Adelaide River Off-stream Water Storage (AROWS)

Air Quality Impact Assessment

Department of Logistics and Infrastructure

21 October 2024

→ **The Power of Commitment**

Project name		D22-0228 AROWS Environmental Services					
Document title		Adelaide River Off-stream Water Storage (AROWS) | Air Quality Impact Assessment					
Project number		12600780					
File name		Appendix E - Air Quality Assessment_REP-3_AROWS.docx					
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S3	0	E. Smith	K. Pechazis		N. Fries		03/05/2024
S4	1	E. Smith	K. Pechazis		N. Fries		19/08/2024
S4	2	E. Smith	K. Yale		N. Fries		25/09/2024
S4	3	E. Smith	K. Pechazis		N. Fries		21/10/2024

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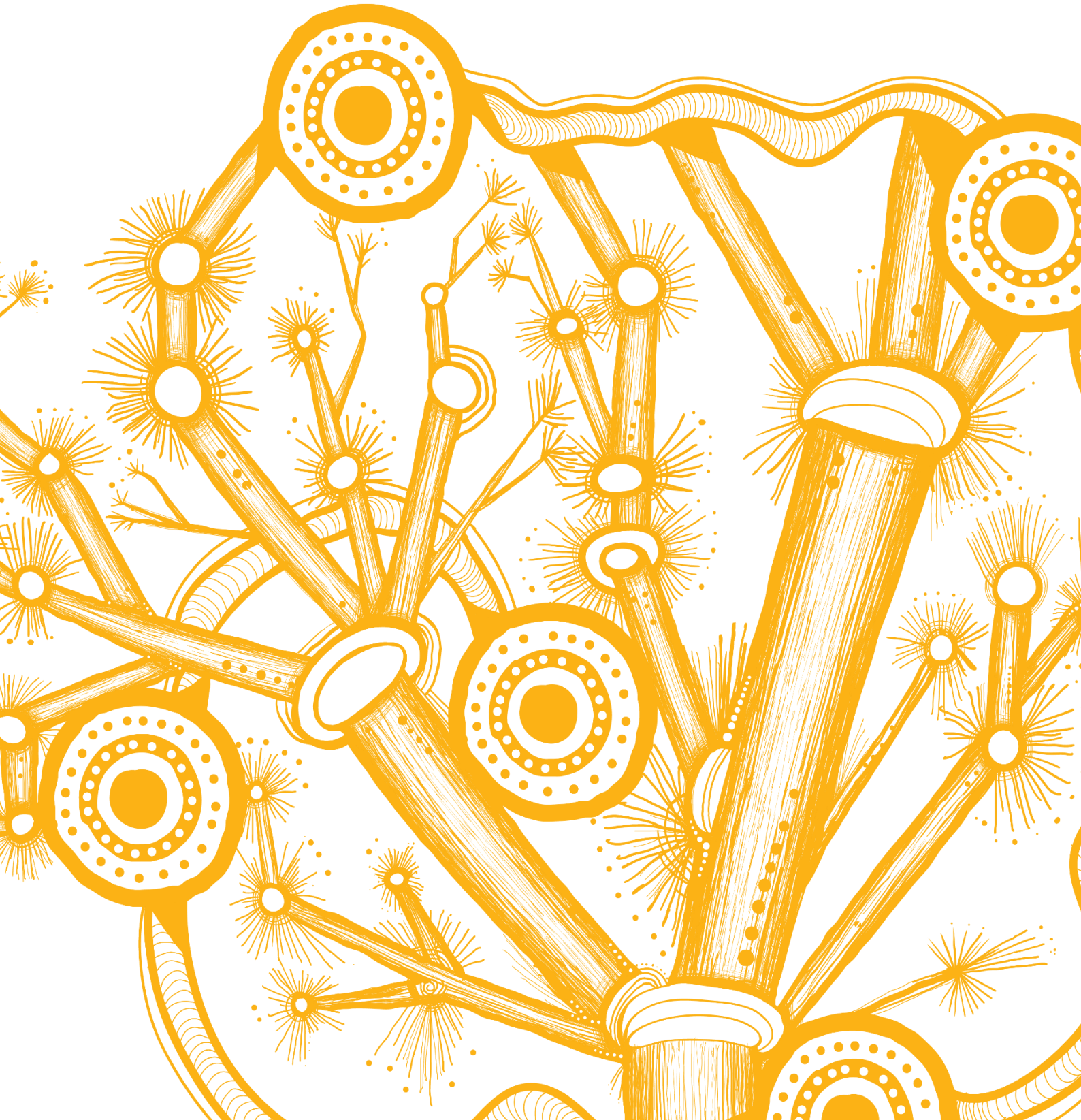
Acknowledgement of Country

GHD acknowledges Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the land, water and sky throughout Australia on which we do business. We recognise their strength, diversity, resilience and deep connections to Country. We pay our respects to Elders of the past, present and future, as they hold the memories, knowledges and spirit of Australia. GHD is committed to learning from Aboriginal and Torres Strait Islander peoples in the work we do.



Acronyms and abbreviations

Abbreviation	Description
AAQ NEPM	National Environment Protection (Ambient Air Quality) Measure
AROWS	Adelaide River Off-stream Water Storage
BoM	Bureau of Meteorology
CDMP	Construction Dust Management Plan
DLI	Department of Logistics and Infrastructure
EIS	Environmental Impact Assessment
EP Act	*Environmental Protection Act 1994*
EPA	Environmental Protection Authority
EPP (Air)	*Environmental Protection (Air) Policy 2019*
NOx	Oxides of Nitrogen
NT	Northern Territory
NTEPA	Northern Territory Environmental Protection Authority
O_3	Ozone
PM_{10}	Particulate Matter (airborne dust) with size of 10 micrograms
$PM_{2.5}$	Particulate Matter (airborne dust) with size of 2.5 micrograms
ppb	parts per billion
TSP	Total suspended particles
VOCs	Volatile organic compounds

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1. Introduction

1.1 Project background

In early 2020, the NT Government, in collaboration with Power and Water Corporation (Power and Water), identified a strategic need to address the supply and demand issues associated with water in the greater Darwin region. A Detailed Business Case (DBC) was developed to investigate and evaluate potential water supply augmentations and interventions that could respond to the forecasted future industrial, agricultural, horticultural, and urban demand (PwC 2021).

The DBC found that Darwin's existing water supply sources are currently operating at or above capacity, with investment in new water infrastructure required to ensure water availability does not constrain social and economic growth in the region.

