AIR QUALITY IMPACT ASSESSMENT 7 LONG STREET SMITHFIELD – SLUDGE DEWATERING PLANT UPGRADE

Element Environment

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Air Quality Impact Assessment
7 Long Street Smithfield – Sludge Dewatering Plant Upgrade

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1 INTRODUCTION

Todoroski Air Sciences has prepared this air quality impact and greenhouse gas assessment for Element Environment on behalf of Demast Pty Ltd (Demast). It assesses the potential air quality impacts associated with the upgrades to the sludge dewatering plant (SDP) at 7 Long Street, Smithfield, New South Wales (NSW) (hereafter referred to as the Project).

Approved activities at the site involves the processing of 46,720 tonnes per annum (tpa) of drilling mud and the storage of up to 640 tonnes (t) of treated drill mud. The Project involves increasing the processing capacity up to 300,000 tpa and expanding the waste streams processed to include groundwater, soils, virgin excavated natural materials (VENM) and excavated natural material (ENM).

To assess the potential air quality impacts associated with the Project, this report comprises:

- A background to the Project and description of the site and existing operations;
- A review of the existing meteorological and air quality environment surrounding the site;
- A description of the dispersion modelling approach and emission estimations used to assess potential air quality impacts;
- Presentation of the predicted results and discussion of the potential air quality impacts and associated mitigation and management measures; and,
- An assessment of GHG emissions associated with the Project.

2 STUDY REQUIREMENTS

The purpose of this report is to provide an assessment of the likely Project-related effects on air quality and GHG emissions. The assessment presented in this report addresses planning and regulatory agency requirements, as set out below.

2.1 Planning Secretary's Environmental Assessment Requirements

In preparing this Air Quality Impact Assessment, the Planning Secretary's Environmental Assessment Requirements (SEARs), which were issued for the Project (SSD-72775222) on 29 July 2024, have been addressed and the key matters raised for consideration in this report are outlined in **Table 2-1** along with a reference to where the requirements are addressed in the report.

Table 2-1: SEARs - SSD-72775222

Specific issue	General requirements	Section
Air Quality and Odour	A quantitative assessment of the potential air quality, dust and odour impacts of the development (operation) on surrounding landowners, businesses and sensitive receptors, in accordance with the relevant Environment Protection Authority guidelines, including:	This report & model predictions in Section 7
	- details of buildings and air handling systems and strong justification for any material handling, processing or stockpiling external to buildings.	Section 3
	- details of proposed mitigation, management and monitoring measures.	Section 8

2.2 NSW EPA Requirements

This report has been prepared in general accordance with the NSW EPA documents *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA, 2022**) and *Guide for Large Emitters* (**NSW EPA, 2025**). The specific requirements outlined therein as well as the SEARs requested by the NSW EPA as outlined in **Table 2-2**.

Table 2-2: NSW EPA SEARs input

Specific issue	Input	Section
Site Specific Requirements - Air Quality	As the Proposal is for a large scale facility, you will need to take special precautions to prevent dust being emitted offsite through the open doors of the building. The Proponent should consider the installation of a dust extraction system to minimise dust in the building which can potentially emit offsite through open doors used by traffic. Any openings in the building must be included when modelling dust emissions from the site.	Section 6.2.3 & 8
	The EIS must include an Air Quality Impact Assessment (AQIA) prepared in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2022). The AQIA must:	This report
	Identify all potential discharges of fugitive and point source emissions of pollutants and odour from the Premises during construction and operation, including, but not limited to, coarse particulates, PM10, PM2.5 and odour. All processes that could result in air emission must be identified and described. Sufficient detail to accurately communicate the characteristics and quantity of all emissions must be provided.	Section 6.2.3
	Describe the receiving environment in detail. The proposal must be contextualised within the receiving environment (local, regional, and inter-regional as appropriate). The description must include but need not be limited to: a) Meteorology and climate b) Topography c) Surrounding land-use d) Identified sensitive receptors; and e) Ambient air quality	Section 3.1 & 5

Specific issue	Input	Section
	Identify comparable facilities within the airshed and consider the cumulative of air emissions from these facilities.	Section 3.1 & 5.3
	Detail emission control techniques/practices, including emission sampling and monitoring, that will be employed by the proposal, and benchmark these techniques/practices against best practice emission control and management.	Section 8
	Assess all risks to the environment, human health and amenity associated with emissions of air pollutants, including odour from all stages of the proposal.	Section 4 & 7
	Justify the level of assessment undertaken on the basis of risk factors including but not limit to: i. Proposal location ii. Characteristics of the receiving environment and iii. Type and quantity of pollutants emitted	This report
	Include a consideration of 'worst case' emission scenarios and impacts at proposed emission limits.	Section 6.2.3
	Account for cumulative impacts with existing emissions sources as well as any currently approved developments linked to the receiving environment.	Section 7
	Demonstrate the Proposal's ability to comply with the relevant regulatory framework, specifically the Act and the *Protection of the Environment Operations (Clean Air) Regulation 2022*.	Section 4.3
	Note: In relation to air impacts, all sensitive receivers need to be considered when conducting air quality and odour impact assessments. A sensitive receiver includes a place where someone works. Therefore, any industrial neighbours to the Premises must be included as sensitive receivers.	Section 3.1 & 7
General requirements - Air	Identify all sources or potential sources of air emissions from the development. *Note: emissions can be classed as either:* *- point (e.g. emissions from stack or vent) or* *- fugitive (from wind erosion, leakages or spillages, associated with loading or unloading, conveyors, storage facilities, plant and yard operation, vehicle movements (dust from road, exhausts, loss from load), land clearing and construction works).*	Section 3.2 & 6.2.3
	Provide details of the project that are essential for predicting and assessing air impacts including: a) the quantities and physio-chemical parameters (e.g. concentration, moisture content, bulk density, particle sizes etc) of materials to be used, transported, produced or stored b) an outline of procedures for handling, transport, production and storage c) the management of solid, liquid and gaseous waste streams with potential to generate emissions to air.	Section 3.2 & 6.2.3
	Describe the topography and surrounding land uses. Provide details of the exact locations of dwellings, schools and hospitals. Where appropriate provide a perspective view of the study area such as the terrain file used in dispersion models.	Section 3.1
	Describe the surrounding buildings that may effect plume dispersion.	Section 3.1
	Provide and analyse site representative data on following meteorological parameters: a) temperature and humidity b) rainfall, evaporation and cloud cover c) wind speed and direction d) atmospheric stability class e) mixing height (the height that emissions will be ultimately mixed in the atmosphere) f) katabatic air drainage g) air re-circulation.	Section 5.1, 5.2 & 6.2.1
	Provide a description of existing air quality and meteorology, using existing information and site representative ambient monitoring data.	Section 5
	Identify all pollutants of concern and estimate emissions by quantity (and size for particles), source and discharge point.	Section 4 & 6.2.3
	Estimate the resulting ground level concentrations of all pollutants. Where necessary (e.g. potentially significant impacts and complex terrain effects), use an appropriate dispersion model to estimate ambient pollutant concentrations. Discuss choice of model and parameters with the EPA.	Section 7
	Describe the effects and significance of pollutant concentration on the environment, human health, amenity and regional ambient air quality standards or goals.	Section 7

Specific issue	Input	Section
	Describe the contribution that the development will make to regional and global pollution, particularly in sensitive locations.	Section 7
	For potentially odorous emissions provide the emission rates in terms of odour units (determined by techniques compatible with EPA procedures). Use sampling and analysis techniques for individual or complex odours and for point or diffuse sources, as appropriate. Note: With dust and odour, it may be possible to use data from existing similar activities to generate emission rates.	Section 4.2
	Outline specifications of pollution control equipment (including manufacturer's performance guarantees where available) and management protocols for both point and fugitive emissions. Where possible, this should include cleaner production processes.	Section 8
Cumulative impacts	Identify the extent that the receiving environment is already stressed by existing development and background levels of emissions to which this proposal will contribute.	Section 3 & 4
	Assess the impact of the proposal against the long-term air, noise and water quality objectives for the area or region.	Section 7

2.3 Cumberland City Council

Comments by Cumberland City Council as input to the SEARs include:

a) Environmental Management

It is recommended that a site-specific environmental management plan should be prepared by a suitably qualified person that outlines all potential environmental impacts and the proposed mitigation/pollution prevention measures needed to ensure protection of local waterways. This plan should include a review of stormwater systems and wastewater treatment systems; odour management; spill and emergency management/response procedures; waste storage/collection areas including for material to be transported off the site for the ongoing operational phases of the proposed development.

The mitigation and management measures outlined in **Section 8** should be included in a site-specific environmental management plan for the Project.

3 PROJECT SETTING AND DESCRIPTION

3.1 Project setting

The Project site is located at 7 Long Street, Smithfield, approximately 3 kilometres (km) northwest of Fairfield and approximately 4.2km east of Wetherill Park. The area surrounding the Project site is predominantly comprised of a mix of commercial and industrial businesses. The nearest identified residential area to the Project is located to the south, approximately 400 metres (m) away.

Figure 3-1 presents the location of the Project with reference to the residential and industrial receptor locations considered in this assessment. **Table 3-1** identifies the approximate address for each of the assessment locations. These locations represent the nearest locations likely to experience any air quality effects due to the Project.

Table 3-1: Assessment locations

Assessment location ID	Address	Type
R1	4 Low Street, Smithfield	Residential
R2	3 Low Street, Smithfield	Residential
R3	24 Smithfield Road, Smithfield	Residential
IND1	9 Long Street, Smithfield	Industrial
IND2	5 Long Street, Smithfield	Industrial
IND3	8 Tait Street, Smithfield	Industrial
IND4	12 Tait Street, Smithfield	Industrial

Figure 3-2 presents a pseudo three-dimensional visualisation of the topography in the general vicinity of the Project. The local topography is gently undulating with elevation increasing to the northwest of the site.

Figure 3-1: Project setting

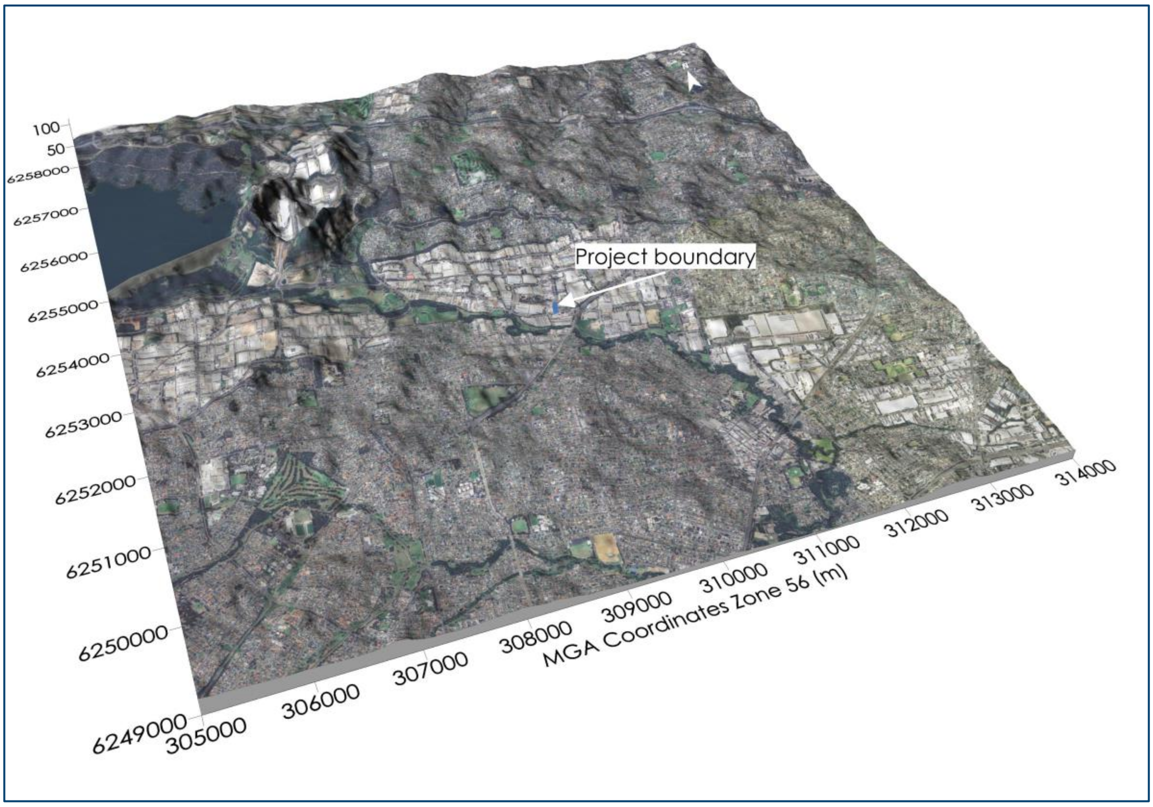

Figure 3-2: Representative visualisation of topography in the area surrounding the Project

3.2 Project description

The existing SDP operations allow for the maximum processing of 46,720 tpa of drill mud and storage of up to 640 t of treated drill mud at the site.

The SDP reclaims the liquid waste by means of de-watering and separating the liquid and solid waste. The solid fractions are further screened, washed and tested, resulting in categorised products such as recycled sand, recycled aggregate, and clay fines, which can be re-used.

