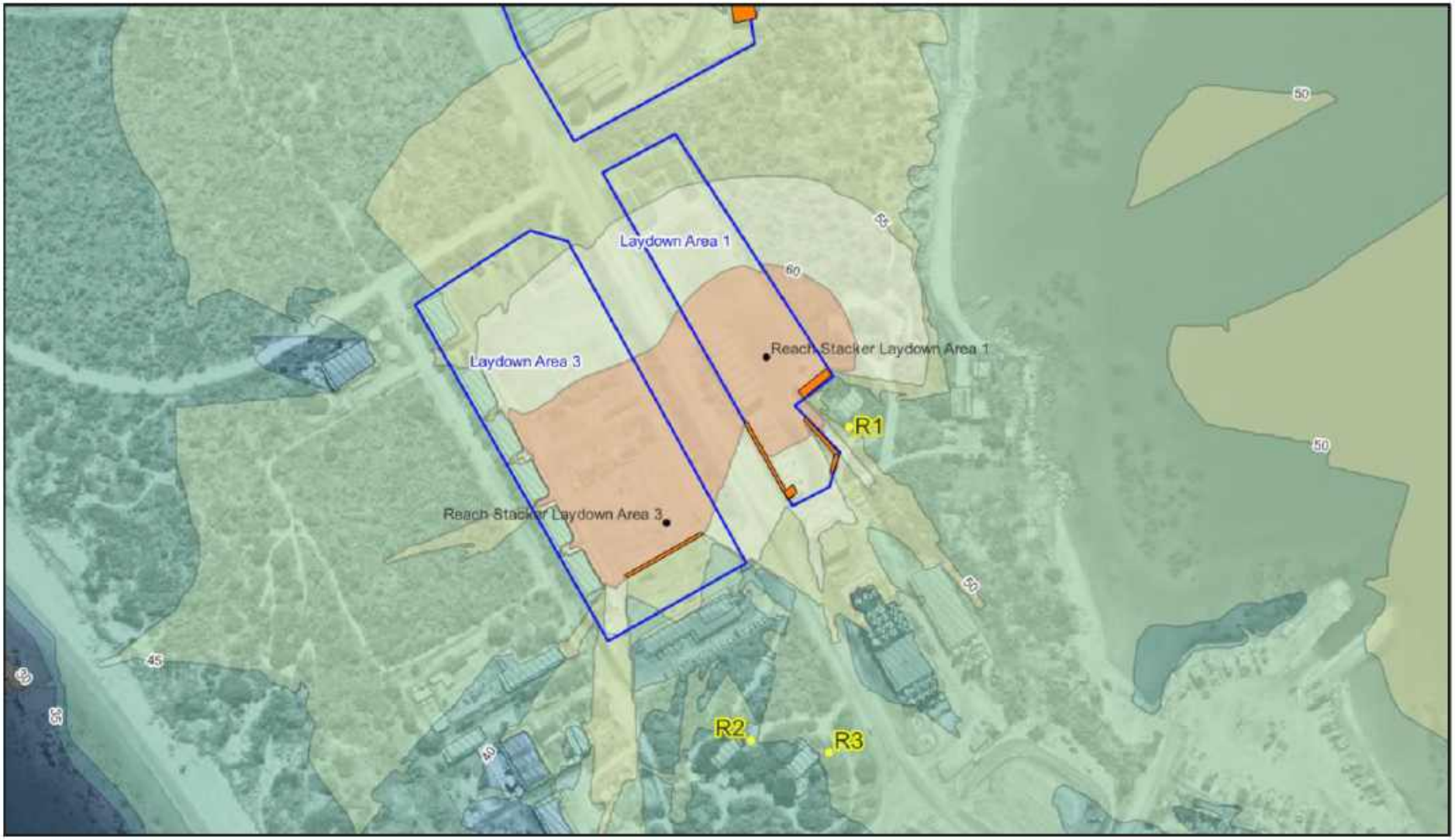
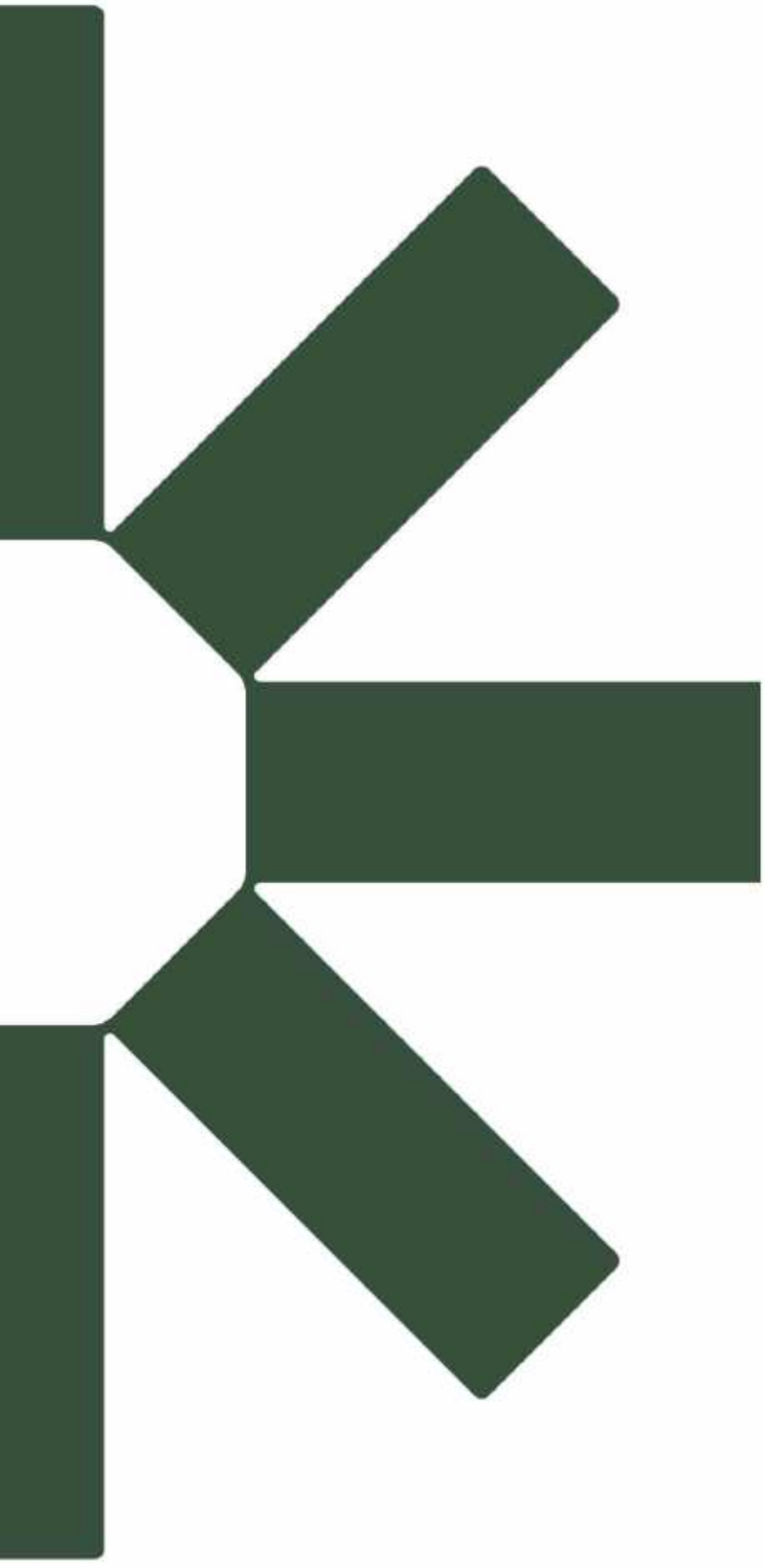


Figure M: Scenario SC4 noise contours – KPA Mineral Sands Loading / KMSB Fodder Loading: Barriers C

Figure N: Scenario SC4 noise contours – KPA Mineral Sands Loading / KMSB Fodder Loading (Key Receptor Area): Barriers C





Making Sustainability Happen

Appendix D KPA Operational Acoustic Assessment

Port of Broome

Licence Amendment Supporting Information

Kimberley Ports Authority

SLR Project No.: 675.072463.00010

1 August 2025

Acoustic Assessment

Broome Port

Kimberly Ports Authority

549 Port Drive, Broome WA 6725

Prepared by:

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SLR Report 675.072463.00003.R01

31 July 2025

Revision: 04

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
04	31 July 2025	Paul Drew	A. Woodward	Paul Drew
03	29 July 2025	Paul Drew	A. Woodward	Paul Drew
02	28 July 2025	Paul Drew	A. Woodward	Paul Drew
01	16 July 2025	Paul Drew	Luke Zoontjens	Draft
0	21 June 2024	Paul Drew	A. Woodward	Paul Drew

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Kimberly Ports Authority (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Executive Summary

SLR Consulting Australia Pty Ltd was commissioned by Kimberley Ports Authority to undertake an acoustic assessment of the Broome Port operations during the Time Limited Operations period for authorised mineral sands ship loading in accordance with Works Approval W6852/2023/1.