In line with the recommendations from the DBC, the NT Government and Power and Water are delivering the Darwin Region Water Supply Program (DRWSP), proposed in two (2) stages:

Stage 1: Address short term water security challenges by maximising the use of existing assets and already disturbed eco-systems

a. Expanded demand management and water efficiency programs – delivered by the NT Department of Lands, Planning and Environment (DLPE) (Office of Water Security) and Power and Water to maximise the efficient use of existing water supply infrastructure assets.
b. Manton Dam Return to Service (RTS) – delivered by Power and Water, as the short term infrastructure solution to meet the existing water supply and demand gap and provide additional water supply redundancy in the system.

Stage 2: Meet the long term water security needs of the Darwin region

a. AROWS project (focus of this proponent-initiated referral) – delivered by DLI (Infrastructure NT) as the step change required in water supply to underpin future social and economic growth in the region and meet long term forecast demand.

The AROWS DBC was endorsed by Infrastructure Australia (Australia's peak Infrastructure advisory body) as a holistic, investment-ready program with national significance. The complete options assessment process undertaken as part of the DBC is accessible through **https://watersecurity.nt.gov.au/darwin-region-future-water-supply**.

1.2 About the AROWS project

In contrast to in-stream dams, the AROWS project (the Project) represents an innovative off-stream water storage initiative. This approach (as developed in other countries) eliminates the need for within-river dam infrastructure, and effectively controls when water is extracted from the river, thereby protecting dry periods and preserving the natural flow of the Adelaide River. Extraction activities will strictly adhere to an approved water extraction licence. The licence will specify the amount of water the AROWS project will extract from a designated consumptive pool be determined by the Adelaide River catchment water allocation plan (currently being developed by the Department of Lands, Planning and Environment).

The AROWS project stands as a distinctive public water infrastructure endeavour, with a primary objective of concurrently enhancing water availability, while ensuring the protection of cultural values and environmental sustainability. The Daly Range inclusive of a geological 'basin-like' formation and proximity to the Adelaide River offers a unique opportunity.

Benefiting from a dependable average annual rainfall into the catchment, the Adelaide River system becomes a focal point for the AROWS project. This favourable hydrological condition provides the NT Government with an uncommon prospect to implement an innovative major water infrastructure project. The AROWS project is designed to significantly bolster water security for public water supply in the Darwin region, comparable to a major dam but with considerably lower environmental impact.

Positioned as a long-term solution, the AROWS project aims to nearly double the current water supply to the Darwin region. During the wet season flows, the Project will judiciously extract water from the Adelaide River, storing it in the naturally formed basin-like feature known as the AROWS basin. This basin is delineated by two north-south trending quartzite ridges situated near the Daly Range, spanning the area between the Manton River and the Adelaide River.

1.3 Purpose of this report

This air quality assessment has been prepared by GHD Pty Ltd (GHD) on behalf of the proponent, the Department of Logistics and Infrastructure (DLI), to identify environmental risks associated with the construction, commissioning and operation of the AROWS project (the Project).

The purpose of this report is to identify and characterise the potential air quality impacts associated with the Project and assess whether the Project is likely to have a significant impact on air quality values and sensitive receptors.

This report supports the referral to the EPA for the Project. The scope of the assessment includes:

– Identification of potential air quality sensitive receptors around the project area
– Assessment of the potential air quality related impacts to the key elements of the proposed development
– Recommendations of suitable avoidance and mitigation measures to minimise the impacts.

1.4 Scope and limitations

This report has been prepared by GHD for Department of Logistics and Infrastructure and may only be used and relied on by Department of Logistics and Infrastructure for the purpose agreed between GHD and Department of Logistics and Infrastructure as set out in section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Department of Logistics and Infrastructure 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 2.2.1 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

2. Air quality

The Northern Territory (NT) Environmental Protection Authority (EPA)'s objective for the Air Quality factor is to: *'Protect air quality and minimise emissions and their impact so that environmental values are maintained'.*

An important aspect of developing the AROWS project is establishing an understanding of the existing air quality within the AROWS project study area. The study area for air quality includes the areas that would be directly and indirectly impacted by the Project's construction, commissioning and operational activities for the various project components. The features of interest can be defined as described below:

– AROWS basin, intake and outlet/delivery infrastructure including; dam walls and spillway, and inundation area.
– Supporting and connecting infrastructure.

In addition to the site preparation works, ancillary works and infrastructure may be required to support the development of the Project and may include borrow pits, batching plant, road and access developments and/or upgrades (e.g., dam and pipelines construction access tracks), site establishment areas, construction compounds/laydown areas, site amenities and temporary workforce accommodation, services and utilities (e.g., electricity/transmission lines, telecommunications). The extent of the study area for the air quality assessment therefore extends to 5 kilometres (km) from the construction and operation footprint.

This section provides a qualitative air quality assessment for the AROWS project. It describes the air quality values around the AROWS project site, and the potential impacts associated with the Project on those values and proposed mitigation measures.

2.1 Environmental values

2.1.1 Sensitive receptors

The AROWS project site is located approximately 55 km southeast from Darwin and approximately 5 km north of Lake Bennett, adjacent to the Adelaide River and within both the Coomalie and Litchfield shires. The nearest residential community to the Project is Acacia Larrakia (Acacia Gap), an Indigenous community located approximately 2.2 km northwest from the AROWS basin within the Manton suburb and locality (SLA). Lake Bennett has a residential community of permanent residents and also provides water and nature-based recreation with short stay accommodation and associated facilities at the Lake Bennett Resort (De Lago Resort) along with private accommodation.

An air quality sensitive receptor refers to a fixed location (including a house, building, residential dwelling, other premises and open areas) where people may reside or work and potentially be exposed to air pollution (e.g. human health may be affected by air emissions from existing or proposed development) or property damage or amenity loss may be caused by air emissions) or plants, animals or ecosystems may be impacted by air emissions (EPA, 2016).

The majority of the AROWS project site traverses sparsely settled rural land, noting the AROWS basin (including inundation area, dam walls, intake infrastructure and associated road works (e.g., upgrade of unsealed and sealed roads and tracks) are generally isolated from locations with a high-density of air quality sensitive receptors as defined above. Comparatively, the AROWS project's proposed outlet (e.g., services corridor), connecting, and supporting infrastructure (i.e., substation and transmission lines, telecommunications line, access tracks and laydown areas) are external to the basin. The construction of these project components, including any associated road works within the project area, may take place in closer proximity to sensitive receptors.

A desktop review and assessment has been undertaken in preparation of this referral and have considered the Project area. This review has identified a total of 672 sensitive receptors within 5 km of the Project area. Further review of this data shows 39 air quality sensitive receptors are within a conservative 250 m of construction elements, a distance which can be considered as in close proximity to construction with potentially higher risk from construction dust impacts.