The SDP operates 24 hours per day, seven days a week. The following is a breakdown of the operating hours for each function of the plant (i.e. importation, exportation and waste processing):

- Importation – 24 hours a day, seven days a week;
- Exportation – 7am – 3pm, Monday to Friday; and,
- Waste processing – 6am – 10pm, Monday to Friday and 7am – 5pm, Saturday.

Demast propose to increase the approved processing limit of the SDP to 300,000 tpa and introduce additional wastes for processing at the site, including groundwater and general solid waste (non-putrescible), including soils, VENM and ENM.

Specifically, Demast proposes to apply for SSD consent to:

- receive and process up to 300,000 tpa of waste;

- expand the waste streams processed at the SDP to include groundwater, general solid waste (GSW) (non-putrescible) soils, virgin excavated natural material (VENM) and excavated natural material (ENM); and,
- extinguish all previous development consents for the site and absorb into a single SSD consent.

Demast will continue to have capacity to store up to 640 t of treated drill mud at any one time. No additional storage of recovered materials is proposed. No changes are proposed to the operating methodology, site infrastructure, plant and equipment.

The Project will continue to operate in accordance with the existing hours of operation (i.e. 24 hours per day, seven days a week) with an extension of hours for exportation to 7am – 6pm, Monday to Friday which is an additional 3 hours per weekday.

Figure 3-3 provides an indicative layout of the Project site.

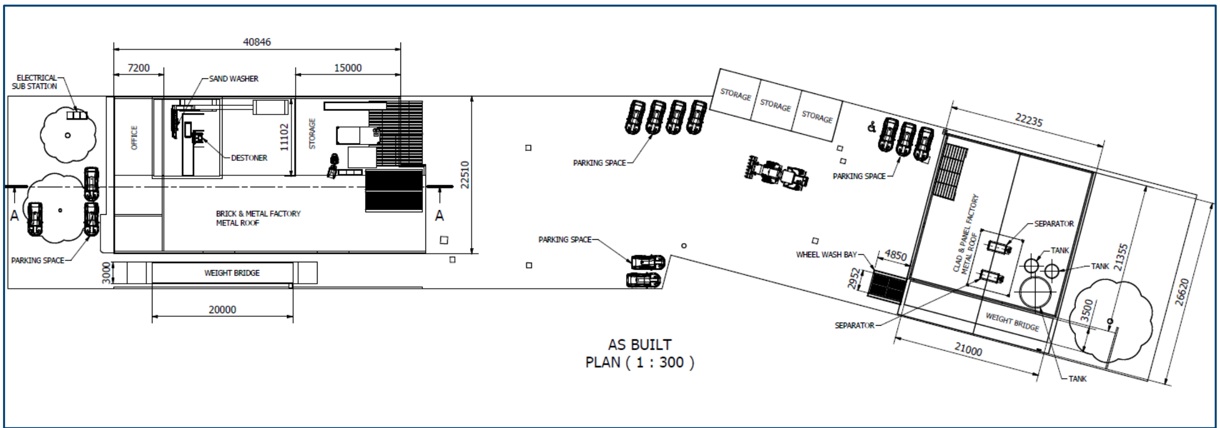

Figure 3-3: Indicative Project layout

4 AIR QUALITY CRITERIA

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The sections below identify the potential air emissions generated by the Project and the applicable air quality criteria.

4.1 Particulate matter

The key emissions generated by operations are particulate matter/dust. Particulate matter consists of dust particles of varying size and composition. Air quality goals refer to measures of the total mass of all particles suspended in air defined as the Total Suspended Particulate matter (TSP). The upper size range for TSP is nominally taken to be 30 micrometres (µm) as in practice particles larger than 30 to 50µm will settle out of the atmosphere too quickly to be regarded as air pollutants.

Two sub-classes of TSP are also included in the air quality goals, namely PM_{10}, particulate matter with equivalent aerodynamic diameters of 10µm or less, and $PM_{2.5}$, particulate matter with equivalent aerodynamic diameters of 2.5µm or less.

Particulate matter, typically in the upper size range, that settles from the atmosphere and deposits on surfaces is characterised as deposited dust. The deposition of dust on surfaces may be considered a nuisance and can adversely affect the amenity of an area by soiling property in the vicinity.

Table 4-1 summarises the air quality goals that are relevant to this assessment as outlined in the NSW EPA document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA, 2022**).

The air quality goals for key pollutants relate to the total pollutant burden in the air and not just the contribution from the Project. Consideration of background pollutant levels needs to be made when using these goals to assess potential impacts.

Table 4-1: NSW EPA air quality impact assessment criteria

Pollutant	Averaging Period	Criterion	Assessment location
TSP	Annual	90 µg/m³	Receptor
PM_{10}	Annual	25 µg/m³	Receptor
	24 hour	50 µg/m³	Receptor
$PM_{2.5}$	Annual	8 µg/m³	Receptor
	24 hour	25 µg/m³	Receptor
Deposited dust	Annual	2 g/m²/month	Receptor
		4 g/m²/month	Receptor

Source: **NSW EPA, 2022**
µg/m³ = micrograms per cubic metre
g/m²/month = grams per square metre per month

4.2 Other air pollutants

Emissions of other air pollutants will also potentially arise from operations and equipment used on-site. Emissions from diesel powered equipment generally include carbon monoxide (CO), nitrogen dioxide (NO_2) and other pollutants, such as sulphur dioxide (SO_2). The amount of CO, NO_2 and SO_2 emissions generated from diesel powered equipment at the Project site is generally considered to be too low to generate any significant off-site pollutant concentrations, and have not been assessed further in this study.

Odour has a low potential for generation as only a small amount of organic material would be stored at the site from time to time. This material would be stored within the building enclosure which would mitigate any odour generated. The potential for any off-site odour impacts is therefore not considered significant to cause any off-site impacts and have not been assessed further in this study.

4.3 Protection of the Environment Operations Act, 1997

The general obligations of the NSW *Protection of the Environment Operations Act, 1997* and the Regulations made under the Act (namely the NSW *Protection of the Environment Operations (Clean Air) Regulation, 2010*) would be followed for the Project. The Project would operate in accordance with the relevant regulatory framework for air quality to ensure compliance with this legislation.

5 EXISTING ENVIRONMENT

This section describes the existing environment including the climate and ambient air quality in the area surrounding the Project.

5.1 Local climatic conditions

Long-term climatic data from the closest Bureau of Meteorology (BoM) weather station at Horsley Park Equestrian Centre (Horsley Park) (Site No. 067119) were analysed to characterise the local climate in the proximity of the Project. The Horsley Park weather station is located approximately 8 kilometres (km) west of the Project.

Table 5-1 and **Figure 5-1** present a summary of data from the Horsely Park weather station collected over a 13 to 27 year period for the various meteorological parameters.

The data indicate that January is the hottest month with a mean maximum temperature of 29.9 degrees Celsius (°C) and July is the coldest month with a mean minimum temperature of 5.9°C.

Rainfall is variable and is generally higher during the first half of the year, with an annual average rainfall of 801.9 millimetres (mm) over 76.7 days. The data indicate that February is the wettest month with an average rainfall of 122.3mm over 7.5 days and September is the driest month with an average rainfall of 37.6mm over 4.9 days.

Relative humidity exhibits variability and seasonal flux across the year. Mean 9am relative humidity ranges from 61% in October to 81% in March. Mean 3pm relative humidity levels range from 42% in August and September to 55% in June.

Wind speeds during the warmer months have a greater spread between the 9am and 3pm conditions compared to the colder months. Mean 9am wind speeds range from 8.9 kilometres per hour (km/h) in March to 12.5km/h in October. Mean 3pm wind speeds range from 12.9km/h in June to 19.9km/h in December.

Table 5-1: Monthly climate statistics summary – Horsley Park

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Temperature													
Mean max. temp. (°C)	29.9	28.7	26.8	23.8	20.5	17.6	17.4	19.2	22.4	24.7	26.4	28.4	23.8
Mean min. temp. (°C)	18.0	17.8	16.2	12.9	9.1	7.1	5.9	6.6	9.3	11.9	14.3	16.2	12.1
Rainfall													
Rainfall (mm)	75.7	122.3	90.1	69.0	43.6	68.1	50.8	38.1	37.6	62.7	77.8	66.2	801.9
No. of rain days (≥1mm)	8.0	7.5	8.6	6.7	4.9	6.1	5.6	4.1	4.9	6.1	7.1	7.1	76.7
9am conditions													
Mean temp. (°C)	22.0	21.5	19.4	17.5	13.8	11.1	10.3	12.0	15.6	18.1	19.2	20.9	16.8
Mean R.H. (%)	73	77	81	76	77	80	78	70	65	61	70	71	73
Mean W.S. (km/h)	10.1	9.7	8.9	10.5	10.7	10.3	10.8	11.7	12.2	12.5	11.8	10.7	10.8
3pm conditions													
Mean temp. (°C)	28.2	27.1	25.3	22.2	19.2	16.6	16.1	17.8	20.8	22.5	24.2	26.5	22.2
Mean R.H. (%)	49	53	54	53	52	55	50	42	42	45	50	48	49
Mean W.S. (km/h)	19.4	17.0	14.8	14.4	13.0	12.9	13.9	16.1	18.1	19.8	19.5	19.9	16.6

Source: **Bureau of Meteorology, 2024**

R.H. – Relative Humidity, W.S. – wind speed

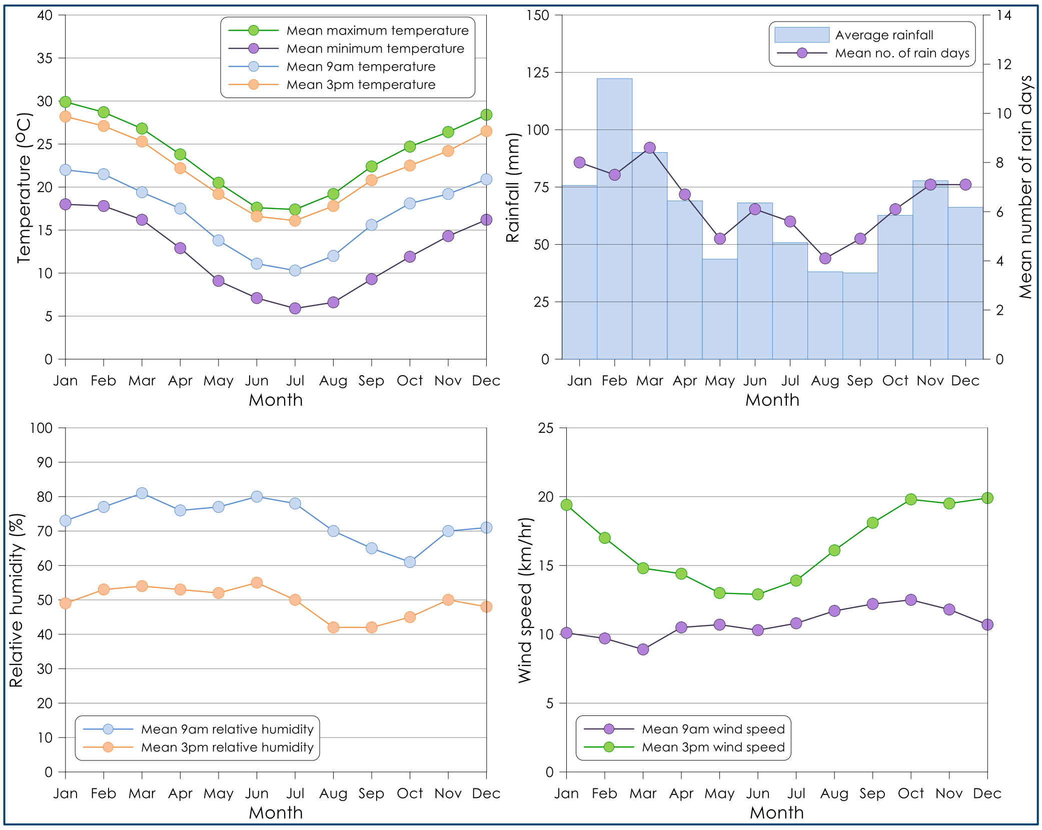

Figure 5-1: Monthly climate statistics summary – Horsley Park

5.2 Local meteorological conditions

Annual and seasonal windroses for the Horsley Park weather station during the 2023 calendar period is presented in **Figure 5-2**.

The 2023 calendar year was selected as the meteorological year for the dispersion modelling based on an analysis of data trends in meteorological data recorded and appropriate monitoring data for the area as outlined in **Appendix A**.

Analysis of the windroses shows the winds are varied on an annual basis and arise from all directions. There is a higher frequency of winds from the southwest sector and conversely a lower frequency of winds from the northeast quadrant. This wind distribution pattern is as expected of the local area when considering the location of the station in relation to the terrain features.

While the meteorological conditions may not overtly reflect the effects of katabatic drainage and air recirculation, terrain features in the wider area suggest that these phenomena contribute to the broader atmospheric conditions in the region.

In summer the winds predominately occur from the southeast quadrant. During winter, the wind distribution essentially mirrors that of the summer distribution with the majority of winds from the southwest and range to the north in a clockwise direction. The autumn wind distribution shows dominant winds from the southwest with fewer winds ranging to the northwest and north. The spring windrose shares similar wind distribution patterns to the annual distribution with varied winds from all directions.