The Works Approval requirement is for a qualified acoustic consultant to investigate the nature and extent of noise emissions from the premises and report against the relevant Assigned Levels specified in the noise regulations.

Site measurement of port operations including ship loading were undertaken to capture the previously identified significant noise generating activities associated with the port operations, including loading of mineral sands rotainers. Fodder loading was also assessed as removal of buildings on the wharf to facilitate mineral sands loading had potential to reduce barrier attenuation of the fodder loader and cause excessive noise emission to some receptors.

Assigned Levels applicable to internal receptors have been reviewed, with appropriate measures to ensure compliance incorporated.

The assessment concludes that based on the monitored operations, noise emissions for all port operations are compliant with the requirements of the *Environmental Protection (Noise) Regulations 1997*.

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Tables

Figures

1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR) was commissioned by Kimberley Ports Authority (KPA) to undertake an acoustic assessment of the Broome Port operations during the Time Limited Operation period for authorised mineral sands ship loading in accordance with Works Approval W6852/2023/1.

The Works Approval requirement to cover Conditions 13-16 is for a qualified acoustic consultant to investigate the nature and extent of noise emissions from the premises and report against the relevant Assigned Levels specified in the noise regulations.

Site measurement of port operations including ship loading were undertaken to capture the previously identified significant noise generating activities associated with the port operations, including loading of mineral sands rotainers. Fodder loading was also assessed as removal of buildings on the wharf to facilitate mineral sands loading had potential to reduce barrier attenuation of the fodder loader and cause excessive noise emission to some receptors.

Assigned Levels applicable to internal receptors have been reviewed and adjusted, with appropriate measures to ensure compliance incorporated.

2.0 Criteria

2.1 Noise Regulations

The site noise emissions are required to achieve compliance with the *Environmental Protection (Noise) Regulations 1997* (the "Regulations"). Under the Regulations, noise levels at nearby residential areas from development operations must not exceed defined limits (assigned levels). The 'assigned levels' vary with time of day and standard workdays vs holiday periods.

The most critical receptors are termed 'noise sensitive premises' in the Regulations. For the Port of Broome, these are residential receptors, for which the 'assigned levels' are determined from a 'base level' with adjustments for proximity to industrial and commercial land uses, and roads with high traffic flows.

The relevant parameter for assessment of mining noise is the L_{A10} statistical noise level, the noise level exceeded from greater than 10% of the representative time period. For these receptors, the 'assigned levels' are presented in **Table A**.

Table A: EPNR Table 1 'Assigned Levels'

Type of premises receiving noise	Time of day	Assigned level (dB)		
		$L_{A\,10}$	$L_{A\,1}$	$L_{A\,max}$
Noise sensitive premises: highly sensitive area	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor

Type of premises receiving noise	Time of day	Assigned level (dB)		
		$L_{A\,10}$	$L_{A\,1}$	$L_{A\,max}$
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premises other than those in the Kwinana Industrial Area	All hours	65	80	90
Industrial and utility premises in the Kwinana Industrial Area	All hours	75	85	90

2.2 Adjustment for Intrusive or Dominant Noise Characteristics

Table B summarises applicable adjustments for intrusive or annoying characteristics.

Table B: Adjustment for Intrusive or Dominant Noise Characteristics

Adjustment where noise emission is not music.			Adjustment where noise emission is music	
Where tonality is present	Where modulation is present	Where impulsiveness is present	Where impulsiveness is not present	Where impulsiveness is present
+5 dB	+5 dB	+10 dB	+10 dB	+15 dB

These adjustments are cumulative to a maximum of 15 dB.

2.3 Exclusions

Regulation 3 of the *Environmental Protection (Noise) Regulations 1997* states that:

> 3. Regulations do not apply to certain noise emissions
>
> *(1) Nothing in these regulations applies to the following noise emissions —*
>
> *(a) noise emissions from the propulsion and braking systems of motor vehicles operating on a road;*
>
> *(b) noise emissions from a safety warning device, other than a reversing alarm, fitted to a motor vehicle operating on a road;*
>
> *[..]*
>
> *(i) noise emissions from an engine, equipment, machinery or plant on a vessel while the vessel is in a port.*

Regulation 3 (1) (a) excludes the noise from road traffic using gazetted or public accessible roads. Therefore truck movements on these roads are not assessed against the noise regulation 'Assigned Levels'.

Regulation 3 (1) (i) excludes the noise generated by the vessels and cranes mounted on the vessels, including any ventilation fans on livestock vessels.

2.4 Key receptors

Representative residential receptors have been determined for the Port of Broome operations. These receptors are shown in **Figure A**.

Figure A: Residential receptor locations

Additionally, there are a number of commercial premises throughout the port-controlled area and surrounds. Key commercial / recreational facilities identified in the vicinity of the port are shown in **Figure B**. Receptors R1, R2 and R3 are within port land and are owned by KPA.

A previous acoustic assessment of the Port of Broome operations (675.X5830.00001-R02 Broome Port Acoustic Assessment – 20230807) had identified receptor R1, R2 and R3 as a 'Noise sensitive premises: highly sensitive area'. Since that study, all residents have vacated the houses and R3 has a caretaker in the house. As the caretaker is not employed by KPA, DWER consider R3 a residential use, not a caretaker role as defined in Schedule 1 of the regulations. Receptors R1 & R2 are currently vacant.

Receptors R1, R2 and R3 are heritage buildings on Port of Broome land. The three heritage buildings are expected to be occupied to preserve the buildings and avoid uninvited occupancy. As the occupants could be either employees of KPA or unrelated residents, this assessment considers both scenarios.

It has been confirmed by the Shire of Broome that Receptor R4 is approved as caretaker dwelling on an industrial lot.

In accordance with Section 8 of Schedule 1 of the regulations, a caretaker's residence has a classification "Industrial and utility premises". Accordingly, the applicable Assigned Level is under this classification in accordance with Table 1 (of the regulations).

The key noise sensitive residential receptors are described in **Table C**.

Table C: Key residential receptors

Sensitive receivers	Description
R1	Heritage residence located within port zoned land.
R2	Heritage occupied residence located within port zoned land
R3	Heritage residence located within port zoned land
R4	Caretaker residence within industrial area
R5	Gun club overflow caravan park (in frequent use)

Figure B: Key commercial / recreational receptor locations

The key commercial receptors surrounding the port are described in **Table D**.

Table D: Key commercial receptors

Sensitive receivers	Description
C1	Fishing Club. Adjacent is also the marine rescue / surf club.
C2	Pearl House. Department of Fisheries and other tenants
C3	Border Force
C4	Tourism and Function Centre
C5	Public lookout / picnic area (not on port land)
C6	Kimberley Training Institute Aquaculture Training and Research Facility
C7	Golf Club buildings

2.5 Receptor assigned levels

The assigned noise levels determined for sensitive receivers adjacent to the site are detailed in **Table E**.

The assigned levels include the influencing factor (IF) derived from the proximity of the receivers to industrial zoned areas. These areas have been identified from the Shire of Broome Local Planning Scheme No. 6.

The Shire of Broome Local Planning Scheme 6 extracted land use zoning is shown in **Figure C**. The grey areas are designated 'Port'. Public use roads have been excluded in the determination of 'influencing factor' as described in Schedule 3 of the Regulations.

