Graphinex – Esmeralda Graphite Project Environmental Impact Statement

Appendix A – Air Quality Assessment

GRAPHINEX

Esmeralda Graphite Project: Air Quality Assessment

Prepared for:

Qld Aus Graphite Pty Ltd

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Final

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Glossary

Term	Definition
µg/m^3	micrograms per cubic metre
µm	microns
°	degrees
°C	degrees Celsius
g/s	grams per second
ha	hectare
km	kilometres
Ktpa	kilotonne per annum
m	metres
m/s	metres per second
m^2	square metres
m^3	cubic metres
Mtpa	million tonne per annum
Nomenclature	**Definition**
CO	carbon monoxide
NO	nitric oxide
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
PM_{10}	particulate matter with a diameter less than 10 micrometres
$PM_{2.5}$	particulate matter with a diameter less than 2.5 micrometres
SO_2	sulfur dioxide
TSP	Total suspended particulates
Abbreviation	**Definition**
AAQ NEPM	*National Environment Protection (Ambient Air Quality) Measure*
AHD	Australian Height Datum
Air NEPM	National Environmental Protection (Ambient Air Quality) Measure
AWS	automatic weather station
BoM	Bureau of Meteorology
CSIRO	The Commonwealth Scientific and Industrial Research Organisation
DETSI	Department of Environment, Tourism, Science and Innovation
EP Act	*Environmental Protection Act 1994*
EP Regulation	*Environmental Protection Regulation 2019*
EPP (Air)	*Environmental Protection (Air) Policy 2019 and Environmental Protection (Air) Amendment Policy 2024*
EIS	Environmental Impact Statement
ERA	Environmentally Relevant Activity
HG ore	high-grade ore
IOA	index of agreement
LG ore	low-grade ore
MIBC	methyl isobutyl carbinol
MLA	mine lease area
NEPC	National Environment Protection Council
NPI	National Pollutant Inventory database
OB	overburden
QLD	Queensland
RMSE	root mean square error
ROM	Run-of-Mine
TAPM	The Air Pollution Model
TGC	Total Graphitic Carbon

Term	Definition
ToR	Terms of Reference
TSF	tailings storage facility
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

Katestone Environmental Australia Pty Ltd was commissioned by Qld Aus Graphite Pty Ltd (Graphinex, the Proponent) to conduct an air quality assessment of the Esmeralda Graphite Project, located approximately 70 kilometres south of Croydon in North Queensland.

Graphinex proposes to develop the Project. The Project involves the construction and operation of an open cut graphite mine and on-site production of graphite concentrate. The Project proposes to produce up to ~3.5 million tonnes per annum of Run-of-Mine ore over an operational mine life of approximately 53 years. The Project will be Queensland's largest graphite resource and will supply graphite concentrate ultimately for the production of high-quality battery anode material integral to lithium-ion batteries.

On 11 July 2025 the QLD Government declared the Project as a Coordinated Project. The Coordinator-General subsequently issued the Project's Terms of Reference for the preparation of the Environmental Impact Statement for the Project. This air quality assessment has been prepared for inclusion in the Environmental Impact Statement for the Project as required under the *Environmental Protection Act 1994*.

Potential impacts to air quality were assessed for mine year 42, representing a maximum operational scenario. Air emission estimation was conducted in accordance with recognised techniques, and subsequent dispersion modelling was undertaken using the regulatory dispersion model, CALPUFF.

Ground-level concentrations of air pollutants associated with Project have been predicted at nearby sensitive receptors and across a Cartesian grid of receptors. A cumulative assessment was conducted including the addition of ambient background concentrations of air pollutants that were determined from measurements collected at representative DETSI air quality monitoring stations.

Results of the air quality assessment demonstrated that predicted ground-level concentrations of all air pollutants and dust deposition rates due to the Project with ambient background levels included are predicted to comply with the relevant air quality objectives at all sensitive receptors.

Mitigation and management measures proposed will contribute to preventing or minimising impacts to the environmental values of the air environment in the surrounding areas.

1. INTRODUCTION

Katestone Environmental Australia Pty Ltd (Katestone) was commissioned by AARC Environmental Solutions Pty Ltd (AARC) on behalf of Qld Aus Graphite Pty Ltd (Graphinex, the Proponent) to conduct an air quality assessment of the Esmeralda Graphite Project, located approximately 70 kilometres (km) south of Croydon in North Queensland (QLD) (Figure 1).

Graphinex proposes to develop the Project. The Project involves the construction and operation of an open cut graphite mine and on-site production of graphite concentrate. The Project proposes to produce up to ~3.5 million tonnes per annum (Mtpa) of Run-of-Mine (ROM) ore over an operational mine life of approximately 53 years. The Project will be QLD's largest graphite resource and will supply graphite concentrate ultimately for the production of high-quality battery anode material integral to lithium-ion batteries.

Mining is proposed to be via conventional truck and excavator methods, to a depth of 250 metres (m) below ground level. Ore extraction necessitates the implementation of controlled blasting techniques. Mine construction is scheduled to span approximately 18 months, with mining ramping up over the first three years. The Project presents significant potential opportunity for additional resource development and operational life extension within the proposed mining lease area.

On 11 July 2025 the QLD Government declared the Project as a Coordinated Project. The Coordinator-General subsequently issued the Project's Terms of Reference (ToR) for the preparation of the Environmental Impact Statement (EIS) for the Project. This air quality assessment has been prepared for inclusion in the EIS for the Project as required under the *Environmental Protection Act 1994*.

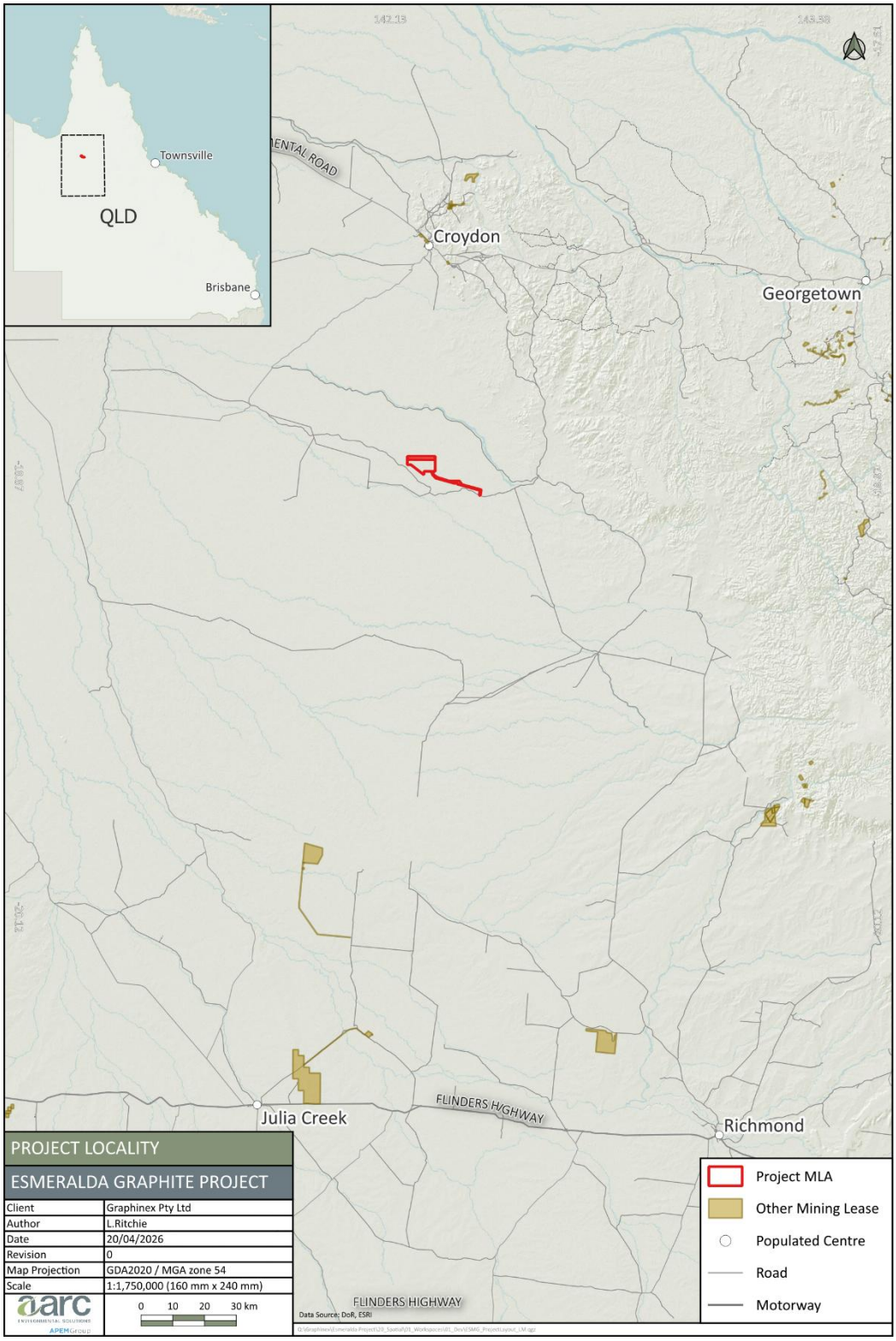


Figure 1 **Esmeralda Graphite Project location**

2. ESMERALDA GRAPHITE PROJECT

Mining at the Project will utilise standard drill and blast techniques to clear overburden and expose ROM ore. Waste overburden (OB) and ROM extraction will be via excavators, haul trucks and dozers. ROM ore will either be stockpiled as low-grade (LG) ore for later reclaim and concentration or directly fed to the mineral processing plant as high-grade (HG) ore. Figure 2 depicts a flow diagram of the graphite concentration process. ROM will be concentrated on site to a 94% Total Graphitic Carbon (TGC) concentrate via a closed milling and conventional flotation method after some initial crushing and sizing. A combination of standard flotation reagents will be used such as diesel, sodium silicate and methyl isobutyl carbinol (MIBC). Graphite concentrate will then be dried to <0.1% moisture and stored in concentrate storage silos before being loaded to lined shipping containers with transfers occurring pneumatically. Flotation tailings produced from the mineral processing circuit will be transferred to one of four purpose designed tailings storage facilities (TSF), to be constructed in stages over the production life of the mine.

Other features of the Project include:

- Topsoil stockpiles and in- and out-of-pit overburden dumps
- The active mining pit area
- Internal haul routes for OB, ROM, and concentrate product transport
- On-site processing plant, dryer, and storage silos
- Worker's crib and accommodation including associated sewage and water treatment plants
- Solar farm and energy storage system, transmission infrastructure and diesel generators
- Mine infrastructure area (including offices, workshops, laydown areas, washing bays, effluent and liquid waste storage, fuel storage and refuelling facilities, and airfield)

The total area of the mine lease area (MLA) is 4,444.46 hectares (ha) while the proposed disturbance area is 2,413.7 ha (Figure 3). Topsoil stockpiles, embankments of tailings storage facilities, and unused dump areas will be proactively managed to reduce wind or water erosion, including with drainage and establishment of vegetation, as mining progresses. Post-mining rehabilitation milestone criteria will be developed for each stage of rehabilitation to return the Project site to target post-mining land uses.

Key activities at the Project which may give rise to emissions of dust and are of primary concern for this air quality assessment include:

- drilling and blasting of OB, OB removal using dragline and/or truck and shovel fleets
- drilling and blasting of pit floor for geotechnical stability to allow for in-pit dumping
- ROM mining using excavators
- formation of out-of-pit and in-pit OB dumps as mining progresses
- progressive rehabilitation of OB dump areas.
- handling of mined materials including truck loading and dumping and ROM crushing
- hauling of mined materials
- wind erosion from exposed surfaces
- combustion emissions from diesel gensets
- dust emission from the concentrate flash dryer

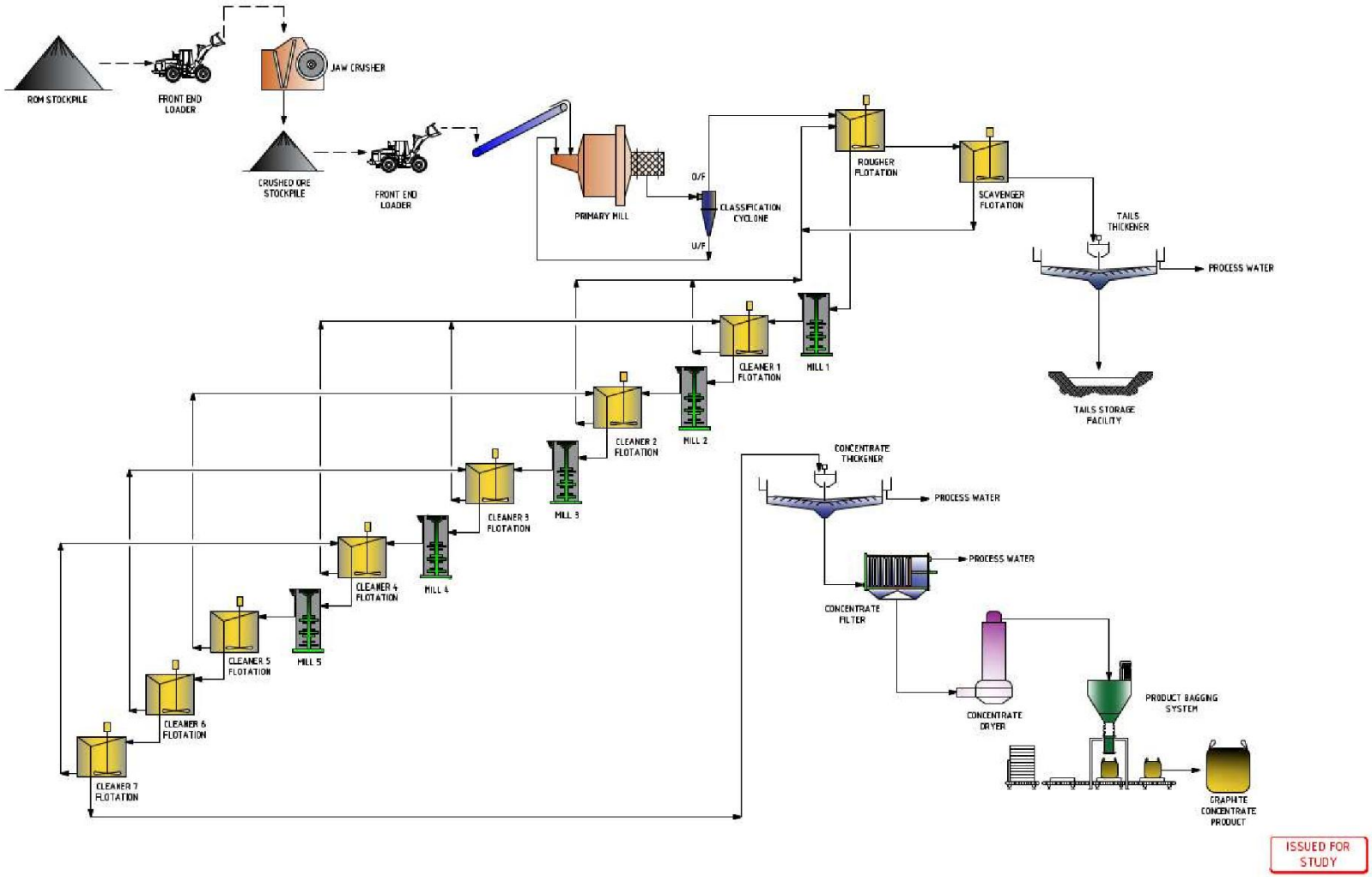


Figure 2 **Process block flow diagram of the graphite concentration process**

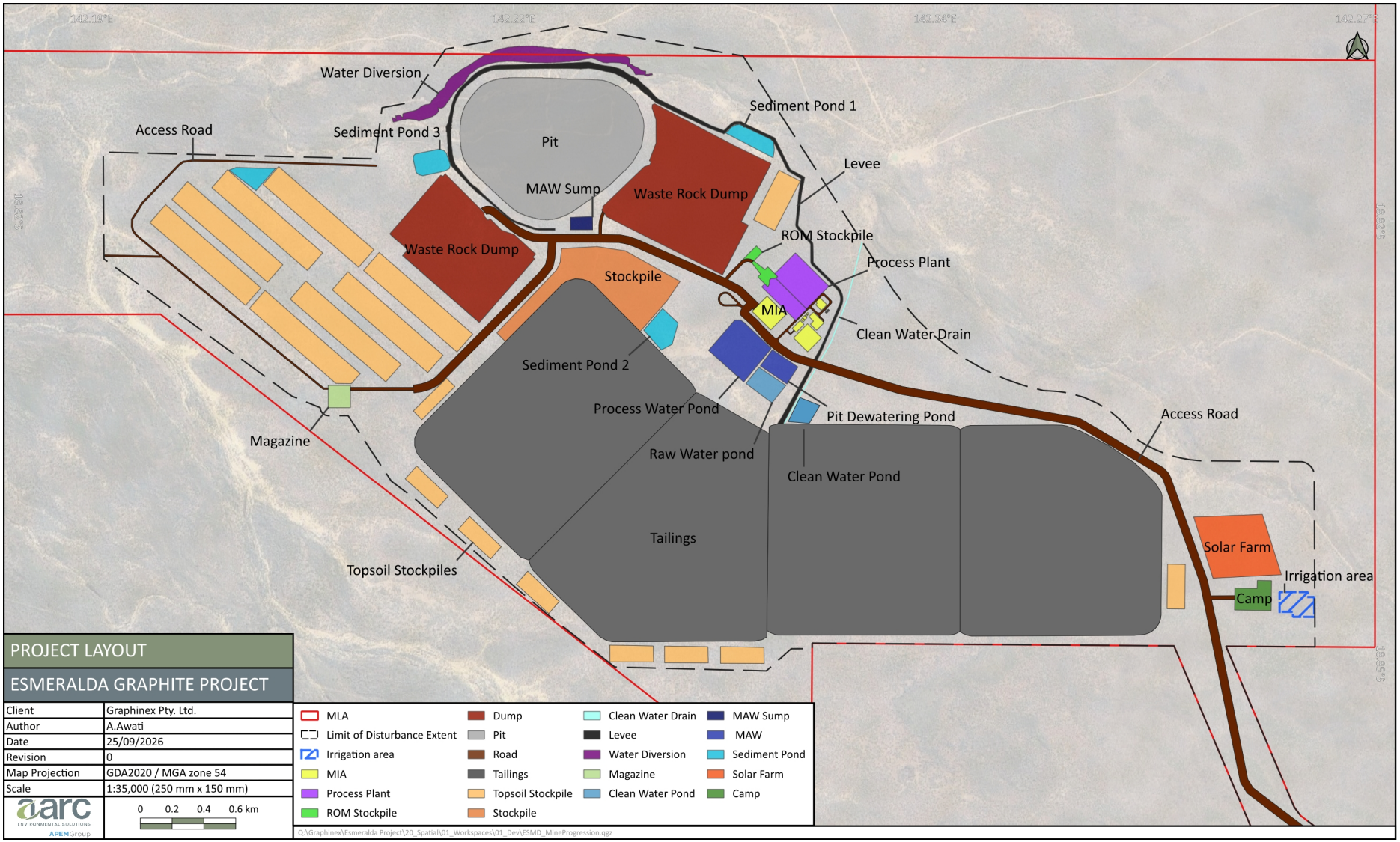


Figure 3 Project layout and disturbance areas.

3. TERMS OF REFERENCE

Table 1 presents the Terms of Reference for the Project as issued by the Coordinator General. References to the relevant sections of the air quality assessment are also included in the table.

Table 1 Terms of Reference for the Project

#	Terms of reference	Section addressing ToR
23.1	The following guidance is relevant for the assessment of air quality: (a) Queensland Government, *Air – EIS information guideline* ESR/2020/5924 (b) Queensland Government, *Guideline – Application requirements for activities with impacts to air*, ESR/2015/1840	Section 4.1
Existing environment		
23.2	Identify and map the location of any sensitive receptors and environmental values of the project footprint and surrounding areas that may be impacted by air emissions from the project.	Section 6.2
23.3	Provide baseline data on local and regional meteorology up to the airshed scale. Parameters should include temperature, wind speed and directions, atmospheric stability, mixing depth and other parameters necessary for input to the model.	Section 6.5 Section A1.5
23.4	Discuss the existing local and regional airshed and air quality, referencing available data from any site-specific air monitoring, the National Pollutant Inventory reporting, and/or ambient air quality monitoring undertaken by Queensland Government, including background/ambient levels and source of particulates, gaseous and odour compounds and any major constituent and contaminants. Identify/illustrate any existing significant sources of contaminants.	Section 6.3 Section 6.4
Impact assessment		
23.5	Identify, quantify and describe the air emissions from the project (point, diffuse and fugitive emission sources) in an emissions inventory.	Section 7.3
23.6	Tabulate the air quality criteria and objectives applicable to the air emissions from the Project.	Section 4.3
23.7	Detail the potential impacts of air emissions from the Project on environmental values and sensitive receptors including	Section 8

#	Terms of reference	Section addressing ToR
	identifying any exceedances of the air quality criteria in accordance with the *Environmental Protection (Air) Policy 2019 (EPP(Air)),* Air – EIS information guideline, and Application requirements for activities with impacts to air. The potential impacts must include the quantification of human health risk and amenity impacts associated with emissions from the project for all contaminants whether or not they are covered by the *National Environmental Protection (Ambient Air Quality) Measure* of the EPP Air.	
23.8	Where there is a potential for nuisance odours to impact on sensitive receptors an odour impact assessment should be undertaken in accordance with the Guideline – Odour Impact Assessment from Developments.	Section 5.4.2
23.9	Detail the compatibility of air quality impacts on the project on existing and approved land uses in the project footprint and surrounding area.	Section 8 Section 10
23.10	Demonstrate how the project will meet the environmental objectives and performance outcomes relevant to air in Schedule 8 of the EP Regulation	Section 8 Section 9 Section 10
Mitigation Measures		
23.11	Describe the mitigation measures that will be applied to the Project to: (a) Achieve the air quality criteria that has been developed for the project (b) Avoid, minimise and/or mitigate adverse air quality impacts to sensitive receptors (c) Protect the environmental values of the air environment.	Section 9
23.12	Describe the monitoring and auditing processes to achieve the air quality criteria that has been developed for the project.	Section 9
23.13	Describe the process for corrective actions to address any exceedance of the air quality criteria	Section 9

4. LEGISLATIVE FRAMEWORK FOR AIR QUALITY

4.1 EP Act and subordinate legislation

Management of the air environment in Queensland is addressed under two key pieces of legislation, the overarching *Environmental Protection Act 1994* (EP Act) which outlines fundamental principles, objectives, and powers related to environmental regulation, including air quality management; and the subordinate regulation to the EP Act, the *Environmental Protection Regulation 2019* (EP Regulation) which elaborates how the principles and objectives of the EP Act are to be implemented and enforced.

