130 Wentworth Avenue, Banksmeadow

Air Quality Assessment

ESR Developments (Australia) Pty Ltd

135 King St,
Sydney NSW 2000

Prepared by:

SLR Consulting Australia

SLR Project No.: 610.032079.00001

8 November 2024

Revision: 1.0

Making Sustainability Happen

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.0	8 November 2024	K Barker	A Naghizadeh	A Naghizadeh

Basis of Report

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

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

Table of Contents

Tables

Figures

Appendices

1.0 Introduction

This report has been prepared to accompany an SSDA seeking consent for the construction and operation of a two-storey warehouse and distribution centre development 130 Wentworth Avenue, Banksmeadow, Banksmeadow (Project).

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (**SEARs**) dated 30 Jul 2024 and issued for the SSDA (**SSD-73846459**).

Specifically, this report has been prepared to respond to the SEARs requirement issued below.

Table 1 SEARs Requirements

Item	Description of requirement	Section reference (this report)
10. Air Quality	*Identify significant air emission sources at the proposed development (during construction and operation), assess their potential to cause adverse off-site impacts and detail proposed management and mitigation measures that would be implemented.* *Where air emissions during operation have the potential to cause adverse off-site impacts, provide a quantitative air quality impact assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines*	Identify sources: **Section 2.3** Assess potential impacts: **Section 5.0** and **Section 6.0** Mitigation measures: **Section 5.1.4** and **Section 6.5**

1.1 Approach to Assessment

1.1.1 Construction Impact Assessment Methodology

A quantitative modelling assessment of potential dust emissions associated with the construction activities would require a number of assumptions to be made to enable the estimation of particulate emission rates for input into the models. The uncertainty associated with the output of such study means it would be of limited value and would not (in itself) assist with the identification of air quality control measures to actively manage the risks. Therefore, for the assessment of construction phase impacts, the IAQM Guidance on the Assessment of Dust from Demolition and Construction, developed in the United Kingdom by the Institute of Air Quality Management (IAQM 2024), has been used to provide a qualitative assessment method (see **Appendix A** for full methodology). The IAQM method uses a four-step process for assessing potential dust impacts from construction activities:

- Step 1: Screening based on distance to the nearest sensitive receptor; whereby the sensitivity to dust deposition and human health impacts of the identified sensitive receptors is determined.
- Step 2: Assess risk of dust effects from activities based on:

  - the scale and nature of the works, which determines the potential dust emission magnitude; and
  - the sensitivity of the area surrounding dust-generating activities.
- Step 3: Determine site-specific mitigation for remaining activities with greater than negligible effects.
- Step 4: Assess significance of remaining activities after management measures have been considered.

1.1.2 Operational Impact Assessment Methodology

The key potential air quality issue identified for the operational phase of the Project is emissions of combustion products associated with vehicle movements generated by the Project.

To estimate potential peak impacts associated with operational stage emissions from the Project, a quantitative assessment in general accordance with the NSW EPA's *Approved Methods for Modelling and Assessment of Air Pollutants in NSW* publication (NSW EPA 2022) (hereafter referred as the Approved Methods), has been prepared.

Section 2.1 of the Approved Methods outlines a two-tiered approach to Air Quality Impact Assessments (AQIA):

- Level 1, which is a basic screening using worst-case assumptions, and
- Level 2, a more detailed assessment with refined techniques and site-specific data.

If a Level 1 assessment shows that adverse impacts are unlikely, there is no need to proceed to Level 2.

For this assessment the Roadside Air Quality Screening Tool (RAQST) is employed. RAQST, developed by Transport for NSW (TfNSW), is a simplified version of a road vehicle emission model used for initial air quality impact screening. It employs worst-case scenarios to determine if a detailed Level 2 assessment is necessary, providing conservative predictions of incremental impacts. TfNSW recommends its use as a Level 1 equivalent for near-field ground-level pollutant concentration prediction from traffic.

2.0 Project Overview

2.1 Project Location

The Project is located at 130 Wentworth Avenue, Banksmeadow (the Site), within the Bayside Council local government area (LGA) and is legally described as Lot 11 DP701187. The Site location is illustrated in **Figure 1.**

The Site is located in the Banksmeadow Industrial Precinct, approximately 2 kilometres (km) southeast of Sydney Airport and 9 km south of Sydney CBD. The Site is currently developed, and is surrounded predominantly by a mix of industrial, residential and recreational uses.