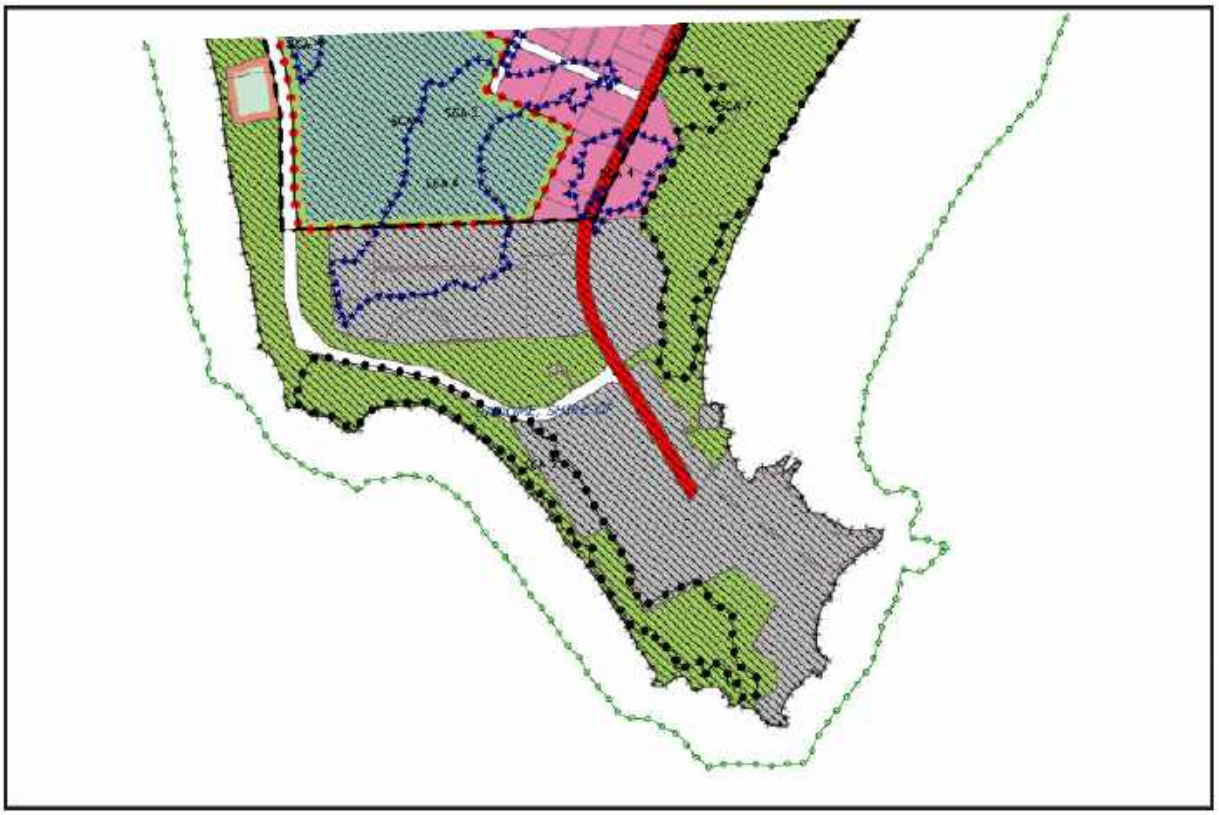
The 'red' major road is also identified as a major road within the PlanWA web site, State Planning Policy 5.4. This categorization means that the road has been assessed for heavy vehicle traffic to the port. Unless the road is 'modified' there is no requirement under State Planning Policy 5.4 to undertake a road traffic noise assessment as the road has been assessed for future traffic flow. New developments within 300m of the roadway already have a requirement to assess and design to mitigate the existing and future road traffic noise.

The roads that lead to the commercial receptors, including the Fishing Club and Pearl House are used by the public and road traffic noise from vehicles using these roads is not assessed against regulation 'Assigned Levels' in accordance with regulation 3.

Road is defined in the 'Road Traffic (Administration) Act 2008', section 4:

> ***road*** *means any highway, road or street open to, or used by, the public and includes every carriageway, footway, reservation, median strip and traffic island on it;*

Figure C: Broome Port LPS6 land use zoning



The key receptors have determined influencing factors shown in **Table E**.

Table E: Assigned levels – key receptors

Sensitive receivers	Influencing Factor, dB	Assigned Levels, L_{A10} dBA		
		Day	Evening	Night
R1	11	56	51	46
R2	13	58	53	48
R3	13	58	53	48
R1, R2 & R3 – KPA caretaker role	Not applicable as own premises, however Industrial Classification adopted.	65	65	65
R4	11	56	51	46
R5 – Gun Club overflow accommodation	3	48	43	38
R6 – Habitat Resort	3	48	43	38
All commercial	Not applicable	60	60	60

3.0 Methodology

3.1 Measurement

Operational and equipment noise levels were measured on site over the period 17 – 20th March 2024. The site visit was arranged to include a range of wharf activities including livestock and fodder loading (17th) and rig tender and mineral sands rotainer loading (20th).

The noise measurement method included:

- The environmental noise measurements were taken using a calibrated Class 1 sound level meter that met the requirements of Australian Standard *AS/NZS IEC 61672.1:2019 – Electroacoustics – Sound level meter specifications*
- To estimate equipment and operation sound power levels for acoustic modelling, measurements were undertaken at known distances from the noise source over a representative period of operation. Where other equipment was operating in the vicinity, locations were selected to minimise the influence of those noise emissions on the measurement.
- Far-field noise measurements were undertaken and observations made near key receptor locations to ensure that all significant noise sources were identified and included in the assessment. The alignment of shipping schedules limited the opportunity to undertake measurements based on forecast wind conditions.

3.2 Modelling

Modelling of noise from fixed plant and vehicles was undertaken as follows:

- The location of the site was reviewed to identify the nearest noise sensitive receivers from aerial imagery and land-use information. The adopted noise sensitive receivers are detailed in the location maps detailed in Section 2.4 of this report.
- The primary sources of noise were identified from a noise emission survey of current operations at Broome Port.
- Noise prediction models for each site were developed utilising the SoundPLAN noise prediction software (version 8.2). The noise models applied geospatial datasets for existing terrain, buildings and structures and design drawings for the existing and proposed infrastructure at the port.
- Meteorological conditions in line with DWER guidelines, were modelled for downwind propagation of noise. CONCAWE methods for calculating other noise attenuation effects were applied.
- Given the typical terrain covering and to align with local measurements / calibrations, ground was conservatively modelled as 60% hard reflective, with water modelled as 100% hard reflective.
- Environmental noise levels for the existing operations and future operations with the new and upgraded infrastructure were predicted at the identified sensitive receivers.
- The predicted noise levels were assessed against the noise assessment criteria detailed in Section 2.5.

Sound propagation to the far-field can be increased during the night period in response to thermal gradients in the lower 300m of the air column. The climate of Broome is warmer than the south-west of Western Australia where temperature inversions can be expected. Therefore, temperature inversions and the associated higher sound propagation conditions

are less frequent in Broome. However, to be conservative, a Pasquil stability class has been used for acoustic modelling as per DWER guidelines.

Due to night operations being the same activities as during the day, the night 'worst case' conditions have been used to model the various scenarios, with the predicted emissions assumed to apply to either day or night. Compliance with the night climatic conditions means that the day situation will also be compliant.

