Air Quality Assessment

GEMCO Excess Water Disposal

GEMCO

24 January 2025

→ The Power of Commitment

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Executive summary

Groote Eylandt Mining Company Pty Ltd (GEMCO) is proposing to install and operate a marine outfall pipeline which will run from a northern quarry on the existing GEMCO mineral lease (ML), along the Rowell Highway, through to an ocean outfall located adjacent to their existing port facility at Milner Bay (the Project).

This report has been prepared by GHD to assess potential impacts to air quality from the construction and operation of the Project. The Project has the potential to generate air quality impacts during the installation of the pipeline, ocean outfall and pump and generator station, and during the operation of the proposed pump and generator station. The air quality pollutant of concern was identified as fine particulate matter.

A qualitative assessment was undertaken to estimate the impacts of dust emissions for the construction stage in accordance with the IAQM Guidance on the assessment of dust from construction. Risk of dust impacts to sensitive receptors is low across all construction stages.

It was determined that a detailed risk assessment was not required for the operation of the pipeline, as the nearest sensitive receptor is over 4 km away from the proposed generator and pump station. As such, the risk of air quality impacts is negligible.

Management and mitigation measures have been identified for the construction of the pipeline in order to manage potential air quality impacts.

This report is subject to, and must be read in conjunction with, the limitations set out in 1.5 of this report.

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Abbreviations

Abbreviations	Definition
µg/m^3	Micrograms per cubic metre
AQMS	Air Quality Monitoring Station
CO	Carbon monoxide
EPA	Environment Protection Authority
EP Act	*Environment Protection Act 2019* (NT)
FS	Feasibility Stage
GEMCO	Groote Eylandt Mining Company Pty Ltd
GHD	GHD Pty Ltd.
GL	Gigalitres
ha	Hectares
HDV	Heavy-duty vehicle
IAQM	Institute of Air Quality Management
km	Kilometre
kL	Kilolitres
kV	Kilovolts
kVA	Kilovolt-Amps
kW	Kilowatts
m	metre
m/s	metres per second
ML	Mineral Lease
MMP	Mining Management Plan
NEPC	National Environmental Protection Council
NEPM	National Environmental Protection Measure
NO_2	Nitrogen dioxide
NT	Northern Territory
O_3	Ozone
pa	Per annum
SO_2	Sulphur dioxide
TSP	Total Suspended Particulate
the Port	Milner Bay Port Facility
the Project	Excess Water Disposal project
VOC	volatile organic compound

1. Introduction

1.1 Project background

Groote Eylandt Mining Company Pty Ltd (GEMCO) operates an open cut, strip-mining operation, on Groote Eylandt, in the Gulf of Carpentaria in Northern Territory (NT). The existing operation mines manganese ore by open-cut methods before processing the ore at an on-site facility. Manganese is then transported by road train to GEMCO's Milner Bay Port Facility (the Port) (Figure 1.1).

To access the manganese ore, existing vegetation is cleared, topsoil and overburden is removed, forming mine pits (quarries). As mining intersects aquifers and due to rainfall and runoff in some areas, water naturally collects within the quarries. The water is extracted, and a portion is typically used during operations with surplus water transferred between quarries and released to bushland in accordance with the existing Mining Management Plan (MMP).

Deeper mining has resulted in greater groundwater intrusion within the quarries while progression of mining towards the coast has resulted in an increase in salinity within quarry water in some areas. Mine models indicate dewatering volumes could reach up to 100 gigalitres (GL) per annum (pa) in the near future. To address this increase in quantity and salinity a marine outfall project (the Excess Water Disposal project (herein the Project)) is being evaluated to allow the discharge of up to 80 GL pa of water from the quarries.

GEMCO is currently in the Feasibility Stage (FS) of the Project, which will include pipeline (approximately 12 km length of terrestrial pipeline and 600 m length of underwater pipeline (which includes 200-300 m buried through surf zone)) and pumping infrastructure from an existing northern quarry to a discharge point at the Port. The pipeline is planned to traverse adjacent to the Rowell Highway (road train haul route; (Figure 1.1) and utilise areas of existing or historical disturbance as far as practical. A referral under the *Environment Protection Act 2019* (NT) (EP Act) has been prepared to assess the potential impacts of the Project.

Legend

- Road
- Stream
- Proposed pipeline
- Disturbance area
- Special purpose lease
- Lease boundaries

Paper Size ISO A3

0 230 460 690 920

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 53

N

GHD

South32 Group Operations Pty Ltd
GEMCO Excess Water Disposal Project
Air Quality Assessment Report

Project No. **12624084**
Revision No. **A**
Date **29/11/2024**

Locality plan

FIGURE 1.1

N:\AU\Brisbane\Projects\44\12624084\GIS\Maps\Working\12624084_GEMCO\12624084_GEMCO.aprx - 12624084_NVIA_601_LocalityPlan
Print date: 29 Nov 2024 - 08:10

Data source: GHD: predicted mixing zone (2024); South32: Aerial photos (2023), Pipeline route (2024), GEMCO tenements (2024), Pipeline disturbance footprint (2024); South32/GHD: Special purpose lease (2024); GA: road (2024); NT gov: Stream (2024); World Imagery: Earthstar Geographics
World Imagery: Maxar. Created by: mvandermerwe

1.1.1 Spatial boundary

The Project spatial boundary (geographic area) and definitions for this report is provided in Table 1.1.

Table 1.1 Project spatial boundary

Term	Definition
Project	All aspects of the GEMCO Excess Water Disposal Project (excluding internal movement of water) including construction and operation as outlined in Section 2).
Construction footprint	Area directly impacted by the construction of the Project including both onshore and offshore areas and totalling 25.17 hectares (ha). This has been calculated as 1.84 ha in the marine environment and 23.33 ha in the non-marine environment, noting only non-marine aspects are considered within this report.

1.2 Purpose of this report

This air quality impact assessment report has been prepared to support the assessment of the Project impacts and forms part of the referral documentation. This report has been prepared by GHD to assess potential impacts to air quality from the construction and operation of the Project. The Project has the potential to generate air quality impacts during the installation of the pipeline, outfall and pump and generator station, and during the operation of the proposed pump and generator station.

1.3 Scope of works

The air quality impact assessment follows the methodology as detailed below.

A qualitative air quality impact assessment was undertaken to estimate the potential air quality impacts associated with the construction and operation of the Project. The assessment included:

– Review of the existing environment (land use, ambient air quality, and meteorology).
– Review of the proposed construction methodology.
– Identification of construction activities which may lead to air emissions, primarily dust and particulates.
– A review of operational emission sources.
– Identification of nearby sensitive receptors to construction activities and any new sources of operational emissions from the proposed pump and generator station.
– A qualitative risked based air quality assessment with a focus on construction and operation particulates and dust.
– Identification of project-specific mitigation measures to manage the potential for dust impacts.

1.4 Assumptions

This report has been prepared with consideration to the following assumptions:

– Ambient air quality and meteorological data is considered representative however may vary year to year and be influenced by external factors including climate trends and bushfires.
– Sensitive receptors were identified using aerial photography and land use planning and may not include all existing or future receptors in the area surrounding the Construction footprint but are considered representative of receptors.
– This report encompasses land-based construction and operation emissions only. Works on or in the water are expected to have negligible air quality impacts.

1.5 Limitations

This report: has been prepared by GHD for GEMCO and may only be used and relied on by GEMCO for the purpose agreed between GHD and GEMCO as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than GEMCO arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

2. Proposal description

A detailed project description is included in the Environmental Referral Report.

GEMCO proposes to install and operate a marine outfall pipeline. A dual pipeline is proposed to run from one of the northern quarries (herein NH2 quarry) on the existing GEMCO mineral leases (MLs), along the Rowell Highway. The dual pipeline will join to form a single pipeline near the ocean outfall location adjacent to the Port. The majority of the pipeline will be above ground. Structures and pipework associated with the creek / gully crossing points, road / track underpasses and break tank / sump structures will either be trenched and buried or elevated using pipeline cradles or supports. The overall Construction footprint is presented in Figure 1.1.

The alignment is proposed to be powered and supported by two 3.3 kilovolts (kV) (2500 kilovolt-amps (kVA) generators and two 710 kilowatts (kW) pontoon pumps and an additional 710 kW NH2 pontoon standby pump. This plant will be installed at the southernmost point of the alignment. An example layout of pump and generator station at GEMCO is shown in Figure 2.1.