A map showing the distribution of sensitive receptors within 5 km of the Project area and within 250 m of construction elements is provided in Figure 2.1. Within the air quality study area, there were no educational institutions, hospitals, medical centres, business or commercial properties identified.

Cox Peninsula Road
Stuart Highway
Adelaide River
Acacia Gap
Manton River
Manton Dam Wall Picnic Area
Manton Dam
Darwin River Dam
Adelaide River
Stuart Highway
Margaret River
Heathers Lagoon Road
Marrakai Road
Otto Creek Road
Chinner Road
Lake Bennett
Owen Lagoon Road

Legend

Air quality sensitive receptor (Residential)
- within 250m
- within 5km

Air quality sensitive receptor (Other)
- Business
- Farm and garden
- Government
- Historical Site
- Hospital
- Hotel
- Park and recreational area
- Restaurant
- Road
- Rail line
- Major watercourse
- AROWS basin
- AROWS basin catchment
- AROWS scheme (Reference Project)
- Project area
- Cadastre
- 250m Buffer area from construction elements
- 5km Buffer area from contruction elements

Paper Size ISO A3

0 1 2 3 4

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 52

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Department of Logistics and Infrastructure
(Northern Territory Government)
D22-0228 AROWS Environmental Services

Project No. 12600780
Revision No. 0
Date 23/10/2024

Project sensitive receptors

FIGURE 2.1

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Data source: GHD: Locality labels (2023), Buffer areas, Building points (2024); DIPL: Rail line (2021), AROWS basin (2023); DEPWS: Major watercourse (2021); DLI: Cadastre (2024); DIPL/GHD: Road (2007/2023); PW/GHD: AROWS Scheme; Google Earth Pro: Community, Receptor (2024). World Ocean Base - GeosciencesAustralia, Esri, Garmin, NaturalVue. Created by: eguardian

2.1.2 Air quality existing environmental values

The results of a campaign monitoring undertaken by the NT Government in 2000-2001 identified particles from landscape fires affecting the Darwin region as the primary air pollutant of concern in the NT. Analysis of the 2000-2001 data indicated that nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3) and lead aerosols were not a cause for concern in the Darwin/Palmerston region when assessed against the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) standards. Since that time the population and industrial activities in Darwin has increased and more detailed monitoring of airborne pollutants was required. The NT Government committed funding in 2008-09 to the establishment and ongoing operation of a comprehensive air quality monitoring system for the Darwin region allowing for monitoring of all pollutants identified in the AAQ NEPM with the exception of lead.

The NT EPA has four Air Quality stations installed across the Territory, three in the Darwin region (Palmerston, Winnellie, and Stokes Hill) and one in Katherine. The closest air quality monitoring station to the AROWS project site is the Palmerston station which is approximately 50 km northwest of the basin and 25 km from northern-most extent of the transfer pipeline into the Hughes Balance Tank. The air quality data from this monitoring station has been selected for review, as it is closest to the Project site.

General health advice and recommended actions by the NT EPA are based on air quality categories for the different pollutants. These categories are defined as 'good', 'fair', 'poor', 'very poor' and 'extremely poor' and are specific to each pollutant and their respective short-term averaging time (**Envista - Air Resources Manager (ntepa.webhop.net)**).

2.1.2.1 Air pollutants

The AAQ NEPM identifies target ambient concentrations for the following pollutants:

- SO_2
- CO
- NOx
- O_3 (surrogate for photochemical oxidants)
- Lead and compounds
- Particulate matter <10 µm (PM_{10})
- Particulate matter < 2.5 µm ($PM_{2.5}$)

Particulate matter (airborne dust particles) measured at a maximum size of 2.5 micrograms ($PM_{2.5}$) which are the finer dust particles and maximum size of 10 micrograms (PM_{10}) have been identified by the NT EPA as the air pollutants of primary concern in Darwin and Palmerston.

It is noted that construction-related dust mainly comprises larger dust fractions, Total suspended particles (TSP) and PM_{10}. In consideration of the primary air pollutant of concern and the main dust generating activity, ambient PM_{10} data has been selected as of most relevant in this study and has been considered in further detail below. Natural environmental conditions (bushfire, dry season) and existing roads and activities (agricultural) within the regional area, contribute to the background air quality already present within the study area. Other existing sites or industry in the area may be an existing source of dust and PM_{10}, including vehicles on unpaved roads, quarries and agricultural activities.

This section describes the general baseline air quality in relation to the particulates (PM_{10}), as they generally constitute the main pollutants of concern. These are discussed in relation to their concentrations recorded by the Palmerston station.

Particulate Matter (PM_{10})

The importance of measuring dust particulate in different fractions is they have the potential to impact, in the worst-case human health or at the other end of the spectrum nuisance or inconvenience.

A pollution event for particulates (PM_{10}) occurs when the daily average concentration measured at any of the air quality monitoring stations exceeds any of the AAQ NEPM standards for particulates – 25 µg/m³ (1-year average) and 50 µg/m³ (1-day average) for PM_{10} dust.

Mean daily concentrations of PM_{10} dust measured at Palmerston for the period 2013 – 2023 are presented in Table 2.1 and illustrated in Figure 2.2, respectively against the NT EPA categories. The highest average daily levels for each of these particulates were recorded in the dry season of each year with August 2023 recording the highest exceedances for both pollutants to their respective AAQ NEPM standards. These are generally attributed to exceptional events such as smoke from regional and local vegetation burning and distant large-scale savanna fire activity such as hazard reduction burns during the dry season (NT EPA, 2023). While there are currently no air quality monitoring stations within or in the immediate surrounds of the AROWS project site, exceedances in particulate concentrations as a result of these exceptional events are generally thought to occur across the NT as part of the existing background environment.

Air quality monitoring suggests generally the air quality of the regional study area falls into the 'good' category with 99% of all measured PM_{10} concentrations falling in this category, 1% of all PM_{10} concentrations in the 'fair' category and only 0.1% falling into the 'poor' category. The pollution events noted in the air quality monitoring data were all attributed to smoke from fires.