Figure 1 Site Location

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Sub Base Platypus
North Sydney NSW 2060
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Project Number:	610.032079
Location:	Banksmeadow, NSW
Source:	
Projection:	GDA 2020/MGA Zone 56
Date:	28/10/2024

ESR Developments
130 Wentworth Avenue, Banksmeadow
Air Quality Impact Assessment

Site Location

2.2 Proposed Development

The proposed development involves construction and operation of a multi-level warehouse and distribution centre and includes the following scope of works:

- Demolition of the existing buildings and hardstand;
- Site preparation works, including earthworks;

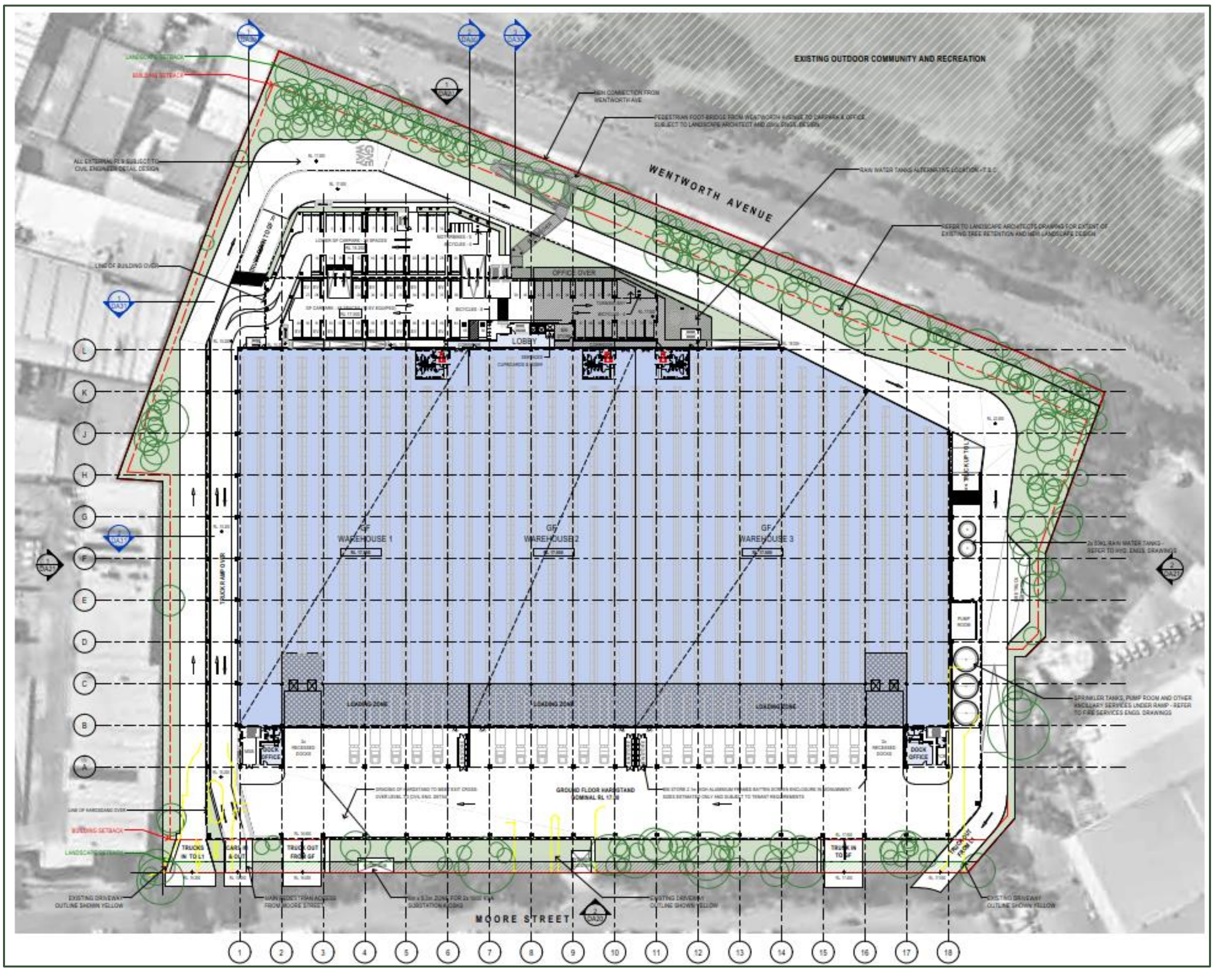
- Associated landscaping and tree removal;
- Construction of a multi-level car park;
- Construction and operation of warehouse and distribution centre within a two-storey building including ancillary office space; and
- Business identification signage and wayfinding signage.

The Level 1 layout of the development is shown in **Figure 2** below.

Detailed information on the future operational activities within each warehouse is not available at the time of preparing this report. It is anticipated that the activities will be limited to general warehousing (storage and distribution of packaged goods).