Figure 2.1 Example of existing GEMCO two-stage pumping system

3. Legislation and policy context

3.1 Government plans, policies and guidelines

The Northern Territory Environment Protection Authority's (EPA's) environmental objective for air is to protect air quality and minimise emissions and their impact so that environmental values are maintained. The Northern Territory has yet to implement state specific air quality criteria and instead adopts the national criteria. The National Environment Protection Council of Environmental Ministers, now the National Environment Protection Council (NEPC), updated the Air National Environment Protection Measure (NEPM) in May 2021. The Air NEPM sets uniform national standards for ambient air quality and outlines the framework for state and territory jurisdictions to monitor and report against these standards. The Air NEPM states that the desired outcome of the legislation is "ambient air quality that minimises the risk of adverse health impacts from exposure to air pollution". As such, this air quality assessment was prepared with reference to the following plans/policies/guidelines:

– National Environment Protection (Ambient Air Quality) Measure (NEPM) (Department of Climate Change, Energy, the Environment and Water, 2021).
– Guidance on the Assessment of Dust from Demolition and Construction (IAQM Guidance) (Institute of Air Quality Management, 2024).

3.2 Assessment criteria

Assessment criteria for the Project were taken from the NEPM. The objective of the criteria is to maintain ambient air quality that minimises the risk of adverse health impacts from exposure to air pollution. There is an obligation during construction and operation of the Project to comply with the criteria.

Relevant assessment criteria for the primary pollutants associated with construction and operation of the Project are presented in Table 3.1. The criteria apply to the total impact (increment plus background) and must be reported as the 100th percentile (maximum).

Table 3.1 Air quality impact assessment criteria

Pollutant [1]	Averaging period	Impact location	Impact type	Criteria (µg/m^3)
TSP	Annual	Sensitive receptor	Cumulative	90
PM_{10}	24 hour	Sensitive receptor	Cumulative	50
	Annual	Sensitive receptor	Cumulative	25
$PM_{2.5}$	24 hour	Sensitive receptor	Cumulative	25
	Annual	Sensitive receptor	Cumulative	8

[1] TSP = Total Suspended Particulate
PM = Particulate Matter

4. Existing environment

4.1 Climate and meteorology

Local climate and meteorology (weather) within the Construction footprint is of critical importance when assessing the potential for air quality impacts at sensitive receptors. Wind direction and speed data was sourced from an onsite automatic weather station (AWS-WL-02) owned and operated by GEMCO. AWS-WL-02 is located approximately 4.6 km southeast of the nearest receptors and approximately 1.3 km from the Construction footprint. This AWS was chosen due to its proximity to the Project and nearby receptors. Data between the dates of 1/1/2019 until 31/12/2023 has been analysed to gain an understanding of the wind conditions of the Construction footprint.

AWS-WL-02 only has complete yearly datasets from 2019 onwards. As such, temperature and rainfall data were sourced from the Bureau of Meteorology AWS located at Groote Eylandt Airport (Station ID: 014518), located approximately 9 km from the nearest sensitive receptors and approximately 4 km from the Construction footprint. Data from Groote Eylandt Airport, from 1999 to 2024 was analysed to gain insight into meteorological conditions within the Construction footprint.

4.2 Temperature

Average monthly temperatures, as well as average monthly range of temperatures (average monthly maximum and average monthly minimum temperatures) are presented in Figure 4.1. Average monthly temperatures are consistent with tropical conditions, with relatively little variation in temperature across the year. Average monthly temperatures range from 29.8 °C in December to 22.3 °C in July. Average maximum monthly temperatures were observed in November at 34.6 °C and the average minimum monthly temperature was 15.4 °C in August.

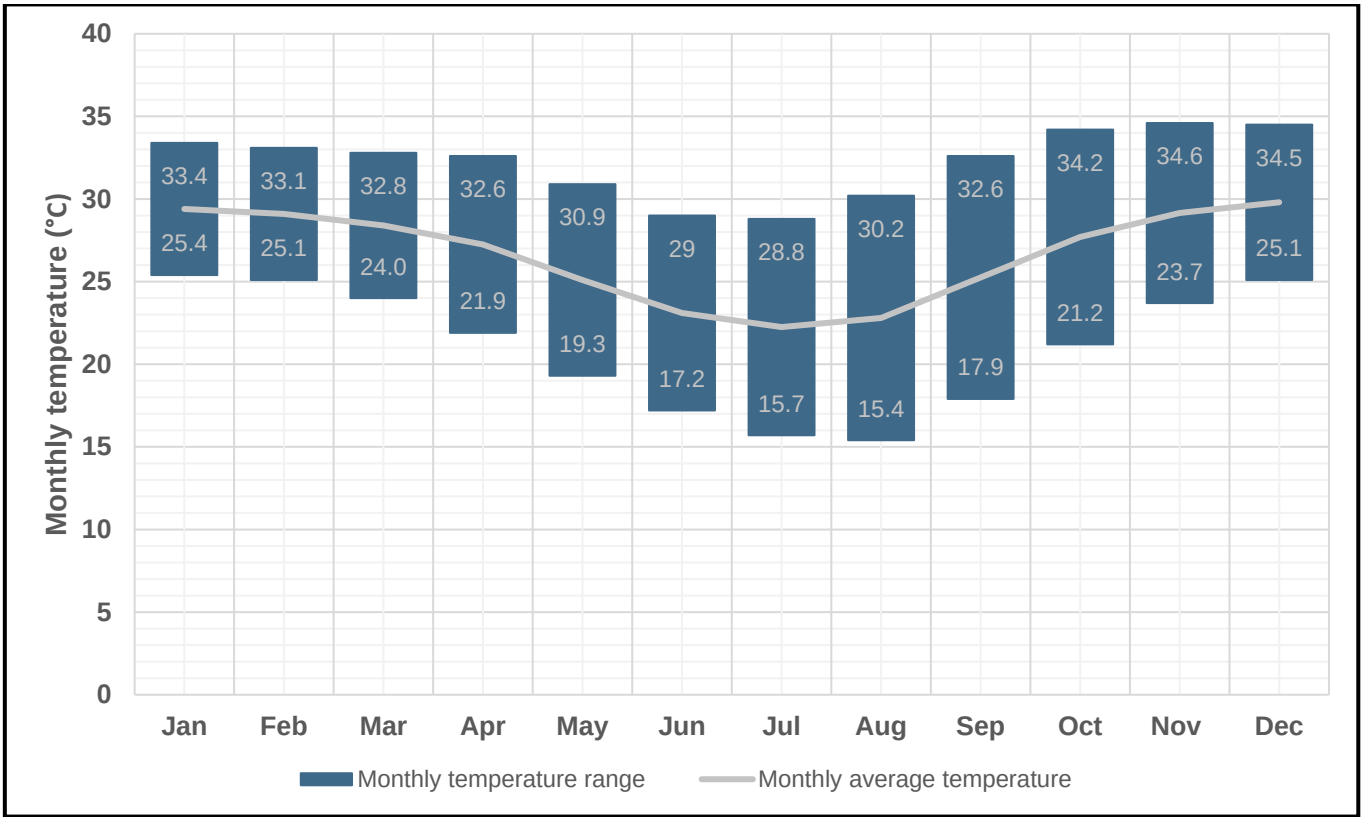

Figure 4.1 Average Monthly climate temperatures collected from Groote Eylandt Airport (1999 – 2024)

4.3 Rainfall

Average rainfall amount and average days of rainfall between the years 1999 and 2024 are presented in Figure 4.2. Rainfall patterns are consistent with tropical/equatorial conditions, with a high volume of rain during the wet season (November to April), and little to no rain during the drier winter months (May-October). Maximum amount and days of rain were observed in March. The lowest period of rainfall was in August, when almost no rain was observed.