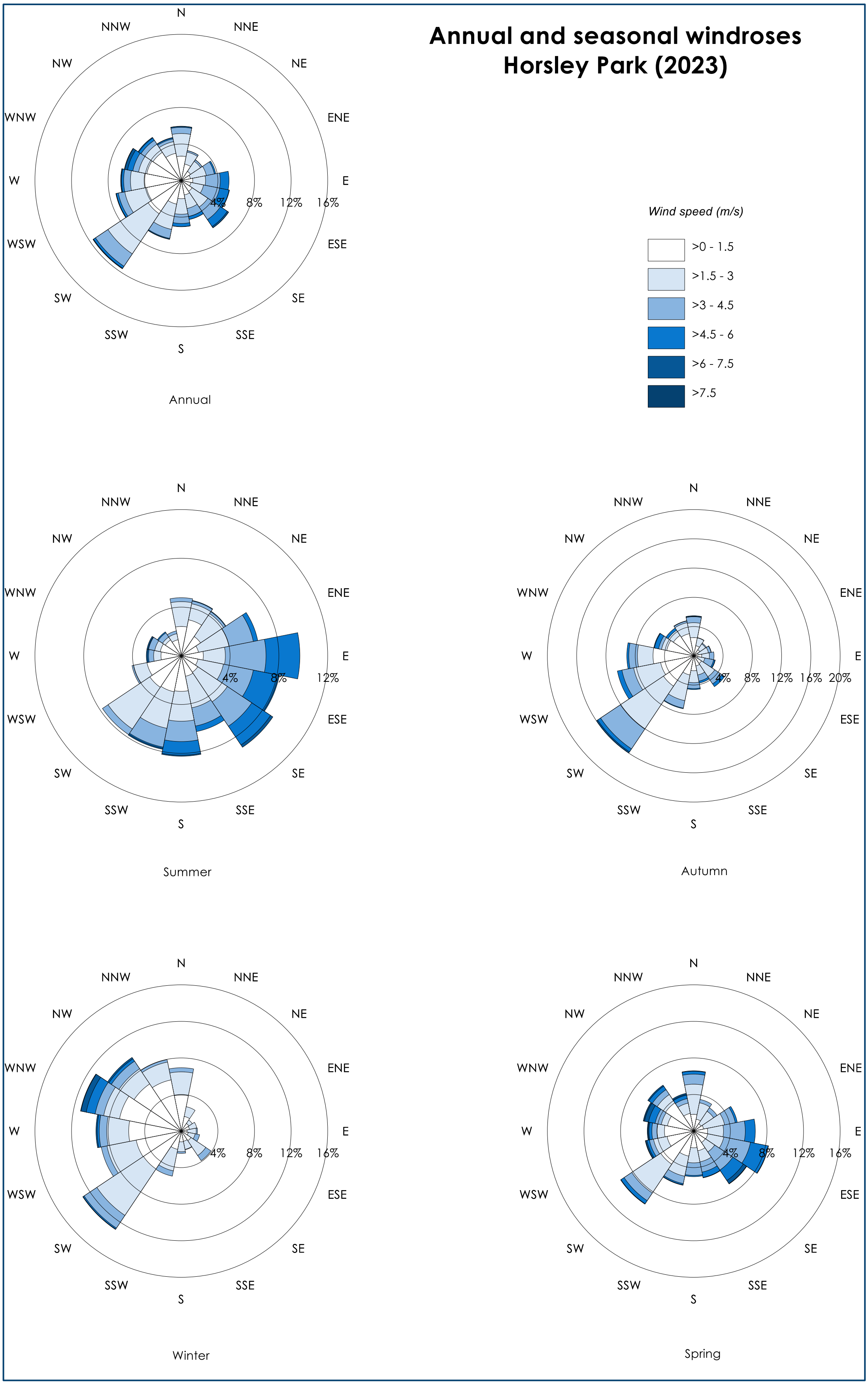

Figure 5-2 : Annual and seasonal windroses – Horsley Park (2023)

5.3 Local air quality monitoring

The main sources of particulate matter in the wider area around the Project would include emissions from commercial and industrial operations, motor vehicle exhaust and other local anthropogenic activities such as wood heaters.

Available data from the nearest air quality monitors operated by the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) at Chullora, Prospect and Parramatta North were used to quantify the existing background level for the assessed pollutants at the Project site. **Figure 5-3** shows the approximate location of each of the monitoring stations with reference to the Project site.

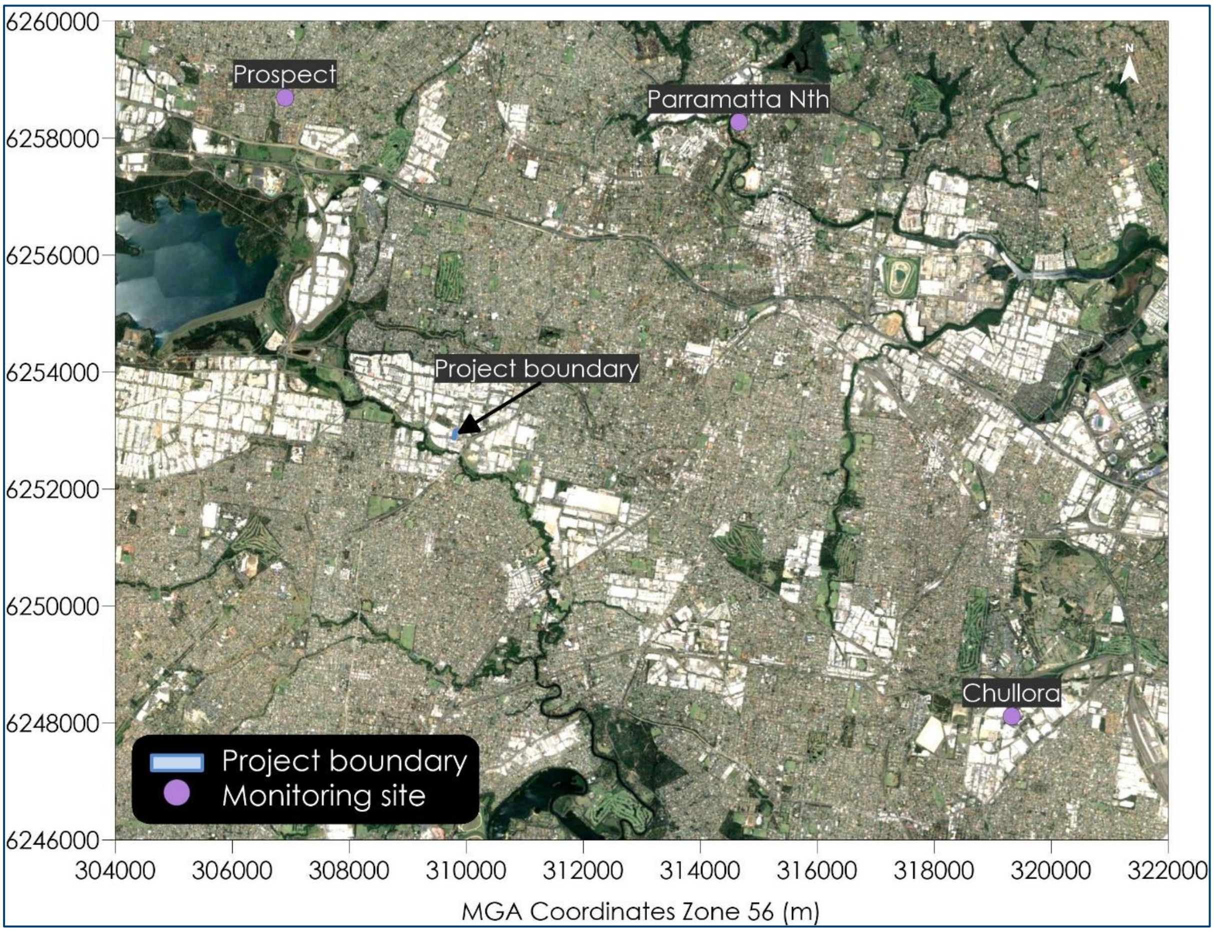

Figure 5-3: Location of DCCEEW air quality monitors relative to the Project site

5.3.1 $PM_{2.5}$ monitoring

A summary of the available $PM_{2.5}$ data from 2019 to 2023 is presented in **Table 5-2** and **Figure 5-4**. These data include levels measured during all extraordinary event days. Extraordinary event days are characterised as those days influenced by exceptional events such as bushfires, dust storms and hazard reduction burns.

A review of **Table 5-2** indicates that the annual average $PM_{2.5}$ concentrations were above the relevant criterion of 8µg/m^3 in 2019 and 2020. It is to be noted that monitors that contain less than 75% available data have been excluded from calculating annual average $PM_{2.5}$ levels. The maximum 24-hour average

$PM_{2.5}$ concentrations were found to exceed the relevant criterion of 25µg/m^3 on occasion for all years of the review period except in 2022 at all monitors and 2023 at Parramatta North.

Figure 5-4 shows that there was a significant increase in the frequency of exceedances of the 24-hour average $PM_{2.5}$ criterion in the 2019/ 2020 summer, predominately due to smoke associated with the widespread bushfires occurring at this time.

Table 5-2: Summary of $PM_{2.5}$ levels from monitoring stations (µg/m³)

Year	Chullora	Prospect	Parramatta North	Criterion
	Annual average			
2019	**11.7**	**11.9**	**10.5**	**8**
2020	**8.8**	**8.6**	**8.2**	**8**
2021	7.2	6.9	6.6	**8**
2022	-	5.3	5.2	**8**
2023	ND	7.4	6.6	**8**
Year	**Maximum 24-hour average**			**Criterion**
2019	**97.6**	**134.1**	**130.1**	**25**
2020	**86.2**	**70.8**	**72.9**	**25**
2021	**33.7**	**37.3**	**27.4**	**25**
2022	13.1	18.2	16.9	**25**
2023	ND	**29.6**	24.0	**25**

- less than 75% data available, ND = no data

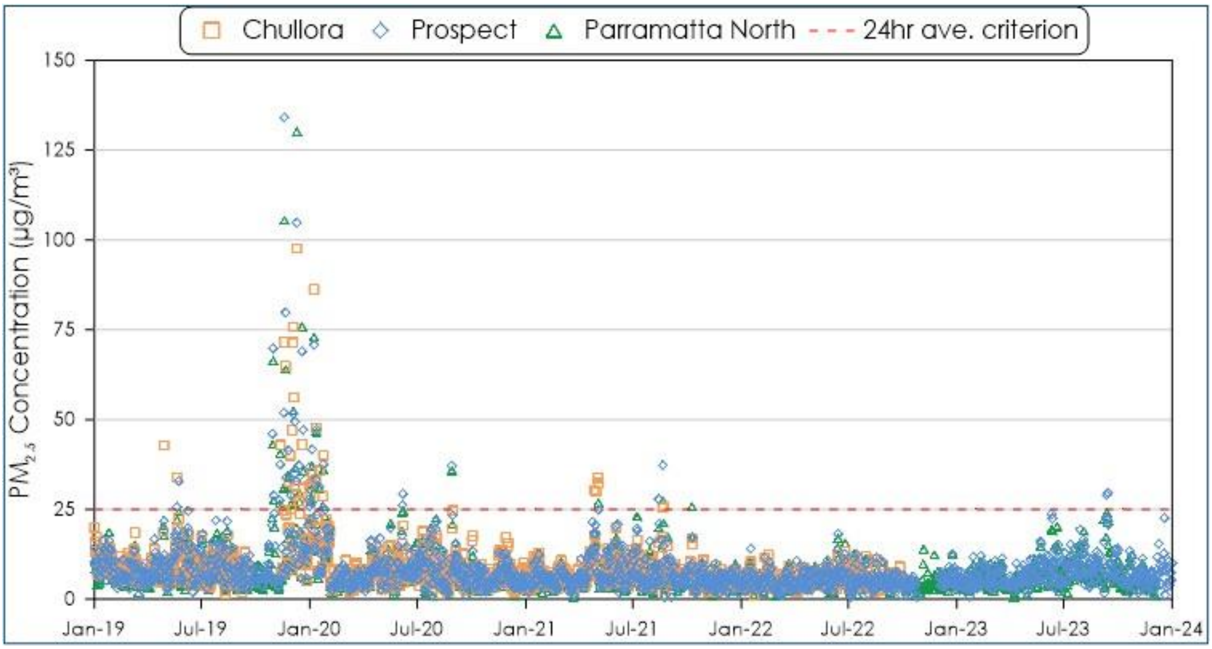

Figure 5-4: 24-hour average $PM_{2.5}$ concentrations

5.3.2 PM_{10} monitoring

A summary of the available PM_{10} monitoring data from 2019 to 2023 is presented in **Table 5-3**. Recorded 24-hour average PM_{10} concentrations are presented in **Figure 5-5**.

A review of **Table 5-3** indicates that the annual average PM_{10} concentrations were below the relevant criterion of 25µg/m^3 for all years, except for 2019 at Prospect and Parramatta North. The maximum 24-hour average PM_{10} concentrations were found to exceed the relevant criterion of 50µg/m^3 for all years of the review period except in 2021, 2022 and 2023.

Similar to the $PM_{2.5}$ levels in 2019/2020 summer, there were several days where the Sydney region was impacted by smoke from bushfires and is shown in the recorded 24-hour average PM_{10} concentrations in **Figure 5-5**.