4.0 Measured Noise Sources

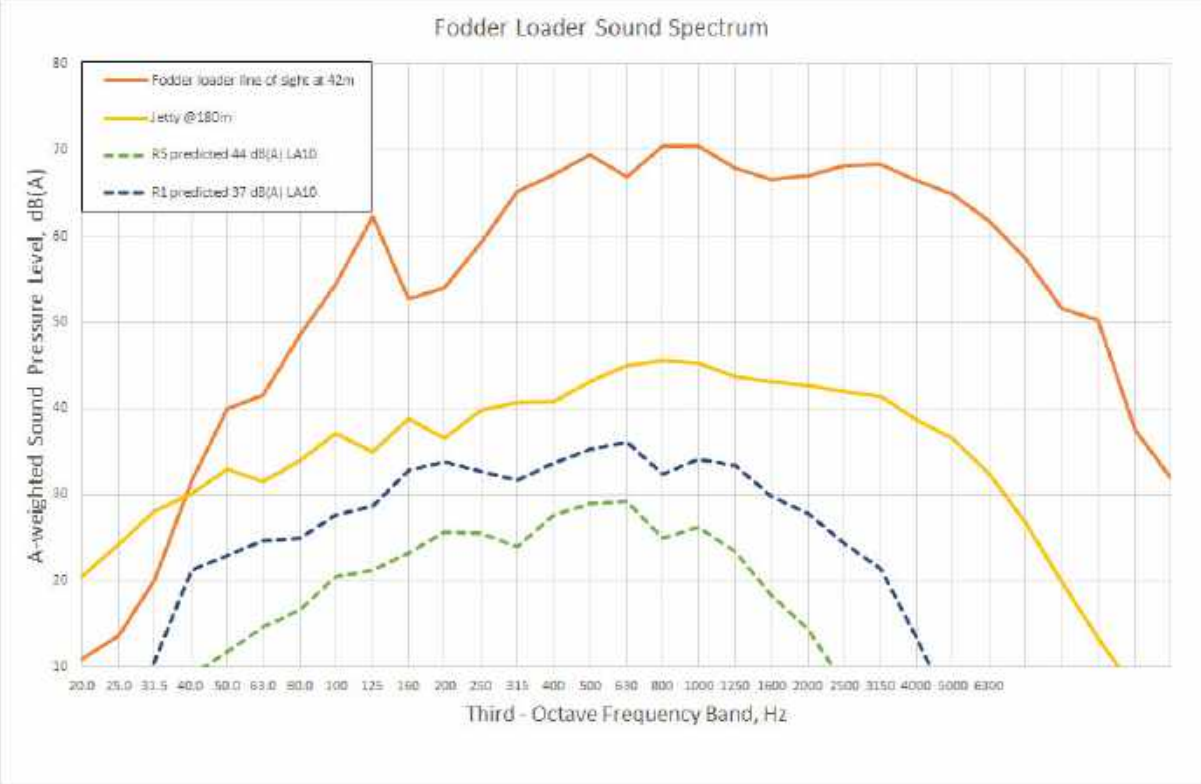
Noise levels were measured for a representative range of equipment items and port activities were undertaken during the ship loading operations over the period 17 – 20 March 2024. The measurements captured noise emissions from operational rotainer ship loading activities and additionally, the operation of the wharf fodder loading. A list of the noise sources and representative sound power levels is provided in **Table F**.

Table F: Noise source representative sound power levels

Item or Operation	Sound Power Level, dBA
Mobile Harbour crane – mineral sands loading	106
Forklift loading empty rotainers onto truck	105
Reach stacker unloading empty rotainers and loading full rotainers, L_{A10} for B-double truck	105
Bulk (liquid) truck travelling on wharf (20 km/hr)	102
Cattle truck/rotainer truck travelling on wharf (accelerating)	106
Walinga Agrivac transporting fodder mix onto ship – line of sight	116
Walinga Agrivac transporting fodder mix onto ship – alignment towards port buildings / residences. Fodder truck body acting as a partial barrier (normal operation).	112

Measurements of the fodder loader at 180 m, taken from an accessible location on the causeway demonstrated a noticeable reduction in tonal characteristic compared to measurements close to the fodder loader. Predicted fodder loading noise emissions at key receptors do not exhibit noise characteristics requiring adjustment under regulation (9).

Figure D: Fodder loader frequency spectrum, dBA



5.0 Impact Assessment

The Port of Broome operates on a 24-hour 7-day basis, with wharf activity dependent on vessel schedules and for some operations the tidal movements.

5.1 Modelled Scenarios

Noise levels were measured at locations near the operating equipment. During fodder loading on the early afternoon of the 17 March 2024, winds tended from the north-west, away from the nearest residences on Port land. During rotainer loading on the early afternoon of the 20 March 2024, winds tended from the SSW, not directly towards the nearest residences.

Acoustic modelling can be used to predict noise emissions for the ‘worst case’ adverse winds toward receptors. The operating scenarios for the fodder loading and for mineral sands loading were modelled to predict the noise emissions during maximum propagation wind conditions.

The acoustic assessment scenarios are described in **Table G**.

Table G: Port operation scenarios – winds from source to receptor (worst case)

Ref	Scenario	Description
A	Fodder loading and Rig Tender. Mineral sands receival from mine, Laydown Area 1. Cargo handling in Area 3.	Livestock ship fodder loading with average of one truck travelling on causeway. Fodder loaded with Walinga Agrivac engine powered blower on south side of wharf with feed truck aligned to partially barrier the fodder loader (normal arrangement). Rig Tender loading with Mobile Harbour Crane & truck travel on causeway. Mineral Sands receival from mine, to Laydown Area 1. Cargo handling in Area 3.
B	Bulk mineral sands loading (rotainer) from Laydown 1 & 2 and Rig Tender on wharf. General cargo receival in Laydown Area 3.	Wharf mineral sands loading via Mobile Harbour Crane via rotainers, large forklift loading empty rotainers back on trucks. Rig Tender loading bulk liquid. Reach Stacker operating, unloading empty rotainers and loading filled rotainers onto B-double trucks at Laydown 1 & 2. Simultaneous receival of general cargo in Laydown Area 3 with truck and forklift.
C	Bulk mineral sands loading (rotainer) from Laydown 1 & 2 and Rig Tender on wharf. Mineral sands receival in Laydown Area 3.	Wharf mineral sands loading via Mobile Harbour Crane via rotainers, large forklift loading empty rotainers back on trucks. Rig Tender loading bulk liquid. Reach Stacker operating, unloading empty rotainers and loading filled rotainers onto B-double trucks at Laydown 1 & 2. Simultaneous receival of mineral sands in Laydown Area 3 with Reach Stacker. This scenario is unlikely to occur very often, however there are different grades of mineral sands product so trucks coming from the mine may not unload directly to ship.

Designated barriers (Appendix A) are incorporated to ensure compliance with the 'Assigned Levels' for the Regulation 'night-time' period for operation of a reach stacker in Laydown Areas 1 and 3. The barriers are not required for operations during the weekday and evening periods if R2/R3 are occupied. This allows for barriers constructed of stacked rotainers to be fully removed or replaced during periods other than the Regulation 'night-time' period. If R1 is occupied then the barriers designated 'Barriers A' should be in place during occupancy during the night-time period, and 'Base Barriers' in place during the day and evening. No specific barriers are required for Laydown Area 3 general cargo unloading or loading activity with trucks and forklift.

The designated barrier for Laydown Area 3 should be on the southern side of any (future) mineral sands rotainer stacking area, allowing for either full or partial use of Laydown Area 3, the remainder could be used for general cargo. The designated barriers are based on three rotainers stacked vertically (nominal 6m acoustic barrier).

Normal operations are likely to have more significant stacks of rotainers (typically six high), the worst-case scenarios have been modelled, larger barriers can be expected to reduce noise emissions to some receptors.

Noise propagation at distance can be strongly dependent on wind and temperature, with wind directivity controlling that maximum noise emissions usually only impact receptors in each direction at one time. The acoustic modelling / assessment covers 'worst case' situations, it can be expected that noise emissions to receptors will be lower for significant periods of time.

The livestock and mineral sands utilise the same berth and wharf turn around space, therefore these will not be concurrent activities, however the loading of rig tenders may occur at the same time.

5.2 Predicted Emissions

The predicted noise emissions for the modelling scenarios described in **Section 5.1** are shown in **Table H**.

Table H: Predicted noise emissions, Night worst case winds, dBA

Receptor	Night AL	Operational Scenario		
		A – Fodder Loading, Mineral Sands Stacking Laydown 1	B – Mineral Sands Loading Laydown 1 & 2	C – Mineral Sands Loading Laydown 1 - 3
R1 – Caretaker, base barrier scenario	65	50	51	51
R2 – Caretaker, base barrier scenario	65	49	51	51
R3 – Caretaker, base barrier scenario	65	49	50	50
R1 – No barriers	65	59	59	59
R1 – Barrier A	46	45	45	46
R2- Barrier B	48	46	44	NA
R3 – Barrier B	48	45	46	NA
R2- Barrier C	48	NA	NA	45
R3 – Barrier C	48	NA	NA	47
R4 – Caretaker	65	42	46	46
R5 – Gun Club	38	37	38	38
R6 – Habit Resort	38	34	36	36
C1 – Fishing Club	60	45	45	45
C2 – Border Force	60	47	47	47
C3 – Pearl House	60	59	59	59
C4 – Function	60	47	47	47
C5 – Lookout	60	56	57	57
C6 – Aqua Tafe	60	49	48	48
C7 – Golf Club	60	35	35	35

During the Regulation weekday and evening periods, predicted noise emissions without any designated barriers for Laydown Areas 1 & 3 are shown to be compliant with the 'Assigned Levels'. This is demonstrated in Table I.