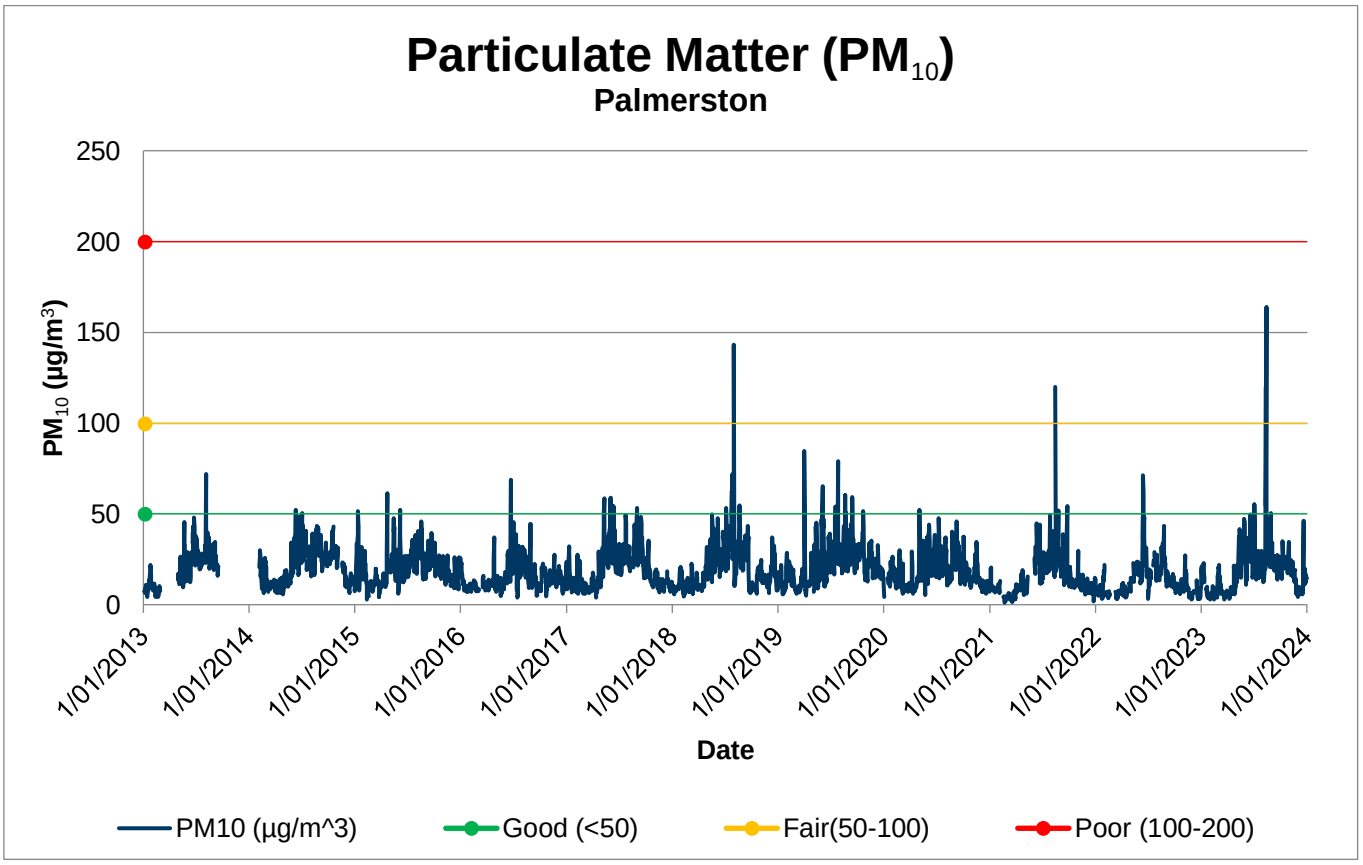


Figure 2.2 Air quality – Palmerston Station PM_{10} (Data: NT EPA, 2023)

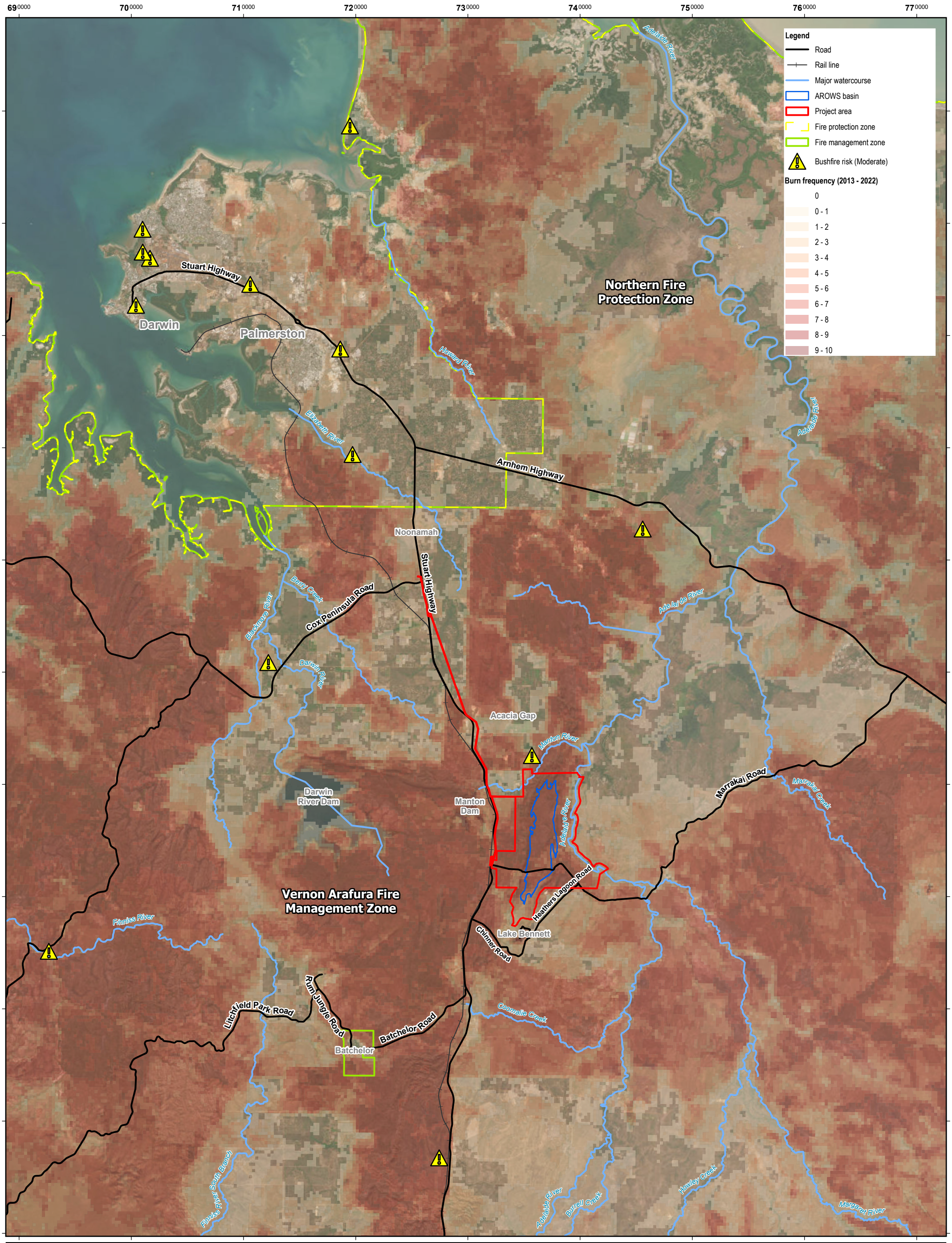
Table 2.1 Summary of PM_{10} concentrations at Palmerston AQMS