Table 5-3: Summary of PM_{10} levels from monitoring stations ($\mu g/m^3$)

Year	Chullora	Prospect	Parramatta North	Criterion
	Annual average			
2019	24.6	**26.0**	**25.5**	**25**
2020	20.5	20.2	19.3	**25**
2021	16.5	17.2	17.1	**25**
2022	13.6	13.4	14.1	**25**
2023	ND	16.8	16.8	**25**
Year	**Maximum 24-hour average**			**Criterion**
2019	**140.4**	**182.8**	**195.3**	**50**
2020	**167.9**	**245.8**	**188.9**	**50**
2021	40.3	44.6	42.5	**50**
2022	29.6	29.2	42.7	**50**
2023	ND	44.4	48.8	**50**

ND = no data

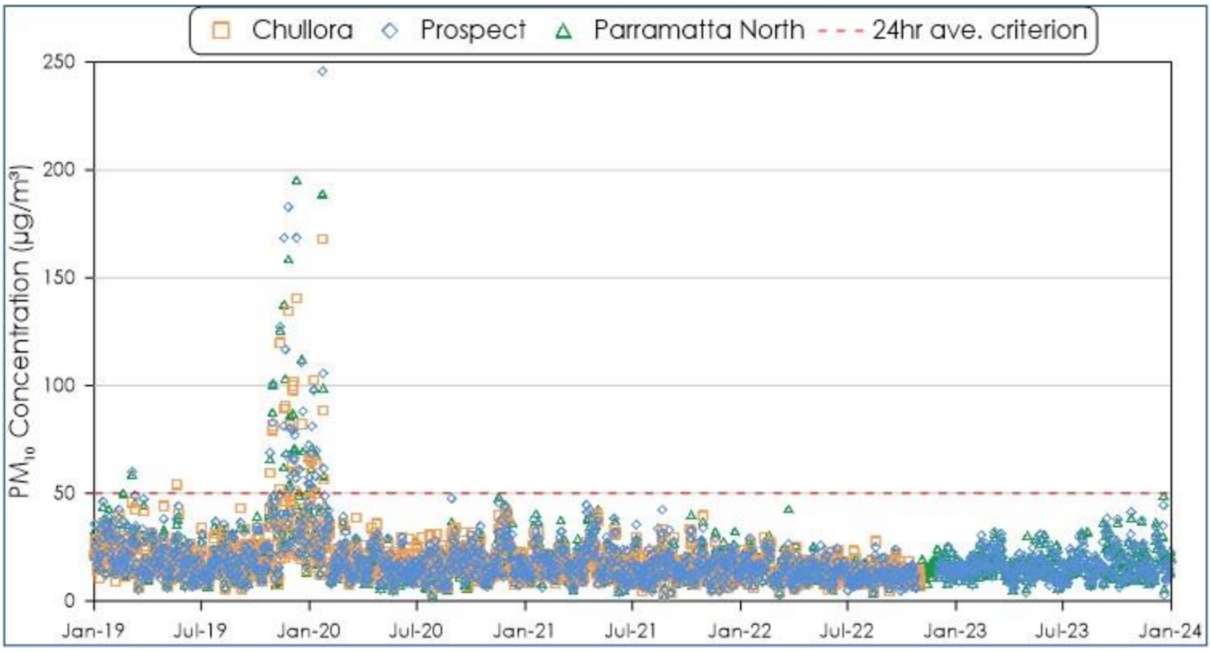

Figure 5-5: 24-hour average PM_{10} concentrations

5.3.3 Estimated background levels

Background air quality levels from the Parramatta North monitor were used to represent the background levels for the Project. The data collected during the 2023 calendar period, which correspond to the period of meteorological modelling has been applied.

In the absence of measurement data, estimates of the annual average background TSP concentrations and deposited dust levels can be determined from a relationship using the measured PM_{10} levels. This relationship assumes that an annual average PM_{10} concentration of $25\mu g/m^3$ corresponds to a TSP concentration of $90\mu g/m^3$ and a deposited dust level of $4g/m^2$/month, based on the NSW EPA air quality impact criteria. Applying this relationship with the measured annual average PM_{10} concentration of

16.8µg/m^3 indicates an approximate annual average TSP concentration of 60.4µg/m^3 and a deposited dust level of 2.7g/m^2/month.

The background air quality levels applied in this assessment are summarised in **Table 5-4**.

Table 5-4: Summary of background levels

Pollutant	Background level	Units
24-hour average $PM_{2.5}$	Variable	µg/m^3
Annual average $PM_{2.5}$	6.6	µg/m^3
24-hour average PM_{10}	Variable	µg/m^3
Annual average PM_{10}	16.8	µg/m^3
Annual average TSP	60.4	µg/m^3
Annual average deposited dust	2.7	g/m^2/month

6 DISPERSION MODELLING APPROACH

6.1 Introduction

The following sections are included to provide the reader with an understanding of the model and modelling approach applied for the assessment. The CALPUFF is an advanced air dispersion model which can deal with the effects of complex local terrain on the dispersion meteorology over the modelling domain in a three-dimensional, hourly varying time step.

The model was setup in general accord with the methods provided in the NSW EPA document *Generic Guidance and Optimum Model Setting for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia'* (**TRC**, **2011**).

6.2 Modelling methodology

Modelling was undertaken using a combination of the CALPUFF Modelling System and the Weather Research and Forecasting model (WRF). The CALPUFF Modelling System includes three main components: CALMET, CALPUFF and CALPOST and a large set of pre-processing programs designed to interface the model to standard, routinely available meteorological and geophysical datasets.

6.2.1 Meteorological modelling

The WRF model was applied to the available data to generate a three-dimensional upper air data file for use in CALMET. The centre of analysis for the WRF modelling used is 309800mE and 6252900mN. The simulation involved an outer grid of 306km with 9km grid spacing, with two nested grids with 3km and 1km grid spacing.

The CALMET domain was run on a domain of 10 x 10km with a 0.1km grid resolution. The available meteorological data the year 2023 from Horsley Park (BoM) was included in the simulation.

Local land use and detailed topographical information was included to produce realistic fine scale flow fields (such as terrain forced flows) in surrounding areas, as shown in **Figure 6-1**.

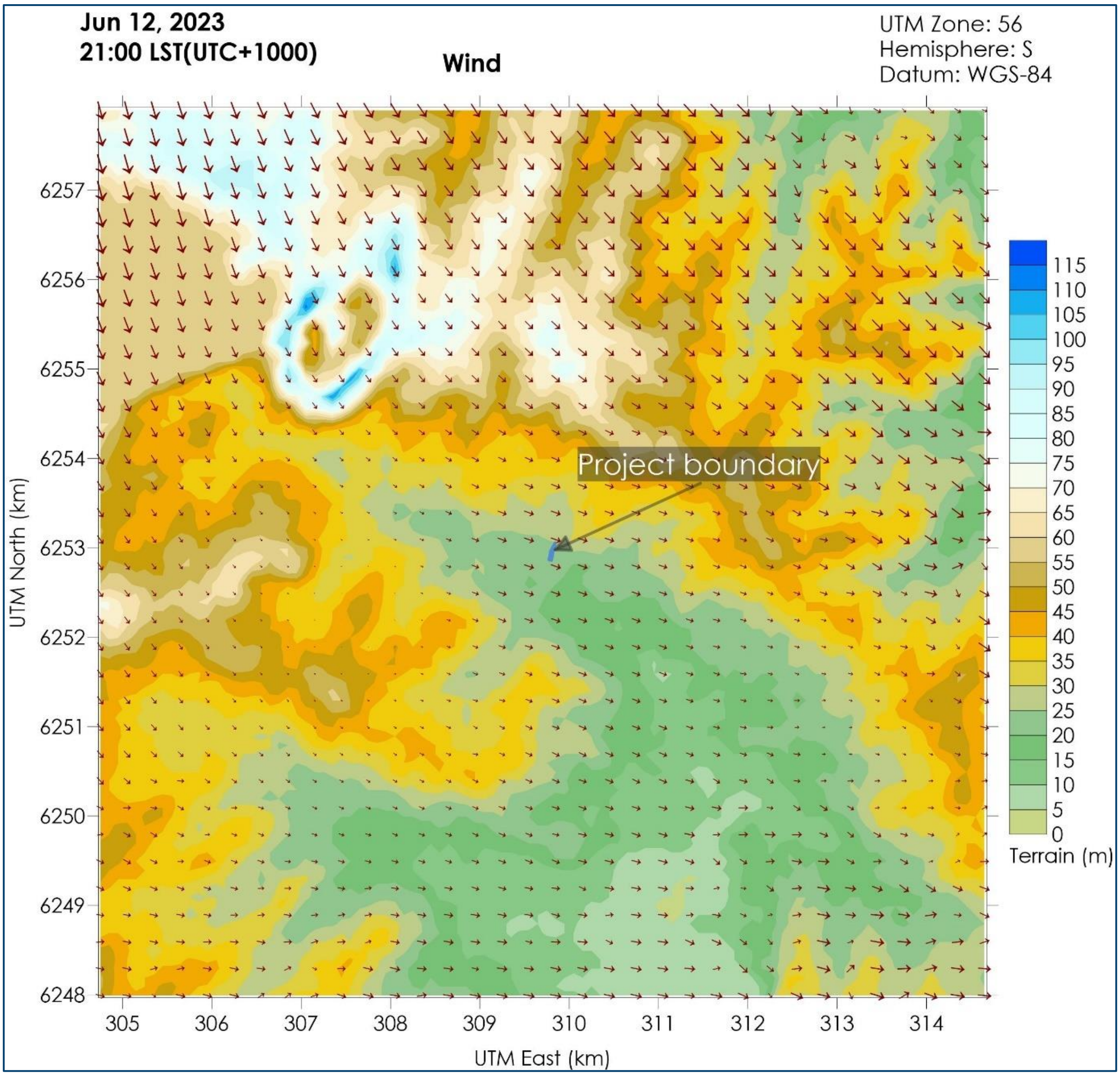

Figure 6-1: Representative 1-hour average snapshot of wind field for the Project

CALMET generated meteorological data were extracted from a point within the CALMET domain and are graphically represented in **Figure 6-2** and **Figure 6-3**.

Figure 6-2 presents the annual and seasonal windroses from the CALMET data. Overall, the windroses generated in the CALMET modelling reflect the expected wind distribution patterns of the area as determined based on the available measured data and the expected terrain effects on the prevailing winds. **Figure 6-3** includes graphs of the temperature, wind speed, mixing height and stability classification over the modelling period and shows sensible trends considered to be representative of the area.

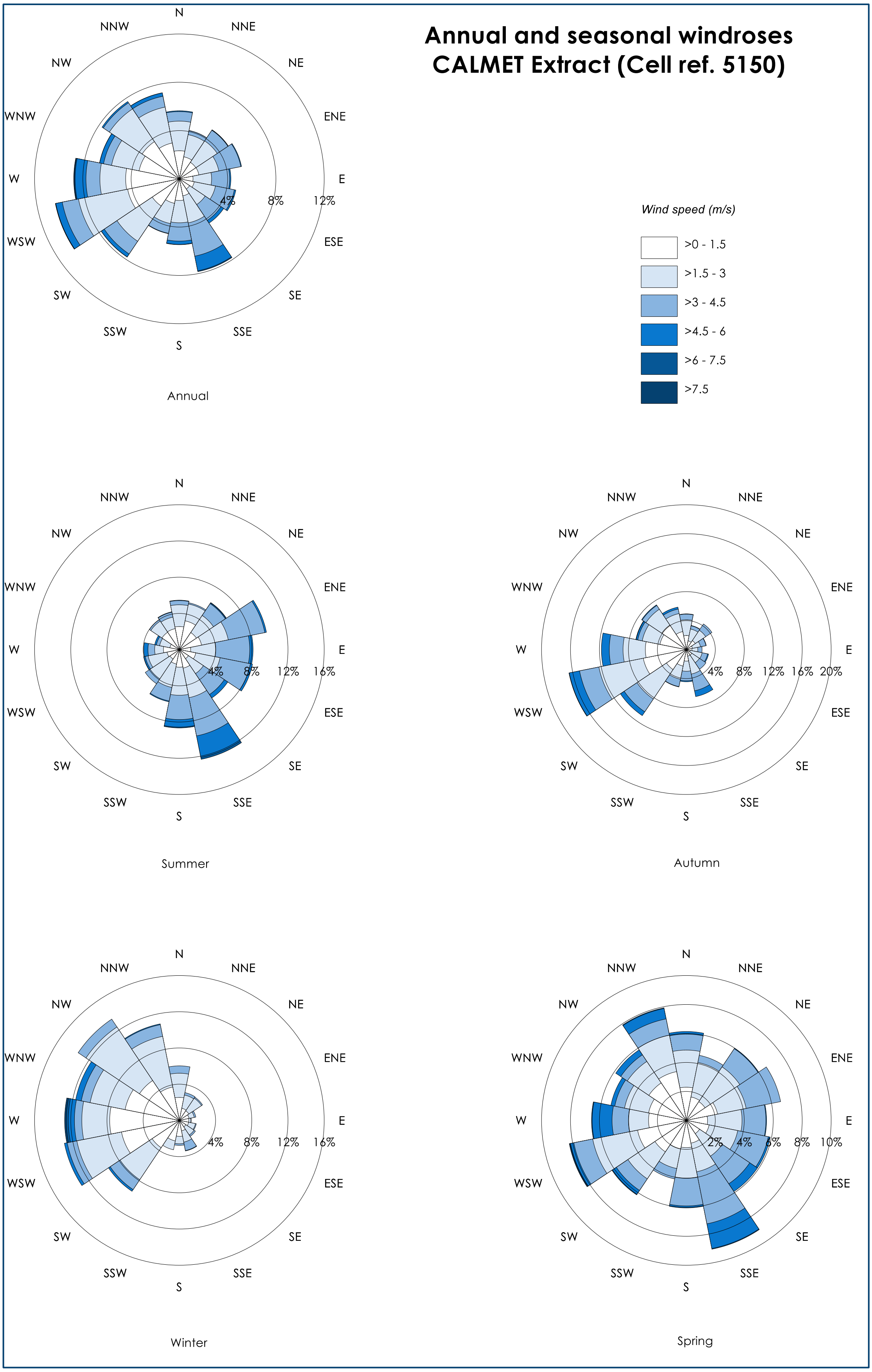

Figure 6-2: Annual and seasonal windroses from CALMET (Cell ref 5150)