The EP Act gives the Department of Environment, Tourism, Science, and Innovation (DETSI) the power to create Environmental Protection Policies that identify and aim to protect, environmental values of the atmosphere that are conducive to the health and well-being of humans and biological integrity. The specific policies relating to air quality are *The Environmental Protection (Air) Policy* 2019 and the *Environmental Protection (Air) Amendment Policy 2024* (EPP (Air)).

The objective of the EPP (Air) is:

...to identify the environmental values of the air environment to be enhanced or protected and to achieve the objective of the Environmental Protection Act 1994, i.e. ecologically sustainable development.

The environmental values to be enhanced or protected under the EPP (Air) are the qualities of the environment that are conducive to:

- Protecting health and biodiversity of ecosystems
- Human health and wellbeing
- Protecting the aesthetics of the environment, including the appearance of building structures and other property
- Protecting agricultural use of the environment

The administering authority must consider the requirements of the EPP (Air) when it decides an application for an EA, amendment of a licence or approval of a draft environmental management plan. Schedule 1 of the EPP (Air) specifies air quality indicators and objectives for specific air emissions.

Further to the EPP (Air), DETSI has published the *Guideline: Application requirements for activities with impacts to air, ESR/2015/1840* (DETSI 2025) (Impacts to Air Guideline). The Impacts to Air Guideline is relevant to the Project and outlines information to be provided to DETSI as part of an EA application and for assessing Environmentally Relevant Activities (ERA). In general, the Impacts to Air Guideline considers three key areas to be identified and addressed:

- Identifying the environmental values of the receiving air environment including the identification of any nearby sensitive places (Section 6.2)
- Identifying the possible impacts of the proposed activity and all associated risks to the environmental values (Section 7)
- Identifying the strategies to mitigate the identified risks to the environmental values (Section 9)

The term ‘environmental value’ is generally used to describe the physical, aesthetic, social and cultural values of a location or proposed site. Specific environmental values relevant to air are defined in the EPP (Air).

4.2 National Environment Protection Council

The National Environment Protection Council (NEPC) defines national ambient air quality standards and goals in consultation and with agreement from all Australian State and Territory governments. These were first published in 1998 in the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) and varied in 2015 and 2021. The AAQ NEPM contains, amongst other parameters, standards for particulates and combustion products. Compliance with the AAQ NEPM standards is determined by ambient air quality monitoring undertaken at locations prescribed by the AAQ NEPM and that are representative of large urban populations. The goal of the AAQ NEPM is to monitor and improve ambient air quality.

With respect to particulate matter of an aerodynamic diameter of 2.5 micrometres or less ($PM_{2.5}$), the AAQ NEPM identifies standards for 24-hour average and annual average $PM_{2.5}$ of 25 µg/m^3 and 8 µg/m^3, respectively. The AAQ NEPM also identifies goals (from 1 January 2025) for 24-hour average and annual average $PM_{2.5}$ of 20 µg/m^3 and 7 µg/m^3, respectively. The AAQ NEPM goal for $PM_{2.5}$ relates to desired environmental outcomes and guides the formulation of strategies for the management of human activities that may affect the environment. It provides a framework for continuous improvement to facilitate a review of the $PM_{2.5}$ standard.

The EPP (Air) has adopted these goals for $PM_{2.5}$ from January 2025.

4.3 Air quality objectives

The EPP (Air) objectives of key substances that may be emitted by Project are presented in Table 2.

Table 2 also shows the dust deposition guideline commonly used in QLD as a benchmark for avoiding amenity impacts due to dust. The dust deposition guideline is not defined in the EPP (Air) but is contained within DETSI's Guideline and is therefore adopted here.

Table 2 Air quality objectives used in the assessment

Substance	Environmental value	Averaging period	Air quality objective (µg/m^3)	Basis
TSP	Health and wellbeing	1-year	90	EPP (Air)
PM_{10}	Health and wellbeing	24-hour	50	EPP (Air)
		1-year	25	EPP (Air)
$PM_{2.5}$	Health and wellbeing	24-hour	20	EPP (Air)
		1-year	7	EPP (Air)
Dust deposition rate for total insoluble solids	Amenity guideline	Monthly	120 mg/m^2/day	Impacts to Air Guideline
NO_2	Health and wellbeing	1-hour	164	EPP (Air)
		1-year	31	EPP (Air)
SO_2	Health and wellbeing	1-hour	214	EPP (Air)
		24-hour	57	EPP (Air)
CO	Health and wellbeing	8-hour	11,000	EPP (Air)

4.4 Environmental values

Land use in the region surrounding the Project consists of cattle grazing land (Section 6.1). There are no known criteria or objectives for dust specific to the assessment of impacts to cattle grazing land as an environmental value.

Studies have been undertaken into the effect of coal mine dust on cattle, specifically regarding cattle productivity and palatability of feed, undertaken at the University of Western Sydney (Andrews et al., 1992). The authors found that cattle did not find feed unpalatable if mine dust was present at an equivalent dust deposition rate of 4,000 mg/m^2/day. The same study also offered cattle feed that contained up to 8000 mg/m^2/day of coal dust and dust free feed, and they did not preferentially eat feed that did not contain coal dust.

Whilst this project is not for a coal mine, Katestone expects that cattle could be exposed to similar dust deposition levels (of coal free dust) and would not be affected. These dust levels of 4,000 and 8,000 mg/m^2/day are significantly higher than the 120 mg/m^2/day objective for amenity impacts for humans presented in Table 2. Therefore compliance with the dust deposition amenity guideline would indicate that predicted impacts are well below levels required to adversely impact cattle grazing land.

5. AIR QUALITY ASSESSMENT METHODOLOGY

5.1 Existing environment

The air quality impact assessment has included an analysis of the existing environment (Section 6) for the Project area. Aspects of the existing environment that are important for the dispersion of air emissions and that may influence the concentration of air emissions at sensitive receptors include terrain features, regional land uses, existing sources of emissions, existing ambient emissions concentrations and the locations of sensitive receptors relative to emission sources.

5.2 Meteorology

Site-specific meteorological data was generated by coupling the prognostic model TAPM (version 4.0.5) (The Air Pollution Model) with the diagnostic meteorological model CALMET (version 6.5.0). The coupled TAPM/CALMET modelling system enables high resolution modelling capabilities for regulatory and environmental assessments. The modelling system incorporates synoptic, mesoscale and local atmospheric conditions, and detailed topographic and land use categorisation schemes to simulate synoptic and regional scale meteorology for input into dispersion models, in this case CALPUFF.

The meteorological modelling methodology included the following steps:

- Evaluation of a representative year for wind speed and direction based on the most recent five years of meteorological data at the Bureau of Meteorology (BoM) Georgetown Airport automatic weather station (AWS)
- Selection of a suitably representative meteorological year for modelling based on the BoM AWS data
- TAPM modelling and validation of outputs against monitoring data.
- CALMET modelling
- The calendar year 2021 was ultimately adopted for modelling as it is judged to be the year with the least variation from the mean when averaged across all of the parameters considered in the BoM data.

Technical details of the TAPM and CALMET model configurations are provided in Appendix A, including a validation of the generated data and a summary of the meteorological data generated for the study area.

5.3 Assessment scenario

Mine progression layouts for each year of the Project and annual quantities of material removed (waste, ore, reclaim and backfill) were reviewed to determine a single maximum operational scenario for adoption as the modelling year.

A review of supplied operational data provided by Graphinex identified mine year 42 to be the maximum operational case. This was determined due to the following:

- Year 42 had the highest amount of backfill movement (15.5 Mt) whilst mining operations were still occurring
- The process plant was assumed to operate at peak of 3.5 Mtpa
- Ore and overburden are extracted from pit.

Emissions from the selected maximum operational year are expected to exceed emissions associated with construction or closure of mine activities. Later mine years until approximately year 53, while showing slightly higher material quantities, largely represent backfilling of the mine void with dry tailings material - with reduced mine

production related operations such as ore stockpiling or processing, hauling of waste material from the pit to dumps, graphite production, or road train hauling of product. These years are, therefore, limited in their activities and sources of emissions to air and so were not deemed to represent typical operations of the mine for assessment purposes.

By assessing compliance against the relevant air quality objectives for a conservative maximum case year, demonstration of compliance can be assumed to also demonstrate compliance for all mine years with less intensive operations including construction and closure activities.

5.4 Emissions

5.4.1 Dust and combustion gases

Emissions of dust and particulates constitute the primary substances of concern generated by the Project. Specifically, this will include total suspended particulates (TSP), particulate matter of an aerodynamic diameter of 10 micrometres or less (PM_{10}), $PM_{2.5}$, and deposited dust. Emissions of nitrogen dioxide (NO_2), carbon monoxide (CO), and sulphur dioxide (SO_2) as well as particulates from the diesel generators onsite have also been considered.

Emission rates of dust associated with the operation of the Project during mine year 42 have been estimated, accounting for proposed emission controls, using emission factors published in authoritative sources including the National Pollutant Inventory (NPI) Handbooks or the USEPA AP42 Emission Estimation Manuals (NPI, 2012; USEPA, 1998; USEPA, 2004; USEPA, 2006a; USEPA, 2006b, USEPA, 2006c). Emission rates of key exhaust pollutants due to combustion of diesel in the generators have also been estimated using emission factors for stationary large (greater than 450kW) diesel engines from the NPI (NPI, 2008), with the per generator capacity being 2,700 kW.

Operating parameters such as throughputs, location of equipment and utilisation rates, were based on information provided by the proponent, as detailed in Appendix B.

5.4.2 Odour

Odour may occur during the froth flotation process depending upon what reagents are used. Emissions are expected to be minor and only detectable in the immediate vicinity of the processing plant. Due to the distance between the processing plant and the nearest sensitive receptors (Section 6.2) the risk of odour impacts at sensitive receptors is low.

5.5 Dispersion modelling

The industry standard and regulated model developed by Earth Tech, Inc., namely, the CALPUFF dispersion model (version 7.2.1) was utilised to model the scenarios discussed in Section 5.3.

CALPUFF is an advanced non-steady-state air quality modelling system that is approved by DETSI for dispersion modelling. The TAPM/CALMET models were used to simulate meteorological conditions in the region around the project site. The data generated by these models was used as input for the dispersion model in order to include all weather conditions likely to be experienced in the region during a typical year. The modelling has been used to predict maximum ground-level concentrations and deposition rates of dust across a Cartesian grid of the project region and at the locations of the identified sensitive receptors.

Details of the model configuration are provided in Section A2 of Appendix A.

5.6 Nitric oxide to nitrogen dioxide conversion

NO_X in exhaust plumes is made up of both nitric oxide (NO) and NO_2. Typical NO/NO_2 ratios at the point of release to the atmosphere are around 90%/10%. Once in the atmosphere NO can undergo chemical transformation to form NO_2. The rate at which this conversion occurs depends on the solar reactivity of the atmosphere, presence of other molecules such as ozone, and time since release from the source.

NO_2 is more toxic than NO and is the reason why NO_2 has air quality assessment criteria rather than NO. As NO_X emitted from the diesel gensets is primarily NO, it is important to adequately quantify the transformation of NO to NO_2 for comparison with assessment criteria.

There are various methods for estimating NO_2 concentrations from model predictions of NO_X as the plume disperses from the emission point. A simple and common approach has been taken for this assessment; it has been conservatively assumed that, for annual averaging periods, all NOx converts to NO_2. This will result in an over-prediction of actual annual average NO_2 concentrations. For 1-hour averaging periods, a more realistic approach has been taken, assuming that 30% of NOx is NO_2.

5.7 Presentation of results

Modelling results have been presented as ground-level concentrations or dust deposition rates at sensitive receptors as well as contours across the modelling domain. Predicted results of modelled pollutants have been tabulated due to the Project in isolation and including background levels.

5.8 Limitations and uncertainty

This study relies on the accuracy of a number of data sets that feed into the dispersion model, all of which will have uncertainties associated with them. The input data sets include:

- Meteorological monitoring observations from the BoM
- Air quality monitoring observations from DETSI
- Synoptic and surface information datasets from CSIRO.
- Operational data provided by Graphinex
- Approximations of haul routes and lengths
- Accuracy and consistency of application of mitigation measures proposed by Graphinex.

It is also important to note that numerical models are based on an approximation of governing equations and will inherently be associated with some degree of uncertainty. The more complex the physical model, the greater the number of physical processes that must be included. There will be physical processes that are not explicitly accounted for in the model and, in general, these approximations tend to lead to an over prediction of emissions levels.

The dispersion model has been configured with conservative assumptions and, therefore, the assessment is likely to overpredict potential impacts of the Project. Conservative assumptions include the:

- Assumption that mining activities occur constantly for every hour of operation with constant emission rates (does not reflect fluctuations in emissions intensity, for instance, a section of haul road will be constantly generating dust and particulates in the model. In reality the same section of haul will only produce emissions for the few moments a truck is driving across it)
- Assumption that “snapshot” representations of mine layouts are constant over an entire year for the purposes of dispersion modelling which likely overestimate active mining areas

- Use of maximum year operational data to reflect conservative emissions scenarios
- Inability of dispersion modelling to account for the impacts of rainfall on the reduction of dust/particulate emissions.

6. EXISTING ENVIRONMENT

6.1 Local terrain and land-use

The proposed development is located in Far North Queensland, approximately 70 km south of Croydon and 350 km northeast of Mount Isa. Figure 4 displays a terrain map of the study area. The proposed project is in a low-lying area, between 130 m and 150 m Australian Height Datum (AHD). The terrain in the surrounds is relatively uniform and low-lying, with elevation increasing gradually toward the east up to 363 m in the model domain.

The area is remote, and land-use in the region consists primarily of grazing land and the natural environment.

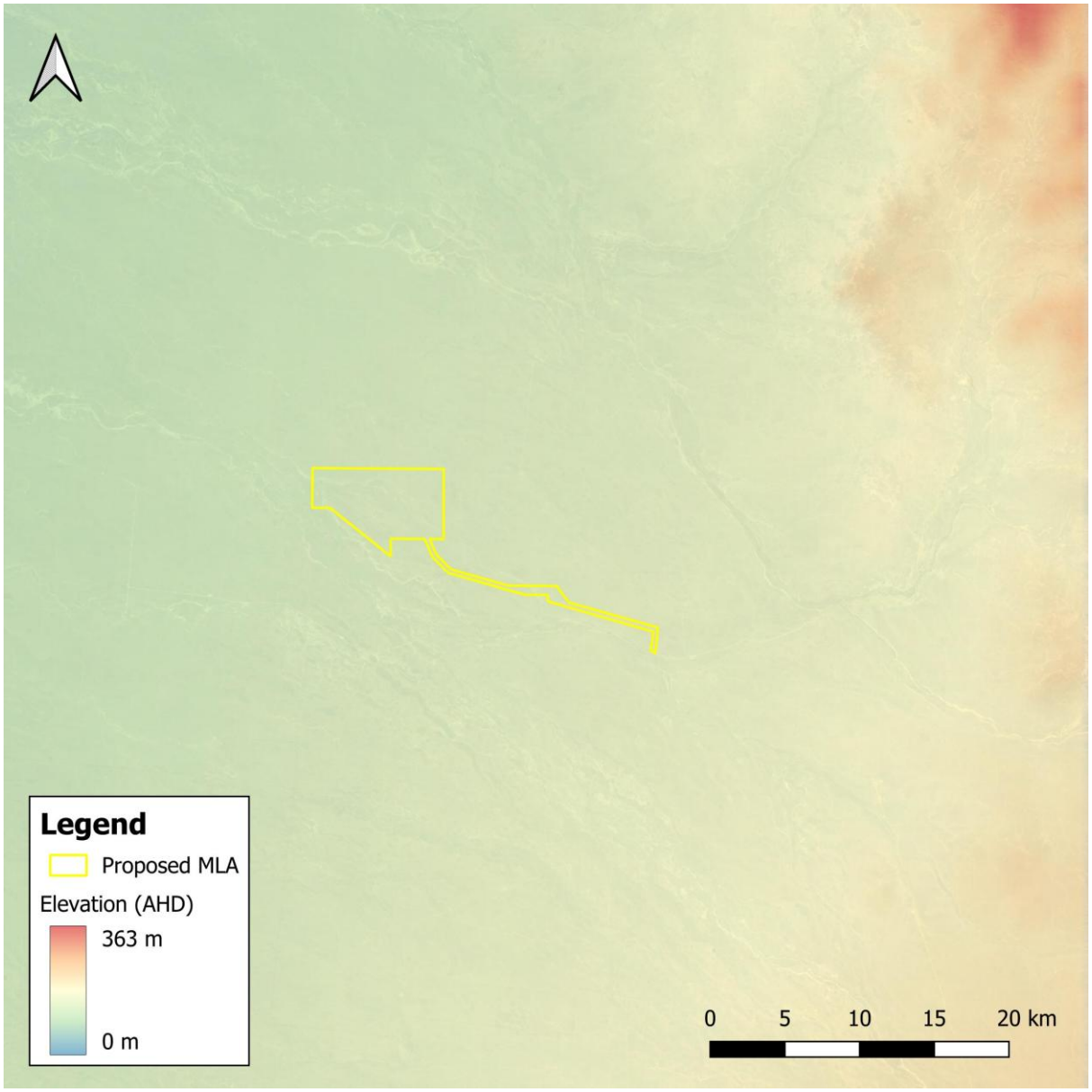


Figure 4 Terrain surrounding the study area

6.2 Sensitive receptors

There are three sensitive receptors in the vicinity of the project site, included as discrete receptors in the dispersion modelling. The locations of the sensitive receptors are presented in Table 3 and shown in Figure 5.

Table 3 Nearest sensitive receptors to the Project

Receptor ID	Description	Easting (km)	Northing (km)	Distance and direction from the proposed MLA
R1	Esmeralda Homestead (Residential)	665.762	7914.629	18 km E
R2	Prospect Homestead (Residential)	631.806	7908.655	5 km S
R3	Homestead (Residential)	612.870	7910.311	14 km SW

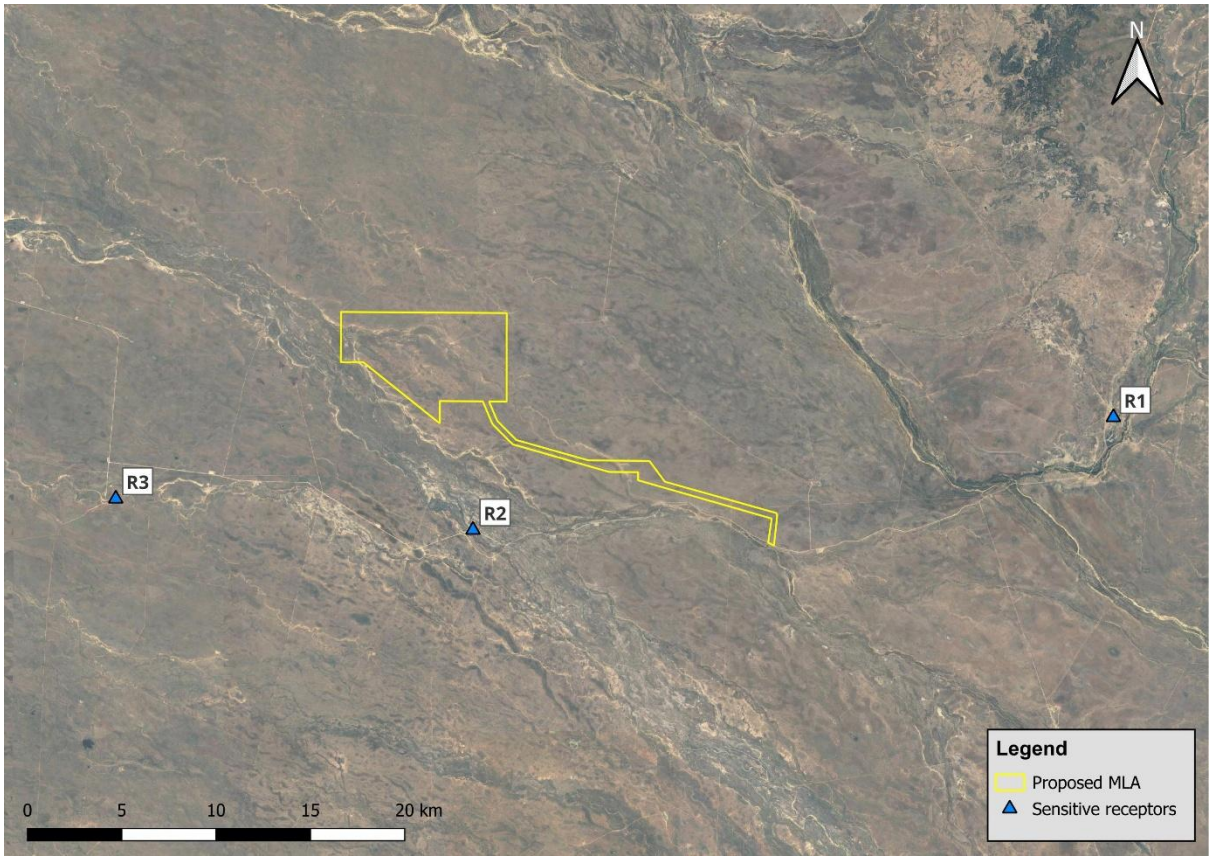


Figure 5 Sensitive receptors in the vicinity of the Project

6.3 Existing air quality

6.3.1 Existing sources of emissions

The proposed project site is remote and located on light grazing land. The region is sparsely populated with only three homesteads located within 20 km of the proposed MLA boundary. Ambient levels of air pollutants in the study area will therefore be predominantly influenced by naturally generated dust in the environment, from sources such as pollen, grass seeds and wind erosion of non-vegetated areas.