Pollutant	Averaging Period	Recorded background concentration by year (µg/m³)										
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
PM_{10}	24-hour maximum	72.1	52.2	61.3	68.9	58.8	143.1	84.5	52.3	119.9	71.3	164.0
	Annual average	20.0	21.1	20.2	15.2	19.5	8.7	22.0	18.3	15.1	13.1	18.6
	70th percentile	25.5	26.0	23.6	16.8	23.7	25.0	25.9	21.7	17.6	15.5	22.8

2.1.2.2 Bushfire

Bushfires are one of the primary sources for Particulate Matter emissions and are known to frequently occur in the natural environment within the NT in the dry season (NT EPA 2020). Smoke emissions can cause or contribute to human respiratory irritations.

The AROWS project site is within the Northern Fire Protection Zone and Vernon Arafura Fire Management Zone and is assessed as moderate risk for impact from bushfire (NR Maps 2023). The project area is mapped as having a burn frequency 9-10 events between 2013 and 2022 (NAFI 2023).



Paper Size ISO A3

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 52

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D22-0228 AROWS Environmental Services

Project No. 12600780
Revision No. 0
Date 24/10/2024

Fire scar (2013 - 2022)

FIGURE 2.3

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Data source: DENR: Bushfire community risk (2021); NAFI: Burn frequency (2022); GHD: Locality labels (2023); DIPL: Rail line (2021); AROWS basin (2023); DEPWS: Major watercourse (2021), Fire management zone, Fire protection zone (2024); DIPL/GHD: Road (2007/2023); PW/GHD: AROWS Scheme (2024); World Imagery - Earthstar Geographics. Created by: eguardian

2.1.2.3 Meteorology

The local meteorology (weather) within the air quality study area is of critical importance when assessing the potential for air quality impacts at sensitive receptors, especially with regards to construction generated dust impacts. Meteorology will influence construction dust impacts through emission potential and emission transport.

The emission potential (emission rates) from construction dust generating activities is dependent on both wind speeds at the activity location and the surface moisture content. Worst-case construction dust emissions would occur during periods of high wind speeds and low surface moisture content, where a combination of low rainfall, elevated temperatures and elevated solar radiation would lead to a drying of the surface.

The emission transport (dispersion) of construction dust from the activity location is influenced primarily by the direction of the winds, and to a lesser degree by the speed of the winds and the atmospheric stability (measure of atmospheric turbulence).

The AROWS project site's climate zone is classified as tropical in accordance with the Köppen – major classes classification mapping, marked by a wet summer and a dry winter, and is typically described as having a hot humid summer (BOM, 2023a). Rainfall is affected by local factors such as topography and broader scale (global) weather patterns, including effects of climate change which is associated with an increase in annual temperatures and the decline of June-August rainfall (Climate Change in Australia, 2022). In 2023, the mean wind speed at the Bachelor Airport weather station (Site number 014272) ranged from 9 km/hr in November to 14.2 km/hr in June which reflects the wet/dry season nature of top end environments within the NT.

The prevalence of wind can act as dispersal for air pollutants however also dilute the concentration of pollutants.

Annually, winds are predominantly from the southeast and the northwest. Winds are rarely from the northeast or southwest quadrants. The seasonal data shows that when surface moisture content would likely be at its lowest (Winter and Spring) predominant wind directions are also generally from the southeast or northwest.

Relevant to potential dust impacts, this means that any receptors to the northeast or southwest of construction areas are less likely to be impacted.

Calms, which are defined as wind speeds less than 0.5 m/s and are associated with poor dispersion outcomes, occur 15% of the time and are generally high except for summer.