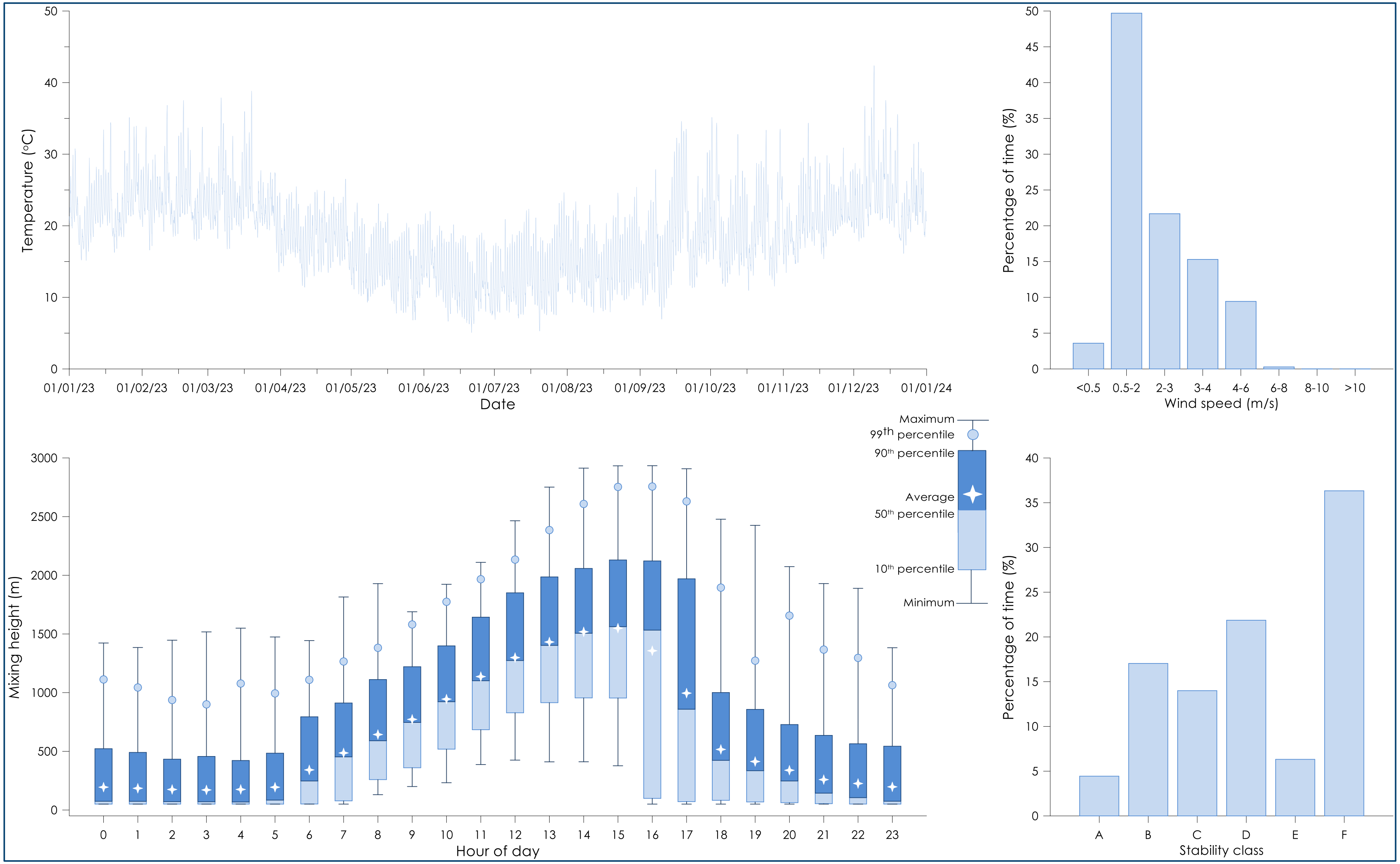

Figure 6-3: Meteorological analysis of CALMET (Cell ref 5150)

6.2.2 Dispersion modelling

The CALPUFF dispersion model, in conjunction with a CALMET generated meteorological data file, was applied to provide predictions of the ground level concentrations of potential pollutant concentrations associated with the operation of the Project.

Ground based operational activity of the Project were represented by a series of volume sources and were included in the CALPUFF model via an hourly varying emission file. Meteorological conditions associated with dust generation (such as wind speed) and levels of dust generating activity were considered in calculating the hourly varying emission rate for each source.

It should be noted that as a conservative measure, the effect of the precipitation rate (rainfall) in reducing dust emissions has not been considered in this assessment.

The modelled source locations for the Project are shown in **Figure 6-4**.

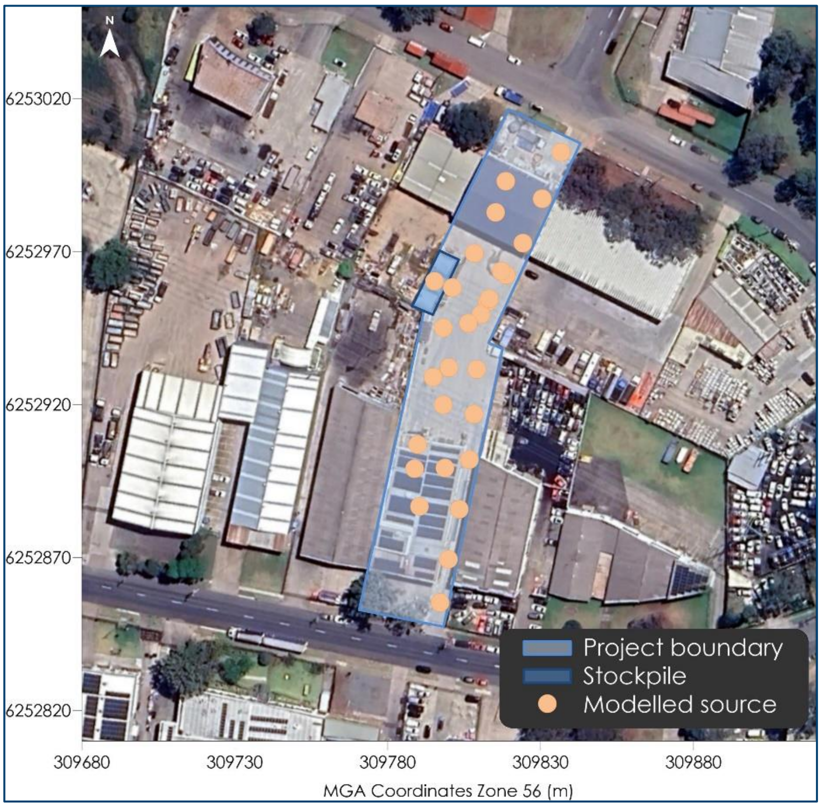

Figure 6-4: Modelled source locations

6.2.3 Emission estimation

The dust generating activities associated with operation of the Project are identified as the handling and processing of the material and vehicles travelling on-site. The vehicles also have the potential to generate particulate emissions from the diesel exhaust.

Dust emission estimates have been calculated by analysing the various types of dust generating activities taking place and utilising suitable emissions sourced from both locally developed and United

States various types of activities taking Environmental Protection Agency (US EPA) developed documentation.

To adequately assess potential short-term impacts (i.e. 24-hour average impacts), the modelling scenario assumes a maximum daily production rate of 850 tonnes per day (tpd), occurring every day of the year (365 days). This equates to an annual tonnage of 310,250 tpa, which is greater than the facility's proposed actual annual production of 300,000 tpa. As a result, the modelling predictions for annual average concentrations are conservative, and would show more impacts.

A summary of the estimated annual TSP, PM_{10} and $PM_{2.5}$ emissions are presented in **Table 6-1**. Detailed calculations of the dust emission estimates are provided in **Appendix B**.

Table 6-1: Summary of estimated emissions for the Project (kg/year)

Activity	TSP emission	PM_{10} emission	$PM_{2.5}$ emission
Hauling material on-site (sealed)	890	171	41
Hauling material on-site (sealed)	774	148	36
Unloading sludge and groundwater to hopper	27	13	2
Unloading GSW soils to stockpile	127	60	9
Rehandle GSW soils at stockpile	127	60	9
Loading GSW soils to hopper	38	18	3
Screening and dewatering material (wet process)	-	-	-
Screening aggregate	51	17	1
Unloading aggregate to stockpile	57	27	4
Unloading sand to stockpile	34	16	2
Unloading clay to stockpile	23	11	2
Loading aggregate to truck for dispatch	57	27	4
Loading sand to truck for dispatch	34	16	2
Loading clay to truck for dispatch	23	11	2
Hauling processed material off-site (sealed)	372	71	17
Hauling processed material off-site (sealed)	323	62	15
Wind erosion from stockpiles	107	54	8
Exhaust emissions	152	152	148
Total emissions (kg/yr.)	**3,219**	**936**	**306**

7 DISPERSION MODELLING RESULTS

The dispersion model predictions presented in this section include those for the operation of the Project in isolation (incremental impact) and the operation of the Project with consideration of other sources (total impact). The results show the predicted:

- Maximum 24-hour average $PM_{2.5}$ and PM_{10} concentrations;
- Annual average $PM_{2.5}$, PM_{10} and TSP concentrations; and,
- Annual average dust (insoluble solids) deposition rates.

It is important to note that when assessing impacts per the maximum 24-hour average levels, these predictions are based on the highest predicted 24-hour average concentrations which were modelled at each point within the modelling domain for the worst day (i.e. a 24-hour period) during the one year long modelling period.

Associated isopleth diagrams of the dispersion modelling results are presented in **Appendix C**.

The total (cumulative) impact is defined as the operation of the Project combined with the estimated ambient background levels in **Section 5.3.3.**

Table 7-1 presents the predicted incremental and cumulative particulate dispersion modelling results at each of the assessed receptor locations.

The predicted incremental results show that minimal incremental effects would arise at the receptor locations due to the Project. The predicted cumulative results indicate that the receptor locations are predicted to experience levels below the relevant criteria for each of the assessed dust metrics.

Table 7-1: Dust dispersion modelling results for sensitive receptors

Receptor ID	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DD* (g/m²/mth)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	TSP (µg/m³)	DD* (g/m²/mth)
	Incremental						Cumulative			
	24-hr ave.	Ann. ave.	24-hr ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.	Ann. ave.
	Air quality impact criteria									
	-	-	-	-	-	2	8	25	90	4
R1	0.2	<0.1	0.5	0.1	0.3	<0.1	6.6	16.9	60.7	2.7
R2	0.1	<0.1	0.5	0.1	0.3	<0.1	6.6	16.9	60.7	2.7
R3	0.1	<0.1	0.4	0.1	0.2	<0.1	6.6	16.9	60.6	2.7
IND1	1.9	0.5	7.4	1.9	7.0	0.5	7.1	18.7	67.4	3.2
IND2	2.8	0.9	9.8	3.6	15.2	1.1	7.5	20.4	75.6	3.8
IND3	3.0	0.9	10.6	3.3	12.5	0.8	7.5	20.1	72.9	3.5
IND4	2.8	0.8	9.3	2.7	9.4	0.8	7.4	19.5	69.8	3.5

*Deposited dust

7.1 Assessment of Cumulative 24-hour average $PM_{2.5}$ and PM_{10} Concentrations

The results for incremental 24-hour average $PM_{2.5}$ and PM_{10} concentrations indicate there are no predicted exceedances of the relevant criteria at the assessed receptors.

When assessing the cumulative 24-hour average impacts based on model predictions, an assessment of cumulative 24-hour average $PM_{2.5}$ impacts was undertaken in accordance with Section 7.1 of the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA**,**2022**).

A "Level 2 assessment - Contemporaneous impact and background approach" has been applied to assess the potential cumulative 24-hour average $PM_{2.5}$ and PM_{10} impacts.

In simple terms, the Level 2 assessment involves matching one year of ambient air quality monitoring data with the corresponding Project only level predicted using the same day's weather data to account for the spatial and temporal variation in background levels on a given day.

Exceptional events days during this period have been excluded from the assessment of contemporaneous impacts. This includes widespread hazard reduction burns on 12 September 2023, which impacted the Sydney region, as well as the Duck Creek Pilliga Forest bushfire in December 2023, which also influenced air quality levels in the Sydney region (**DCCEEW, 2024d**).

Table 7-2 provides a summary of the findings from the Level 2 assessments for selected assessment locations.

The results in **Table 7-2** indicate that the Project does not increase the number of days above the 24-hour average criterion at the assessed receptors for $PM_{2.5}$ and PM_{10}.

Detailed tables of the contemporaneous assessment results are provided in **Appendix D**.