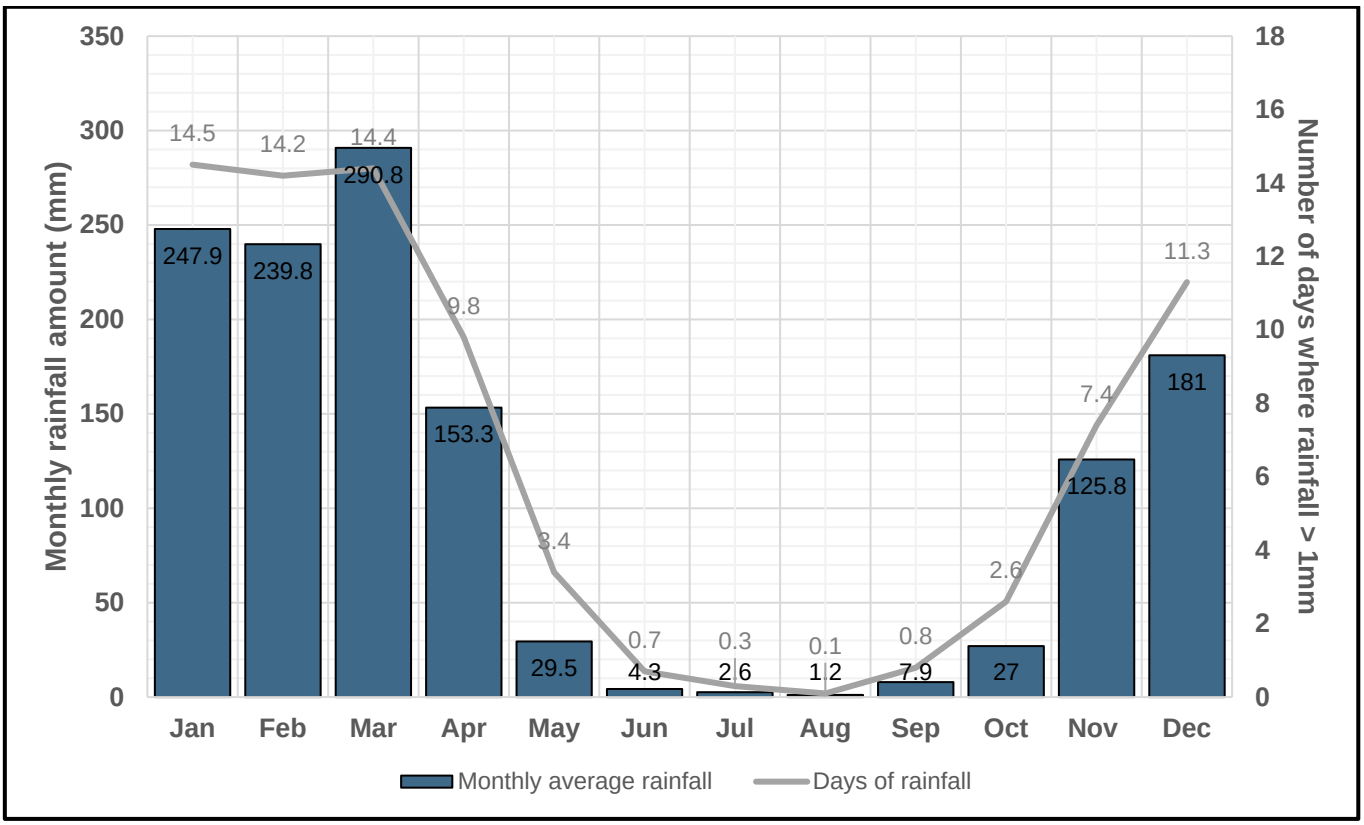

Figure 4.2 Average rainfall collected from Groote Eylandt Airport (1999 – 2024)

4.4 Wind

Figure 4.3 shows the average annual wind rose, Figure 4.4 shows the average diurnal wind rose and Figure 4.5 shows the average seasonal wind rose, measured at AWS-WL-02 for the period 2019 to 2023. Figure 4.3 shows the following features:

- The predominant annual average wind direction is from the southeast.
- The average wind speed measured was 2.2 m/s.
- Calm conditions (wind speeds less than 0.5 m/s) occurred 7.6% of the time. Calm conditions are often associated with poor dust dispersion.
- High wind speeds (winds greater than 5 m/s which are often attributed to dust lift off) mostly occur from the southeast and the northwest.

Figure 4.4 extends these observations showing that:

- Winds blow from the southeast across all time periods.
- Wind speeds are generally higher in the early morning period than all other times, averaging at approximately 3.2 m/s.
- Calm conditions are observed more (between 11.7% to 13.8% of the time) during evening periods and early nighttime periods in comparison to the daytime period and the late nighttime periods (between 1.9% and 4.5%).

Figure 4.5 further shows the following:

– Wind direction differs across seasons, during spring wind primarily occurs from the eastern quadrants (northeast, east and southeast). During summer, wind primarily blows from the northern quadrants (northwest, northeast and north). During autumn and winter, wind primarily blows from the southeast.
– Calm conditions occur most frequently across spring, autumn and summer.
– Average wind speed is similar between seasons, ranging between 2 m/s in spring to 2.5 m/s in winter.

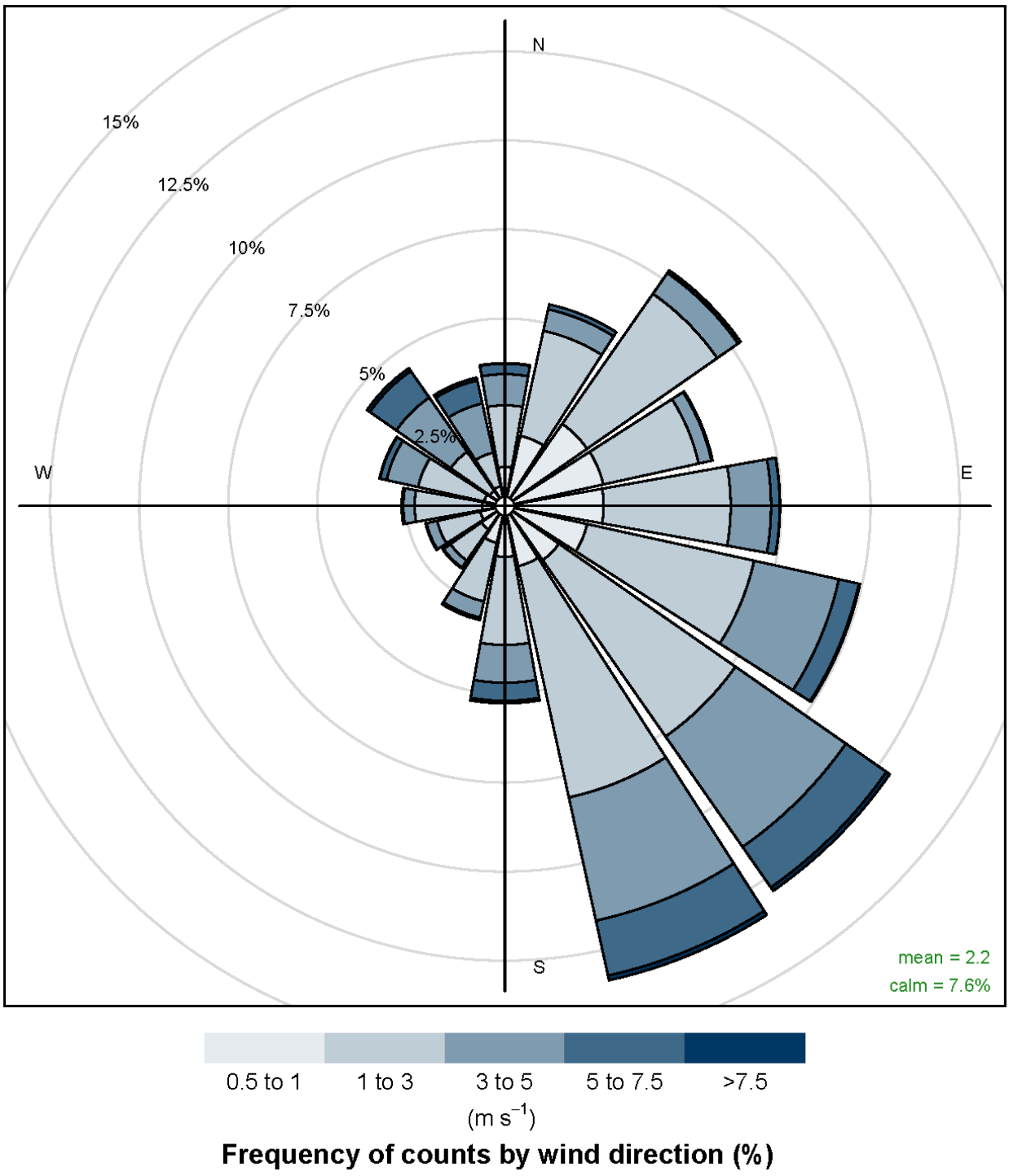

Figure 4.3 Annual average wind direction and speed collected from AWS-WL-02 (2019-2023)