A review of the National Pollutant Inventory (NPI) database for the 2023/2024 reporting period indicated that there were no facilities within 100 km of the project site that reported emissions to air. It is unlikely that facilities outside of this radius will have any influence on air quality at the sensitive receptors in the region of the project.

6.3.2 Existing ambient air quality

DETSI operates a network of ambient air quality monitoring stations throughout Queensland. Due to the remote nature of the greenfield site at Esmeralda there are no DETSI monitoring stations nearby, with the nearest located at Mount Isa and Townsville, roughly 350 km and 460 km away respectively.

Given the large-scale mining and smelting operations present at Mount Isa, monitoring data from this area are not considered representative of air quality at the project site. Of the multiple monitoring stations active in Townsville, the North Ward station has been deemed to be the most appropriate when considering background air quality at the project site. Other stations in Townsville such the Coastguard, Environment Park and Lennon Drive specifically support the monitoring of industrial and port activities and thus are considered less representative than the North Ward station. The North Ward station is expected to provide a conservative estimate of ambient background as it is located in residential areas that would have higher levels of air pollutants due to anthropogenic activities such as vehicle use, than would occur in the project area.

CO is not measured at the North Ward monitoring station. Data for ambient CO has instead been derived from the Miles Airport monitoring station, considered to be appropriate as a non-urban location.

A summary of the background air quality levels used in this assessment are presented in Table 4. Five years of monitoring data have been analysed for 1-hour and 24-hour averaging periods, the 70th percentile value has been presented in the table. The maximum annual average is also presented.

The highest concentration for each air pollutant over the five years (relevant to each averaging period) has been used as the background value in this assessment (unless otherwise stated).

Table 4 Background air quality measured at the DETSI North Ward monitoring station

Pollutant	Averaging Period [a]	Assessment criterion	Concentration (µg/m³)				
			2020	2021	2022	2023	2024
PM_{10}	24-hour	**50**	18.3	18.7	17.5	18.1	17.7
	Annual	**25**	16.1	16.3	15.2	16.2	15.6
$PM_{2.5}$	24-hour	**20**	6.6	6.7	6.6	6.5	6.4
	Annual	**7**	5.8	5.8	5.8	6.2	5.6
NO_2	1-hour	**164**	4.1	6.2	6.2	6.2	6.2
	Annual	**31**	4.5	5.3	5.5	5.0	4.9
SO_2	1-hour	**214**	2.9	0	0	0	0
	24-hour	**57**	1.7	0.5	0.5	0.8	0.2
CO [a]	8-hour	**11,000**	229.2	125	125	125	-

Table notes:
[a] CO ambient air quality levels are from DETSI's Miles Airport monitoring station

6.4 Summary of ambient air quality

Ambient background concentrations selected for use in the air quality assessment are presented in Table 5.

Table 5 Ambient background concentrations selected for use in the air quality assessment

Pollutant	Averaging period	Ambient background (ug/m^3)	Source
PM_{10}	24-hour	18.7	Maximum, 70th percentile from 2020 to 2024 from North Ward monitoring station
	Annual	16.3	Highest annual average from 2020 to 2024 from North Ward monitoring station
$PM_{2.5}$	24-hour	6.7	Maximum, 70th percentile from 2020 to 2024 from North Ward monitoring station
	Annual	6.2	Highest annual average from 2020 to 2024 from North Ward monitoring station
TSP	Annual	32.5	Derived from PM_{10} using PM_{10} to TSP ratio of 0.5 for rural areas
Dust deposition	Monthly	40 mg/m^2/day	Based on experience
NO_2	1-hour	6.2	Maximum, 70th percentile from 2020 to 2024 from North Ward monitoring station
	Ann	5.5	Highest annual average from 2020 to 2024 from North Ward monitoring station
SO_2	1-hour	2.9	Maximum, 70th percentile from 2020 to 2024 from North Ward monitoring station
	24-hour	1.7	Maximum, 70th percentile from 2020 to 2024 from North Ward monitoring station
CO	8-hour	229.2	Maximum, 70th percentile from 2020 to 2023 from Miles Airport monitoring station

6.5 Climate and meteorology

The local meteorological conditions are important for an assessment of potential air quality impacts associated with a project as they dictate the direction of transport, the magnitude of pollutant concentrations, and where and when the higher concentrations are likely to occur. The nearest BoM monitoring station is Croydon Township, 70 km north of the project site. The Croydon Township station is representative of the project site. Data recorded at the BoM's Croydon Township station has been used to summarise the temperature, relative humidity and rainfall typically experienced in the region.

The climate in the region is tropical savanna climate with two distinct seasons: a hot, wet season (October–April) and a dry, warm season (May–September).

6.5.1 Temperature

The mean daily temperatures recorded at the Croydon Township station for the years 1912 to 2014, are presented in Table 6 and Figure 6. The mean recorded daily maximum temperature ranges from 29.2 to 38°C. The mean

minimum temperature ranges from 14.1 to 24.6°C. The analysis identifies a fairly uniform temperature profile typical of the area, with relatively warm temperatures year-round, and slightly cooler temperatures during winter.

Table 6 Mean daily maximum and minimum temperatures at the BoM's Croydon Township station (1912 to 2014)

Mean maximum temperature (°C)												
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
35.5	34.5	34.3	33.9	31.6	29.2	29.2	31.2	34.3	36.9	38	37.3	33.8
Mean minimum temperature (°C)												
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
24.2	23.9	23.3	21	17.9	14.7	14.1	15.7	19.2	22.5	24.4	24.6	20.5

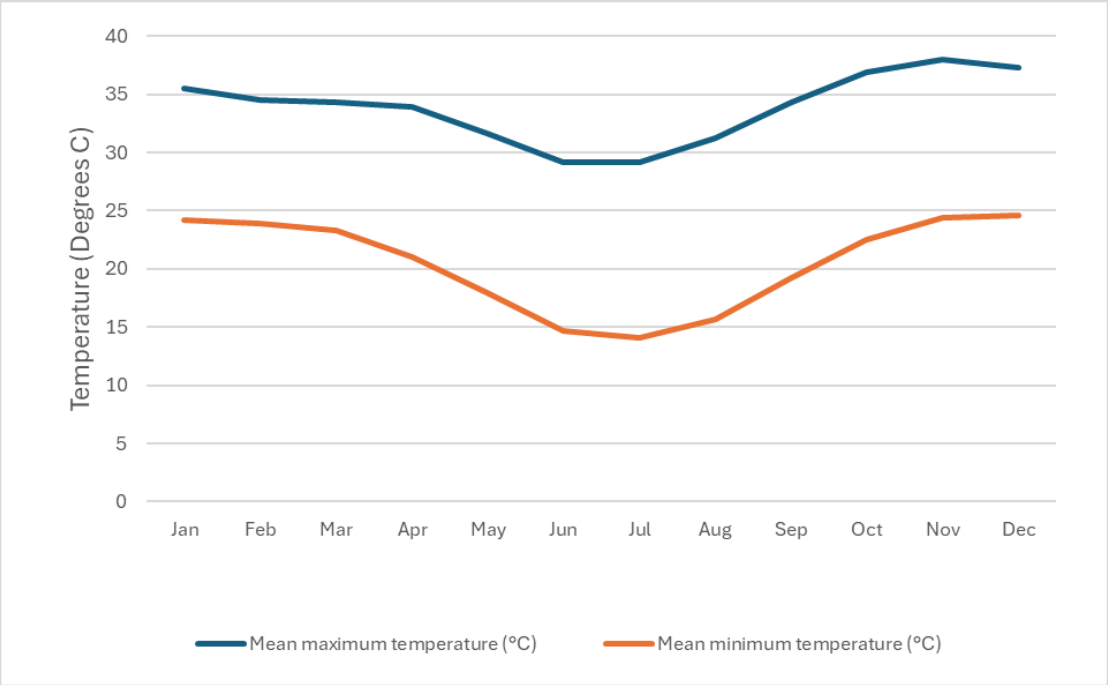


Figure 6 Mean daily maximum and minimum temperatures at the BoM's Croydon Township station (1912 to 2014)

6.5.2 Relative humidity

The availability of atmospheric moisture is an important factor that influences the climate by affecting the transfer of heat in the atmosphere through the balance between sensible and latent heat fluxes, and the occurrence of precipitation. Relative humidity is one of several measures used to describe the quantity of moisture in the atmosphere and is the ratio of the actual amount of moisture in the atmosphere to the maximum amount that could be held, at a given temperature.

The mean monthly relative humidity at 9am and 3pm recorded at the Croydon Township station for the years 1938 to 2010, are presented in Figure 7 and Table 7. The 9am relative humidity ranges from 44% in October to 75% in February. The mean relative humidity for 3pm ranges from 23% in September to 54% in February. The higher relative humidity at 9am compared to 3pm over the winter months is due to any moisture in the morning air typically evaporates as the day progresses resulting in much lower relative humidity by the afternoon.

Table 7 Mean recorded 9am and 3pm relative humidity at the BoM's Croydon Township station (1992 to 2011)

Mean 9am relative humidity (%)												
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
70	75	67	57	54	53	51	45	44	44	51	60	56
Mean 3pm relative humidity (%)												
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
50	54	47	36	34	32	29	25	23	25	30	37	54

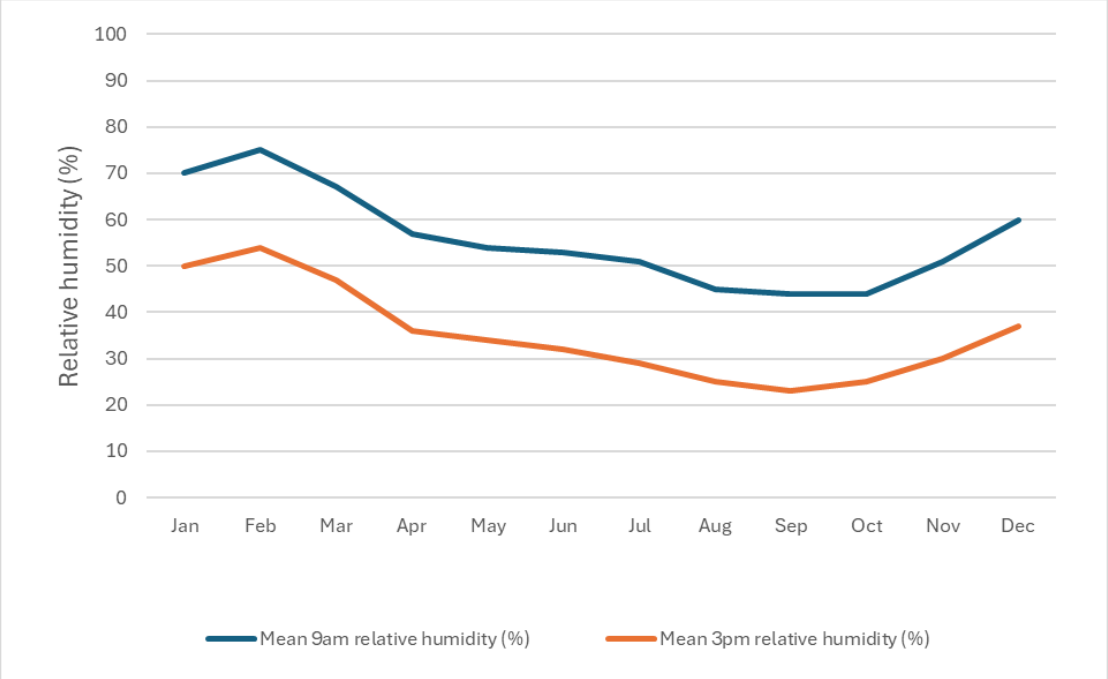


Figure 7 Mean recorded 9am and 3pm relative humidity at the BoM's Croydon Township station (1992 to 2011)

6.5.3 Rainfall

The mean and maximum monthly rainfall recorded at the Croydon Township station for the years 1889 to 2026, are presented in Figure 8 and Table 8. The mean monthly rainfall ranges from 2.4 mm in August to 223 mm in January. The highest monthly rainfall of 860.5 mm was recorded in January 1974.

Table 8 Mean and highest recorded rainfall at the BoM's Croydon Township station (1889 to 2026)

Mean rainfall (mm)												
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
223	180.2	119.2	24.9	8.8	8.2	4.1	2.4	5.2	14.6	45.9	113.2	753.5
Highest rainfall (mm)												
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
860.5	601.4	591.4	279.8	150	139.2	83.4	44.2	92.7	145	384.7	312	1565.8

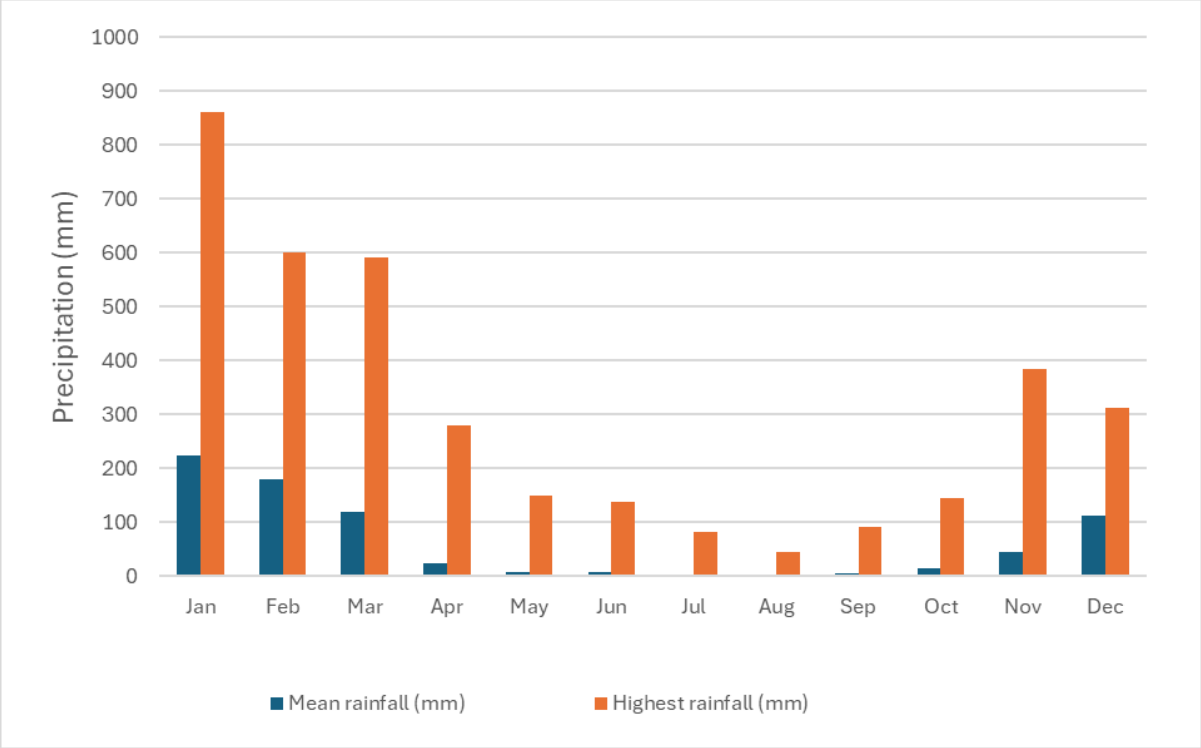


Figure 8 Mean and highest recorded rainfall at the BoM's Croydon Township station (1889 to 2026)

6.5.4 Wind speed and wind direction

Local meteorology is of paramount importance for dispersion of air pollutants generated by the Project's activities; key features are wind speed, wind direction, atmospheric stability and boundary layer mixing height. Conditions in the local area, as derived from the meteorological modelling carried out for the assessment, are discussed in detail in Section A1.5 of Appendix A, but can be summarised in simple terms based upon the wind rose presented in Figure 9, which summarises the wind speed and direction in 2021.

Predicted annual average wind speed at the Project site in 2021 was 2.8 m/s, with winds most commonly coming from the northeast through to the southeast. In terms of annual average dispersion of pollutants, this can be expected to follow this general pattern, with the greatest impacts occurring downwind of the Project under the prevailing wind conditions; in this case, to the northwest through to the southwest.

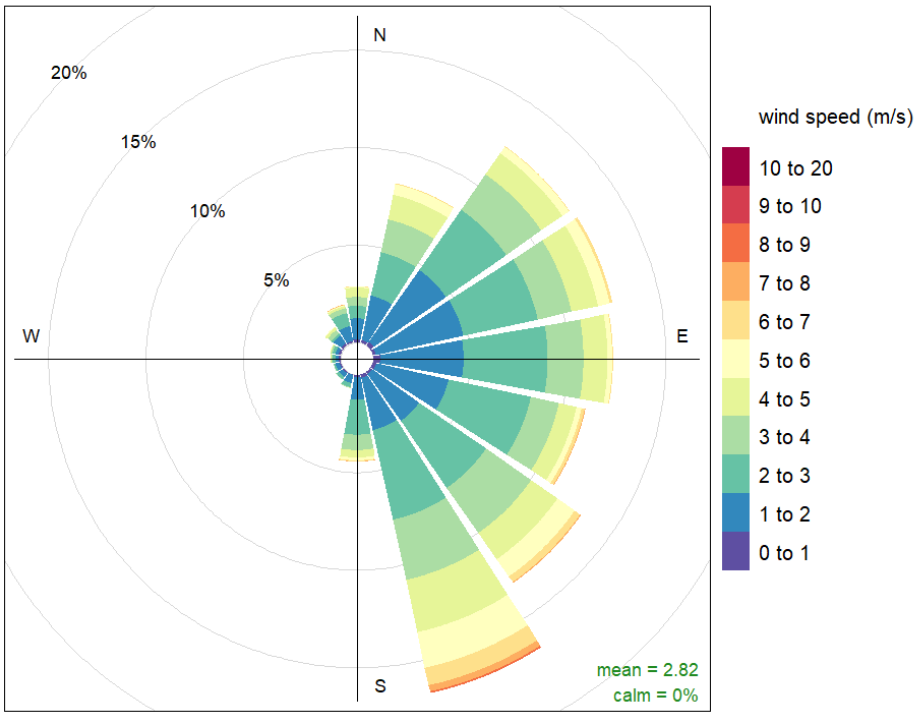


Figure 9 Annual wind rose for the Project site for 2021 (extracted from CALMET)

7. EMISSIONS TO THE ATMOSPHERE

7.1 Construction phase activities

The construction phase of the Project has the potential to cause elevated levels of dust if not managed appropriately. Construction phase activities at the Project site can be broadly described as:

- Site clearance of areas, including vegetation clearance;
- Excavation and stockpiling of topsoil and subsoil;
- Earthworks associated with the construction of the haul roads and mine infrastructure,
- Civil works including temporary and permanent drainage works; and
- Structure and plant erection and installation.

7.2 Operation phase activities

The air quality impact assessment quantitatively assessed emissions associated with the operational phases of the Project, including:

- Drilling and blasting
- Dozing of ROM and OB materials
- Handling of extracted materials including loading and unloading from vehicles
- Haulage of ROM to onsite stockpiles, including return trips
- Haulage of OB to waste dumps, including return trips
- In-pit backfilling of OB and tailings, including return trips
- Haulage of graphite product and delivery of diesel and reagents via B-double trucks, including return trips
- Grading of haul routes
- Wind erosion of exposed surfaces
- Crushing and screening of ore
- Processing of ore
- Diesel generators.