Table 7-2: NSW EPA contemporaneous assessment - maximum number of additional days above 24-hour average criterion

Receptor ID	$PM_{2.5}$	PM_{10}
R1	0	0
IND3	0	0

Time series plot of the predicted cumulative 24-hour average $PM_{2.5}$ and PM_{10} concentrations for the Receptor R1 and IND3 is presented in **Figure 7-1** and **Figure 7-2**.

The orange bars in the figures represent the contribution from the Project and the blue bars represent the applied background levels. It is clear from the figures that the Project has a small influence at the assessed receptor location and would be difficult to discern beyond the existing background level.

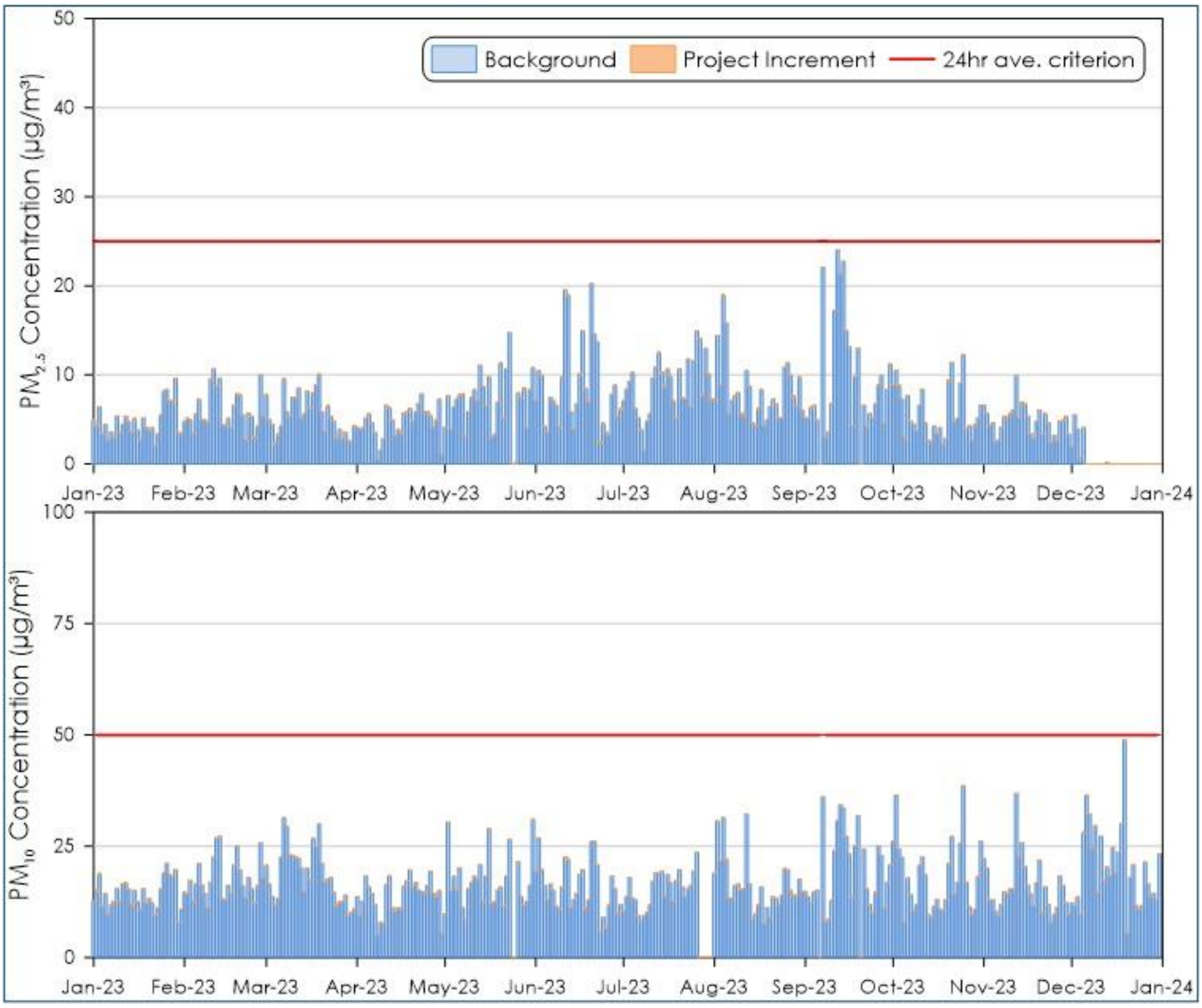

Figure 7-1: 24-hour cumulative $PM_{2.5}$ and PM_{10} concentrations – R1

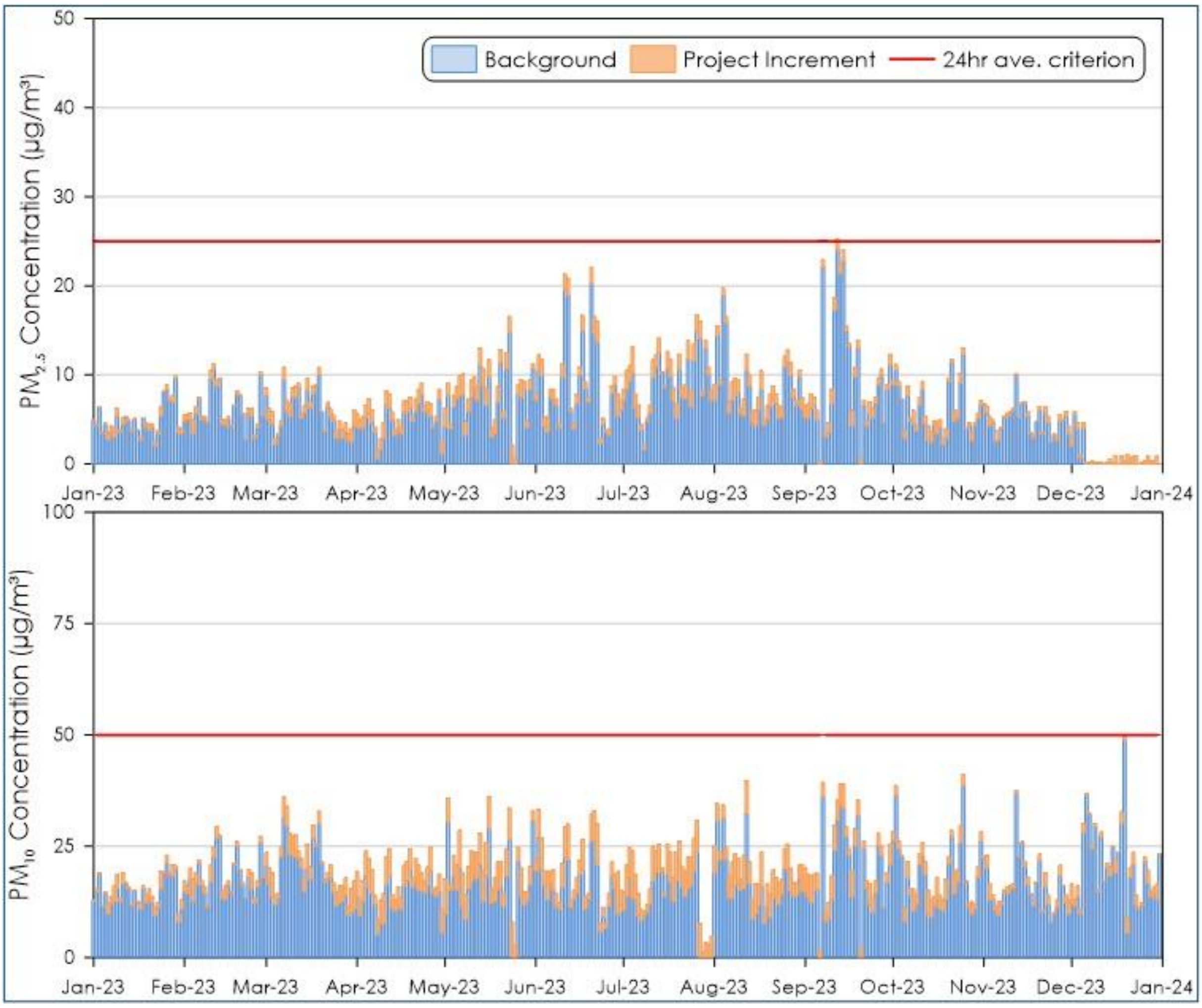

Figure 7-2: 24-hour cumulative $PM_{2.5}$ and PM_{10} concentrations – IND3

8 MITIGATION AND MANAGEMENT

The proposed operations of the Project have the potential to generate air emissions. To ensure that activities associated with the Project have a minimal effect on the surrounding environment, it is recommended that all reasonable and practicable dust mitigation measures be utilised.

Reasonable and practicable air quality mitigation and management measures currently implemented for operations should be maintained for the Project and are list below:

- All dewatering activities to occur within the existing building at the site;
- All processed materials to be stored in dedicated stockpiles at all times to reduce the potential for tracking onto roads and wind erosion;
- Material handling should be restricted at times of adverse weather (e.g. high winds causing a visible dust plumes);
- Regular cleaning of all trafficked road on-site using street sweeper or similar equipment;
- Impose speed limits on site;
- Ensure engines of on-site vehicles are switched off when not in use;
- Where practicable, vehicles are to be fitted with pollution reduction devices;
- Maintain and service vehicles according to manufactures specifications; and,
- Initial "sniff" test to identify odorous nature of the material to prevent any malodourous material being processed at the site.

9 GREENHOUSE GAS ASSESSMENT

The Department of Climate Change, Energy, the Environment and Water (DCCEEW) defines three scopes (Scope 1, 2 and 3) for different emission categories based on whether the emissions are from "direct" or "indirect" sources.

Scope 1 emissions encompass the direct sources from the Project defined as:

> "*...produced from sources within the boundary of an organisation and as a result of that organisation's activities*" (**DCCEEW, 2024c**).

Scope 2 emissions are produced by the burning of fossil fuels to generate electricity and defined as:

> "*...indirect emissions which occur as a result of activities that generate electricity, heating, cooling or stream that is consumed by an organisation but which is generated outside that organisation's boundaries*" (**DCCEEW, 2024c**).

Scope 3 emissions are other indirect emissions which:

> "*...occur outside of the boundary of an organisation as a result of actions by the organisation*" (**DCCEEW, 2024c**).

For the purpose of this assessment, emissions generated in all three scopes defined above provide a suitable approximation of the total GHG emissions generated from the Project.

Scope 3 emissions can be a significant component of the total emissions inventory; however, these emissions are often not directly controlled by the operation. These emissions are understood to be considered in the Scope 1 emissions from other various organisations related to the Project. Other Scope 3 emissions also arise from a number of other sources indirectly associated with the operation of the Project such as emissions generated by employees travelling to and from the site. These relatively minor individual contributions are difficult to accurately quantify due to the diversity and nature of the sources and have not been considered further in this assessment.

9.1 Emission sources

Scope 1 GHG emission sources identified for the Project include the combustion of diesel and Scope 2 emission sources are the on-site consumption of electricity. Scope 3 emissions have been identified as resulting from the transport of the product to customers and the purchase of consumables for use on-site.

Estimated quantities of materials and variables used to calculate the potential GHG emissions associated with Scope 1, 2 and 3 emissions for the Project have been described. These estimates provide a reasonable worst-case approximation of the potential GHG emissions for the purpose of this assessment.

The Proponent has provided estimated diesel and electricity usage required for the Project for the existing operation. These have been linearly scaled to account for the proposed processing limit of the SDP. The site currently has a 99kW solar system installed, which offsets electricity usage. Assuming a production rate of 4 kilowatt hours (kWh) per kilowatt per day, the solar system would generate 144,540 kWh per year and has been factored into the calculations.

For the transport of the product material, this would be primarily delivered to customers in the Sydney region. The quantity of diesel fuel required to transport the product material to and from site has been estimated based on an approximate return travel distance to typical locations in Sydney (60km return). To estimate the consumption of diesel fuel required, the average fuel consumption of 53.1L/100km for articulated trucks is applied (**ABS, 2024**) assuming 300,000 tpa of product material being delivered resulting in 18,750 trips per annum.

Table 9-1 presents a summary of the quantities of material for the operation.

Table 9-1: Summary of quantities of material estimated for the operational phase

Parameter	Value	Unit
Diesel	210	kL
Electricity (including solar system)	3,255	MWh
Product material	300,000	tpa
Distance to customer	60	km – return
Trips per annum	18,750	trips
Truck fuel use	597	kL

Note: Values have been rounded
kL = kilolitres, MWh = mega watt hour, tpa = tonnes per annum, km = kilometres

9.2 Emission factors

To quantify the amount of carbon dioxide equivalent (CO_2-e) material generated from the Project, emission factors were obtained from the NGA Factors (**DEECCW, 2024c**) and *Australia's emissions projections 2023* (**DCCEEW, 2023**) documents.

Emission factors for electricity usage are based on projections for the decarbonising of the NSW electricity grid overtime. The Scope 2 and 3 emissions factors for electricity usage are presented in **Table 9-2** and shown graphically in **Figure 9-1**. From 2031 to 2035, the projections assume no Scope 3 emissions related to electricity production. This suggests that methods associated with fuel extraction, production and transport generate negligible emissions aligning with Australia's net zero target.