Table I: Predicted noise emissions, Evening, worst case winds, dBA

Receptor	Evening AL	Operational Scenario		
		A – Fodder Loading, Mineral Sands Stacking Laydown 1	B – Mineral Sands Loading Laydown 1 & 2	C – Mineral Sands Loading Laydown 1 - 3
R1 – No barriers, commercial or caretaker	65	59	59	59
R1 –base barrier scenario	51	50	51	51
R2 –base barrier scenario	53	49	51	51
R3 –base barrier scenario	53	49	50	50
R4 – caretaker	65	42	46	46
R5 – Gun Club	43	37	38	38
R6 – Habit Resort	43	34	36	36
C1 – Fishing Club	60	45	45	45
C2 – Border Force	60	47	47	47
C3 – Pearl House	60	59	59	59
C4 – Function	60	47	47	47
C5 – Lookout	60	56	57	57
C6 – Aqua Tafe	60	49	50	50
C7 – Golf Club	60	35	35	35

Although the predictions indicate that with a KPA caretaker at residence R1, barriers around the house are not required for compliance, it is recommended that the 'Base' barriers of Appendix A be utilised if a reach stacker is used within Laydown Area 1 during the night-time period.

5.3 Discussion

The nighttime noise emissions are the most critical for the port operations, due to lower 'assigned levels' during this time period for residential receptors.

Acoustic modelling based on measured operational noise emissions has been used for assessment, due to the difficulty in finding 'worst case' wind conditions which align with the ship loading schedule.

With the fodder truck tipper on the north-west side of the fodder loader during fodder loading, the acoustic modelling predicts that noise emissions are compliant at all receptors for 'worst case' sound propagation conditions at night. The measurements and assessment demonstrate that the tonality characteristic evident close to the fodder loader is not present at the receptor locations due to distance attenuation.

Noise emissions from the laydown areas are most significant during ship loading due to the rate of loading. The noise sources are B-double trucks moving at low speed within the laydown area, which stop at idle to be loaded by the Reach Stacker. The Reach Stacker

noise is the dominant noise source; it was generally observed to be stationary during truck movement on site. Measurements of the laydown area operations were undertaken at a moderate distance (nominal 50m) and the L_{A10} of the measured noise level for an unloading / loading cycle used for assessment. Measurements were also undertaken at 135 m distance, with the calculated sound power derived from each of these measurements commensurate with the calculated results.

Laydown areas 3 and 2 are contained within the original application for Works Approval, with Laydown area 1 added as part of the Works Approval amendment in May 2024. Laydown area 3 was unable to be used during the Time Limited Operations, and Laydown area 1 was not yet operational at the time of monitoring. These laydown areas have been assessed by acoustic modelling.

Compliant noise emissions for the Regulation 'night-time' period for operation of a reach stacker in either or both Laydown Areas 1 and 3 is achieved providing specific acoustic barriers are in place. The extend of the required acoustic barriers are detailed in Appendix A. No barrier within Laydown Area 3 is required for normal general cargo operations within Laydown Area 3.

Predictions and barrier options are provided in **Table H** for scenarios with individual residences R1 – R3 vacated or used for commercial use or KPA caretaker occupancy, or if let to persons not classified as 'KPA caretakers'. There are several possible scenarios.

Designated barriers (Appendix A) are incorporated to ensure compliance with the 'Assigned Levels' for the Regulation 'night-time' period for operation of a reach stacker in Laydown Areas 1 and 3. The barriers are not required for operations during the weekday and evening periods if R2/R3 are occupied. This allows for barriers constructed of stacked rotainers to be fully removed or replaced during periods other than the Regulation 'night-time' period. If R1 is occupied then the barriers designated 'Barriers A' should be in place during occupancy during the night-time period, and 'Base Barriers' in place during the day and evening. No specific barriers are required for Laydown Area 3 general cargo unloading or loading activity with trucks and forklift.

The operation of the reach stackers during the night period is compliant when R1-R3 are not occupied as a residence (i.e. if R1-R3 were to be a Caretaker or utilised as an office).

The noise emissions for each of the Laydown areas are shown in Appendix A and in **Table H**. The noise emissions are compliant with the regulation 'Assigned Levels' at all times.

Base Barrier and Barrier A are for mitigation of noise to receptor R1. Barrier B also contributes to control of noise to R1 from Laydown Area 3. Barrier B and Barrier C options are to control noise to receptors R2 / R3 if occupied by a resident, as per scenarios outlined in Table H.

In summary, the barriers required for compliance are:

- R1 – Caretaker under regulations – Base Barrier recommended.
- R1 – residential use with reach stacker on Laydown 1 (or 3) at night – Barrier A (Base Barrier weekday or evening)
- R2 &/or R3 – residential use with reach stacker Laydown 1 at night – Barrier B
- R2 &/or R3 – residential use with reach stacker Laydown 1 & 3 at night – Barrier C

The difference between the R1 Base Barrier and Barrier A is an increased height of barriers and closure of gap on the western side.

6.0 Conclusion

Measurement and assessment of noise emissions for the Port of Broome operations, including mineral sands ship loading are shown to be compliant with the requirements of the *Environmental Protection (Noise) Regulations 1997*. Regulation 'night-time' operation of reach stackers within Laydown Areas 1 & 3 are compliant if R1-3 are occupied as residences, providing minimum barriers are in place as detailed in this report.

Appendix A Designated Barriers

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Figure E: Designated Base Barriers (3 rotainers high, 6m) for Noise Mitigation Day / Evening – R1

Reach Stacker on Laydown Area 1, General Cargo on Laydown Area 3

Figure F: Designated Barriers A: (4/5 rotainers high,8/10m) for Noise Mitigation at Night to R1

Reach Stacker on Laydown Area 1– General Cargo on Laydown Area 3

Figure G: Designated Barriers B: (3 rotainers high, 6m) for Noise Mitigation at Night to R2 / R3