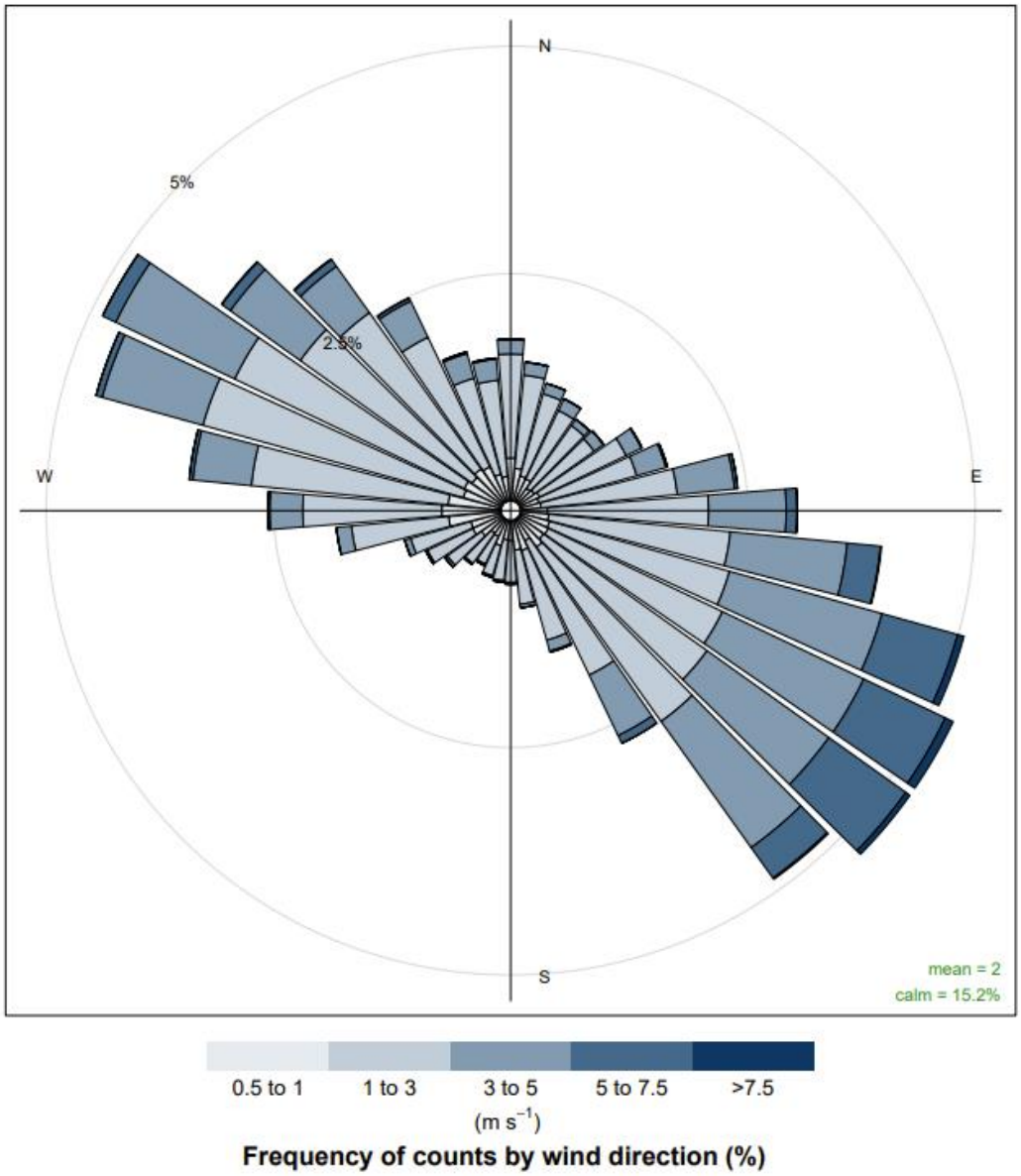

Figure 2.4 Average wind rose from BoM Batchelor Airport AWS (2018-2022)

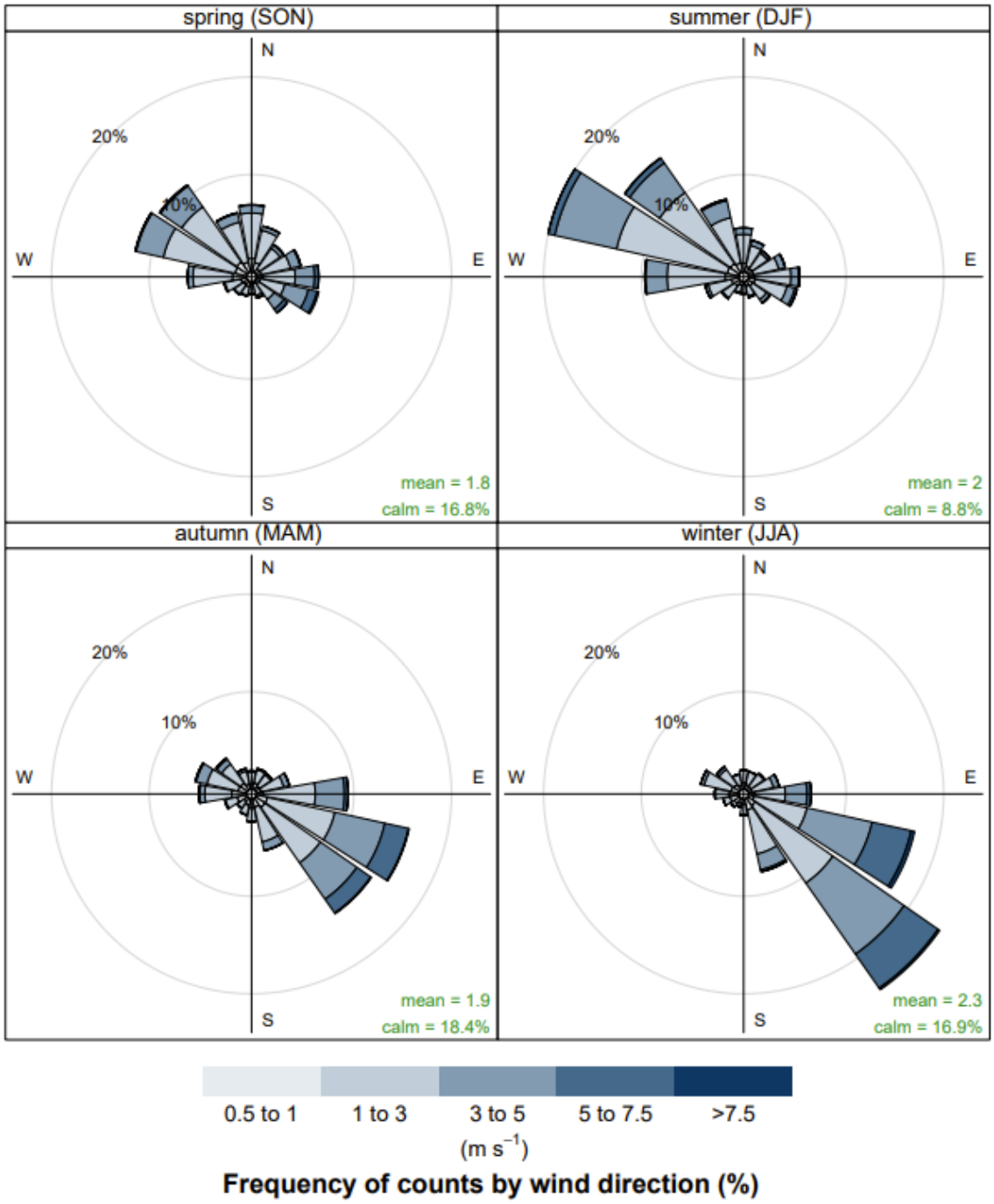

Figure 2.5 Average seasonal wind roses from BoM Batchelor Airport AWS (2018-2022)

2.1.2.4 Topography

The natural landscape, including terrain and the presence of any significant features such as prominent hills, gullies and watercourses can influence local meteorology as well as dispersion of any pollutants. The potential impact on pollutants including construction dust is highly variable.

Complex topography would generally be considered when undertaking dispersion modelling, however for the purpose of this qualitative assessment any impacts or reductions the terrain may have on pollutant dispersion are not considered to facilitate a conservative/precautionary approach.

2.2 Potential impacts

The air quality values may be influenced by project activities from a variety of sources of emissions to air potentially impacting human health (and wellbeing), the aesthetic environment (human amenity), biodiversity and surrounding land uses. This qualitative assessment focuses on the highest risk of impacts with the potential to occur from the AROWS project.

Based on a review of the existing environment, key considerations are:

– Air quality in the area is considered generally good with minimal exceedances of the NEPM 24 hour PM_{10} criteria, and generally only during drier winter months.
– Wind is generally from the northwest during spring and summer and southeast during autumn and winter.
– There are 39 receptors identified within close proximity (250m) to current known construction areas.