Table 9-2: Summary of emission factors for electricity usage (t of CO_2-e per MWh)

Period	Scope 2	Scope 2 and 3	Scope 3 *
2023	0.68	0.73	0.05
2024	0.59	0.63	0.04
2025	0.52	0.56	0.04
2026	0.39	0.42	0.03
2027	0.29	0.32	0.03
2028	0.28	0.3	0.02
2029	0.27	0.3	0.03
2030	0.19	0.2	0.01
2031	0.11	0.11	0
2032	0.06	0.06	0
2033	0.02	0.02	0
2034	0.03	0.03	0
2035	0.03	0.03	0

Source: **DCCEEW (2023b)**
* Calculated by subtracting the Scope 2 column from the Scope 2 and 3 column.

Note: The emission factors for electricity usage are based off calendar years but have been used to calculate emissions from electricity usage on a financial year basis.

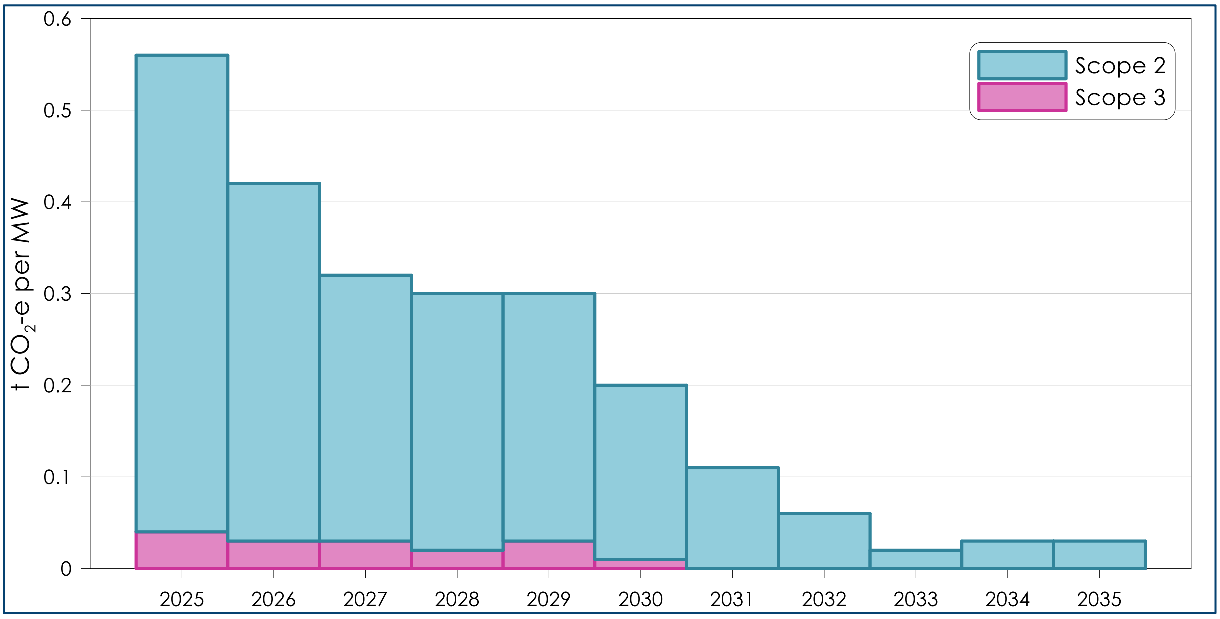

Figure 9-1: Summary of emission factors for electricity usage

The emission factors used for delivering the product material via truck and ship in this assessment are summarised in **Table 9-3**.

Table 9-3: Summary of emission factors

Type	Energy content factor (GJ/kL)	Emission factor			Units	Scope
		CO_2	CH_4	N_2O		
Diesel - Stationary	38.6	69.9	0.1	0.2	kg CO_2-e/GJ	1
		38.6	-	-		3
Diesel - Transport	38.6	69.9	0.1	0.4	kg CO_2-e/GJ	1
		17.3	-	-		3

Note: GJ = gigajoule, GJ/kL = gigajoule per kilolitre, kg CO_2-e = kilograms of carbon dioxide equivalent, t CO_2-e = tonnes of carbon dioxide equivalent, t = tonnes, Mt-km = million tonne-kilometres, CO_2 = Carbon Dioxide, CH_4 = Methane and N_2O = Nitrous Oxide

9.3 Estimated greenhouse gas emissions

Table 9-4 presents a summary of the estimated annual CO_2-e emissions for the Project.

Table 9-4: Summary of estimated CO_2-e emissions for the Project (t CO_2-e)

Project	GHG emissions
Diesel	568
Electricity	1,768
Scope 1	568
Scope 2	1,693
Scope 3	1,894

9.4 Contribution of greenhouse gas emissions

The estimated annual GHG emissions for Australia up to September 2023 was 459.7 million tonnes of carbon dioxide equivalent (Mt CO_2-e) (**DCCEEW, 2024a**). In comparison, the estimated annual average GHG emission for the Project is 0.00226 Mt CO_2-e (Scope 1 and 2). Therefore, the annual contribution of GHG emissions from the modified-business scenario in comparison to the Australian GHG emissions for the 2023 period is estimated to be approximately 0.00049%.

At a state level, the estimated GHG emissions for NSW in the 2022 period were 111.0 Mt CO_2-e (**DCCEEW, 2024b**). The annual contribution of GHG emissions from the modified-business scenario (Scopes 1 and 2) in comparison to the NSW GHG emissions for the 2022 period is estimated to be approximately 0.002%.

9.5 Greenhouse gas abatement measures

Demast will develop a GHG abatement plan aimed at achieving emissions reductions to align with the NSW Government's Net Zero Plan. A range of best-practice GHG abatement measures Demast could consider include:

- Increasing biofuels use to reduce diesel in fleet vehicles;
- Upgrade to an EV fleet;
- Ongoing energy consumption reduction efforts;
- Use of energy efficient lighting; and,
- Purchasing renewable energy from the grid.

10 SUMMARY AND CONCLUSIONS

This report has examined the air quality impacts associated with the proposed upgrade to the SDP at 7 Long Street, Smithfield.

Air dispersion modelling was used to predict the potential for off-site dust impacts in the surrounding area due to the operation of the Project with generally conservative assumptions.

It is predicted that all the assessed air pollutants generated by the operation of the Project would comply with the applicable assessment criteria at the assessed receptors and therefore would not lead to any unacceptable level of environmental harm or impact in the surrounding area. The Project would not result in air pollution that would significantly impact upon the amenity of residential and industrial land uses.

Nevertheless, the site would apply appropriate dust management measures to ensure it minimises the potential occurrence of excessive air emissions from the site.

Overall, the assessment demonstrates that even using conservative assumptions, the Project can operate without causing any significant air quality impact at receptors in the surrounding environment.

A contemporary and conservative GHG assessment of the Project has been completed. The estimated annual average GHG emission is 0.00226Mt CO_2-e material (Scope 1 and 2), which is calculated to be approximately 0.00049% of the Australian GHG emissions for up to September 2023 and approximately 0.002% of the NSW GHG emissions for the 2022 period.

11 REFERENCES

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Appendix A
Selection of Meteorological Year

Selection of meteorological year

A statistical analysis of the latest five contiguous years of meteorological data from the nearest BoM weather station with suitable, continuous available data, Horsley Park, is presented in **Table A-1**.

The standard deviation of the latest five years of meteorological data spanning 2019 to 2023 was analysed against the available measured wind speed, wind direction, temperature and relative humidity. The analysis indicates that the 2019 dataset is closest to the mean for wind speed followed by the other years showing similar values, 2020 is closest for temperature and relative humidity followed by 2021. On the basis of a score weighting analysis, 2020 was calculated to have the lowest score, followed by 2021 and then 2023.

Table A-1: Statistical analysis results for Horsley Park

Year	Wind speed	Temperature	Relative humidity	Score
2019	0.8	0.9	5.5	7.2
2020	0.9	0.5	2.7	4.1
2021	0.9	0.6	3.1	4.6
2022	0.9	0.7	6.2	7.8
2023	0.9	0.9	4.8	6.6

The annual rainfall of the latest five years of meteorological data is presented in **Figure A-1** and compared against the long-term average rainfall. This analysis indicates 2020 and 2021 recorded annual rainfall levels above the long-term average, with 2023 closest to the average whilst still being below the average.

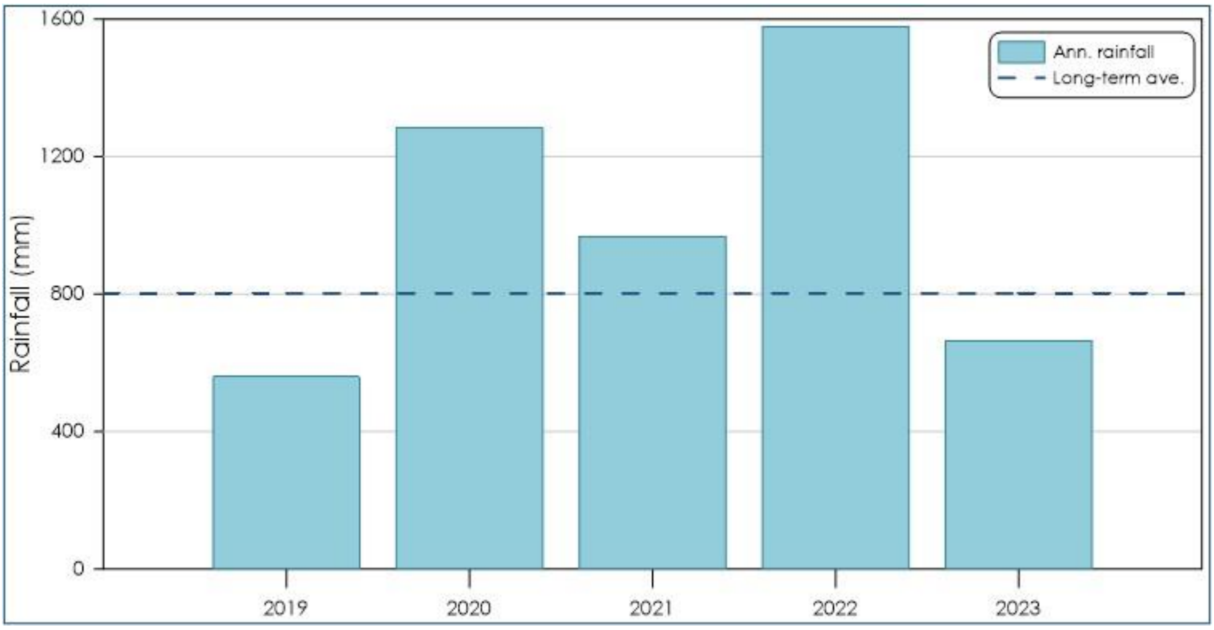

Figure A-1: Annual rainfall

On this basis the 2023 was found to be representative of the long-term data and suitable for use in the air dispersion modelling.

Figure A-2 shows the frequency distributions for wind speed, wind direction, temperature and relative humidity for the 2023 year compared with the mean of the 2019 to 2023 data set. The 2023 year data appear to be reasonably well aligned with the mean data.

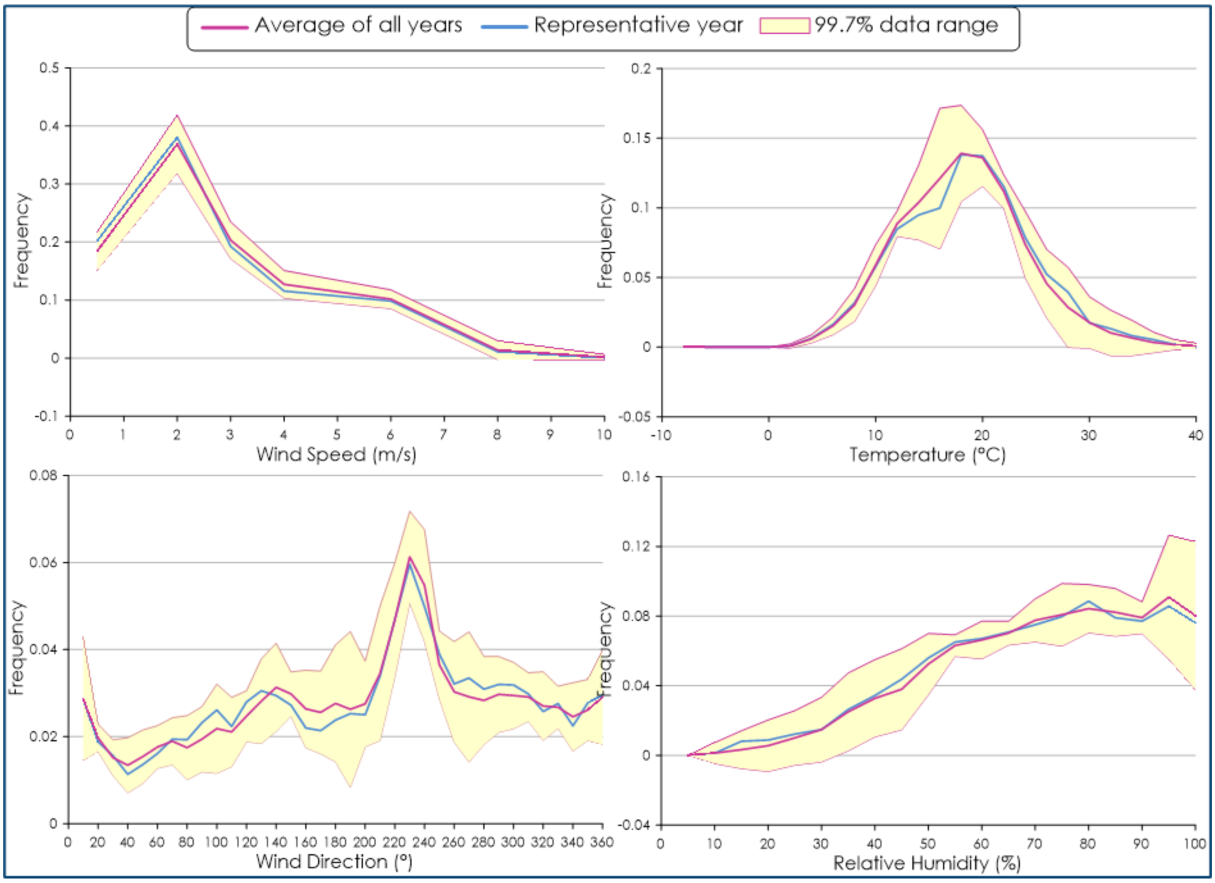

Figure A-2: Frequency distributions for wind speed, wind direction, temperature and relative humidity

Appendix B
Emission Calculations

Emission Calculation

The dust emissions from the Project have been estimated from the operational description of the proposed activities provided by the Proponent and have been combined with emissions factor equations and utilising suitable emission and load factors which relate to the quantity of dust emitted from particular activities based on intensity, the prevailing meteorological conditions and composition of the material being handled.