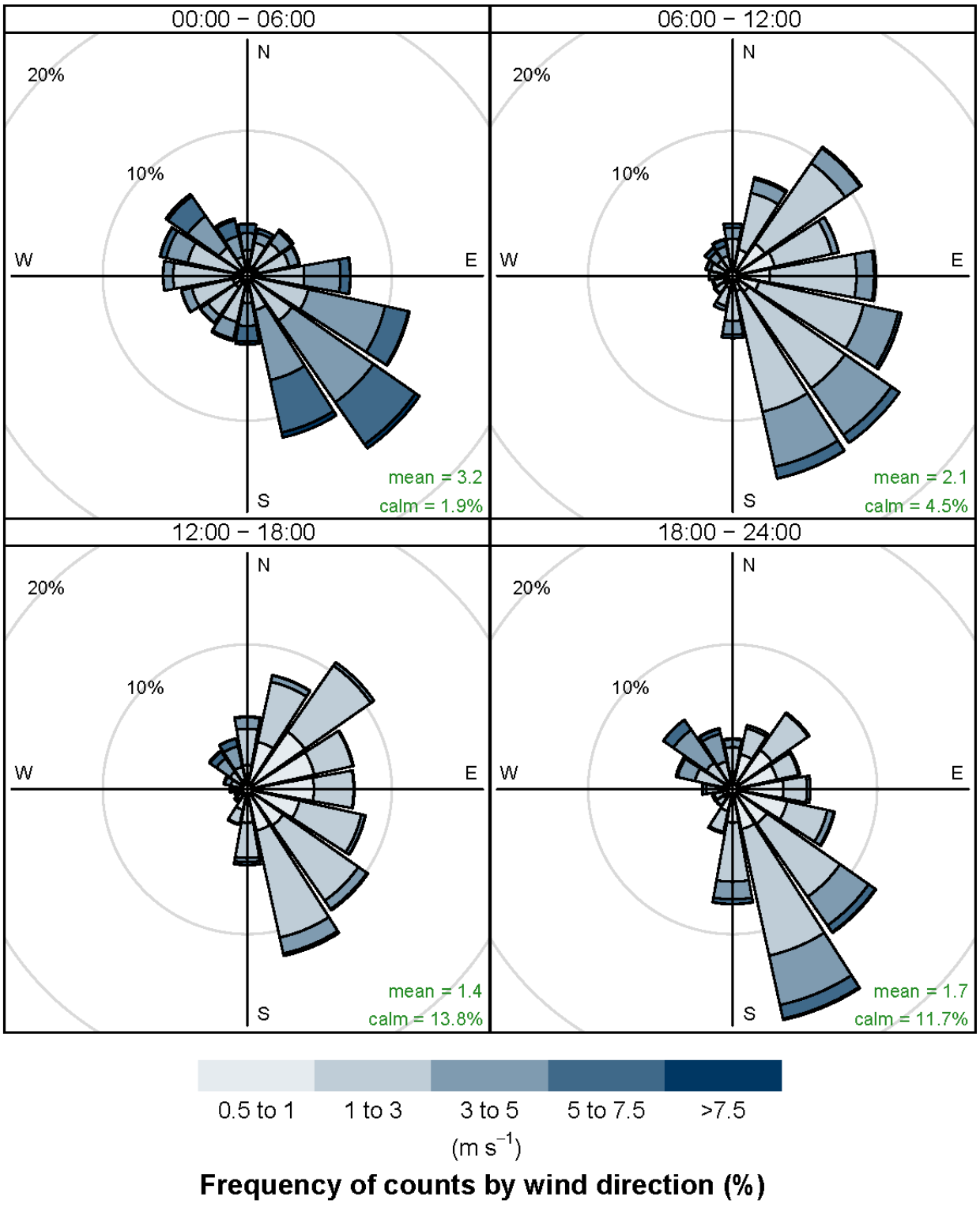

Figure 4.4 *Average diurnal wind direction and speed collected from AWS-WL-02 (2019-2023)*

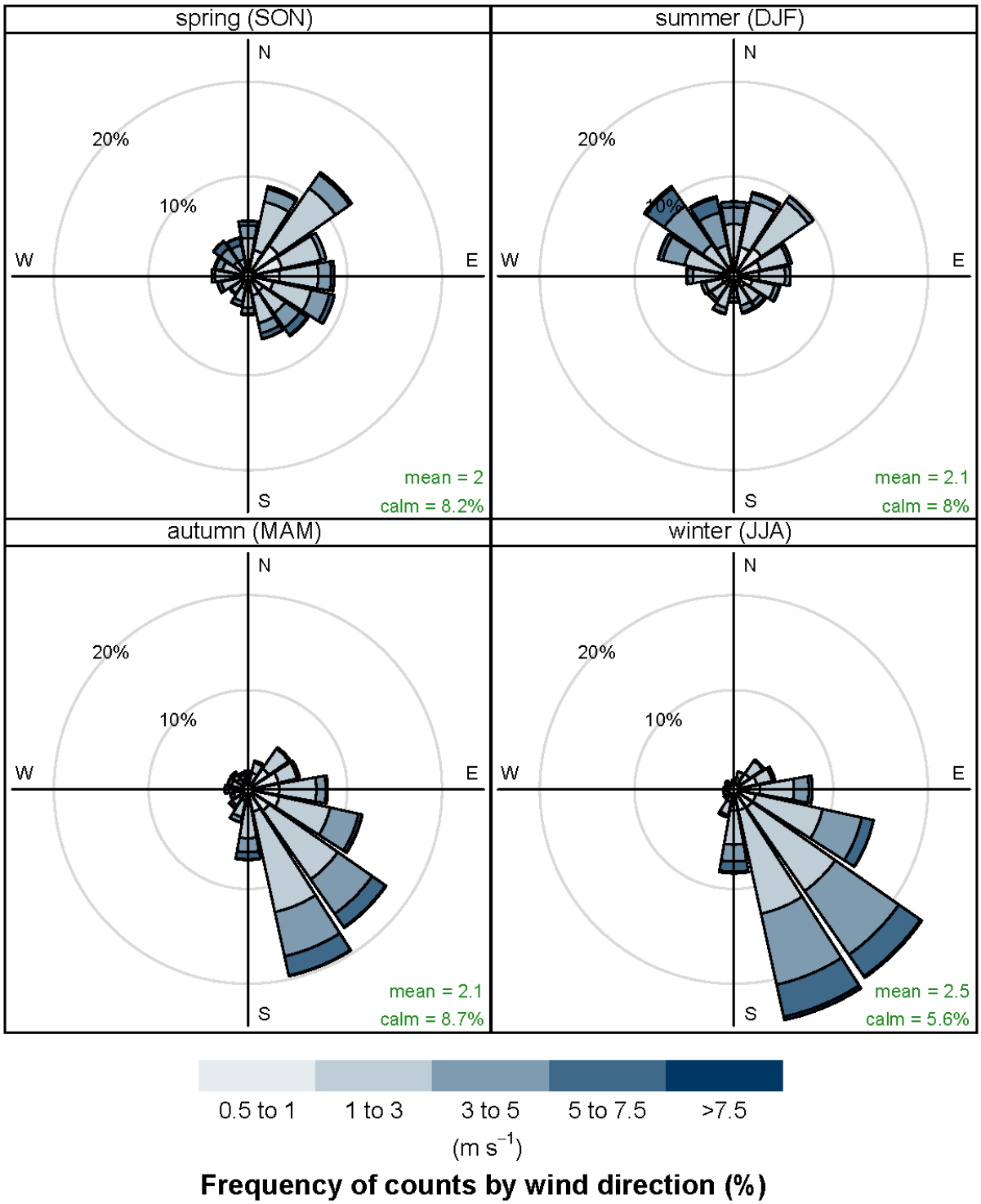

Figure 4.5 *Seasonal wind direction and speed collected from AWS-WL-02 (2019-2023)*

4.5 Ambient air quality

4.5.1 Current air quality monitoring in the Northern Territory

The NT Government provide annual reports on air quality in the NT based on the observations at four monitoring stations. These are prepared in accordance with the Air NEPM and assess compliance against the standards for pollutants. The Air Quality Monitoring Station (AQMS) situated in Katherine, approximately 450 km west of Groote Eylandt is the closest to the Construction footprint. While this station is a large distance from the Project, it is still important to understand ambient air quality conditions in the Northern Territory.

Air quality data from Katherine indicates good air quality in the NT, with occasional decreases in quality during the dry season due to increased levels of smoke and dust from bushfire events.

In general, the primary pollutant in Katherine is particulates ($PM_{2.5}$ and PM_{10}) in smoke from distant and local vegetation burning during the dry season which is expected to be similar on Groote Eylandt. Monitoring indicates that, other air pollutants (NO_2, SO_2 and CO) all occur at very low levels compared to large cities in other parts of Australia, while O_3 occurs at moderate levels, typically due to natural processes.