Small quantities of combustion products may also be emitted from vehicles. However, the emission rates of these substances are low compared to the emission rates of particulate matter and combustion from the diesel generators and are likely to have negligible impacts. Therefore, these emissions have not been considered further.

Odour emissions due to the flotation process are also expected to be minor, and due to the distance from the nearest sensitive receptors, odour impacts are considered to be unlikely and thus odour emissions were also not considered further.

7.3 Emissions inventory

Table 9 presents the calculated emission rates for mine year 42 of the Project. Emissions were calculated using NPI emission factor calculations as discussed in Section 5.4 in conjunction with operational data provided by Graphinex. Presented emission rates are inclusive of the routine mitigation control factors summarised in Table 12. The year 42 mine layout, emission areas and haul routes applied in emissions estimation and subsequent dispersion modelling is presented in Figure 10.

Emissions from the diesel generators have been assumed to occur continuously at maximum load, presented in Table 10. Stack characteristics used in the dispersion modelling of emissions from the generators were based on Katestone's experience with similar generators and are shown in Table 11.

Emissions associated with construction and commissioning of any onsite equipment or worksites, and closure and rehabilitation activities will be insignificant compared to maximum operational mining emissions. The quantification of dispersion modelling results for mine year 42 and the subsequent demonstration of compliance with relevant air quality objectives indirectly supports, with a high degree of confidence, the compliance of significantly less intensive construction and closure activities. Therefore, emissions for construction and closure have not been quantified.

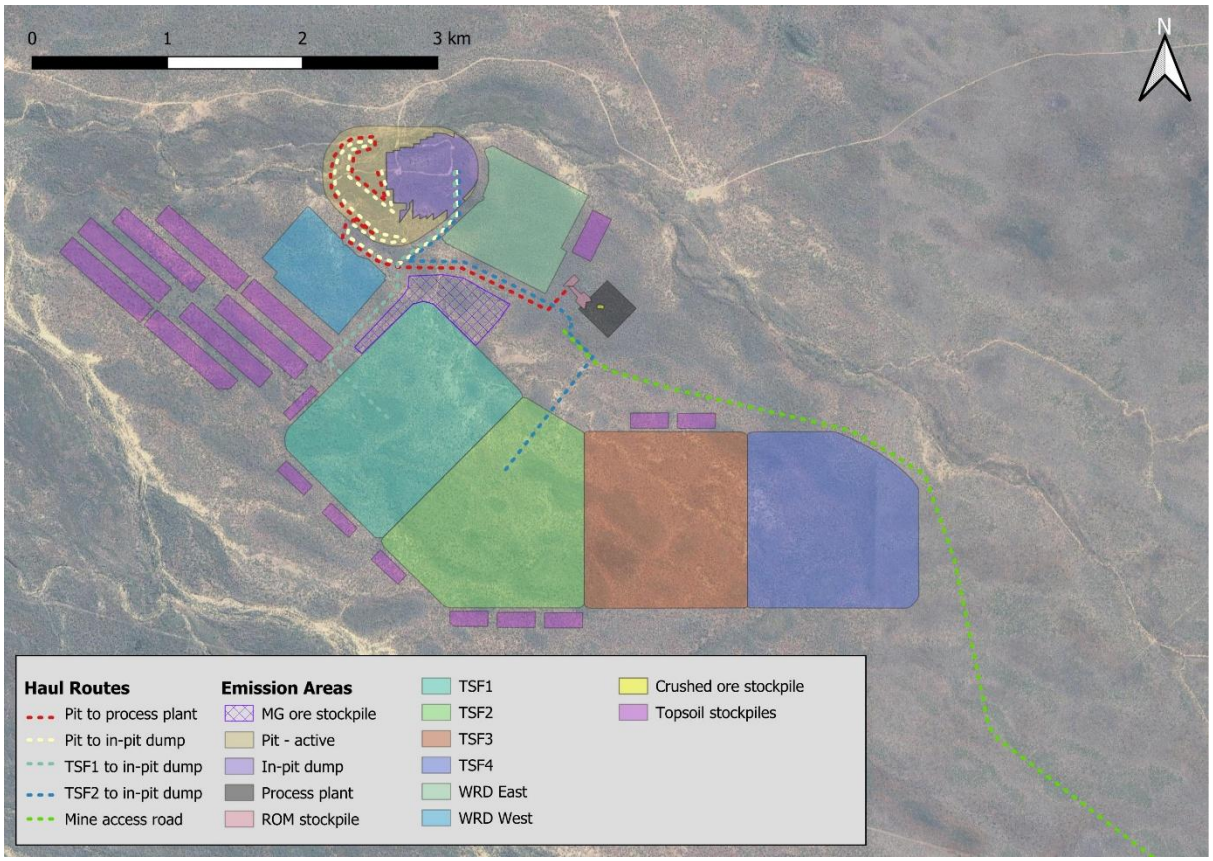


Figure 10 Year 42 mine layout, emission areas and haul routes

Table 9 Emissions inventory – mine year 42

Activity	Emission rates (g/s)		
	TSP	PM_{10}	$PM_{2.5}$
TOTAL	**151.3**	**58.0**	**9.3**
Active pit / in-pit dump			
Drilling/blasting	0.8	0.4	0.02
Dozers	0.8	0.1	0.1
Handling/transfers	0.7	0.3	0.05
Western dump			
Dozer	1.4	0.3	0.1
Stockpiles			
Handling/transfers	0.4	0.2	0.03
Process plant			
Screening/crushing	13.9	10.1	0.4
Handling/Transfers	0.2	0.1	0.01
Tailings storage facility			
Handling/transfers	0.6	0.3	0.05
Haulage			
Pit to LG ore stockpile	6.1	1.7	0.2
Pit to process plant	8.5	2.4	0.2
Pit to in-pit dump	1.1	0.3	0.03
LG ore stockpile to process plant	10.7	3.0	0.3
TSF 1 backfill to in-pit dump	18.4	5.3	0.5
TSF 2 backfill to in-pit dump	44.6	12.7	1.3
Product delivery	7.6	2.0	0.2
Resource delivery	1.3	0.3	0.03
Grading			
All routes	2.3	0.7	0.1
Wind Erosion			
Active pit	1.3	0.6	0.1
Backfill pit - in-pit dump	0.9	0.4	0.1
West dump	1.2	0.6	0.1
East dump	1.7	0.8	0.1
TSF 1	2.2	1.1	0.2
TSF 2	2.2	1.1	0.2
TSF 3	2.1	1.1	0.2
TSF 4	2.1	1.0	0.2
ROM stockpile	0.2	0.1	0.02
Crushed ore stockpile	0.02	0.01	0.002
LG ore stockpile	3.7	1.8	0.3
Topsoil stockpiles	10.9	5.5	0.9
Power Generation			
Diesel gensets (10 units)	3.2	3.2	3.2
Concentrate flash dryer			
Dust collector	0.2	0.2	0.2

Table 10 Emission rates for combustion gases

Location	Emission rate (g/s)		
	NOx	SO_2	CO
Diesel gensets (per genset)	11.25	0.004	2.48

Table 11 Stack characteristics for diesel gensets

Parameter	Diesel Gensets	
	Value	Units
Stack height	5	m
Exit temperature	550	°C
Exit velocity	39	m/s
Stack diameter	0.6	m

Table 12 Routine mitigation measures

Activity	Mitigation Measure	Control Efficiency	Reference
Drilling	Cyclone	70%	NPI Mining v3.1 Table 4
Wheel generated dust from OB hauling	level 1 watering (2 $L/m^2/h$) vehicle speed limits	50%	NPI Mining v3.1 Table 4
Wheel generated dust from ROM hauling	level 1 watering (2 $L/m^2/h$) vehicle speed limits	50%	NPI Mining v3.1 Table 4
Wheel generated dust from tailings and waste backfill hauling	level 2 watering (>2 $L/m^2/h$) vehicle speed limits	75%	NPI Mining v3.1 Table 4
Crushing	Water sprays	50%	NPI Mining v3.1 Table 4
Screening	Water sprays	50%	NPI Mining v3.1 Table 4
Topsoil stockpiles – wind erosion	Vegetation established but not demonstrated to be self-sustaining	40%	NPI Mining v3.1 Table 4
Tailings storage – wind erosion	Initial slurry then crusting of surface	50%	Based on Katestone's experience

8. IMPACT ASSESSMENT

The CALPUFF dispersion model has been used to quantify the incremental change in air pollutants and dust associated with the Project during mine year 42. Ground-level concentrations of dust and key exhaust pollutants, and dust deposition rates associated with the Project have been predicted at the sensitive receptors and across the model domain. Ambient background dust levels have been added to the incremental model predictions to obtain an estimate of the potential cumulative impact of the project with existing natural and anthropogenic sources of dust. Air pollutant levels have been assessed by comparing the predicted concentrations and dust deposition rates with the relevant air quality objectives.

Ground-level concentrations of dust and dust deposition rates were also predicted at a network of evenly spaced grid points covering the study region. Contour plots indicative of ground-level concentrations or dust deposition rates due to the project and existing ambient background levels are presented in the following section.

When considering the results, it is important to note that the 24-hour average dispersion modelling results are based on the maximum concentration of each pollutant predicted at the receptors over the one-year period and thus represent a peak-impact scenario. The contour plots are constructed such that the maximum value is obtained and stored from each point in the modelled domain. As these maximum values may occur at different times at different grid points, these figures do not represent a single snapshot of conditions at any given time.

Table 13 and Table 14 provide the predicted ground-level concentrations of key air pollutants and dust deposition rates due to mine year 42 of the Project in isolation, and due to the project with ambient background levels included, respectively. Contour plots of the predicted ground-level concentrations of dust and dust deposition rates are presented in Plate 5 to Plate 6, whilst predicted ground level concentrations of combustion gases are presented in Plate 7 to Plate 11. All contours presented are for impacts due to the Project with ambient background levels included.

The results show that ground-level concentrations of all air pollutants and dust deposition rates due to the Project in isolation and with ambient background levels included are predicted to comply with the relevant air quality objectives at all sensitive receptors. Separate to the sensitive receptors, the impacts of deposited dust on cattle grazing land as an environmental value of the region is also predicted to be negligible, given the low deposition rates predicted (Plate 6).

Table 13 Predicted ground-level concentrations of dust due to the Project in isolation

Receptor		PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m^3)		TSP (µg/m^3)	Dust deposition (mg/m^2/day)	NO_2 (µg/m^3)		SO_2 (µg/m^3)		CO (µg/m^3)
ID	Description	Maximum 24-hour	Annual Average	Maximum 24-hour	Annual Average	Annual average	Maximum Monthly	Maximum 1-hour	Annual average	Maximum 1-hour	Maximum 24-hour	Maximum 8-hour
R1	Esmeralda Homestead	0.1	0.005	0.02	0.001	0.01	0.04	0.82	0.01	0.001	0.0001	0.2
R2	Prospect Homestead	24.2	1.2	4.6	0.2	1.3	1.8	39.4	0.2	0.04	0.004	5.3
R3	Homestead	26.7	1.5	4.5	0.3	1.6	2.3	50.4	0.5	0.05	0.003	4.9
EPP (Air) objective		**50**	**25**	**20**	**7**	**90**	**120**	**164**	**31**	**214**	**57**	**11,000**

Table 14 Predicted ground-level concentrations of dust due to the Project plus ambient background concentrations

Receptor		PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m^3)		TSP (µg/m^3)	Dust deposition (mg/m^2/day)	NO_2 (µg/m^3)		SO_2 (µg/m^3)		CO (µg/m^3)
ID	Description	Maximum 24-hour	Annual Average	Maximum 24-hour	Annual Average	Annual average	Maximum Monthly	Maximum 1-hour	Annual average	Maximum 1-hour	Maximum 24-hour	Maximum 8-hour
R1	Esmeralda Homestead	18.8	16.3	6.7	6.2	32.5	40.0	7.0	5.5	2.9	1.7	229.4
R2	Prospect Homestead	42.9	17.5	11.3	6.4	33.8	41.8	45.6	5.7	2.9	1.7	234.5
R3	Homestead	45.4	17.8	11.2	6.5	34.1	42.3	56.6	6.0	3.0	1.7	234.1
EPP (Air) objective		**50**	**25**	**20**	**7**	**90**	**120**	**164**	**31**	**214**	**57**	**11,000**

9. MITIGATION AND MANAGEMENT

The air quality assessment has taken into account a range of routine mitigation measures that will be established by the Project, including:

- Watering used on all ROM, overburden and backfill haulage roads
- Water sprays on ROM feed to the process plant
- Water sprays on transfers within crushing and screening operation
- Progressive rehabilitation of topsoil stockpiles
- Cyclones on drills
- Cyclone on concentrate flash dryer dust collector in process plant.

The assessment predicts no exceedances of the relevant air quality criteria at sensitive receptors, indicating that dust emissions from the Project can be adequately managed using the above mitigation measures to prevent adverse impacts at sensitive receptors and protect the environmental values of the air environment in the region.

A dust management plan should still be included in an overarching environmental management plan to ensure adequate monitoring of routine mitigation measures and potential changes to operations to mitigate dust impacts under adverse meteorological conditions.

The plan should include the following:

- Overview of the routine operational procedures and mitigation measures considered in this assessment to prevent or minimise dust emissions
- Procedures for visual inspection of dust emissions from the Project
- Utilisation of publicly available meteorological forecasting tools to inform potential adverse meteorological conditions
- A framework for identifying actual and potential dust impacts based on visual inspection and forecast analysis, and for applying pro-active and reactive mitigation and management measures to address those potential impacts
- Adequate record keeping for any actions taken
- Procedures for investigating and addressing dust complaints
- Procedures for review and revision of the management plan.

10. AIR QUALITY CONCLUSIONS

Katestone was commissioned by AARC on behalf of Graphinex to conduct an air quality assessment of the Esmeralda Graphite Project

Potential impacts to air quality were assessed for mine year 42, representing a maximum operational scenario. Air emission estimation was conducted in accordance with recognised techniques, and subsequent dispersion modelling was undertaken using the regulatory dispersion model, CALPUFF.

Ground-level concentrations of air pollutants associated with Project have been predicted at nearby sensitive receptors and across a Cartesian grid of receptors. A cumulative assessment has been conducted including the addition of ambient background concentrations of air pollutants that were determined from measurements collected at representative DETSI air quality monitoring stations.

Results of the air quality assessment demonstrated that predicted ground-level concentrations of all air pollutants and dust deposition rates due to the Project with ambient background levels included are predicted to comply with the relevant air quality objectives at all sensitive receptors. Compliance of all assessed pollutants with the relevant air quality objectives indicates that the Project is unlikely to adversely impact the environmental values of the region, including relating to dust impacts on cattle grazing land in the region. Mitigation and management measures proposed will contribute to preventing or minimising impacts to the environmental values of the air environment in the surrounding areas.

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USEPA, 1998, AP42, Section 11.9 *Western Surface Coal Mining*

USEPA, 2004, AP42 Section 11.19.2 *Crushed Stone Processing and Pulverized Mineral Processing*

USEPA, 2006a, AP42 Section 13.2.2 *Unpaved Roads*

USEPA, 2006b, AP42, Section 13.2.4 *Aggregate Handling and Storage Piles*

USEPA, 2006c, AP42, Section 13.2.5 *Industrial Wind Erosion*

12. CONTOUR PLATES

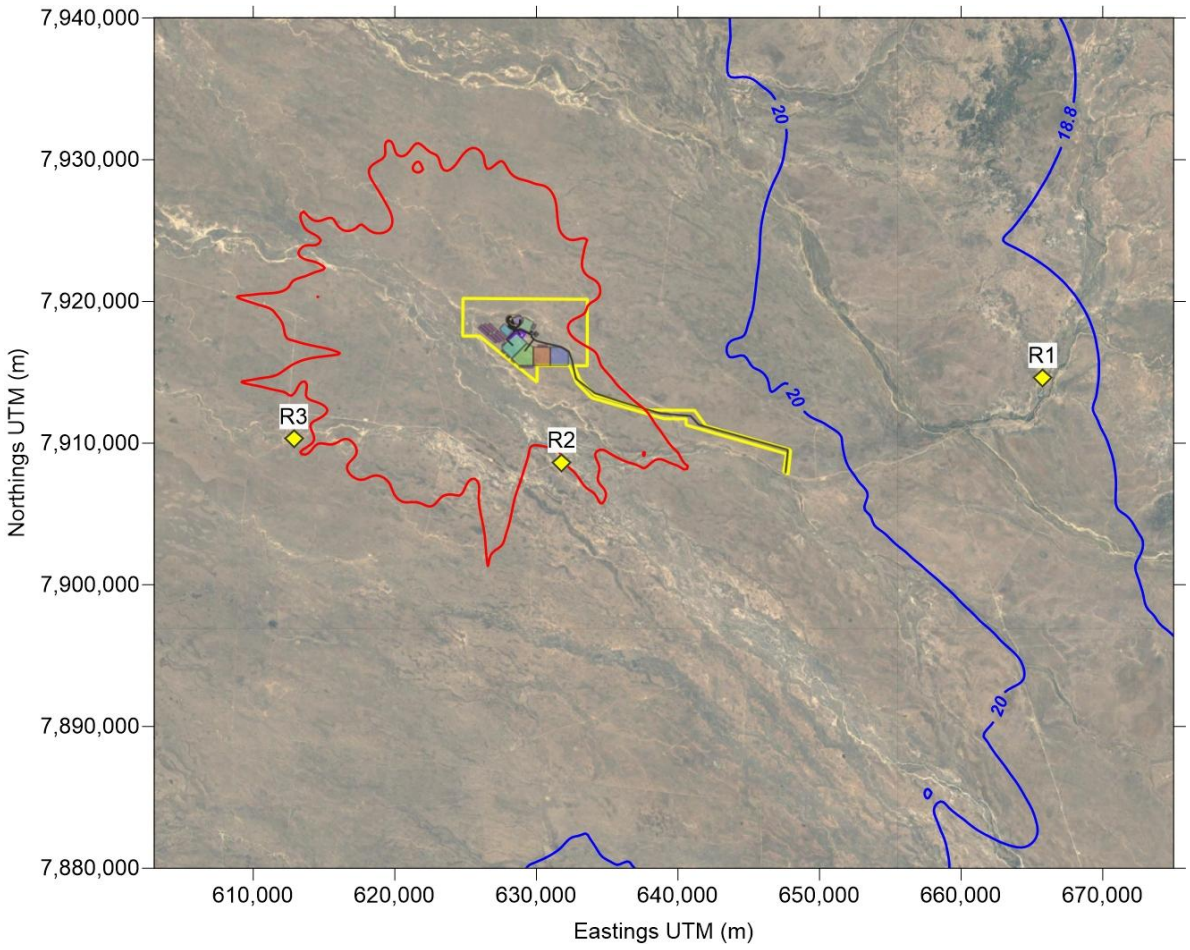


Plate 1 **Predicted maximum 24-hour average ground-level concentrations of PM_{10} due to the Project including ambient background levels**

Location:	**Averaging period:**	**Data source:**	**Units:**
Esmeralda, QLD	24-hour	CALPUFF	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Maximum contour	50 µg/m3	Joel von Treifeldt	May 2026

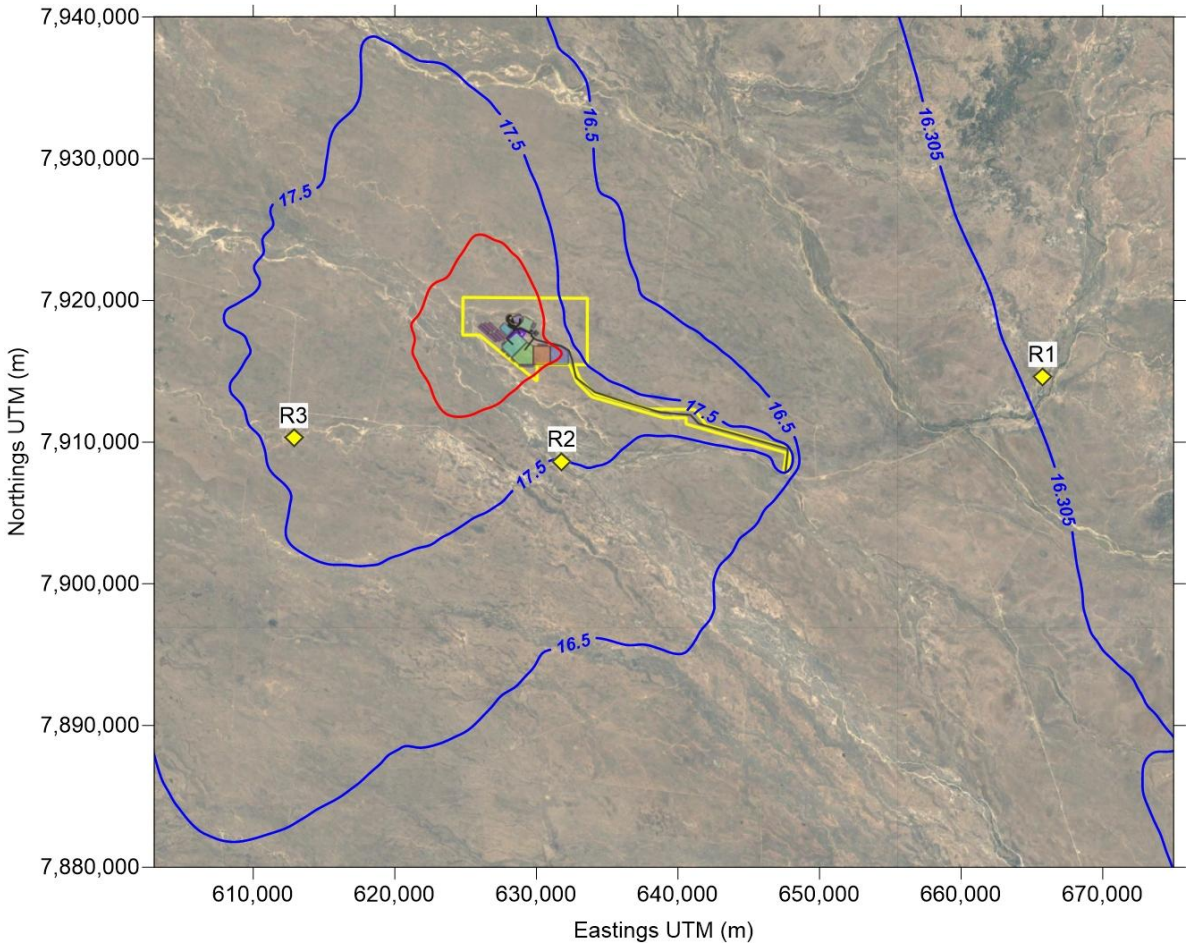


Plate 2 **Predicted annual average ground-level concentrations of PM_{10} due to the Project including ambient background levels**