Reach Stacker on Laydown Area 1, General Cargo on Laydown Area 3

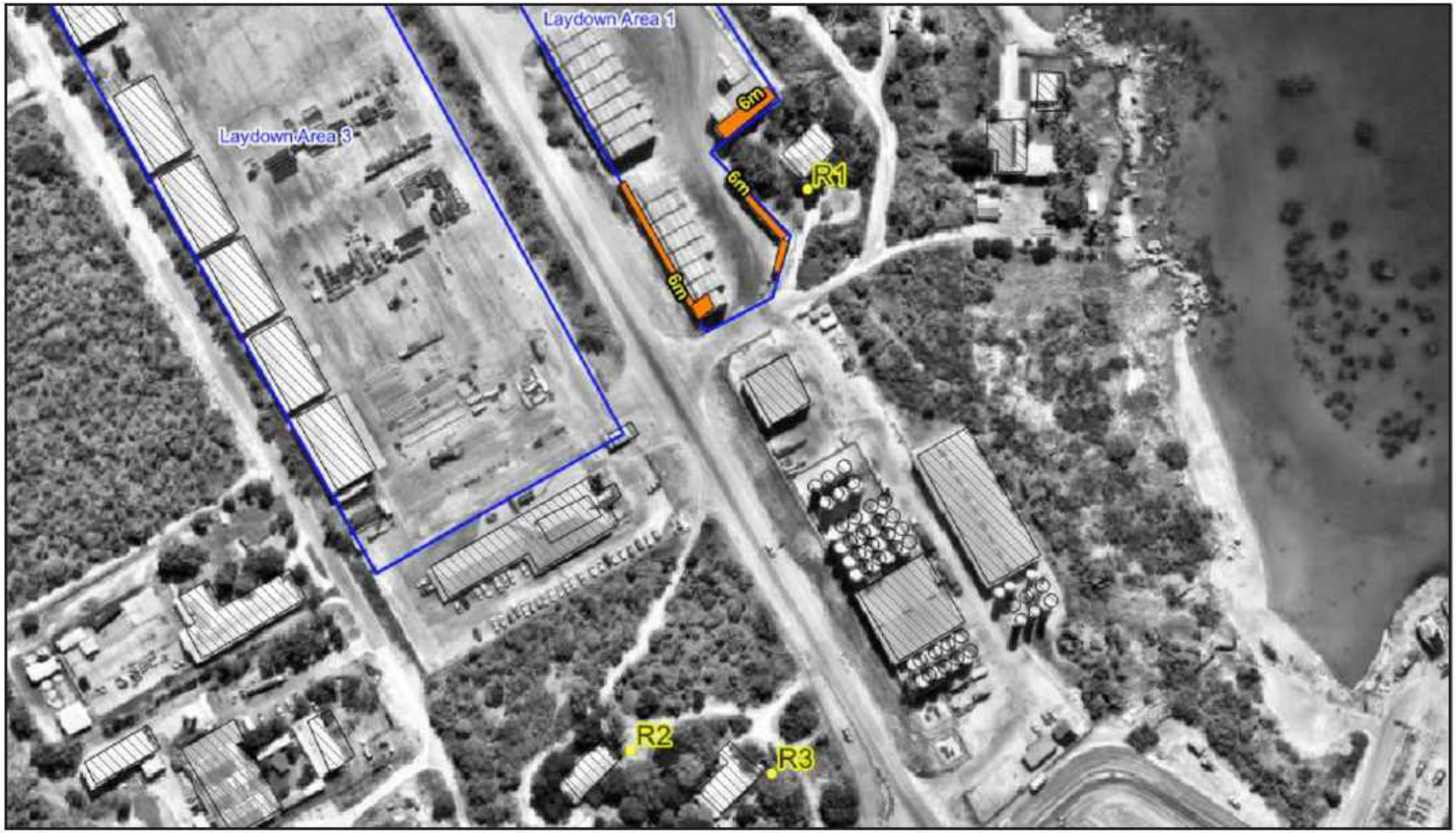
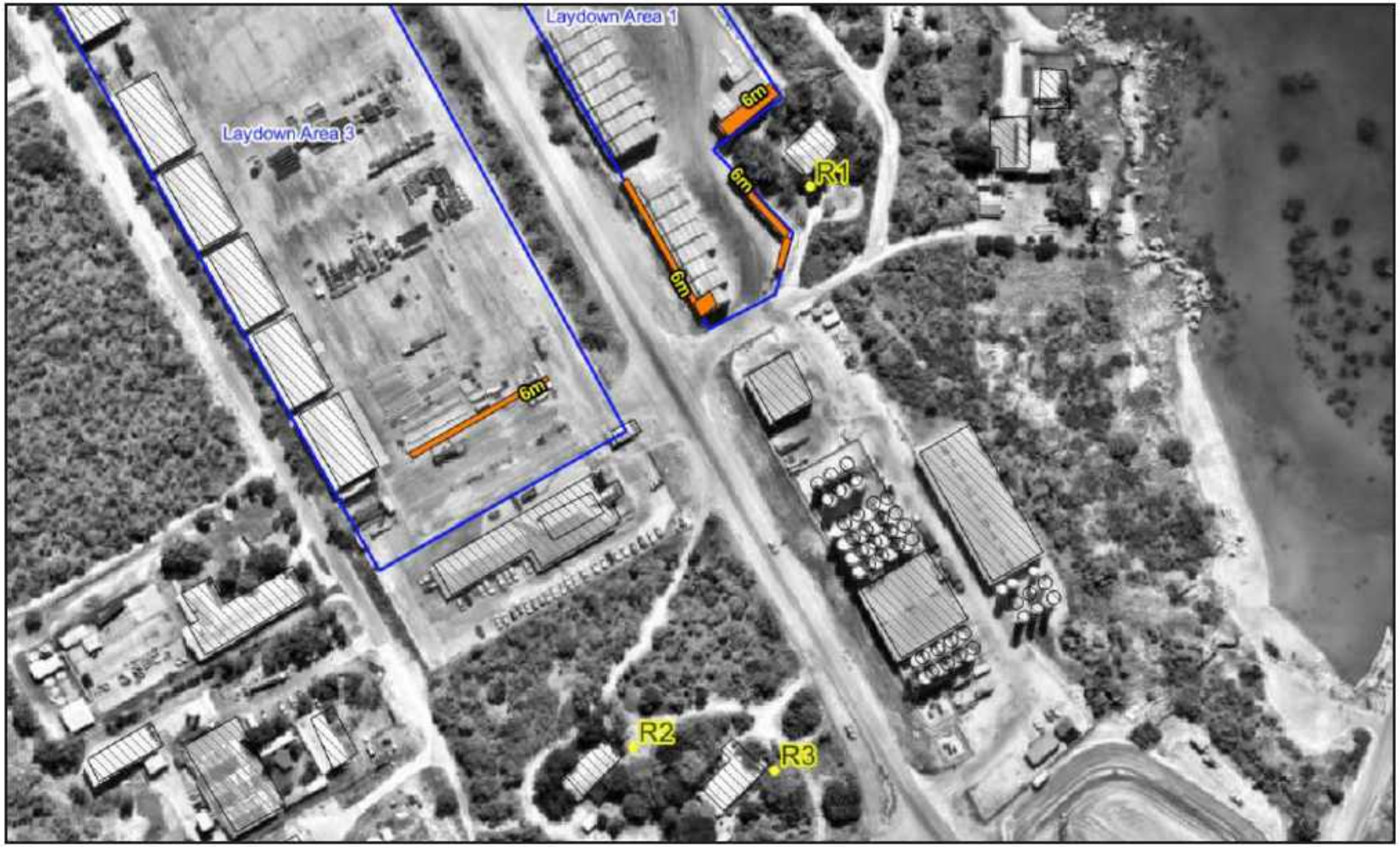


Figure H: Designated Barriers C: (3 rotainers high, 6m) for Noise Mitigation at Night to R2 / R3

Reach Stacker on Laydown Area 1 & 3



Appendix B Noise Contours

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Figure I: Scenario A noise contours – fodder loading, Barriers B

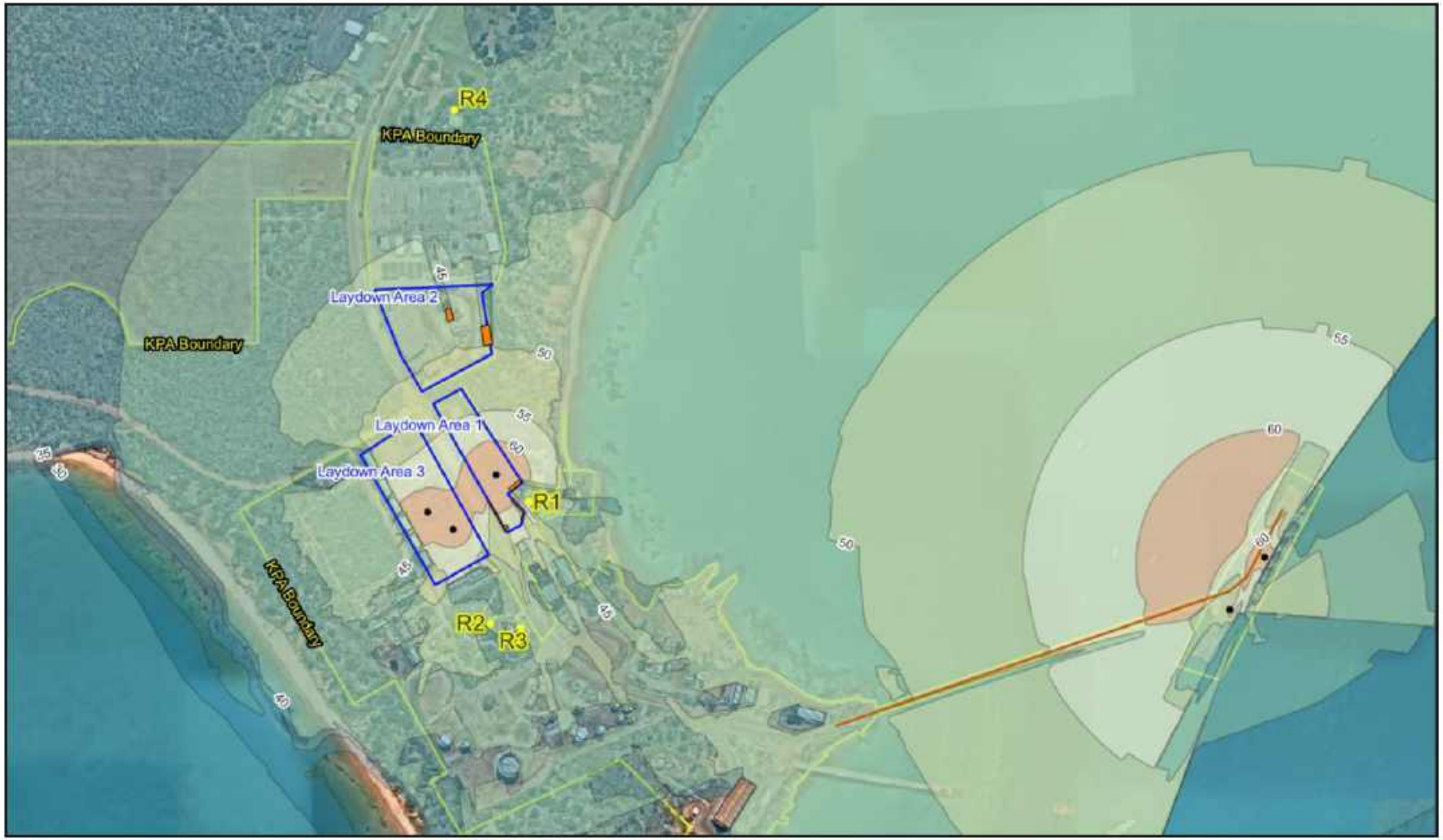


Figure J: Scenario A noise contours – fodder loading (Key Receptor Area), Barriers B