Summaries of observations from these stations are provided in annual reports prepared by the NT EPA, including assessment against the NEPM standards, and historical data is available for download on the NT EPA website. The annual reports and available data have been reviewed. The following trends were observed:

– The maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations regularly exceed the NEPM standards. The peak concentrations for each year are within the dry season, and concentrations during the wet season are significantly reduced.
– NO_2 and SO_2 levels were below the Air NEPM standards for both the peak 1 hour and annual average concentrations across all stations throughout the monitoring period.
– CO levels were below the Air NEPM standards across all stations throughout the monitoring period, except for one exceedance at Winnellie in 2018.
– Ozone levels were below the Air NEPM standards for the peak 8-hour concentrations across all stations throughout the monitoring period except for at Palmerston and Stokes Hill in 2018.

The existing NT EPA monitoring sites give a good indication of air quality in the NT, however ambient air quality monitoring (particulates only) is undertaken on Groote Eylandt, which would be more representative of the Construction footprint and also expected pollutants during construction. This is summarised in Section 4.5.2.

4.5.2 Air Quality monitoring at Groote Eylandt

Air quality data has been obtained from a High Volume Air Sampler (HVAS) dust monitor located in Alyangula (approximately 800 metres north of the project alignment), which is operated by GEMCO. The HVAS monitors are operated on a six-day basis periodically throughout the year and collects $PM_{2.5}$ and PM_{10} dust concentrations.

Data from the previous full five calendar years (2019-2023) at the Alyangula air quality monitoring stations ($PM_{2.5}$ 653781E, 8467858N and PM_{10} 654984E, 8468688N) has been used in this assessment. Air quality at Alyangula fluctuates, with between 2 to 12 exceedances of NEPM PM_{10} guidelines being observed per year and between 1 to 2 exceedances of NEPM $PM_{2.5}$ criteria per year. Regular exceedances of NEPM particulate matter criteria are consistent with previous observations of Northern Territory air quality as outlined in section 4.5.1 and are mostly due to smoke from vegetation burning. Both PM_{10} data and $PM_{2.5}$ data show more exceedances in the dry season. Particulate matter concentrations for PM_{10} and $PM_{2.5}$ are outlined in Figure 4.6 and Figure 4.7 respectively.

It should be noted that air quality data is not available daily for the Construction footprint and surrounding area with between 15% to 17% of days per year having available air quality data for PM_{10} concentrations and between 10% to 16% of days per year having available air quality data for $PM_{2.5}$ concentration. Air quality measurements have been undertaken approximately three to six times per month throughout the measurement period.

Table 4.1 Summary of available background air quality data recorded at Alyangula

Pollutant	Averaging Period	Concentration (µg/m^3)					
		Criteria	2019	2020	2021	2022	2023
PM_{10}	Maximum 24 hour average	50	78	132	202	406	81
	Annual average	25	32	22	41	37	23
	Number of NEPM criteria exceedances	-	8	2	12	5	2
	Percentage of year with air quality data	-	16%	15%	16%	16%	17%
	Percentage of days measured with criteria exceedance	-	14%	4%	20%	9%	3%
$PM_{2.5}$	Maximum 24 hour average	25	N.D	N.D	31	77	30
	Annual average	8	N.D	N.D	8	9	9
	Number of NEPM criteria exceedances	-	N.D	N.D	1	2	1
	Percentage of year with air quality data	-	N.D	N.D	10%	16%	16%
	Percentage of days measured with criteria exceedance	-	N.D	N.D	3%	3%	2%

N.D = No Data

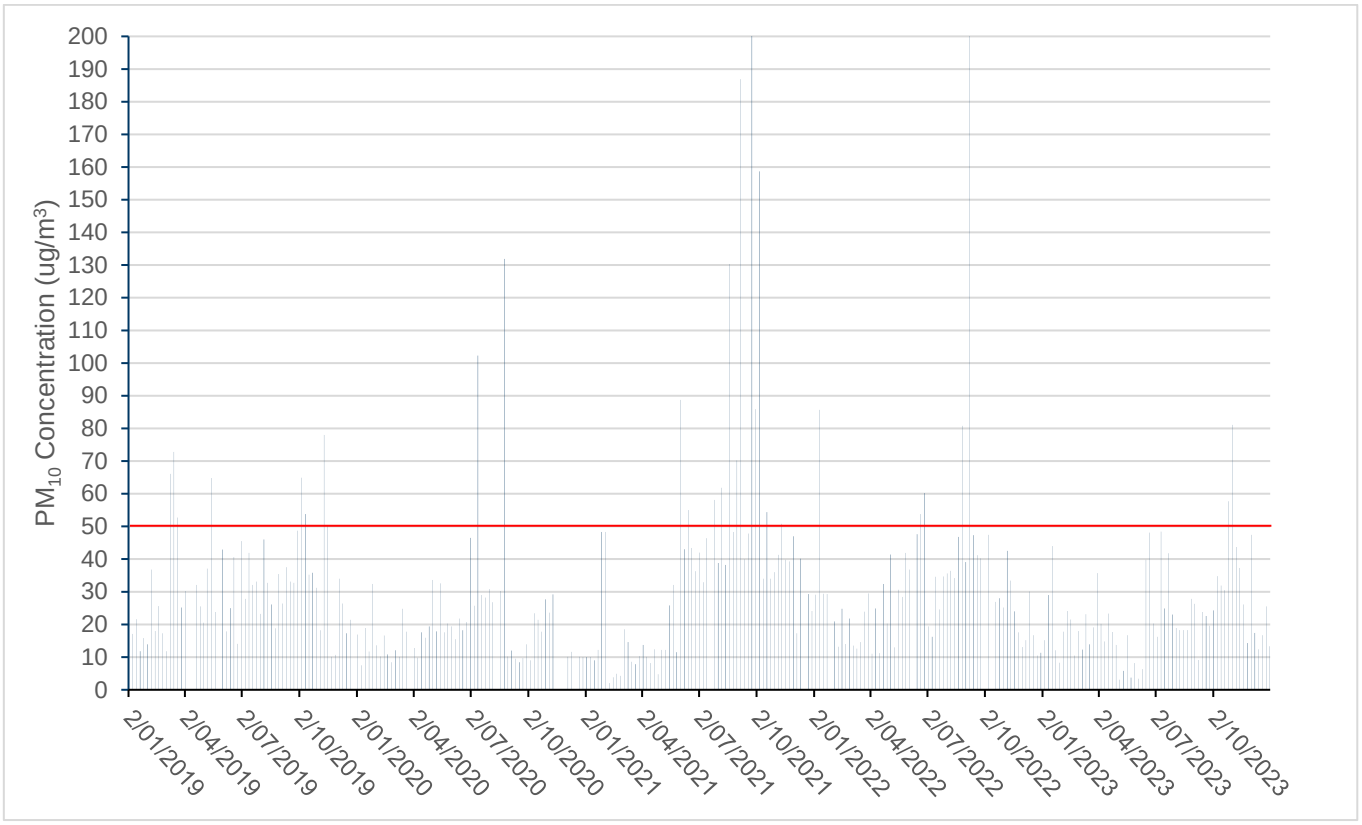

Figure 4.6 PM_{10} concentration data recorded at Alyangula (collected 2019-2023)