Location: Esmeralda, QLD	**Averaging period:** Annual	**Data source:** CALPUFF	**Units:** µg/m^3
Type: Average contour	**Objective:** 25 µg/m^3	**Prepared by:** Joel von Treifeldt	**Date:** May 2026

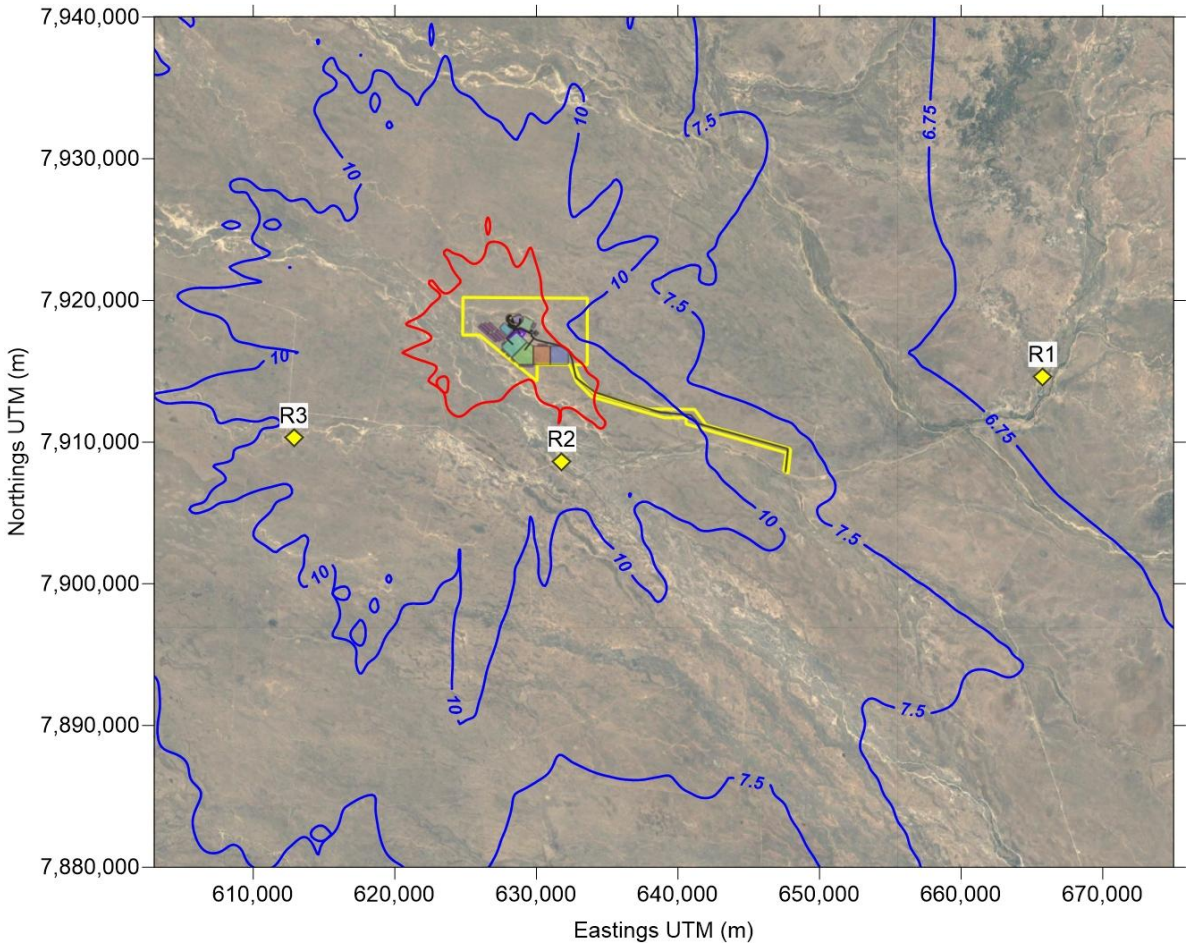


Plate 3 **Predicted maximum 24-hour average ground-level concentrations of $PM_{2.5}$ due to the Project with ambient background levels included**

Location:	**Averaging period:**	**Data source:**	**Units:**
Esmeralda, QLD	24-hour	CALPUFF	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Maximum contour	20 µg/m^3	Joel von Treifeldt	May 2026

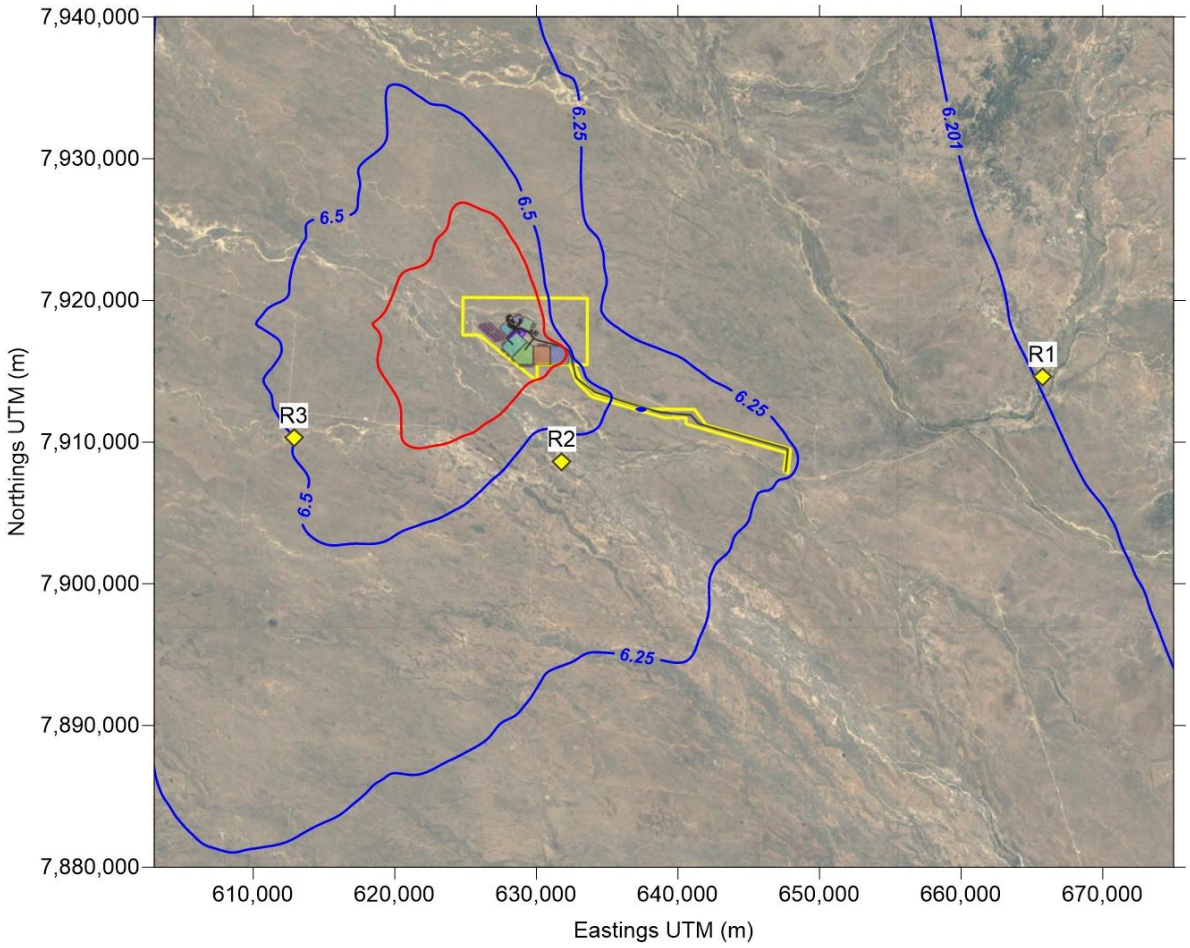


Plate 4 **Predicted cumulative annual average ground-level concentrations of $PM_{2.5}$ due to the Project with ambient background levels included**

Location:	**Averaging period:**	**Data source:**	**Units:**
Esmeralda, QLD	Annual	CALPUFF	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Average contour	7 µg/m^3	Joel von Treifeldt	May 2026

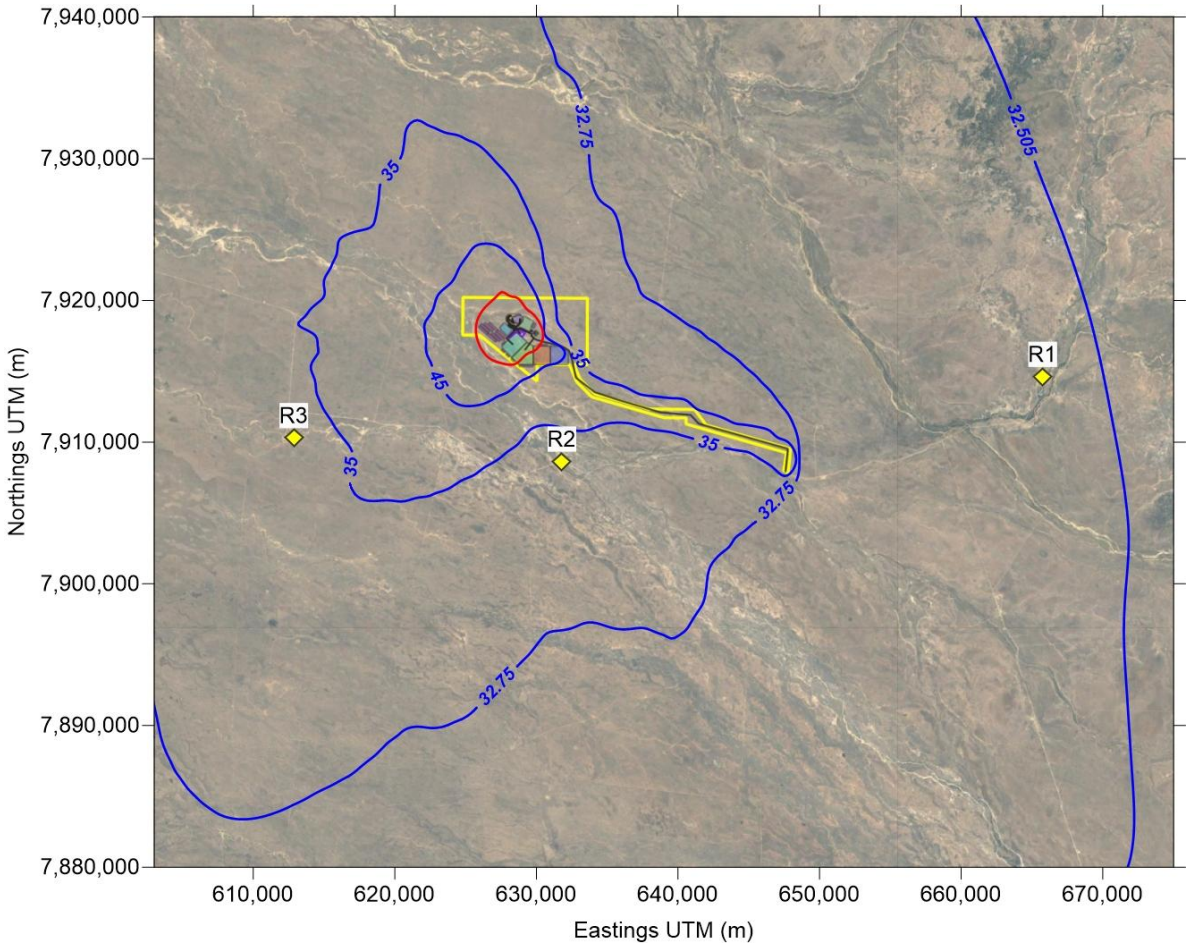


Plate 5 **Predicted annual average ground-level concentrations of TSP due to the Project with ambient background levels included**

Location: Esmeralda, QLD	**Averaging period:** Annual	**Data source:** CALPUFF	**Units:** µg/m^3
Type: Average contour	**Objective:** 90 µg/m^3	**Prepared by:** Joel von Treifeldt	**Date:** May 2026

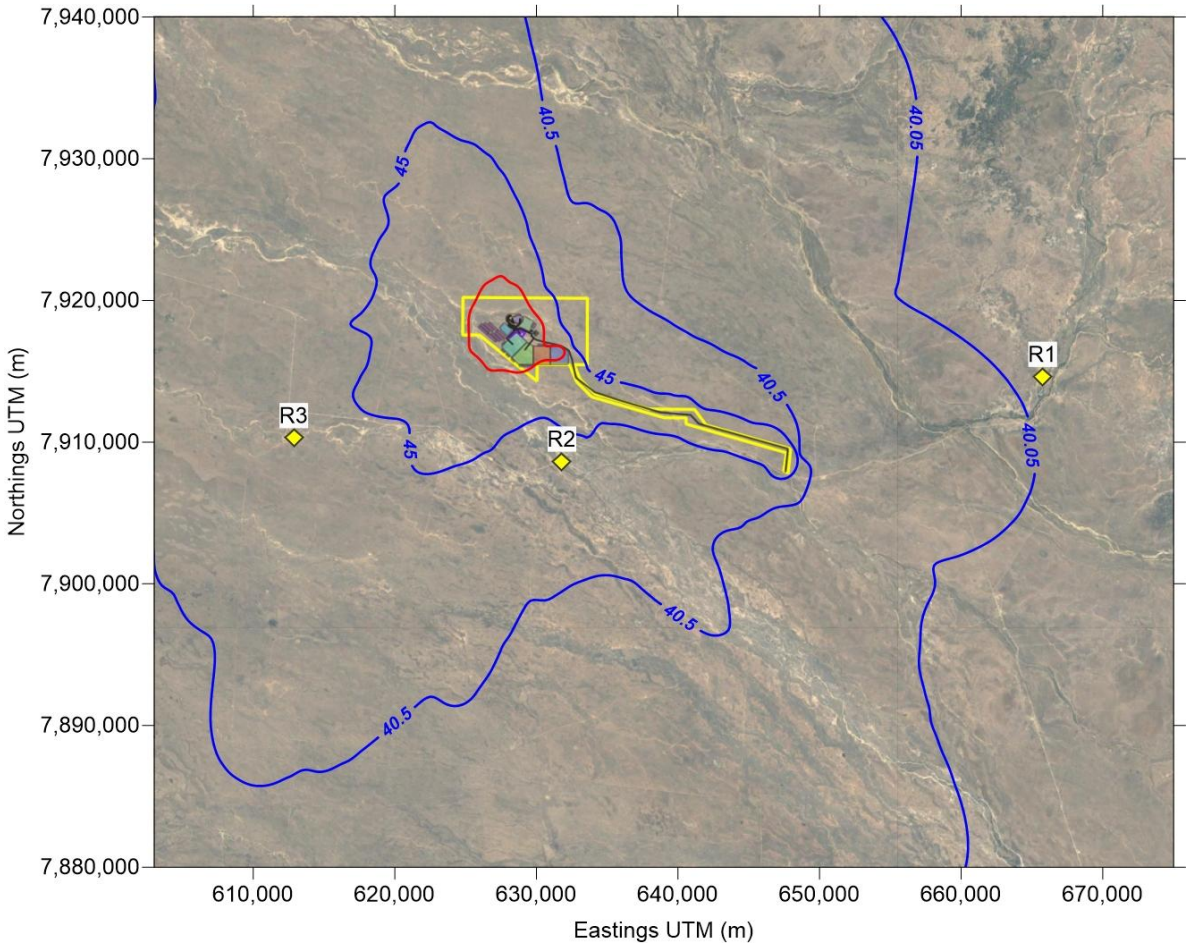


Plate 6 **Predicted maximum monthly dust deposition rate due to the Project with ambient background levels included**

Location:	**Averaging period:**	**Data source:**	**Units:**
Esmeralda, QLD	Monthly	CALPUFF	mg/m^2/day
Type:	**Objective:**	**Prepared by:**	**Date:**
Maximum contour	120 mg/m^2/day	Joel von Treifeldt	May 2026

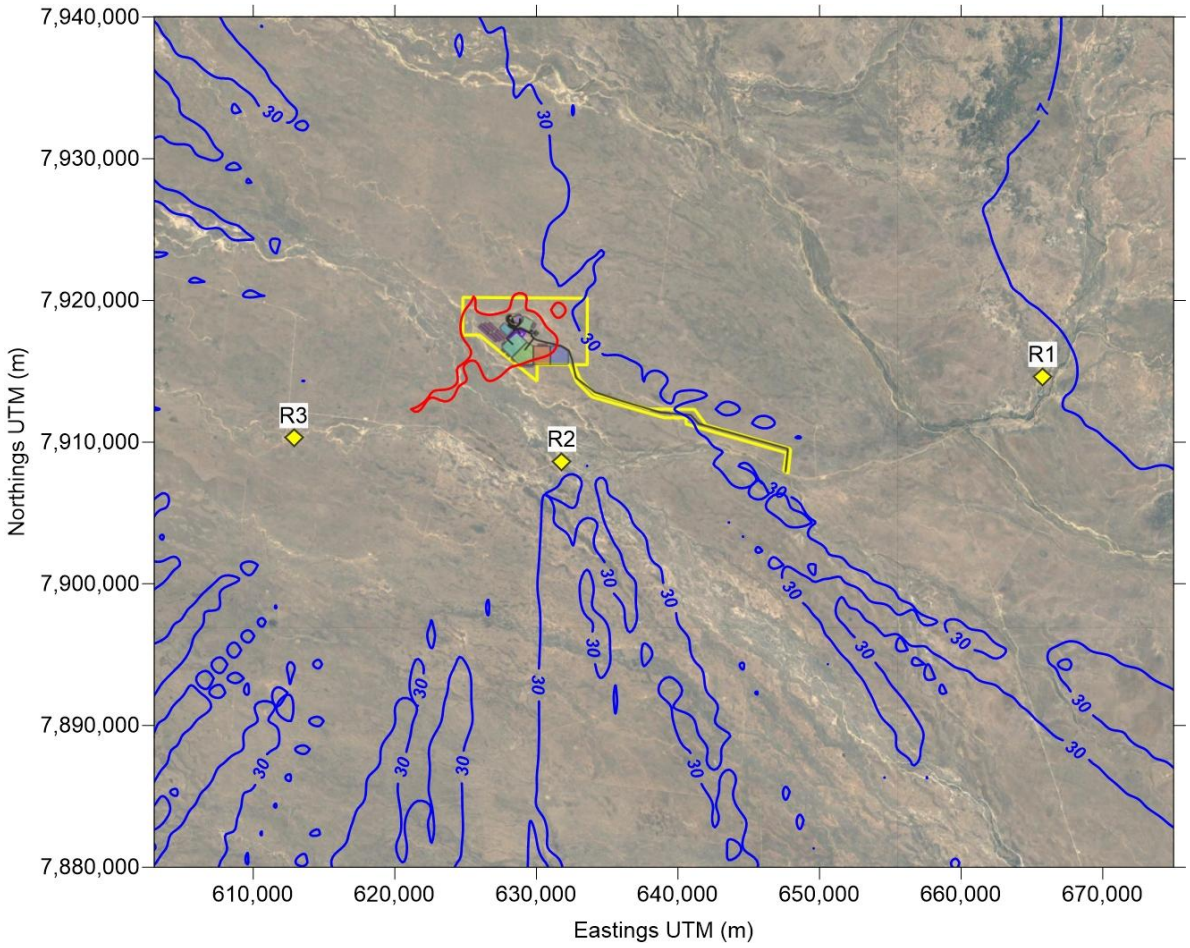


Plate 7 **Predicted maximum 1-hour average ground-level concentrations of NO_2 with ambient background levels included**

Location:	**Averaging period:**	**Data source:**	**Units:**
Esmeralda, QLD	1-hour	CALPUFF	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Maximum contour	164 µg/m^3	Joel von Treifeldt	May 2026