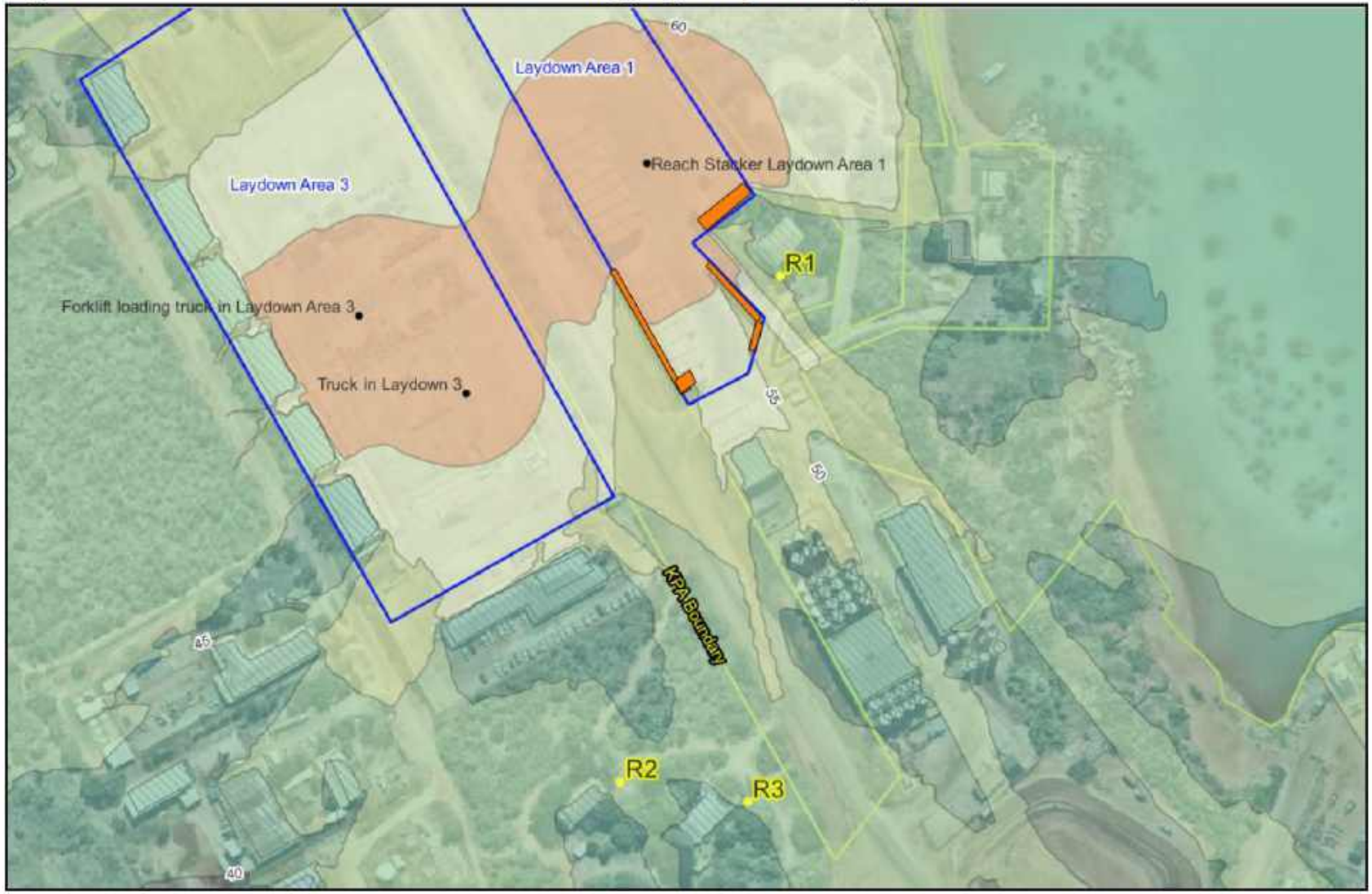


Figure K: Scenario B noise contours – KPA mineral sand loading, Barriers B

Figure L: Scenario B noise contours – KPA mineral sand loading (Key Receptor Area), Barriers B