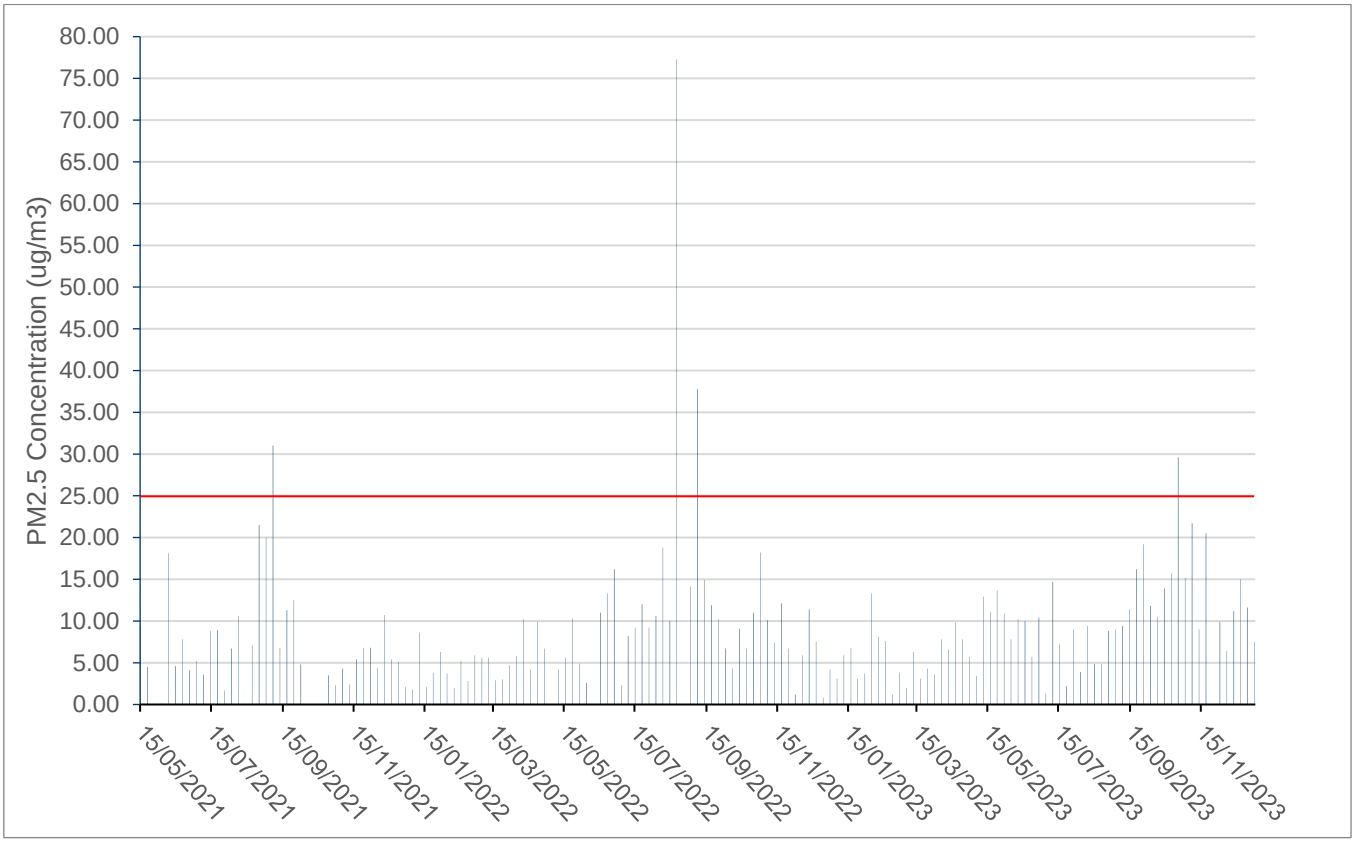

Figure 4.7 $PM_{2.5}$ concentration data recorded at Alyangula (collected 2019-2023)

4.6 Sensitive receptors

The Northern Territory defers to the NEPM and the IAQM for the assessment of air quality impacts. The NEPM defines sensitive land uses as areas which include residential premises, education and childcare facilities, nursing homes, retirement villages, hospitals and outdoor recreational sites. The IAQM defines sensitive receptors as surrounding land uses where:

– Users can reasonably expect enjoyment of a high level of amenity or;
– The appearance, aesthetics or value of their property would be diminished by soiling and;
– The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.

Indicative examples include dwellings, museums and other culturally important collections, medium- and long-term car parks and car show rooms.

A review of satellite data of the Construction footprint determined that ten sensitive receivers located at Malkula Creek are positioned approximately 100 m to 250 m east of the Construction footprint (R01 to R10), and one sensitive receiver (R11) is located approximately 220 m from the Construction footprint. A summary of identified sensitive receptors is provided in Table 4.2. Locations of sensitive receptors are outlined in Figure 4.8.

There are also sensitive receptors located in Angurugu township and Alyangula township, located approximately 4 km southeast and 450 m north of the Construction footprint respectively and are outlined in Figure 4.8.

The IAQM Construction Dust Guidance states that ‘an assessment will normally be required where there is a ‘human receptor within 250 m of the site boundary’. As such, receptors that are greater than 250 m distance from the site have not been assessed.

Table 4.2 Identified sensitive receptors

Receptor ID	Land use	Easting (E)	Northing (S)	Distance and direction from construction footprint
R01	Residential	655797.2	8463809	233 m West
R02	Residential	655787.7	8463852	244 m West
R03	Residential	655800.7	8463936	232 m West
R04	Residential	655835.6	8463907	196 m West
R05	Residential	655871.8	8463901	161 m West
R06	Residential	655901	8463887	130 m West
R07	Residential	655891.6	8463840	132 m West
R08	Residential	655842.5	8463840	187 m West
R09	Residential	655882.6	8463813	145 m West
R10	Residential	655783.6	8463891.4	249 m West
R11	Residential	654975.2	8467715	236 m North

Alyangula

R11

Rowell Highway

Malgala creek

R03

R04

R05

R06

R10

R02

R08

R07

R09

R01

Rowell Highway

Malgala creek

Andungwa creek

Rowell Highway

Angurugu

Angurugu Creek

Legend

- Receptor points
- Watercourse
- Road
- 250m buffer distance
- Project footprint
- Far field receptors

Paper Size ISO A3

0 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 53

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GHD

South32 Group Operations Pty Ltd
GEMCO Excess Water Disposal Project
Air Quality Assessment Report

Identified sensitive receptors and far field receptors

Project No. 12624084
Revision No. A
Date 20/09/2024

FIGURE 4.8

\\ghdnet\ghd\AU\Brisbane\Projects\44\12624084\GIS\Maps\Working\12624084_GEMCO\12624084_GEMCOv2.aprx - 12624084_AQ_702_IdentifiedSensitiveReceptors
Print date: 20 Sep 2024 - 10:50

Data source: GHD: project footprint, far field receptors, 250m buffer distance, receptor points(2024); GA: road (2024); NT gov: watercourse (2024); World Imagery: Earthstar Geographics
World Imagery: Maxar. Created by: mvandermerwe

4.7 Ecological receptors

As part of the Project, a separate terrestrial ecology assessment has been undertaken by GHD (Terrestrial Ecology Assessment GEMCO Excess Water Disposal, dated 27 August 2024). This report has been reviewed to determine the ecological sensitivity of the surrounding habitat. The ecological assessment undertaken by GHD determined that the Construction footprint and its surroundings have been heavily impacted by human activity.

The critically endangered Northern Quoll was detected during an ecological field survey within proximity to the Construction footprint, however the Northern Quoll is not considered a dust sensitive species. Furthermore, no endangered or sensitive flora were observed during the investigation. As such the ecological sensitivity of the project should be considered low.

5. Construction methodology

This section provides an overview of the proposed construction program and activities that has been used to undertake the impact assessment in Section 6. Construction is anticipated to occur between March to December 2026, with the ocean outfall works occurring from June and December 2026. Pipeline construction would progress along the alignment at an anticipated rate of 1.5 km per 6 days or approximately 250 metres per day.

Detailed design in underway for the pipeline.

Key construction activities used in the assessment are summarised in Table 5.1

Table 5.1 Summary of construction activities

Construction activities	Overview
Preliminary works	Construction of an access road and works areas on the southern side of the stockpile yard along the construction footprint of the pipe, to the Break Tank Location. This is to include: – Construction pads at the Sump and Break Tank Locations. – Setup of site offices, ablutions, stores and temporary power generation. – Setup up of batch plant. – Mobilise local equipment to site. – Transport of materials from the GEMCO Port to the access road. – Setup pipe support rollers, pipe track and welding equipment. – Commence testing of welder setup and preparation of pipe strings.
Right of way preparation (vegetation clearing and grading)	Prior to installation of the pipeline, vegetation will be cleared in the immediate vicinity of the proposed pipeline alignment within the construction footprint (a maximum of eleven metres total width). Terrain will also be graded in order to provide a level surface for the pipeline's installation. Dust generating equipment expected to be used during this phase of construction would include excavators, skid steers, bulldozers, wheel loaders and articulated dump trucks. It is expected that this phase would progress approximately 250 m per day along the construction footprint.
Pipeline installation – Corridor installation works	The majority of the pipeline will be installed directly on the ground. The main sources of dust for pipeline installation are expected to be from heavy vehicle movements, and displaced dust as heavy sections of pipeline are positioned. Pipeline would be delivered via trucks and lifted into place using mobile cranes. The pipeline will follow the alignment outlined in Figure 1.1, with a pump and generator facility located on the southern end of the new pipeline. It is expected that this phase would progress approximately 250 m per day along the construction footprint.