2.2.1 Assessment method

The air quality impact assessment has been undertaken to estimate the potential air quality impacts associated with the construction and operation of the AROWS project. Air pollution from construction of the Project has the potential to cause health and amenity impacts to those receptors in close proximity to the construction areas if not appropriately managed. The main emissions to air during construction are dust and particulate matter.

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 emissions
– Identification of nearby sensitive receptors to construction activities
– A qualitative air quality assessment with a focus on construction particulates and dust
– Review of published buffer or separation distance guidelines for certain project activities
– Review of operational activities and identification of sources of odour emissions
– Identification of project specific mitigation measures to manage the potential for dust and odour impacts.

In the absence of any specific NT guidance for conducting air quality assessments, the qualitative assessment has been completed with consideration to the *Guidance on the assessment of dust from demolition and construction* (Institute of Air Quality Management, 2023) (the 'IAQM guidance').

Separation distance review has been undertaken following South Australia EPA guidance *Evaluation distances for effective air quality and noise management (EPA, 2016)*

2.2.1.1 Dust assessment criteria

Dust assessment criteria for the project were taken from the AAQ NEPM. The objective of the criteria is 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. During the undertaking of activities, natural background sources may influence the ability for project compliance.

Relevant assessment criteria for the primary pollutants associated with construction of the project are presented in Figure 2.2. The criteria apply to the total impact (project increment plus background sources) and must be reported as the 100^{th} percentile (maximum) as a precautionary approach.

Table 2.2 Air quality impact assessment criteria

Pollutant	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

2.2.1.2 Separation distance review

The Environment Protection Authority (EPA) in several states has specified minimum separation distances between industrial land uses that emit odour or dust and those that may be sensitive land uses. These guidelines are published as one method of considering potential conflicts between incompatible land uses. These are recommendations only, and there is always opportunity for a proponent to demonstrate compliance with relevant legislative requirements through other methods. It is noted that separation distances are developed to minimise impacts that may occur when there are accidents, power failure, equipment failure (i.e., pollution controls) or unusual meteorological conditions that may occur, as well as normal operation.

Project activities which are defined in the South Australia EPA guidance *Evaluation distances for effective air quality and noise management (EPA, 2016)* and relevant to the project are summarised in Table 2.3.

Table 2.3 Recommended separation distances for effective air quality management

Project activity	Evaluation distance	Relevance to project
Abrasive blasting	500 m	May be required as part of construction activities, in particular the construction of dam walls. Construction methodology will be explored through a Concept Design process. The impacts associated with the chosen construction methods will be considered through the environmental risk assessment process that will be undertaken during the EIS.
Hot mix asphalt preparation	500 m	May be required as part of construction activities in particular, work required on tracks and roads. Construction methodology will be explored through a Concept Design process. The impacts associated with the chosen construction methods will be considered through the ERA process that will be undertaken during the EIS.
Concrete batching works	200 m	Construction of dam walls and other project requirements
Bulk storage facilities	300 m	Potentially relevant to large construction storage areas with lots of truck movements
Crushing, grinding or milling	500 m	Relevant for crushing of rocks etc
Extractive industries (quarrying)	Individual assessment	The main concern is dust, which is generated at sites from excavation areas, haul roads, raw feed and product stockpiles, processing and screening plants, blasting, rock crushers, mobile screening plants, crushing, grinding and milling. Location of project quarries are not yet determined. Commercial quarries may be considered.
Stockpiling	Individual assessment	The major impacts of stockpiling are dust, and in some cases odour. The environmental risk posed by stockpiling is dependent on a number of factors including the material being stockpiled, stockpile size and height, and the measures used to control emissions.

It is unlikely that any identified activities in the table above would be located within 500 m of a sensitive receptor (as shown in Figure 2.1) noting that the environmental risk assessment process during the EIS stage will identify risks and impacts and will consider the most effective and appropriate controls to prevent significant air quality impacts. Should the above activities occur outside the evaluation distance, then impacts to air quality are unlikely.

2.2.1.3 Construction and commissioning phase

During the construction of AROWS, the primary risk to air quality values is airborne particulate matter (PM), mainly in the form of dust emissions associated with mechanical interference with earth as well as wind-blown emissions from exposed areas. Common significant dust generating sources from the construction activities include, but are not limited to:

– Land clearing, earthmoving and excavation, quarrying (including blasting, excavation of material, crushing, sorting (mechanically generated dust)
– Concrete batching
– Vehicle movement on unsealed surfaces (wheel generated dust)
– Exposed surfaces / stockpiles (wind-blown dust).

The primary pollutants with potential to impact air quality during construction are:

– Total suspended particulates (TSP) (health risk for long term exposure, amenity risk for short-term exposure)
– Particulate Matter (PM_{10}) (health risk for short and long-term exposure)
– Dust amenity (visual plumes or deposition).

The AROWS construction footprint is the total surface area that would be disturbed during the construction of AROWS embankment walls, pipeline installation, access roads, pumps and power, and any temporary infrastructure that would likely be established to support construction activities such as, but not limited to, construction laydown areas, coffer dams and onsite accommodation.

Construction activities that will be carried out within the AROWS project construction footprint are anticipated to be staged, meaning potential emission sources will move around and be transient in nature.

The pre-construction early works of AROWS are planned to commence in 2026, with construction works estimated to take about three to five years to complete, given wet seasons are likely to impede construction during each of these years. As a maximum assessment, it is expected that construction could occur 24 hours per day, seven days per week over the construction schedule.

Other criteria pollutants such as $PM_{2.5}$, NO_x, CO associated with vehicle exhaust emissions, diesel generators and small industrial facilities (e.g., concrete batching plants) used during construction activities may also be generated.

Impacts to air quality values, (in particular from construction dust emissions), while certain to occur, are likely to be temporary and localised in nature.

During commissioning, a reduction in sources of fugitive dust emissions is expected where land clearing, mechanical/ masonry activities, movement of vehicles, etc are less likely to occur.

2.2.2 Construction dust assessment

The generation of dust and particulate matter are the primary pollutants during the construction phase of the project. A risk-based assessment in accordance with the United Kingdom's *Guidance on the assessment of dust from demolition and construction* ('IAQM guidance') was undertaken to assess potential particulate impacts during the construction of the project.

This guidance may not be suitable to be used for very large, long term construction sites such as the basin site if construction was to occur over the full basin extent, large-scale concrete batching and quarries which may be constructed and operate for several years, and if they were in close proximity to sensitive receptors. Given no sensitive receptors have been identified in close proximity to these potential construction sites and the construction time period then it is unlikely any additional detailed assessment is required.