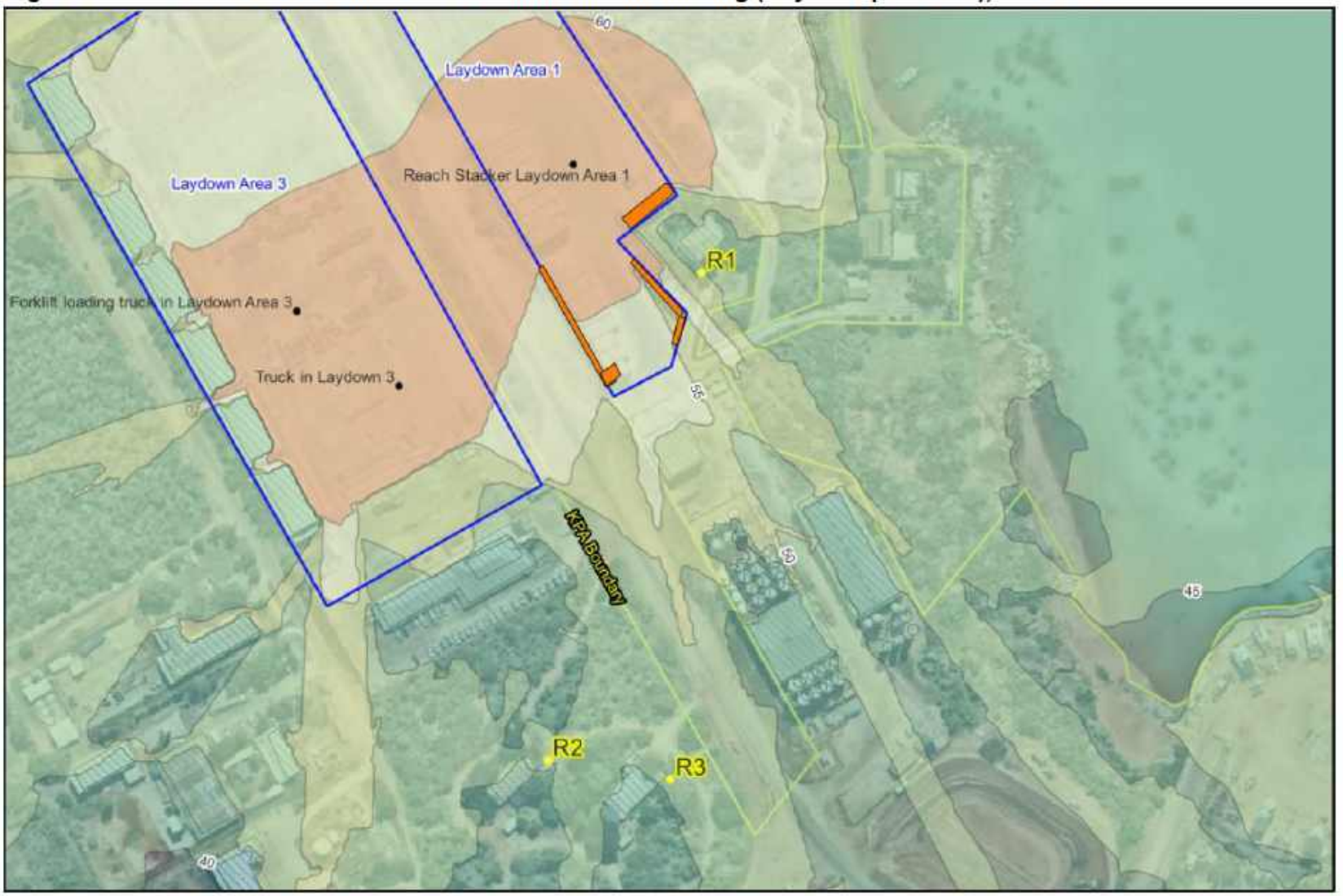
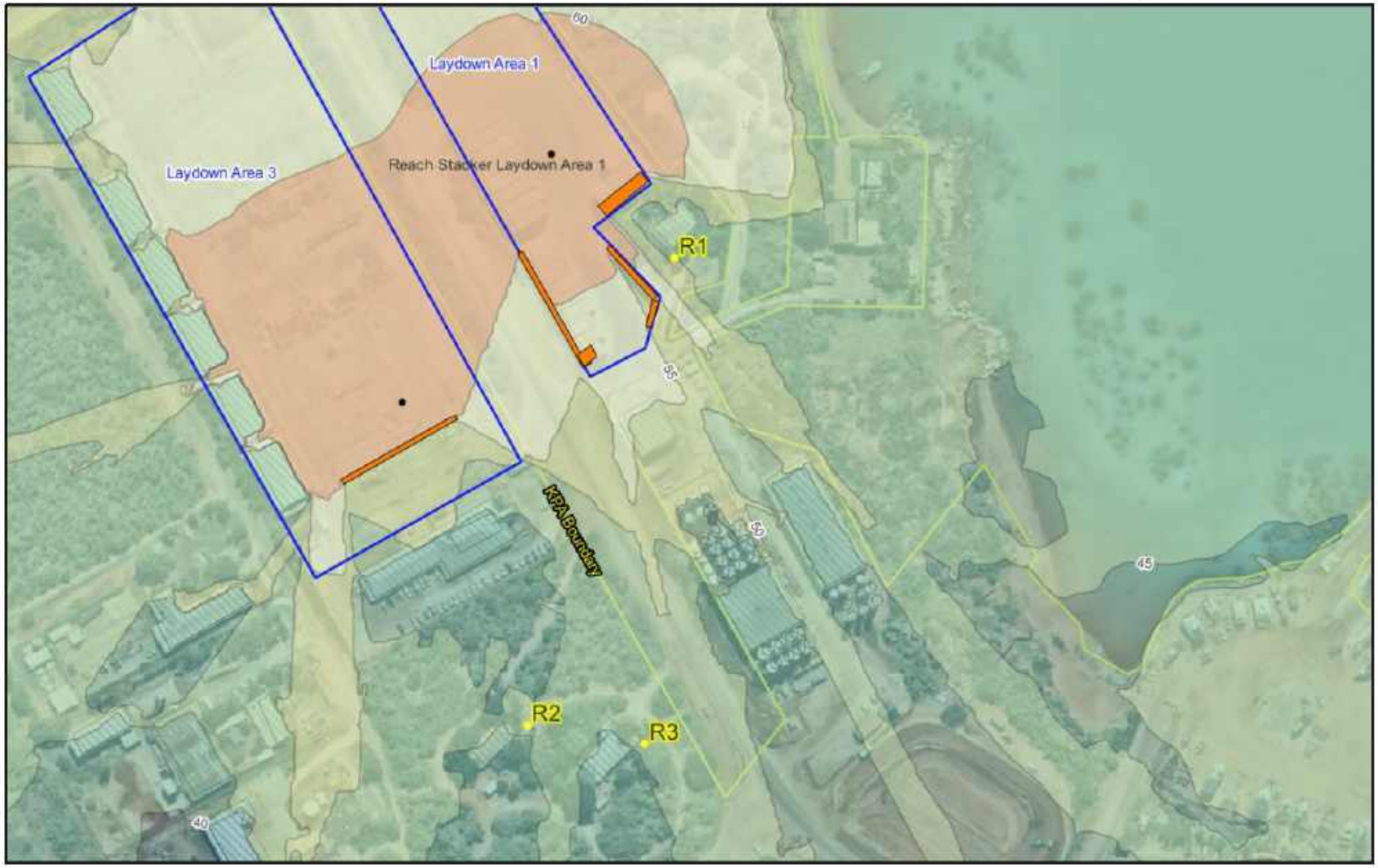
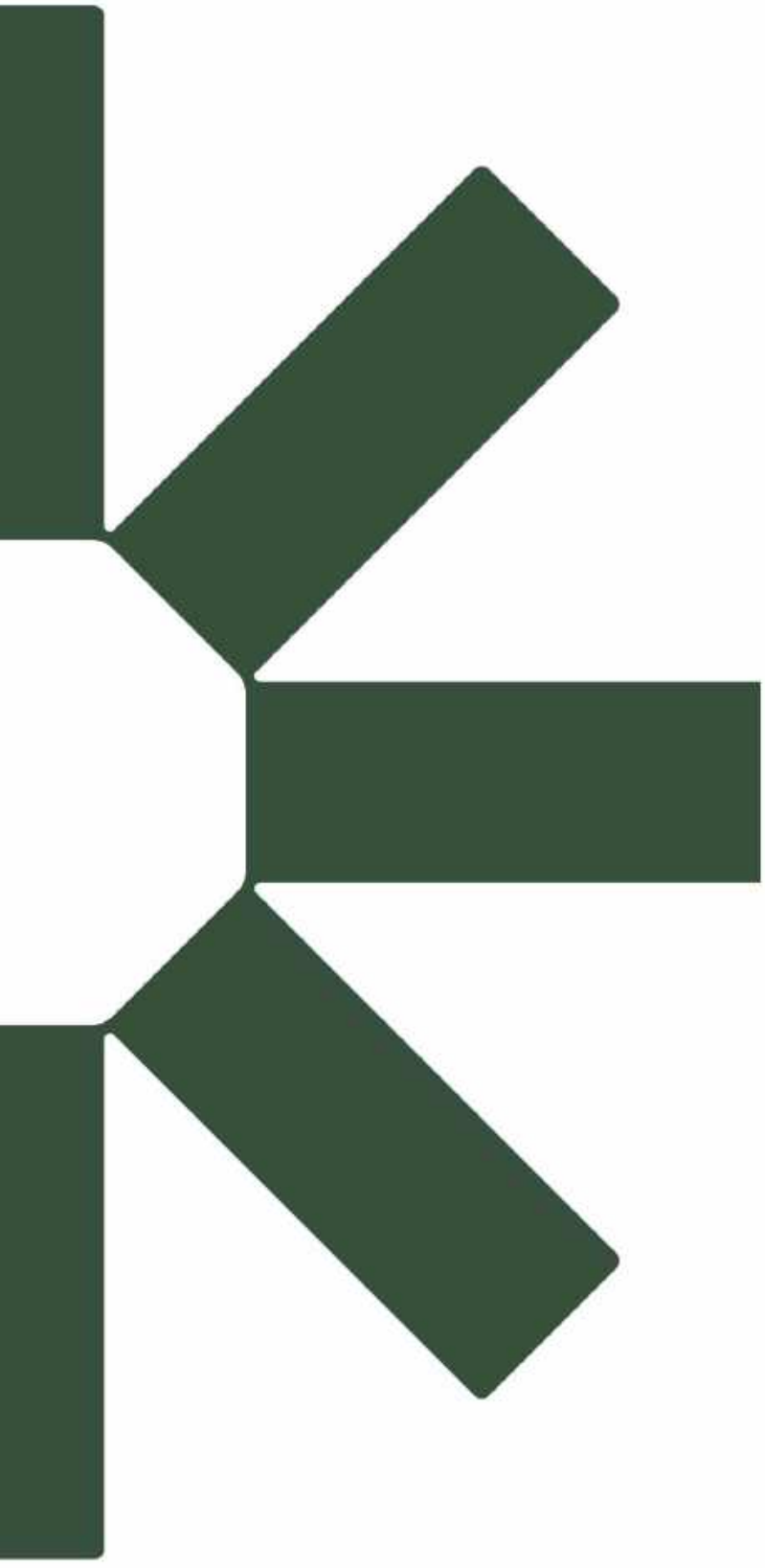


Figure M: Scenario C noise contours – mineral sand loading – All Laydown Areas, Barriers C

Figure N: Scenario C noise contours – mineral sand loading – All Laydown Areas (Receptor Local Area), Barriers C





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