Project traffic data provided by the Project's traffic consultants (JMT Consulting) indicates that the existing peak traffic movements generated by the Site occurs at 2 PM and is 61 vehicles per hour (vph). The anticipated peak hour traffic generation due to the proposed development is anticipated to be another 58 vph for a total of 119 vph. According to the information provided by JMT Consulting no significant change to the heavy vehicle percentage is anticipated as a result of the Project.

Figure 2 Proposed Ground Floor Layout



Source: ESR 2024

2.3 Potential Sources of Emissions to Air

2.3.1 Construction Phase

The main air quality issues associated with construction works relate to emissions of fugitive dust. The potential for dust to be emitted during the construction works will be directly influenced by the nature of the activities being performed at any given time. Generally, the activities that are most likely to lead to short-term emissions of dust, include:

- Grading.
- Loading and unloading of materials.
- Wheel-generated dust and combustion emissions from construction equipment.
- Wheel-generated dust from trucks travelling on unpaved surfaces.
- Wind erosion of exposed surfaces.

Temporary elevations in local dust levels are most likely to occur when construction activities are undertaken during periods of low rainfall and/or windy conditions. The impact of elevated dust emissions is dependent upon the potential for particulates to become and remain airborne prior to being deposited as dust or experienced as an ambient particulate concentration.

A number of environmental factors may affect the generation and dispersion of dust emissions, including:

- Wind direction - determines whether dust and suspended particles are transported in the direction of the sensitive receptors.
- Wind speed - determines the potential suspension and drift resistance of particles.
- Surface type - more erodible surface material types have an increased soil or dust erosion potential.
- Surface material moisture - increased surface material moisture reduces soil or dust erosion potential; and
- Rainfall or dew - rainfall or heavy dew that wets the surface of the soil reduces the risk of dust generation.

Where diesel-powered mobile machinery and vehicles are used, localised elevations in ambient concentrations of combustion-related pollutants may also occur, however the potential risk of the relevant impact assessment criteria for these pollutants to be exceeded at surrounding sensitive areas is considered to be low. Fugitive dust emissions are generally considered to have the greatest potential to give rise to downwind air quality impacts at construction sites.

2.3.2 Operational phase

During the operational phase, the main source of air emissions would be emissions of products of fuel combustion and particulate matter (from brake and tyre wear as well as re-entrainment of road dust) associated with the trucks and other vehicles entering and leaving or idling at the Site during loading/unloading operations. It is assumed that no refuelling or power generation will occur on site.

Emissions associated with the combustion of fuel (diesel, petrol, etc.) in road vehicles will include carbon monoxide (CO), oxides of nitrogen (NO_x), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2) and volatile organic compounds (VOCs). The exact rate and composition of air pollutant emissions from road vehicles is a function of a number of factors, including the type, size and age of the vehicles, the type of fuel combusted, number and speed of vehicles and the road gradient.

2.4 Pollutants of Interest

As identified in **Section 2.3**, the key air pollutants of interest are considered to be particulate matter from construction works, and wheel-generated dust and products of fuel combustion from operations.

The following sections outline the potential health and amenity issues associated with particulate matter and products of fuel combustion, while **Section 3.4** identifies the relevant air quality assessment criteria.

2.4.1 Particulate Matter

Airborne contaminants that can be inhaled directly into the lungs can be classified on the basis of their physical properties as gases, vapours or particulate matter. In common usage, the terms “dust” and “particulates” are often used interchangeably. The health effects of particulate matter are strongly influenced by the size of the airborne particles. Smaller particles can penetrate further into the respiratory tract, with the smallest particles having a greater impact on human health as they penetrate to the gas exchange areas of the lungs. Larger particles primarily cause nuisance associated with coarse particles settling on surfaces.

The term “particulate matter” refers to a category of airborne particles, typically less than 30 microns (µm) in diameter and ranging down to 0.1 µm and is called total suspended particulate (TSP). Particulate matter with an aerodynamic diameter of 10 microns or less is referred to as PM_{10}. The PM_{10} size fraction is sufficiently small to penetrate the large airways of the lungs, while $PM_{2.5}$ (2.5 microns or less) particulates are generally small enough to be drawn in and deposited into the deepest portions of the lungs. Potential adverse health impacts associated with exposure to PM_{10} and $PM_{2.5}$ include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

2.4.2 Nuisance Dust

In addition, nuisance impacts need also to be considered, mainly in relation to deposited dust. Dust can cause nuisance by settling on surfaces and possessions, affecting visibility and contaminating tank water supplies. High rates of dust deposition can also adversely affect vegetation by blanketing leaf surfaces.

2.4.3 Products of Combustion

Emissions associated with road traffic and the combustion of fossil fuels (diesel, petrol, AVGAS etc.) will include CO, NO_x, PM_{10}, $PM_{2.5}$, SO_2 and VOCs.