Emission factors and associated controls have been sourced from the United States (US) EPA AP42 Emission Factors (**US EPA, 1985 and Updates**).

The emission factor equations used for each dust generating activity are outlined in **Table B-1** below. A detailed dust emission inventory for the modelled scenario is presented in **Table B-2**.

Control factors include the following:

- Activities that occur within the warehouse - 70% control for enclosure.

Table B-1: Emission factor equations

Activity	Emission factor equation		
	TSP	PM_{10}	$PM_{2.5}$
Loading / emplacing material	$EF = 0.74 \times 0.0016 \times \left(\left(\frac{U}{2.2}\right)^{1.3} / \left(\frac{M}{2}\right)^{1.4} \right) kg/tonne$	$EF = 0.35 \times 0.0016 \times \left(\left(\frac{U}{2.2}\right)^{1.3} / \left(\frac{M}{2}\right)^{1.4} \right) kg/tonne$	$EF = 0.053 \times 0.0016 \times \left(\left(\frac{U}{2.2}\right)^{1.3} / \left(\frac{M}{2}\right)^{1.4} \right) kg/tonne$
Hauling on sealed surfaces	$EF = 3.23 \times s.L.^{0.91} \times (1.1023 \times W)^{1.02} kg/VKT$	$EF = 0.62 \times s.L.^{0.91} \times (1.1023 \times W)^{1.02} kg/VKT$	$EF = 0.15 \times s.L.^{0.91} \times (1.1023 \times W)^{1.02} kg/VKT$
Screening (controlled)	$EF = 0.0011\, kg/tonne$	$EF = 0.00037\, kg/tonne$	$EF = 0.000025\, kg/tonne$
Wind erosion	$EF = 850\, kg/ha/year$	$0.5 \times TSP$	$0.075 \times TSP$

EF = emission factor, U = wind speed (m/s), M = moisture content (%), s.L. = silt loading (g/m^2), W = average weight of vehicle (tonne), VKT = vehicle kilometres travelled (km)

Table B-2: Dust Emissions Inventory

Activity	TSP emission	PM10 emission	PM25 emission	Intensity	Units	EF - TSP	EF - PM10	EF - PM25	Units	Var 1	Units	Var 2	Units	Var 3 - TSP	Var 3 - PM10	Var 3 - PM25	Units	Var 4	Units	Var 5	Units	Var 6	Units
Hauling material on-site (sealed)	890	171	41	310,250	t/yr	0.003	0.001	0.000	kg/t	8	t/load	0.1	km/return	0.3	0.1	0.016	kg/VKT	5	Silt load	21	ave weight (t)		
Hauling material on-site (sealed)	774	148	36	310,250	t/yr	0.002	0.000	0.000	kg/t	8	t/load	0.1	km/return	0.1	0.0	0.007	kg/VKT	2	Silt load	21	ave weight (t)		
Unloading sludge and groundwater to hopper	27	13	2	206,833	t/yr	0.0001	0.0001	0.0000	kg/t	1.04	ave ws (	10.0	M.C %										
Unloading GSW soils to stockpile	127	60	9	103,417	t/yr	0.0012	0.0006	0.0001	kg/t	1.04	ave ws (	2.0	M.C %										
Rehandle GSW soils at stockpile	127	60	9	103,417	t/yr	0.0012	0.0006	0.0001	kg/t	1.04	ave ws (	2.0	M.C %										
Loading GSW soils to hopper	38	18	3	103,417	t/yr	0.0012	0.0006	0.0001	kg/t	1.04	ave ws (	2.0	M.C %									70	% C.
Screening and dewatering material (wet process)																						70	% C.
Screening aggregate	51	17	1	155,125	t/yr	0.0011	0.0004	0.0000	kg/t													70	% C.
Unloading aggregate to stockpile	57	27	4	155,125	t/yr	0.0012	0.0006	0.0001	kg/t	1.04	ave ws (	2.0	M.C %									70	% C.
Unloading sand to stockpile	34	16	2	93,075	t/yr	0.0012	0.0006	0.0001	kg/t	1.04	ave ws (	2.0	M.C %									70	% C.
Unloading clay to stockpile	23	11	2	62,050	t/yr	0.0012	0.0006	0.0001	kg/t	1.04	ave ws (	2.0	M.C %									70	% C.
Loading aggregate to truck for dispatch	57	27	4	155,125	t/yr	0.0012	0.0006	0.0001	kg/t	1.04	ave ws (	2.0	M.C %									70	% C.
Loading sand to truck for dispatch	34	16	2	93,075	t/yr	0.0012	0.0006	0.0001	kg/t	1.04	ave ws (	2.0	M.C %									70	% C.
Loading clay to truck for dispatch	23	11	2	62,050	t/yr	0.0012	0.0006	0.0001	kg/t	1.04	ave ws (	2.0	M.C %									70	% C.
Hauling processed material off-site (sealed)	372	71	17	310,250	t/yr	0.001	0.000	0.000	kg/t	16	t/load	0.1	km/return	0.3	0.1	0.013	kg/VKT	5	Silt load	17.6	ave weight (t)		
Hauling processed material off-site (sealed)	323	62	15	310,250	t/yr	0.001	0.000	0.000	kg/t	16	t/load	0.1	km/return	0.1	0.0	0.006	kg/VKT	2	Silt load	17.6	ave weight (t)		
Wind erosion from stockpiles	107	54	8	0.42	ha	850.0	425.0	63.8	kg/ha/year													70	% C.
Exhaust emissions	152	152	148																				
Total emissions (kg/yr.)	**3,219**	**936**	**306**																				

Appendix C

Isopleth Diagrams

Figure C-1: Predicted incremental maximum 24-hour average $PM_{2.5}$ concentrations (µg/m³)

Figure C-2: Predicted incremental annual average $PM_{2.5}$ concentrations (µg/m³)

Figure C-3: Predicted incremental maximum 24-hour average PM_{10} concentrations (µg/m³)

Figure C-4: Predicted incremental annual average PM_{10} concentrations (µg/m³)

Figure C-5: Predicted incremental annual average TSP concentrations (µg/m³)

Figure C-6: Predicted incremental annual average dust deposition levels (g/m²/month)

Appendix D

Further detail regarding 24-hour $PM_{2.5}$ and PM_{10} analysis

Further detail regarding 24-hour average $PM_{2.5}$ and PM_{10} analysis

The analysis below provides a cumulative 24-hour $PM_{2.5}$ and PM_{10} impact assessment in accordance with the NSW EPA Approved Methods; refer to the worked example on Page 50 to 51 of the Approved Methods.

The background level is the ambient level at the Parramatta North monitoring station.

The predicted increment is the predicted level to occur at the receptor due to the Project.

The total is the sum of the background level and the predicted level. The totals may have minor discrepancies due to rounding.

The left half of the table examines the cumulative impact during the periods of highest background levels and the right half of the table examines the cumulative impact during the periods of highest contribution from the project.

Exceptional event days (**DCCEEW, 2024d**) have been included in the tables, however, are not considered in the assessment for the cumulative impacts.

The green shading represents days ranked per the highest background level but below the criteria.

The blue shading represents days ranked per the highest predicted increment level but below the criteria.

The orange shading represents days where the measured background level is already over the criteria.

Any value above the $PM_{2.5}$ criterion of 25µg/m^3 and the PM_{10} criterion of 50µg/m^3 is shown in **bold red.**

Table D-1: Cumulative 24-hour average $PM_{2.5}$ concentration (μg/m³) – Receptor R1

Ranked by Highest to Lowest Background Concentrations				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
12/09/2023	24*	0.0	24.0	19/06/2023	7	0.2	7.2
14/09/2023	22.7	0.0	22.7	13/12/2023	ND	0.1	0.1
7/09/2023	22.1	0.0	22.1	18/03/2023	8.8	0.1	8.9
13/09/2023	21.3	0.0	21.3	31/07/2023	7.1	0.1	7.2
20/06/2023	20.2	0.0	20.2	15/09/2023	14.9	0.1	15.0
11/06/2023	19.5	0.0	19.5	26/02/2023	4.1	0.1	4.2
12/06/2023	18.9	0.1	19.0	28/08/2023	7.5	0.1	7.6
4/08/2023	18.9	0.1	19.0	28/04/2023	4.8	0.1	4.9
11/09/2023	17.2	0.0	17.2	30/06/2023	6.1	0.1	6.2
5/08/2023	15.8	0.0	15.8	18/01/2023	5.1	0.1	5.2

* Exceptional event day, ND – no data

Table D-2: Cumulative 24-hour average $PM_{2.5}$ concentration (μg/m³) – Receptor IND3

Ranked by Highest to Lowest Background Concentrations				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
12/09/2023	24*	1.2	**25.2**	4/07/2023	10.2	3.0	13.2
14/09/2023	22.7	1.4	24.1	29/06/2023	5.3	2.5	7.8
7/09/2023	22.1	0.8	22.9	22/06/2023	13.6	2.4	16.0
13/09/2023	21.3	1.2	22.5	6/05/2023	7.7	2.2	9.9
20/06/2023	20.2	1.8	22.0	7/05/2023	7.9	2.2	10.1
11/06/2023	19.5	1.8	21.3	17/08/2023	8.3	2.1	10.4
12/06/2023	18.9	1.9	20.8	1/05/2023	4.1	2.1	6.2
4/08/2023	18.9	0.8	19.7	24/05/2023	ND	2.1	2.1
11/09/2023	17.2	1.5	18.7	2/07/2023	8.4	2.1	10.5
5/08/2023	15.8	0.8	16.6	7/08/2023	7.1	2.1	9.2

* Exceptional event day, ND – no data

Table D-3: Cumulative 24-hour average PM_{10} concentration (µg/m³) – Receptor R1

Ranked by Highest to Lowest Background Concentrations				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
19/12/2023	48.8*	0.1	48.9	18/03/2023	24.9	0.5	25.4
25/10/2023	38.5	0.1	38.6	19/06/2023	12.9	0.5	13.4
12/11/2023	36.9	0.0	36.9	28/08/2023	13.8	0.5	14.3
2/10/2023	36.4	0.2	36.6	31/07/2023	ND	0.5	0.5
6/12/2023	36.4	0.0	36.4	13/12/2023	20.2	0.5	20.7
7/09/2023	36.1	0.1	36.2	15/09/2023	27.1	0.5	27.6
13/09/2023	34.3	0.1	34.4	26/02/2023	15.9	0.4	16.3
14/09/2023	33.5	0.2	33.7	28/04/2023	13.8	0.4	14.2
12/08/2023	32.2	0.0	32.2	3/10/2023	24.3	0.4	24.7
7/12/2023	32.1	0.2	32.3	8/11/2023	14.6	0.4	15.0

* Exceptional event day, ND – no data

Table D-4: Cumulative 24-hour average PM_{10} concentration (µg/m³) – Receptor IND3

Ranked by Highest to Lowest Background Concentrations				Ranked by Highest to Lowest Predicted Incremental Concentration			
Date	Measured background level	Predicted increment	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment	Total cumulative 24-hr average level
19/12/2023	48.8*	0.9	49.7	4/07/2023	13.3	10.6	23.9
25/10/2023	38.5	2.6	41.1	29/06/2023	9.6	9.6	19.2
12/11/2023	36.9	0.8	37.7	22/06/2023	20.8	9.2	30.0
2/10/2023	36.4	2.1	38.5	6/05/2023	20.1	8.5	28.6
6/12/2023	36.4	0.4	36.8	7/08/2023	13.2	8.1	21.3
7/09/2023	36.1	3.2	39.3	24/05/2023	ND	8.0	8.0
13/09/2023	34.3	4.8	39.1	7/05/2023	11.1	7.9	19.0
14/09/2023	33.5	5.3	38.8	12/06/2023	22	7.9	29.9
12/08/2023	32.2	7.5	39.7	17/08/2023	15.9	7.9	23.8
7/12/2023	32.1	0.3	32.4	11/07/2023	17.1	7.8	24.9

* Exceptional event day, ND – no data