Construction activities	Overview
Pipeline installation – Existing pipeline, connectivity crossings, gully crossings and earthen ramps	At locations at existing pipeline crossings, the pipeline would be installed on the ground with no additional measures to hold it in place. Where earthen ramps are proposed (i.e. at one crossing location) to facilitate connectivity at the Port the section of pipeline would require increased excavation and movement of earth materials than corridor installation works. It is expected that approximately 25 m of pipeline would be earthen ramped along the footprint. This length of pipeline would be approximately 640 metres south of Alyangula township. Gully and connectivity crossings are expected to be either trenched, or installed above ground on pipeline cradles/supports. Gully / connectivity crossings have been assessed assuming the trenched option as a conservative approach and are dispersed throughout the alignment.
Pipeline installation – Rowell Highway Crossing	The pipeline crosses Rowel Highway at one point as indicated in Figure 4.8. The proposed crossing is located approximately 1.5 km south of R10 and 2.5 km north of R01-R09 (656637E 8459201N). The crossing will be made by using an open cut trench method. Dust emissions are expected to be relatively short in duration, as excavators and other heavy earth moving equipment would establish and close the open cut trench.
Pipeline installation – Creek crossings	Creek crossings will be either trenched and buried with rock erosion protection or raised in cradles/supports. Creek crossings will be required intermittently along the length of the pipeline alignment and align with existing watercourse crossing points along the Rowell highway. If water is present in the watercourse, temporary bunding may be required during construction. Creek crossings have been assessed assuming the trenched option as a conservative approach and are dispersed throughout the alignment.
Generator and pump construction	As part of general pipeline construction, a 3.3 kV generator and 710 kW pump station will be constructed at the southernmost point of the pipeline. Construction of the generator and pump station will require earthworks, road works and general construction works. It is likely that as part of generator and pump construction, excavators, mobile cranes, articulated dump trucks, wheel loaders, cement mixers/trucks, skid steers and bulldozers would be utilised. The proposed pump and generator station is located approximately 6 km from the nearest sensitive receptor. Air quality impacts are not expected from the construction of this facility and as such a detailed risk assessment of its construction is not necessary under the IAQM guidelines.

Construction activities	Overview
Ocean Interface Construction	Construction of the ocean interface can be broadly categorised into Sump tank works and Break Tank works. Except for the pipeline which connects directly to the sump and break tank, the majority of pipework is still expected to be installed primarily above ground level, with minor underground pipeline sections connecting break tanks and sump tanks to the rest of the pipeline. Material excavated from the ocean interface works and subsea trenching will be stockpiled at the existing spoil disposal site. Management of emissions from stockpiled material at the existing spoil site will be managed under GEMCO's existing dust management strategy. It is understood that as part of this management strategy emissions from the spoil pile are currently actively monitored by an E-Sampler and a HVAS monitor. **Sump tank construction** Construction of sump tank will require earth works (excavation). The tank will have an 8 m diameter, and a depth of 4.6 m. Excavated substrate will be composed of beach sand and may be inundated with water during high tide periods. General construction of the tank will involve installation of precast segments and will likely not result in significant dust emissions. The sump tank will be connected to the rest of the subterranean pipeline arrangement as part of general alignment construction. **Break tank construction** The break tank will be similar to the construction of the Sump tank; however, the substrate being excavated will likely have a higher potential to result in air quality impacts as it is not situated on coarse grained beach sand.

6. Air quality impact assessment

6.1 Construction dust risk assessment

Expected construction activities within the construction footprint are defined in section 5.

The generation of dust and particulate matter are the primary pollutants during the construction phase of the Project. A risk-based approach in accordance with IAQM guidance was adopted to assess potential particulate matter impacts during construction of the Project.

The IAQM guidance recommends that a detailed risk assessment be undertaken where there is a human receptor within 250 m of the construction footprint, or where there is a human or ecological receptor within 50 m of any haulage routes up to 250 m from the site entrance. There are eleven receptors within 250 m of the pipeline installation footprint, and as such a detailed risk assessment has been undertaken for this stage.

Receptor sensitivity

Receptor risk is generally identified for dust soiling impacts, human health impacts and ecological impacts. Dust soiling is defined in the IAQM as “the effect of deposited dust on surfaces, which can lead to annoyance”. There are ten sensitive receptors which are between 100 m and 250 m distance from the construction footprint. As such the sensitivity of human receptors for the Project would be low as per the IAQM guidance.

Ecological Receptors

Areas within and around (<20 m) the Construction footprint are considered as potential habitats for endangered and critically endangered species of fauna. The critically endangered Northern Quoll was identified in proximity to the study area; however Northern Quolls are not considered dust sensitive and as such the ecological receptor sensitivity was considered as low.

Dust emission magnitude

The expected construction description in Section 5 has been used to gain an understanding of activities which may be a source of dust. No potential sources of odour were identified and therefore this assessment strictly focuses on particulate matter impacts.

The IAQM guidance provides example definitions for small, medium and large dust emissions magnitude for each stage of construction which have been adopted for this assessment

– Earthworks: Total site area (small, medium and large thresholds of <18,000 m^2, 18,000-110,000 m^2, and >110,000 m^2 respectively), soil type, number of heavy earth moving vehicles, formation of bunds.
– Construction: Total building volume (small, medium and large thresholds of <12,000 m^3, 12,000-75,000 m^3 and >75,000 m^3 respectively), construction materials, presence of onsite concrete batching.
– Trackout: number of heavy-duty vehicle (HDV) movements (small, medium and large thresholds of <20 HDV outward movements, 20-50 HDV outward movements, >50 HDV outward movements respectively), surface material, and length of unpaved road (small, medium and large thresholds of <50 m, 50-100 m, and >100 m respectively).

Activities expected to produce the largest dust emissions have been identified and mitigation measures to manage these emissions have been provided in Section 6.3.

Risk assessment

A summary table of the assessment findings are presented below in Table 6.1. Preliminary works and right of way preparation (vegetation clearing and grading) were determined to have the highest risk of dust impacts to sensitive receivers as the construction footprints are closest to them. This is due to associated earthworks and dust impacts from vehicle movements on dusty roads. Dust impacts are of highest risk at receptors R04 through to R09 due to being closer to the construction footprint. Mitigation strategies to limit risk of impacts to amenity are presented in Section 6.3.

Table 6.1 Dust risk assessment of the construction stage

Step 1: Screen the need for a detailed assessment			
There are residences within 250 m of the construction footprint. A detailed risk assessment is needed.			
Step 2A: Define the potential dust emission magnitude			
Construction activity	**IAQM construction stage classification**	**Description**	**Dust emission magnitude**
Pipeline Construction			
Preliminary works	Construction	Preliminary works will involve the construction of an access road, pipe laydown area, construction pads, site offices, batch plant equipment mobilisation and construction material delivery and clearing of vegetation where required. It has been assumed that less than 12,000 m^3 material would be installed as part of preliminary works.	Small
Right of way preparation (Vegetation clearing and grading)	Earthworks	Removal of existing vegetation from areas planned for pipeline right of way and grading of earth to ensure level surfaces for pipeline installation. It is assumed that the alignment will progress at a maximum rate of 250 m per day with a maximum disturbance width of 11 m. This would result in an area less than 18,000 m^2 of soil being disturbed per day. As such the dust emission magnitude for this would be low. Most significant sources of dust such as excavators and trucks would be limited to the daily disturbance area however there would likely be some areas yet to be rehabilitated along the alignment subject to wind erosion which has a small dust emission magnitude.	Small
Pipeline delivery	Track out	Delivery of pipeline sections will likely involve up to 24 heavy vehicle trips per day, and 6 light vehicle trips on sealed roads. Trucks delivering trucks may move onto the unpaved escarpment.	Small
Pipeline installation – Corridor Installation Works	Construction	Pipeline installation would involve installing pipeline with pipe track on to concrete sleepers. The highest source of dust generation will come from disturbed earth during anchoring of concrete sleepers. During these works, the pipeline may also be bunded to capture water runoff in the event of a pipeline burst or leak It is assumed that the pipe installation would progress along the alignment at 250 m per day and that the width of disturbed earth would be approximately eleven metres (250 m x 11 m). The pipeline is also not expected to be above 2 m in height. As such, it is assumed that the building material brought in per day (soil or concrete depending on anchoring method) would be less than 12,000 m^3 per day.	Small