The IAQM guidance states that assessment is required where there is:

– A 'human receptor' within 250 m of the boundary of the site, or 50m of the route(s) used by construction vehicles on the public highway up to 250 m from the site entrance.
– An 'ecological receptor' within 50 m of the boundary of the site, or 50m of the route(s) used by construction vehicles on the public highway up to 250 m from the site entrance.

However, in some cases a more detailed assessment may still be required where regulatory bodies consider there to be the potential for a significant residual impact.

Based on a review of the Project, there are no identified human receptors within 250 m of the proposed basin infrastructure (i.e. embankment walls), intake and outlet infrastructure.

The assessment has identified that there are 39 sensitive receptors within 250 m of the delivery and connecting infrastructure corridor, mostly within Livingstone and Hughes.

It is noted that culturally sensitive receptors will be determined through the project's cultural values impact assessment study (to be undertaken at the EIS stage) and ongoing discussions with the Traditional Owners and Custodians to inform impact assessment and culturally appropriate mitigation measures for consideration.

Depending on the construction methodology including type of works, equipment used, and duration of time spent working in proximity to receptors, some receptors may have a higher risk of dust impacts than others and additional mitigation measures may therefore be required for receptors within 250 m of any construction activities, especially any haul routes, and areas of bulk earthworks (refer Section 2.3).

2.2.3 Operation phase

During the operation of the AROWS project, no significant fugitive dust emissions to air are expected and as such minimal impact on air quality values are predicted.

2.3 Environmental protection and management

2.3.1 Impact avoidance

Direct impacts to air quality values and sensitive receptors have been largely avoided consequently through the siting and design considerations of the AROWS project, in particular the AROWS basin and controlled catchment water intake areas, which are located away from populated areas and prevent larger uncontrolled inundation areas required.

2.3.2 Impact mitigation

2.3.2.1 General mitigation and management considerations

It is likely a Construction Dust Management Plan (CDMP) will be developed prior to construction commencing to ensure controls identified during the EIS are implemented. The CDMP will outline all mitigation and management measures which will be employed to prevent construction related dust emissions. At a minimum, it is expected that the following mitigation and management measures would be considered in the CDMP:

- Dust suppression through watering of internal dirt haul roads, access tracks and exposed areas during periods of high risk.
- Dust suppression through water sprays at crushing and screening plant during period of high wind and dry soil.
- Minimising stockpile areas.
- Access track site selection to consider location and densities of sensitive receptors when determining option for best location.
- Maximising opportunities for sourcing of construction materials and disposal of construction wastes close to the construction area, where practicable.
- Road/access tracks to be marked with speed limits appropriate to the traffic and nature of road.
- Construction material transport to minimise fugitive emissions from surface exposure (where possible).

2.3.2.2 Receptor specific mitigation and management considerations

Sensitive receptors identified in Section 2.2.2 have the potential to be impacted by site construction works and may require additional dust mitigation and management considerations to be employed when construction works progress towards these receptors for the protection of short term human health and amenity values.

These additional measures would only be needed when works are adjacent to these receptors and generally only when visible dust is observed to be leaving the worksite and towards receptor. Additional dust mitigation measures to be considered include:

– Increasing rate of water application on exposed surfaces
– Significantly reducing speed limits for heavy vehicles
– Adhering to specific working hours/times
– Reducing traffic access or construction work rate or ceasing construction during certain 'at-risk' wind directions.

With dust mitigation measures in place, the risk for significant air quality impacts at all receptors is considered low.

The CDMP should include provisions for community engagement specific to management of dust impacts from access tracks.

Additional mitigation measures would be considered to manage other construction related emissions (e.g., NO_2 from heavy diesel non-road construction equipment) include:

– Operating equipment at optimum rated loads as determined by equipment manufacturer and following routine equipment maintenance procedures.
– Ensuring all heavy duty on-road and non-road vehicles are late model and meet all commonwealth and NT emission standards.
– Ensuring all equipment brought to site is in good working order accompanied by inspection certificates and not exceeding 10% opacity.
– Positioning stationary emission sources such as generators away from sensitive receptors with due regard to safety, security, traffic, and other geographic restrictions.

2.3.3 Monitoring and auditing

The control of construction dust associated with the AROWS project would be monitored and maintained through the development and adherence to a CDMP during construction. The CDMP would include:

– Description of key construction dust generating activities and the general mitigation and management measures to be employed.
– Identification of potentially impacted receptors associated with construction activities and the specific mitigation measures that should be employed for protection of these receptors.
– Monitoring of the effectiveness of the mitigation and management measures implemented under the CDMP will be important for continual improvement and adaptive management to ensure the ongoing protection of sensitive receptors.
– Review and evaluation of the effectiveness of the CDMP over the course of the project phases.
– Complaints management procedure, including the use of a suitable complaint register.

2.4 Residual impact

The results of this qualitative impact assessment undertaken for the air quality factor indicate the AROWS project is unlikely to have residual impacts to human health and nuisance as a result of changes in air quality across all project locations for both construction and operations, assuming the adoption of the impact avoidance, mitigation and monitoring measures described in this report.

3. Conclusion

A qualitative air quality assessment has been undertaken of the AROWS project which included a review of ambient air quality, meteorology and identification of sensitive receptors near to the AROWS project area. This review found that air quality in the project area is considered generally good with minimal exceedances of the NEPM 24 hour PM_{10} criteria, and generally these pollution events only during drier winter months. Wind direction in the area is generally from the northwest during spring and summer and southeast during autumn and winter.

The assessment identified that most dust impacts would occur with 250 m of construction activities as per the Guidance on the assessment of dust from demolition and construction (Institute of Air Quality Management, 2023). There are 39 receptors identified within close proximity (250m) to the proposed construction areas (most within the connecting infrastructure corridor) and about 672 within the broader 5 km project area.

During construction, air quality impacts are likely to be temporary and localised which limits the potential for cumulative impacts to air quality. The construction phase of the Project is expected to have the greatest impact on air quality values, lasting about 6 months each year over the construction period (3 - 5 years). Impact significance at sensitive receptors from particulates (i.e., fugitive dust emissions) is generally expected to be reduced to lower levels during the commissioning and operation phases where soil disturbance activities are not expected to occur.

Assuming effective implementation of the above noted mitigation measures, it is concluded that the AROWS project is unlikely to have a residual impact on air quality values and human health and the NT EPA's objective will be met.

The proposed controls are routine for land development activities, assuming proper implementation and adaptive management, should be effective in ensuring air (dust) emissions do not pose unacceptable impacts to health of the community or amenity of areas surrounding the AROWS project construction footprint. The measures provided in this report, along with any additional measures required to address conditions of approvals, permits and licences, will be integrated into the overall Environmental Management Framework that will be prepared for the Project.

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