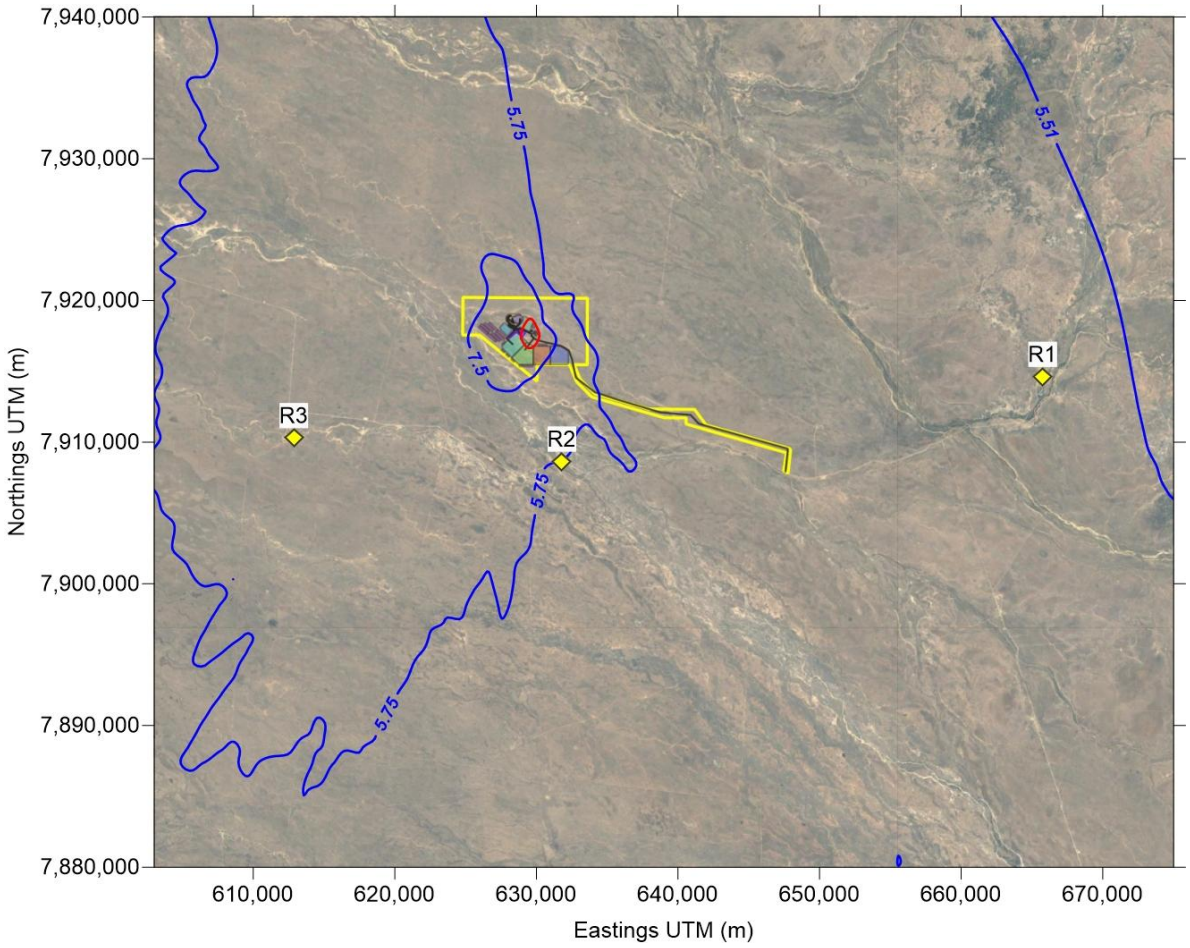


Plate 8 **Predicted annual average ground-level concentrations of NO_2 due to the Project with ambient background levels included**

Location:	**Averaging period:**	**Data source:**	**Units:**
Esmeralda, QLD	Annual	CALPUFF	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Average contour	31 µg/m^3	Joel von Treifeldt	May 2026

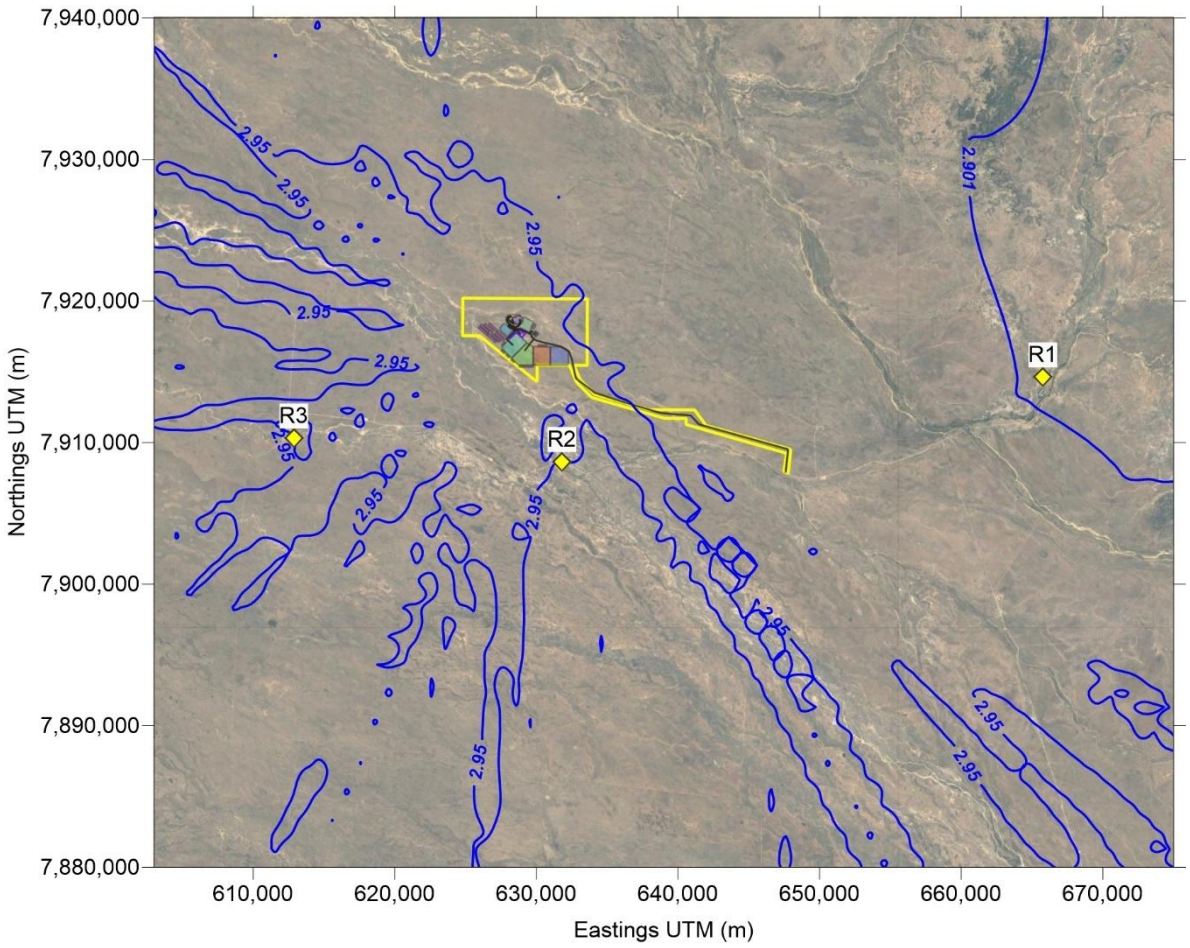


Plate 9 **Predicted maximum 1-hour average ground-level concentrations of SO_2 due to the Project with ambient background levels included**

Location:	**Averaging period:**	**Data source:**	**Units:**
Esmeralda, QLD	1-hour	CALPUFF	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Maximum contour	214 µg/m^3	Joel von Treifeldt	May 2026

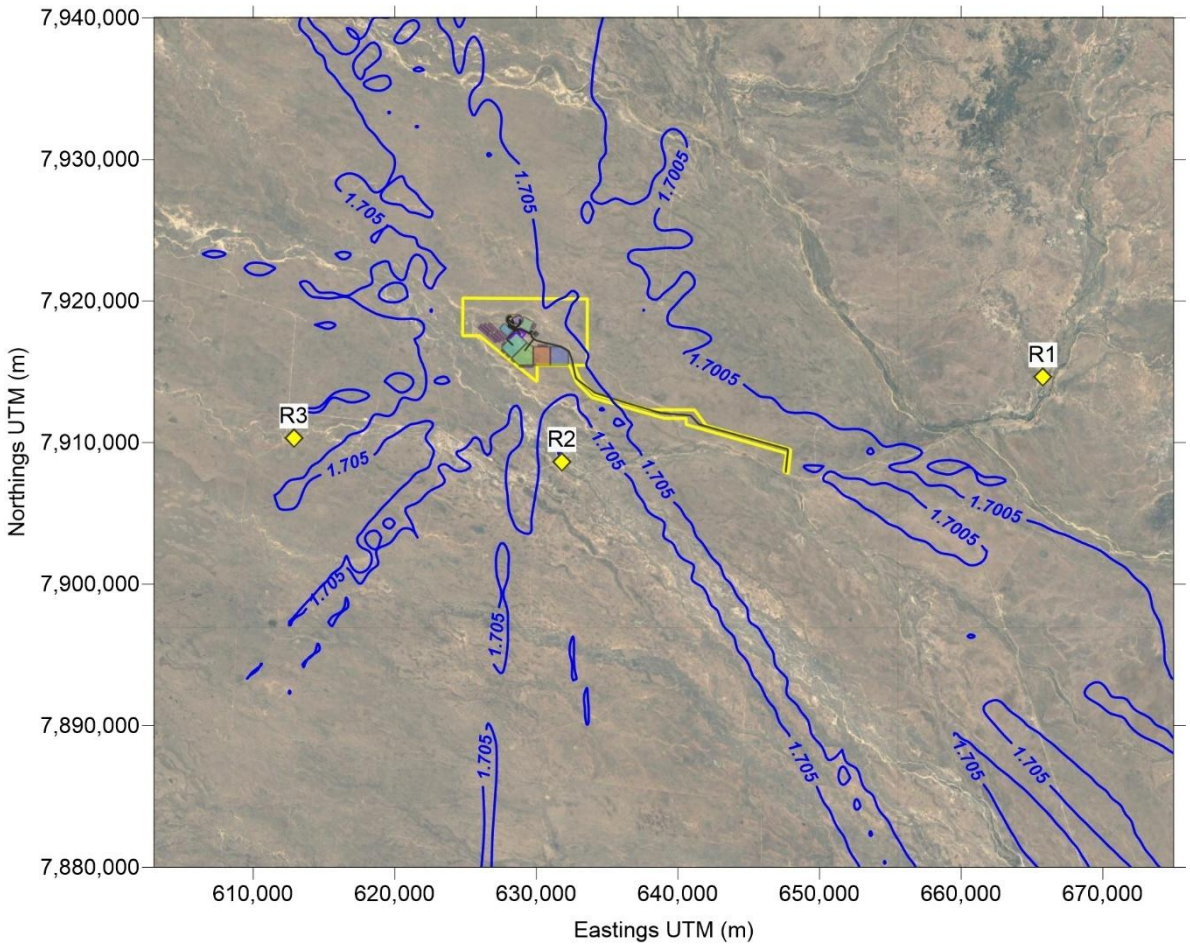


Plate 10 **Predicted maximum 24-hour average ground-level concentrations of SO_2 due to the Project with ambient background levels included**

Location:	**Averaging period:**	**Data source:**	**Units:**
Esmeralda, QLD	24-hour	CALPUFF	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Maximum contour	57 µg/m^3	Joel von Treifeldt	May 2026

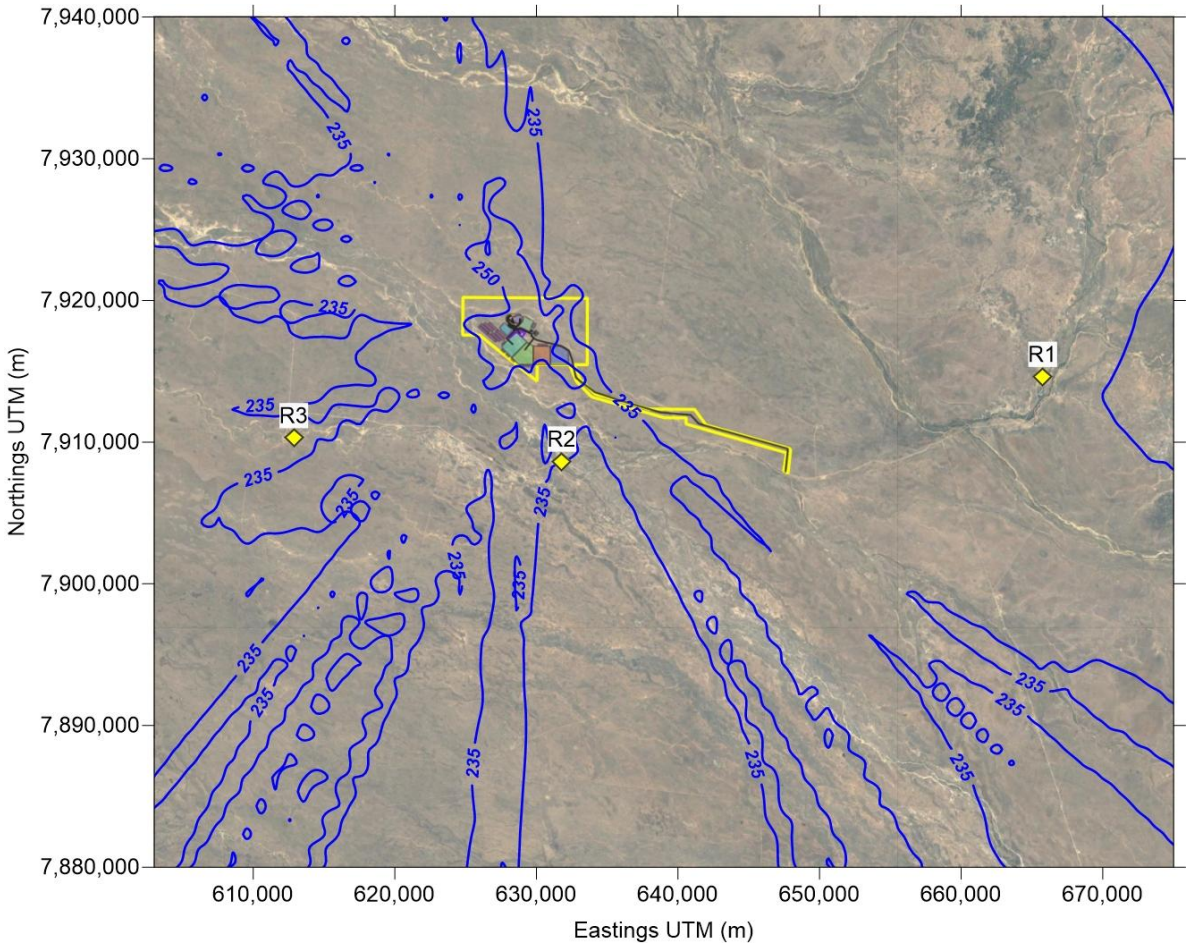


Plate 11 **Predicted maximum 8-hour average ground-level concentrations of CO due to the Project with ambient background levels included**

Location:	**Averaging period:**	**Data source:**	**Units:**
Esmeralda, QLD	8-hour	CALPUFF	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Maximum contour	11,000 µg/m^3	Joel von Treifeldt	May 2026

APPENDIX A METEOROLOGICAL AND DISPERSION MODELLING METHODOLOGY

A1 Meteorology

The meteorological modelling methodology undertaken included the following steps:

- Selection of a representative year
- TAPM modelling and validation
- CALMET modelling

The following sections describe each step of the meteorological modelling conducted for the project. A summary of the meteorological data generated is provided in Section A1.5.

A1.1 Selection of representative year

A representative year is required to be selected at the beginning of the meteorological modelling process. Using a representative year in the air quality assessment ensures that the typical conditions experienced at the project site are reflected in the model.

Selection of a representative year has been done through statistical analysis of historical meteorological observations at the Bureau of Meteorology automatic weather station located at Georgetown Airport. Meteorological observations from the past five years (2021 to 2025) at Georgetown Airport were analysed to assess the inter-annual variability.

Figure A1 presents annual wind roses for the five years and shows that inter-annual conditions are typically very similar. Figure A2 presents frequency distribution plots for humidity, wind direction, wind speed and temperature, with the year 2021 highlighted, and demonstrates that there is relatively little variation in the distribution of these variables year-on-year. Figure A3 presents Z-Scores for each variable for each year, these being a measure of the variation of values in each individual year against the mean of values across all years.

The calendar year 2021 has been used for the modelling as it is judged to be the year with the least variation from the mean when averaged across all of the parameters considered.

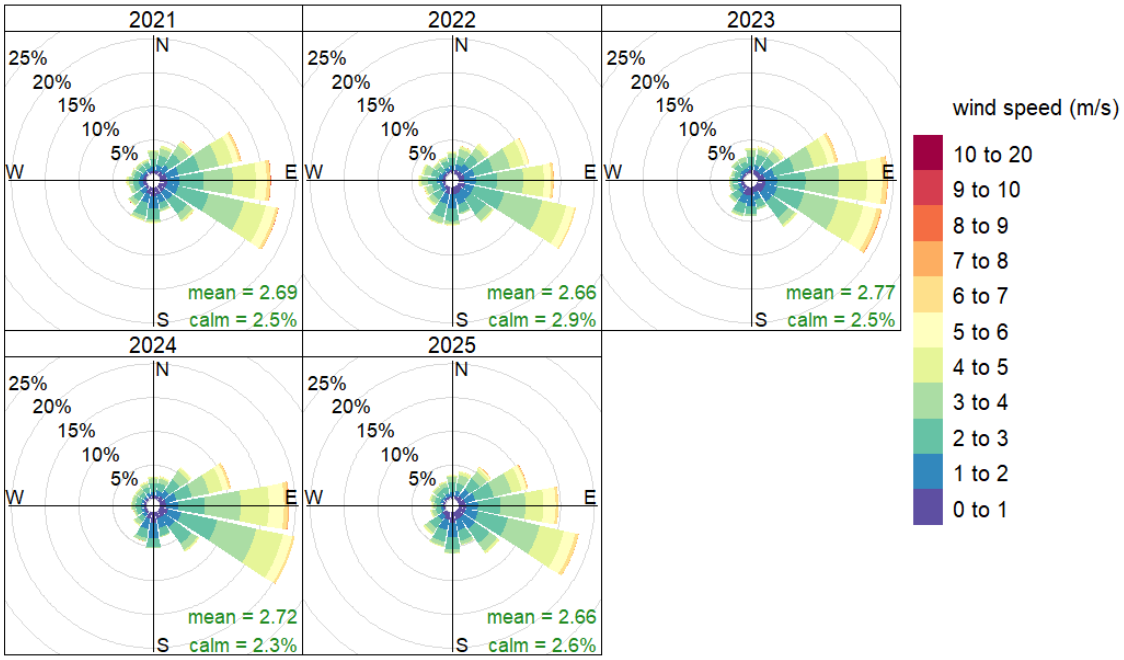


Figure A1 Annual wind roses for Georgetown Airport between 2021 and 2025

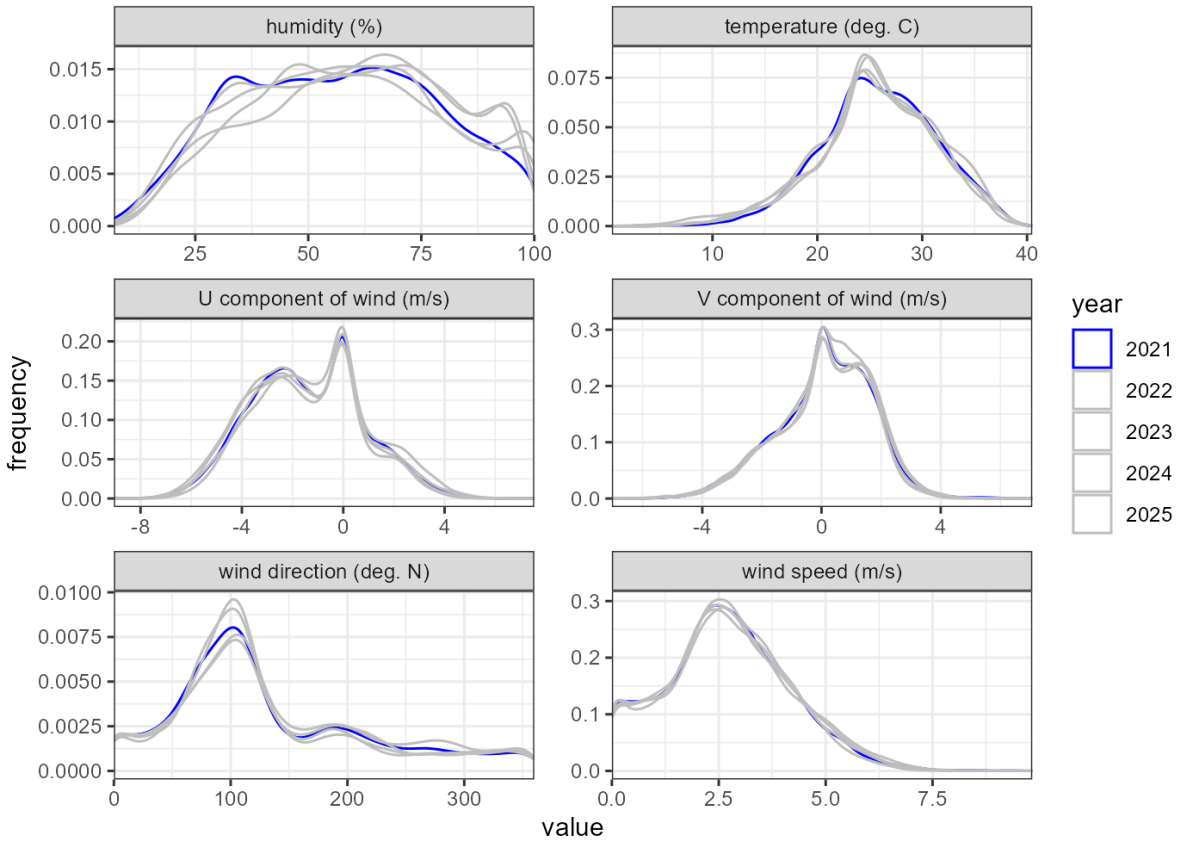


Figure A2 Annual frequency distributions plots for Georgetown Airport between 2021 and 2025 (2021 highlighted)