Pipeline installation – Existing pipeline, connectivity crossings, gully crossings and earthen ramps	Earthworks	At locations where crossing with already existing pipeline is required, the pipeline would be installed on the ground and held in place with loose placed earthen mounds. Gully and connectivity crossings will be undertaken using an open cut trenched crossing methodology and will likely be undertaken using excavators. It is assumed that the pipe installation would progress along the alignment at 250 m per day and that the width of disturbed earth would be approximately eleven metres (250 m x 11 m). A single earthen ramp will be constructed approximately 640 metres south of Alyangula township. This area is expected to be a maximum of 25 metres in length a maximum width of 10 metres. As such the expected area of earthworks being undertaken would be less than 18,000 m^2.	Small
Pipeline Installation – Rowell Highway crossing[1]	Earthworks	The Rowell Highway crossing will be undertaken using an open cut trenched crossing methodology and will likely be undertaken using excavators. It is assumed that the pipe installation would progress along the alignment at 250 m per day and that the width of disturbed earth would be approximately eleven metres (250 m x 11 m). As such the expected area of earthworks being undertaken would be less than 18,000 m^2.	Small
Pipeline installation – Creek crossings	Earthworks	Creek crossings will be undertaken using an open cut trenched crossing methodology and will likely be undertaken using excavators. It is assumed that the pipe installation would progress along the alignment at 250 m per day and that the width of disturbed earth would be approximately eleven metres (250 m x 11 m). The expected area of earthworks being undertaken would be less than 18,000 m^2.	Small
Ocean interface construction			
Earthworks: Sump tank[1]	Earthworks	Earthworks activities for the sump tank will require the excavation of an area less than 18,000 m^2. The expected earthworks footprint is shown in Figure 1.1. Excavated material is expected to be large grain, sandy earth. As such dusts emission magnitudes for this activity are expected to be small.	Small
Earthworks: Break tank[1]	Earthworks	Earthworks activities for the sump tank will require the excavation of an area less than 18,000 m^2. The expected earthworks footprint is shown in Figure 1.1. Excavated material is a potential source of dust emissions, however due to the small area of activity, dust emission magnitudes are expected to be small for this activity.	Small
Construction sump tank and break tank[1]	Construction	Construction of sump tank and break tank will involve the delivery and installation of precast tank segments. Dust emissions from this activity are expected to be primarily driven by movement of heavy vehicles. Due to the relatively simple construction, and construction material which is not expected to result in significant dust generation, as the tanks will not require more than 12,000 m^3 of structures to be constructed.	Small

Step 2B: Define the sensitivity of the area – Sensitive receptors	
There are a total of 11 receptors, between 100 m and 250 m distance from the Construction footprint. Thus, the sensitivity to impacts is low.	
Step 2B: Define the sensitivity of the area – Ecological receptors	
There are no dust sensitive endangered fauna, and no endangered flora observed within 20 m of the construction footprint, thus, the sensitivity to impacts is low.	
Step 2C Define the risk of impacts – Sensitive and ecological receptors	
Description	**Risk of impact**
Pipeline construction	
Preliminary Works	Low Risk
Right of way preparation (Vegetation clearing and grading)	Low Risk
Pipeline delivery	Low Risk
Pipeline installation – Corridor Installation Works	Low Risk
Pipeline installation – Existing pipeline, connectivity crossings, gully crossings and earthen ramps	Low Risk
Pipeline Installation – Rowell Highway crossing[1]	Low Risk[1]
Pipeline installation – Creek crossings	Low Risk
Ocean interface construction	
Earthworks: Sump tank[1]	Low Risk [1]
Earthworks: Break tank[1]	Low Risk [1]
Construction sump tank and break tank[1]	Low Risk [1]
1. There are no receptors within 250 m of the construction footprint, therefore dust impacts are predicted to be negligible.	

6.2 Operational assessment

The primary source of emissions for the operation of the new pipeline would come from additional pumps and generators used to pressurise the pipeline. The new diesel generators are supplied with fuel from 65 kL self-bunded diesel tanks and are expected to output 3.3 kV at 2500 kVA. Up to three new NH2 710 kW pontoon pumps and an additional 710 kW NH2 pontoon standby pump are also expected to be used during standard operations. There are currently no permanently installed generators, pumps or other stationary emissions sources within the vicinity (1 km radius) of the proposed pump and generator station.

Proposed pumps and generators will likely emit $PM_{2.5}$ and PM_{10} particles, volatile organic compounds (VOCs), sulphur dioxide, sulphates, nitrogen dioxide, nitrogen oxide, and water vapor. The proposed pumps and generators are approximately 4 km northeast of the nearest residential receptors. Due to the combination of distance from source to receptor, and the expected low emissions of the pump and generator station in relation to existing magnitude of emissions currently output by operation of the surrounding mine, operational emissions of the new pipeline are expected to have a negligible impact to air quality.

6.3 Mitigation and management measures

Project relevant mitigation measures proposed to avoid or minimise potential air quality impacts sourced from the IAQM Guidance during construction and operation of the Project are listed in Table 6.2. These measures should be implemented where reasonable and practicable in areas of the construction footprint where impacts to sensitive receptors are likely.

It should be noted that existing material stockpiles, which will be utilised during sump/break tank and ocean interface construction are currently managed under the existing MMP, which includes active air quality monitoring adjacent to the north most construction boundary.

Table 6.2 Mitigation measures – air quality

Mitigation measure	Outcome	Timing
Stakeholder engagement and management		
Develop and implement a stakeholder communications plan that includes community engagement before work commences onsite.	Higher quality communication with community.	Pre-construction.
Display the name and contact details of person(s) accountable for the air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	Higher quality communication with community.	Pre-construction.
Record all dust and air quality complaints, identify causes, take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	Higher quality communication with community.	During all phases of construction.
General site management during construction		
Where practicable and feasible, plan site layout, so that machinery and dust causing activities are located away from receptors, as far as is possible.	Reduced dust impact to receptors during construction.	During all phases of construction.
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfill during delivery.	Reduce fine particle emissions during construction.	During all phases of construction.
For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.	Reduce fine particle emissions during construction.	During all phases of construction.
Track out activities		
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continually in use.	Reduce fine particle emissions during construction.	During right of way preparation, pipeline delivery and installation.
Avoid dry sweeping of large areas.	Reduce fine particle emissions during construction.	During right of way preparation, pipeline delivery and installation.
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	Reduce fine particle emissions during construction.	During right of way preparation, pipeline delivery and installation.
Inspect on-site haul roads for integrity and instigate necessary repairs to surface as soon as reasonably practicable.	Reduce fine particle emissions during construction.	During right of way preparation, pipeline delivery and installation.
Record all inspections of haul routes and any subsequent action in a site logbook.	Reduce fine particle emissions during construction.	During right of way preparation, pipeline delivery and installation.
Ensure there is adequate area between the wheel wash facility and the site exit, wherever site size and layout permits.	Reduce fine particle emissions during construction.	During right of way preparation, pipeline delivery and installation.
Earthworks		
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	Reduce fine particle emissions during construction.	During right of way preparation, pipeline delivery and installation.
Use hessian, mulches or tackifiers where it is not possible to re-vegetate of cover with topsoil, as soon as practicable.	Reduce fine particle emissions during construction.	During right of way preparation, pipeline delivery and installation.
Only remove the cover in small areas during work and not all at once.	Reduce fine particle emissions during construction.	During right of way preparation, pipeline delivery and installation.

Mitigation measure	Outcome	Timing
Undertake dust suppression, as required, using water sprays, water extension agents, soil stabilising polymers or other media on: – Unpaved work areas subject to traffic or wind. – Spoil and aggregate stockpiles. – During the loading and unloading of dust generating materials. – Unpaved access tracks.	Reduce fine particle emissions during construction	During right of way preparation, pipeline delivery and installation.
Limit plant /vehicle movements to designated access/haul roads.	Reduce fine particle emissions during construction	During right of way preparation, pipeline delivery and installation.
Switching off plant and equipment when not in use	Reduce fine particle emissions during construction	During right of way preparation, pipeline delivery and installation.
Visual monitoring to confirm implementation measures are effectively managing dust emissions.	Reduce fine particle emissions during construction	During right of way preparation, pipeline delivery and installation.

7. Conclusion

An air quality impact assessment has been undertaken for the proposed GEMCO Excess Water Disposal project. The main pollutants of concern were identified as fine particulate matter.

A qualitative assessment was undertaken to estimate the impacts of dust emissions for the construction stage in accordance with the IAQM Guidance on the assessment of dust from construction. Risk of dust impacts to sensitive receptors is low across all construction stages.

It was determined that a detailed risk assessment was not required for the operation of the pipeline, as the nearest sensitive receptor is over 4 km from the proposed generator and pump station. As such, the risk of air quality impacts is negligible.

Management and mitigation measures have been identified for the construction of the pipeline in order to manage potential air quality impacts.

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