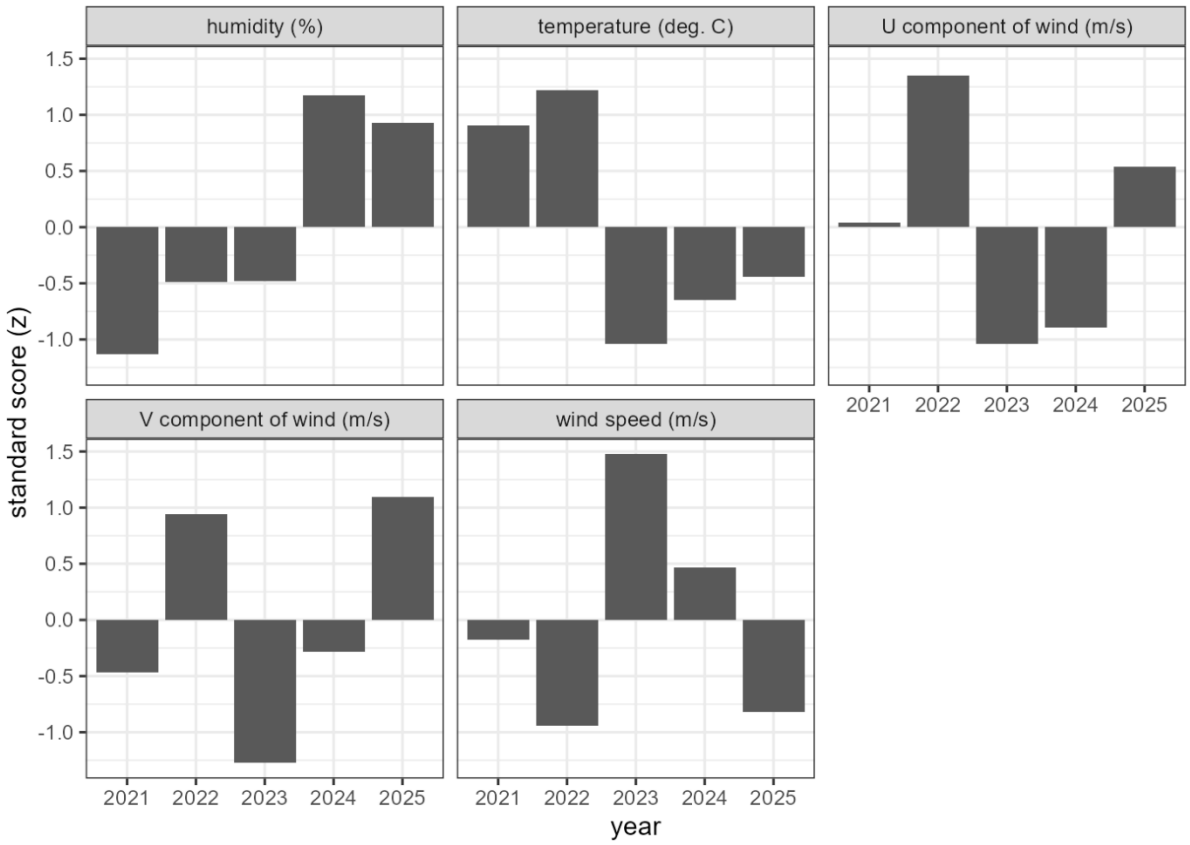


Figure A3 Z-Scores for Georgetown Airport between 2021 and 2025

A1.2 TAPM meteorological modelling configuration

TAPM (The Air Pollution Model) was developed by the CSIRO and has been validated by the CSIRO, Katestone and others for many locations in Australia, in south-east Asia and in North America (CSIRO, 2008). Katestone has extensive experience with TAPM for sites throughout Australia and in parts of America, Bangladesh, New Caledonia and Vietnam. The model performs well in simulating regional wind patterns and has proven to be a useful tool for simulating meteorology in locations where monitoring data providing the vertical distribution of meteorological parameters are unavailable.

TAPM is a prognostic meteorological model which predicts the flows important to regional and local scale meteorology, such as sea breezes and terrain-induced flows from the larger-scale meteorology provided by the synoptic analyses. TAPM solves the fundamental fluid dynamics equations to predict meteorology at a mesoscale (20 km to 200 km) and at a local scale (down to a few hundred metres). TAPM includes parameterisations for cloud/rain micro-physical processes, urban/vegetation canopy, soil type and radiative fluxes.

TAPM requires synoptic meteorological information for the region. This information is generated by a global model similar to the large-scale models used to forecast the weather. The data were supplied on a grid resolution of approximately 75km, and at elevations of 100m to 5km above the ground. TAPM uses this synoptic information, along with specific details of the location such as surrounding terrain, land-use, soil moisture content and soil type to simulate the meteorology of a region as well as at a specific location.

TAPM version 4.0.5 was configured with the following parameters:

- Modelling period from 1 January to 31 December 2021
- 58 x 58 grid point domain with nesting resolutions of 25 km, 10 km and 3 km

- 30 vertical levels
- Grid centred on latitude -18° 51.5', longitude 142° 19.5'
- Geoscience Australia 9 second DEM terrain data
- TAPM default land cover data edited to be consistent with aerial imagery
- Default options selected for advanced meteorological inputs.

A1.3 Comparison of TAPM output with observational data

A1.3.1 Overview

The model validation in this section compares observational data with data derived from running TAPM at the location of the BoM monitoring station at Georgetown Airport. Comparison of the observational data with the model predictions showed that the model generally performed well at simulating the meteorology across the region.

A1.3.2 Validation of TAPM modelling

The following section presents the results of the validation of the TAPM run that was used for the dispersion modelling assessment. There are no BoM stations within the 1km or 3km TAPM domains. Georgetown Airport is the nearest BoM station that records continuous wind speed and direction, and falls within the 10km TAPM domain. The model validation compares observational data from the Georgetown Airport monitor with data extracted from TAPM at the same location.

Figure A4 shows probability density functions that graphically compare statistical distributions of meteorological parameters between the TAPM output and BoM Georgetown Airport observational data. Table A1 presents statistical comparisons of TAPM output (wind speed and temperature) to meteorological data recorded at the BoM Georgetown Airport monitoring station. The TAPM output was extracted from the closest inner grid point to the location of the weather station.

The following statistical measures of model accuracy are presented in the tables:

- The mean bias, which is the mean model prediction minus the mean observed value. Values of the mean bias close to zero show good prediction accuracy.
- The root mean square error (RMSE), which is the standard deviation of the differences between predicted values and observed values. The RMSE is non-negative and values of the RMSE close to zero show good prediction accuracy. The RMSE is given by

$$\mathrm{RMSE} = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(P_i - O_i)^2}$$

  where N is the number of observations, P_i are the hourly model predictions and O_i are the hourly observations

- The index of agreement (IOA), which takes a value between 0 and 1, with 1 indicating perfect agreement between predictions and observations. The IOA is calculated following a method described in Willmott (1982), using the equation

$$\mathrm{IOA} = 1 - \frac{\sum_{i=1}^{N}(P_i - O_i)^2}{\sum_{i=1}^{N}(|P_i - O_{mean}| + |O_i - O_{mean}|)^2}$$

where N is the number of observations, P_i are the hourly model predictions, O_i are the hourly observations and O_{mean} is the observed observation mean.

The wind speeds and temperatures generated by TAPM are outside of benchmark ranges for bias, though are within the benchmark ranges for RMSE and index of agreement for the BoM Georgetown Airport station. The probability density functions illustrate good agreement between predicted and observed meteorological data.

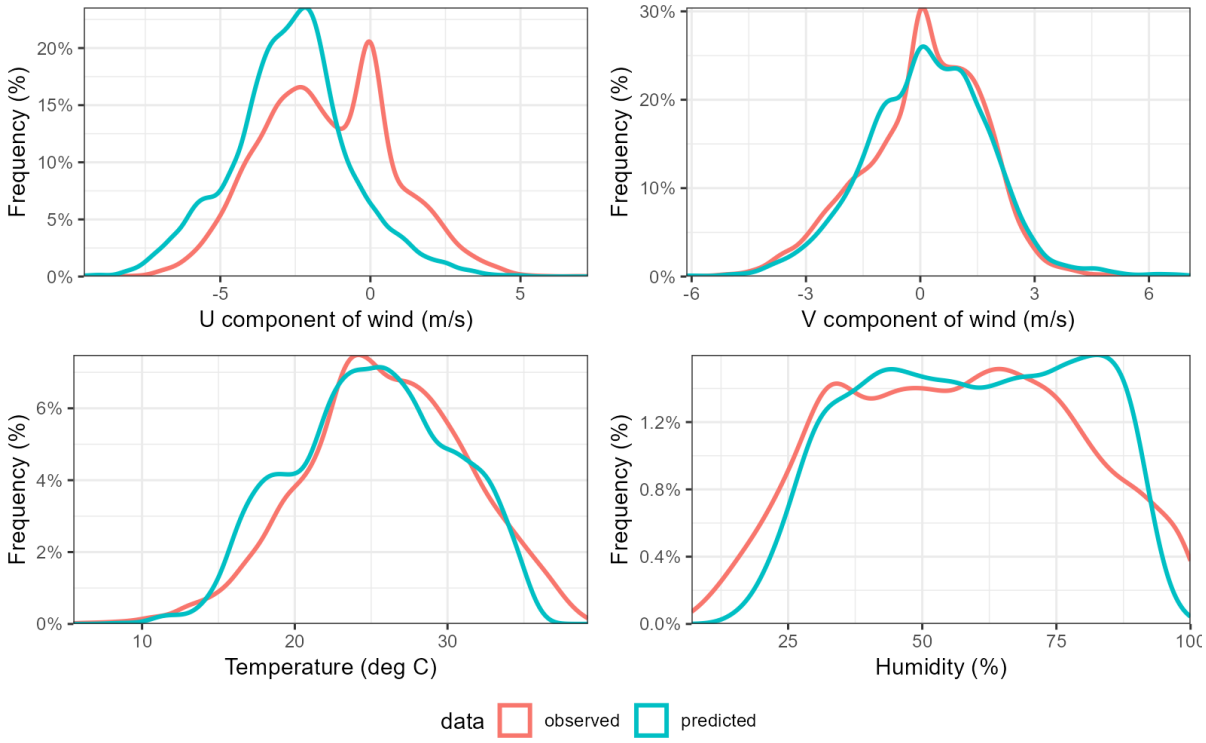


Figure A4 Probability density functions comparing 2021 observational data (red) with TAPM data (blue) at the location of the BoM Georgetown Airport monitoring station

Table A1 Comparison of the observed meteorological data with the TAPM output for 2021 at the location of the BoM Georgetown Airport monitoring station

Statistic	"Good" value	Wind speed			Temperature		
		Benchmark	Observational data	TAPM	Benchmark	Observational data	TAPM
Mean	-	-	2.691	3.362	-	25.945	25.070
SD	-	-	1.467	1.560	-	5.357	5.183
Min	-	-	0.000	0.000	-	5.500	8.000
Max	-	-	9.832	9.600	-	39.200	35.900
Bias	0	<±0.5 m/s	0.671		<±0.5 °C	-0.824	
RMSE	Close to 0	<2 m/s	1.590		-	2.437	
IoA	Close to 1	>0.6	0.705		≥0.8	0.945	

A1.4 CALMET meteorological modelling configuration

CALMET is an advanced non-steady-state diagnostic 3D meteorological model with micro-meteorological modules for overwater and overland boundary layers. The model is the meteorological pre-processor for the CALPUFF modelling system. CALMET is capable of reading hourly meteorological data as data assimilation from multiple sites within the modelling domain; it can also be initialised with the gridded three-dimensional prognostic output from other meteorological models such as TAPM. This can improve dispersion model output, particularly over complex terrain as the near surface meteorological conditions are calculated for each grid point.

CALMET version 6.5.0 was used to simulate meteorological conditions in the region. The CALMET simulation was initialised with the gridded TAPM 3D wind field data from the 3 km grid. CALMET treats the prognostic model output as the initial guess field for the CALMET diagnostic model wind fields. The initial guess field is then adjusted for the kinematic effects of terrain, slope flows, blocking effects and 3D divergence minimisation.

CALMET was configured using default options and parameters, with the following selections:

- Modelling period from 1 January to 31 December 2021
- 75 x 75 grid point domain with 1 km resolution, nested within the TAPM inner domain
- 12 vertical levels at heights of 20, 60, 100, 150, 200, 250, 350, 500, 800, 1600, 2600 and 4600 metres
- Prognostic wind fields generated by TAPM input as MM5/3D.DAT at surface and upper air for “initial guess” field (no-observations mode)
- Gridded cloud cover from prognostic relative humidity at all levels
- No extrapolation of surface wind observations to upper layers
- Terrain radius of influence of 5 km.

A1.5 CALMET meteorological outputs

The following sections provide a description of the CALMET outputs as utilised in the CALPUFF dispersion modelling for the meteorological parameters that are important for the dispersion of air pollutants in the atmosphere, namely wind speed, wind direction, atmospheric stability, mixing layer height, and temperature. These parameters have been extracted from the TAPM/CALMET dataset at the Project site.

A1.5.1 Wind speed and wind direction

The annual distribution of winds predicted by TAPM/CALMET for 2021 is presented in Figure A5. The seasonal and diurnal distribution of winds is presented in Figure A6 and Figure A7.

Winds across the study area are predominantly light to moderate (up to around 5.7 m/s) and range from the northeast through to the southeast. Winds from the west sector are less frequent.

The seasonal breakdown of winds shows that the predominant southeasterly winds are strongest and most common during the autumn and winter months. Spring and summer show increased frequency of winds from the northeast, with average wind speeds relatively uniform throughout the year.

The diurnal breakdown of winds shows that the strongest winds are predicted during the afternoon (midday to 6pm) when winds are predominantly from the southeast. Moderate winds from the northeast also occur during the afternoon. From 6pm through to the morning there is a shift towards lighter winds, with wind direction relatively uniform throughout.

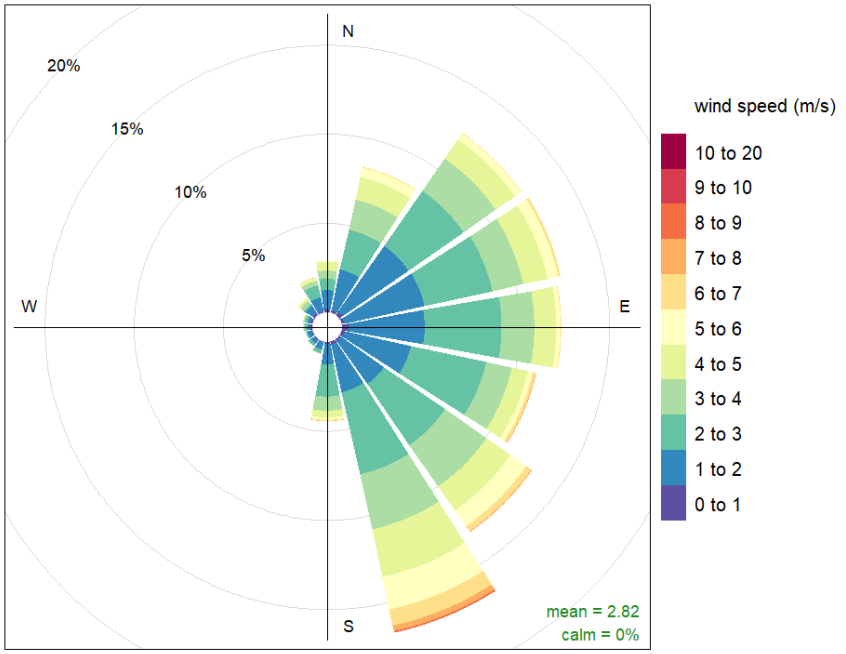


Figure A5 2021 Annual distribution of winds predicted by TAPM/CALMET

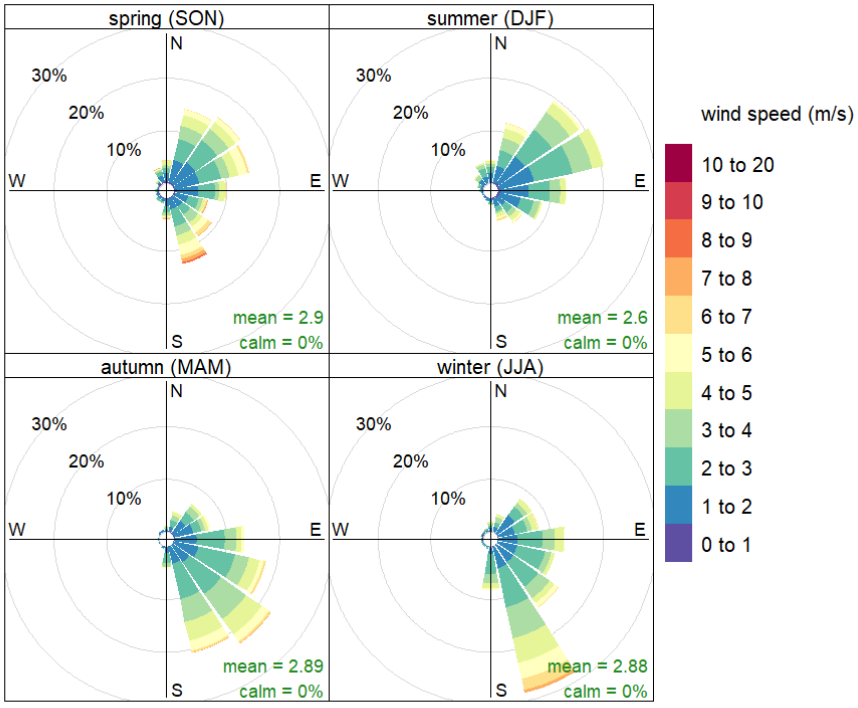


Figure A6 2021 Seasonal distribution of winds predicted by TAPM/CALMET

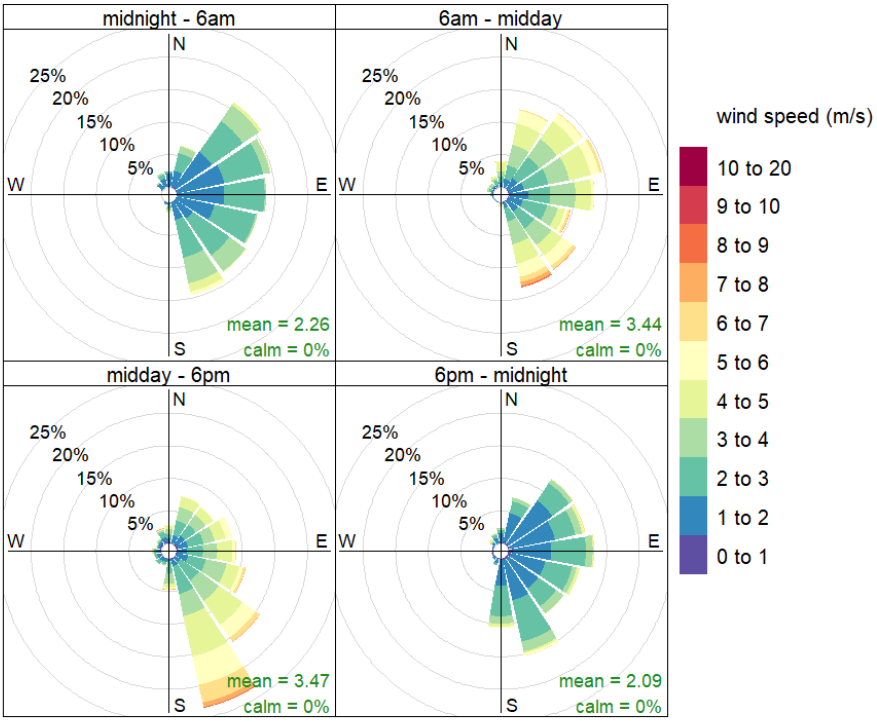


Figure A7 2021 Diurnal distribution of winds predicted by TAPM/CALMET

A1.5.2 Atmospheric stability

Stability classification is a measure of the stability of the atmosphere and can be determined from wind measurements and other atmospheric observations. The stability classes range from A Class, which represents very unstable atmospheric conditions that may typically occur on a sunny day, to F Class, which represents very stable atmospheric conditions that typically occur during light wind conditions at night. Unstable conditions (Classes A to C) are characterised by strong solar heating of the ground that induces turbulent mixing in the atmosphere close to the ground. This turbulent mixing is the main driver of dispersion during unstable conditions. Dispersion processes for Class D conditions are dominated by mechanical turbulence generated as the wind passes over irregularities in the local surface. During the night, the atmospheric conditions are generally stable (often Classes E and F).

Figure A8 shows the distribution of stability classes extracted from the TAPM/CALMET dataset, where Class A represents the most unstable conditions and Class F represents the most stable. Very stable (F class) conditions are present the most throughout the year, comprising 38% of total time and only occurring between 6pm and 7am. Neutral (D class) and slightly unstable (C class) conditions are the next most frequent, comprising 41% of total time together, occurring primarily between 7 am and 6 pm.

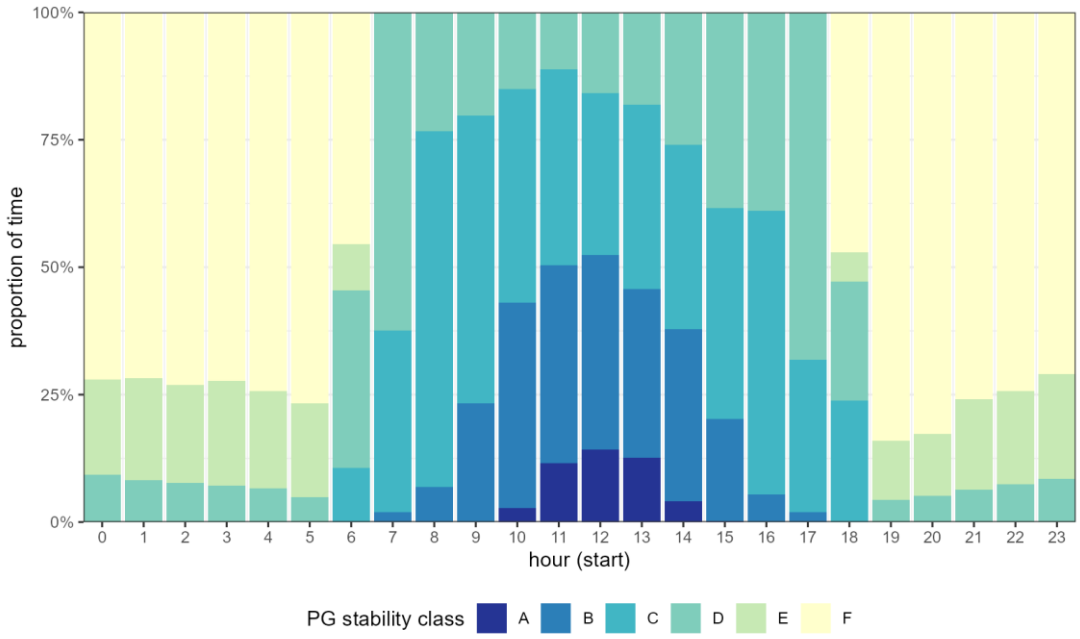


Figure A8 2021 Frequency distribution of atmospheric stability conditions predicted by TAPM/CALMET

A1.5.3 Mixing height

The mixing height defines the height of the mixed atmosphere above the ground (mixed layer), which varies diurnally. Air pollutants released at or near the ground will become dispersed within the mixed layer. During stable atmospheric conditions, the mixing height is often quite low, and dispersion is limited to within this layer. During the day, solar radiation heats the ground and causes the air above it to warm, resulting in convection and an increase to the mixing height. The growth of the mixing height is dependent on how well the warmer air from the ground can mix with the cooler upper-level air and, therefore, depends on meteorological factors such as the intensity of solar radiation and wind speed. Strong winds cause the air to be well mixed, resulting in a high mixing height.

Mixing height information extracted from the TAPM/CALMET dataset are presented as a diurnal frequency (box and whisker) plot in Figure A9. The plot shows that, on average, the mixing height begins to increase around 6 am and peaks around 4-5 pm before descending rapidly into the evening.

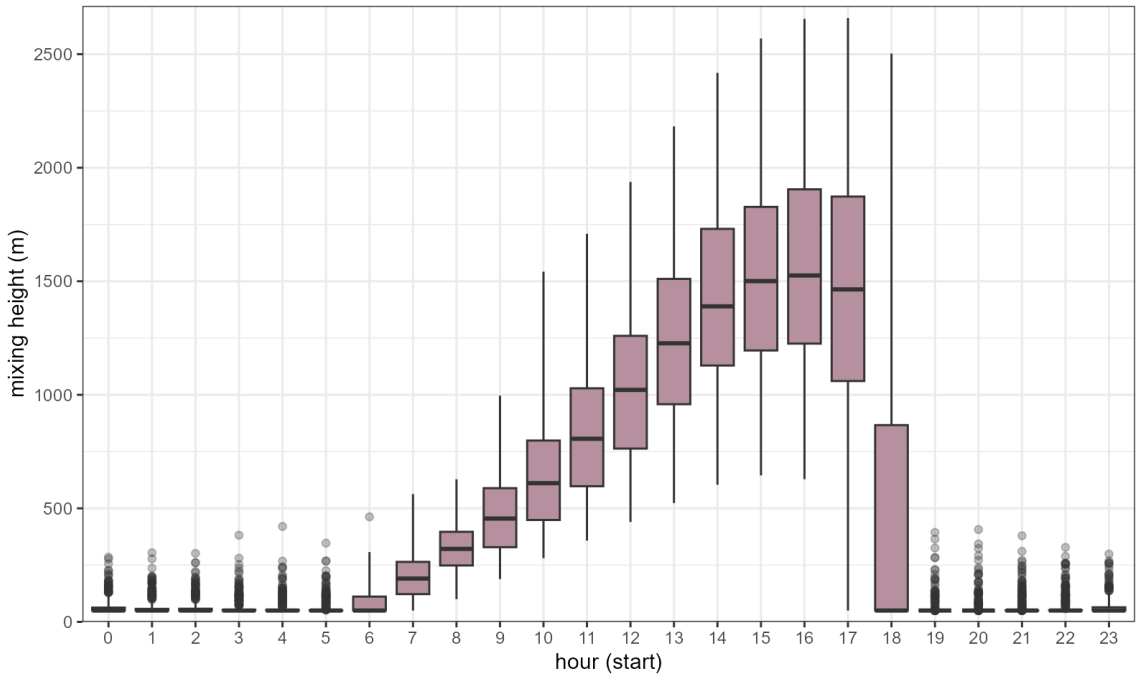


Figure A9 2021 Diurnal profile of mixing height predicted by TAPM/CALMET

A1.5.4 Temperature

The hourly distribution of TAPM/CALMET predicted temperature is provided in Figure A10 and the monthly distribution is provided in Figure A11. Over the twelve-month meteorological simulation, the temperature was predicted to range between 6°C and 39°C (average of 25.8°C).

During winter the temperature was predicted to range between 6°C and 33°C (average of 20.9°C). During summer the temperature was predicted to range between 18.2°C and 39.1°C (average of 29.7°C).

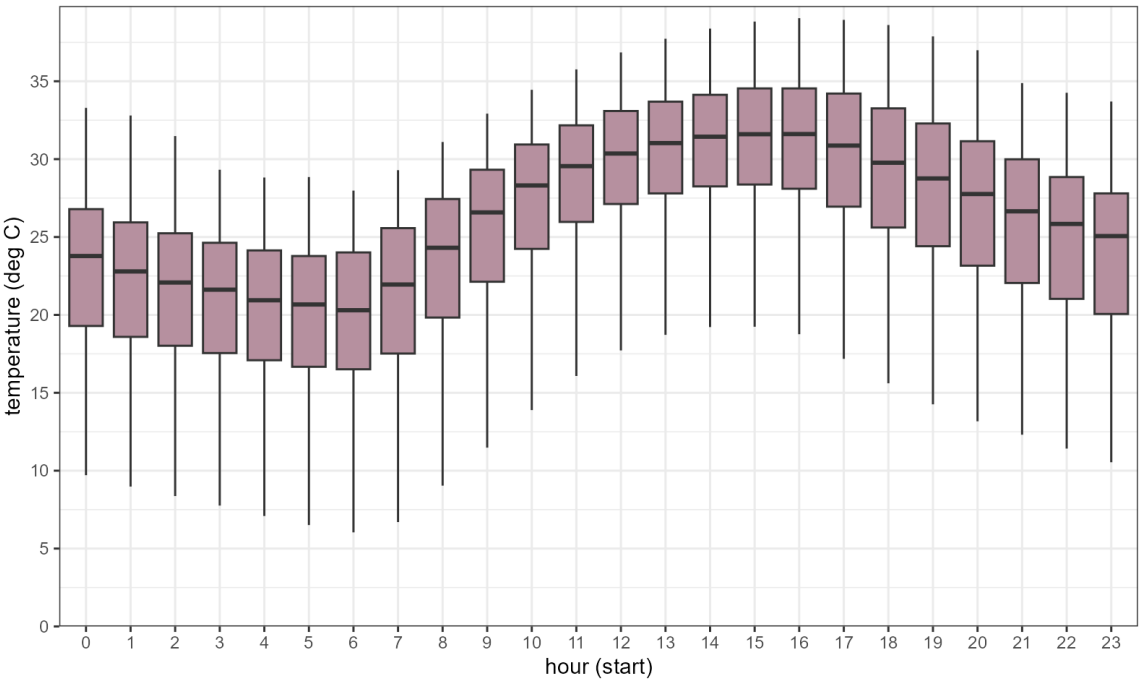


Figure A10 2021 Hourly distribution of TAPM/CALMET predicted temperature

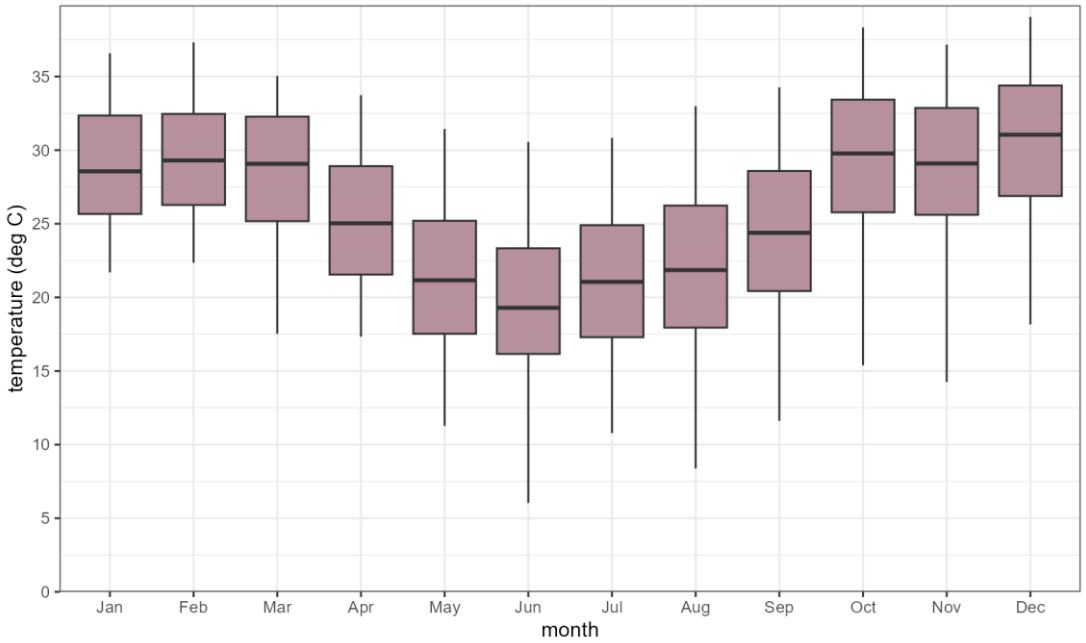


Figure A11 2021 Monthly distribution of TAPM/CALMET predicted temperature

A2 Dispersion modelling

CALPUFF simulates the dispersion of air pollutants to predict ground-level concentration and deposition rates across a network of receptors spaced at regular intervals, and at identified discrete locations. CALPUFF is a non-steady-state Lagrangian Gaussian puff model containing parameterisations for complex terrain effects, overwater transport, coastal interaction effects, building downwash, wet and dry removal, and simple chemical transformation. CALPUFF employs the 3D meteorological fields generated from the CALMET model by simulating the effects of time and space varying meteorological conditions on pollutant transport, transformation, and removal.

CALPUFF takes into account the geophysical features of the study area that affect dispersion of pollutants and ground-level concentrations of those pollutants in identified regions of interest. CALPUFF contains algorithms that can resolve near-source effects such as building downwash, transitional plume rise, partial plume penetration, sub-grid scale terrain interactions, as well as the long-range effects of removal, transformation, vertical wind shear, overwater transport and coastal interactions. Emission sources can be characterised as arbitrarily varying point, area, volume and lines or any combination of those sources within the modelling domain.

Key features of CALPUFF used to simulate dispersion:

- Domain area of 75 by 75 grids at 1.0 km spacing, equivalent to the domain defined in CALMET
- 365 days modelled (1 January 2021 to 31 December 2021)
- Gridded 3D hourly-varying meteorological conditions generated by CALMET
- Partial plume path adjustment for terrain modelled
- Dispersion coefficients calculated internally from sigma v and sigma w using micrometeorological variables
- Stack tip downwash, transitional plume rise and PDF used for dispersion under convective conditions.

All other options set to default.

APPENDIX B ACTIVITY DATA

Table B1 Activity data for mine year 42

Parameter	***Units***	***Value***	***Source***
Operations			
Drilling/blasting	hours/day	12	Graphinex
	day/year	365	Graphinex
Mining (excavating/hauling)	hours/day	24	Graphinex
	day/year	365	Graphinex
Processing	hours/day	24	Graphinex
	day/year	365	Graphinex
Crushing	hours/year	6,132	Graphinex - "11 Operations Management.pdf", Table 11.2
Milling	hours/year	7,884	Graphinex - "11 Operations Management.pdf", Table 11.2
Flotation	hours/year	7,884	Graphinex - "11 Operations Management.pdf", Table 11.2
Material properties			
Overburden density	tonnes/m^3	2.09	Calculated - Average of ultra compressive rock strength (UCS) test bulk density values provided by Graphinex
Overburden moisture content	%	2.91	Based on difference between provided OB dry and wet amounts from MG Graphinex schedule
Overburden silt content	%	6.90	AP42 Ch11.9 Table 11.9-3
ROM density	tonnes/m^3	2.69	Calculated - Average of UCS test bulk density values
ROM moisture content	%	2.91	Based on difference between provided ROM wet and dry amounts from MG Graphinex schedule
ROM silt content	%	2.50	Assumed value – Katestone's experience
Tailings density	tonnes/m3	1.69	Graphinex
Tailings moisture content	%	2.91	Graphinex
Tailings silt content	%	2.50	Assumed value – Katestone's experience
Haul road base silt content	%	8.4	AP 42 Table 13.2.2-1
Plant road base silt content	%	5.1	AP 42 Table 13.2.2-1
Material movements			
Pit to in-pit dump (OB)	dry tonnes/year	135,928	Graphinex
Pit to process plant (ROM/ore)	dry tonnes/year	912,023	Graphinex
Pit to LG ore stockpile (ROM/ore)	dry tonnes/year	764,912	Graphinex
LG ore stockpile to process plant (ROM/ore)	dry tonnes/year	2,587,977	Graphinex
Plant to TSF4 (piped slurry)	dry tonnes/year	3,384,182	Graphinex
TSF1 backfill to in-pit dump (tailings)	dry tonnes/year	7,709,190	Graphinex
TSF2 backfill to in-pit dump (tailings)	dry tonnes/year	12,279,466	Graphinex
Resource delivery - diesel	litres/year	36,632,000	Graphinex
Resource delivery - reagents	litres/year	1,060,000	Graphinex
Drilling/blasting			
Average blasting area	m^2/blast	1,688	Calculation
Average number of drill holes	holes/year	22,647	Calculation
	holes/blast	62	Calculation
Number of blasts	blasts/year	365	Calculation

Processing			
ROM ore throughput	tonnes/year	3,500,000	Graphinex – maximum process plant capacity
Graphite concentrate product	tonnes/year	200,000	Graphinex - Stage 2 annual production
Areas and Stockpiles			
Pit active	sq metres	469,003	GIS - 20260217_Revised_Project_Layout.png
In-pit dump - backfill	sq metres	325,209	
WRD West	sq metres	429,500	
WRD East	sq metres	615,287	
TSF1	sq metres	1,619,504	
TSF2	sq metres	1,619,778	
TSF3	sq metres	1,576,404	
TSF4	sq metres	1,543,456	
ROM stockpile	sq metres	15,807	
Crushed ore stockpile	sq metres	1,435	
LG ore Stockpile	sq metres	250,464	
Topsoil stockpiles	sq metres	1,242,363	
Vehicles			
Overburden haul truck			
Make/Model	-	Komatsu HD785	
Payload	kg	91,780	Calculation
Operating weight	kg	163,780	https://www.komatsu.com.au/equipment/dump-trucks/mechanical-rigid-dump-trucks/hd785-7
Empty weight	kg	72,000	https://www.komatsu.com.au/equipment/dump-trucks/mechanical-rigid-dump-trucks/hd785-7
Avg weight	kg	117,890	Calculation
ROM haul truck			
Make/Model	-	Komatsu HD785	
Payload	kg	91,780	Calculation
Operating weight	kg	163,780	https://www.komatsu.com.au/equipment/dump-trucks/mechanical-rigid-dump-trucks/hd785-7
Empty weight	kg	72,000	https://www.komatsu.com.au/equipment/dump-trucks/mechanical-rigid-dump-trucks/hd785-7
Avg weight	kg	117,890	Calculation
Product haul/Diesel delivery			
Make/Model	-	B-double trucks	Graphinex
Payload	tonnes	50	
	litres	53,000	
Empty weight	tonnes	23	Assumption
Avg weight	tonnes	48.0	Calculation
Dozers - pit			
Make/Model	-	Komatsu 155 Trackdozer	
Number	#	2	MG Graphinex Mining Equipment, 3 total
Utilisation	%	100%	Assumption
Hours of operation	hours/veh/year	6800.22	MG Graphinex Mining Equipment
Dozers - dump			
Make/Model	-	Komatsu 155 Trackdozer	

Number	#	1	MG Graphinex Mining Equipment, 3 total
Utilisation	%	100%	Assumption
Hours of operation	hours/veh/year	6800.22	MG Graphinex Mining Equipment
Loaders - stockpiles			
Make/Model	-	Kom WA480	
Number	#	1.4	MG Graphinex Mining Equipment
Utilisation	%	72%	MG Graphinex Mining Equipment
Hours of operation	hours/veh/year	4284.1	MG Graphinex Mining Equipment
Graders			
Make/Model	-	Caterpillar 12 Grader	
Number	#	2	MG Graphinex Mining Equipment
Travel speed	km/hour	11.4	AP42, Table 11.9-3, mean grader speed.
Utilisation	%	100%	Assumption
Hours of operation	hours/veh/year	4533.48	MG Graphinex Mining Equipment
Grader hours by route			
Pit to LG ore Stockpile	hours/year	826.8	Calculated
Pit to process plant	hours/year	974.0	
Pit to in-pit dump	hours/year	867.0	
LG ore stockpile to process plant	hours/year	431.6	
TSF1 backfill to in-pit dump	hours/year	499.0	
TSF2 backfill to in-pit dump	hours/year	758.4	
Mine access road – product and delivery	hours/year	4710.3	
Haulage - lengths			
Pit to LG ore Stockpile	m	3,964.7	From GIS - provided info (Graphinex overall site plan)
Pit to process plant	m	4,670.5	
Pit to in-pit dump	m	4,157.5	
LG ore stockpile to process plant	m	2,069.5	
TSF1 backfill to in-pit dump	m	2,392.8	
TSF2 backfill to in-pit dump	m	3,636.8	
Mine access road – product	m	22,588.1	
Mine access road – resource delivery	m	22,588.1	
Haulage - widths			
Mine access road	m	9	Graphinex – "10 Non-Process Infrastructure.pdf"
Haul roads	m	26	
Haulage - No. of trips			
Pit to LG ore Stockpile	#	8,584.2	Calculated
Pit to process plant	#	10,235.2	
Pit to in-pit dump	#	1,525.5	
LG ore stockpile to process plant	#	29,043.5	
TSF1 backfill to in-pit dump	#	86,516.3	
TSF2 backfill to in-pit dump	#	137,806.2	
Mine access road – product	#	4,000.0	
Mine access road – resource delivery	#	711.2	
Haulage – Vehicle Kilometres Travelled (VKT)			
Pit to LG ore Stockpile	VKT	68,067	Calculated
Pit to process plant	VKT	95,607	
Pit to in-pit dump	VKT	12,684	

LG ore stockpile to process plant	VKT	120,211	
TSF1 backfill to in-pit dump	VKT	414,032	
TSF2 backfill to in-pit dump	VKT	1,002,349	
Mine access road – product	VKT	180,705	
Mine access road – resource delivery	VKT	32,128	
Meteorology			
Wind speed	m/s	2.82	Average onsite wind speed from CALMET