CO is an odourless, colourless gas formed from the incomplete burning of fuels in motor vehicles. It can be a common pollutant at the roadside and highest concentrations are found at the kerbside with concentrations decreasing rapidly with increasing distance from the road. CO in urban areas results almost entirely from vehicle emissions and its spatial distribution follows that of traffic flow. The incomplete combustion of fuel in diesel powered vehicles can generate particulate in the form of black soot.

NO_x is a general term used to describe any mixture of nitrogen oxides formed during combustion. In atmospheric chemistry, NO_x generally refers to the total concentration of nitric oxide (NO) and nitrogen dioxide (NO_2). NO is a colourless and odourless gas that does not significantly affect human health. However, in the presence of oxygen, NO can be oxidised to NO_2 which can have significant health effects including damage to the respiratory tract and increased susceptibility to respiratory infections and asthma. NO will be converted to NO_2 soon after leaving the engine exhaust.

Engine exhausts can contain emissions of SO_2 due to impurities in the fuel. The sulfur content in diesel fuel has significantly reduced over the years ambient SO_2 concentrations in Australian cities are typically well below regulatory criteria.

VOCs may be emitted as a result of the incomplete combustion of fuel. VOC emissions are reducing significantly due to the improved combustion processes offered by modern engines.

3.0 Relevant Legislation, Policy and Guidance

The following Air Quality Policy and Guidance documents have been referenced within this assessment and have been used to identify the relevant air quality criteria.

3.1 Protection of the Environment Operations (POEO) Act 1997 & Amendment Act 2011

The POEO Act (and Amendment Act 2011) is a key piece of environment protection legislation administered by the EPA group which enables and establishes instruments for setting environmental standards, goals, protocols and guidelines.

The following sections of the POEO Act are of general relevance to the Site:

- Section 126 of the POEO Act requires that materials (e.g. raw ingredients and waste storage/disposal at the Site) are managed in a proper and efficient manner to prevent air pollution (e.g. odour).
- Section 128 of the POEO Act states:

1 The occupier of a premises must not carry out any activity or operate any plant in or on the premises in such a manner to cause or permit the emission at any point specified in or determined in accordance with the regulation of air impurities in excess of [the standard of concentration and/or the rate] prescribed by the regulations in respect of any such activity or any such plant.

2 Where neither such a standard nor rate has been so prescribed, the occupier of any premises must carry on activity, or operate any plant, in or on the premises by such practicable means as may be necessary to prevent or minimise air pollution.

3.2 Protection of the Environment Operations (Clean Air) Regulation 2022

The POEO (Clean Air) Regulation 2022 (the Regulation) is the core regulatory instrument for air quality issues in NSW. In relation to industry, the Regulation:

- sets maximum limits on emissions from activities and plant for a number of substances; and
- restricts the use of high sulphur liquid fuel.

3.3 NSW Environment Protection Authority Air Quality Policy and Guidance

The EPA is the NSW regulatory authority responsible for air quality regulation and associated activities.

NSW Environment Protection Authority document, list Approved Methods lists the statutory methods for modelling and assessing air pollutants from stationary sources and specifies criteria which reflect the environmental outcomes adopted by the EPA. The Approved Methods are referred to in the POEO (Clean Air) Regulation 2022 for assessment of impacts of air pollutants. The air quality criteria set out in the Approved Methods have been reproduced and discussed in **Section 3.4.**

3.4 Ambient Air Quality Criteria

State air quality guidelines specified by the NSW Environmental Protection Agency (EPA) for the pollutants identified in **Section 2.4** are published in the Approved Methods. The air quality impact assessment criteria listed in **Section 7** of the Approved Methods have been established by NSW EPA to achieve appropriate environmental outcomes and to minimise risks to human health. They have been derived from a range of sources and are the defining ambient air quality criteria for NSW and are considered to be appropriate for use in this assessment.

The impact assessment criteria listed in the Approved Methods for relevant pollutants are shown in **Table 2**.

Table 2 NSW EPA Impact Assessment Criteria for Air Quality Assessment

Pollutant	Averaging Period	Ambient Air Quality Criterion	
		µg/m³	pphm
Total suspended particulate (TSP)	Annual	90	-
Particulate matter less than 10 microns (PM_{10})	24-Hour	50	-
	Annual	25	-
Particulate matter less than 2.5 microns ($PM_{2.5}$)	24-Hour	25	-
	Annual	8	-
Nitrogen dioxide (NO_2)	1-hour	164	8
	Annual	31	1.5
Carbon monoxide (CO)	15-minutes	100,000	8,700
	1-hour	30,000	2,500
	8-hour	10,000	900
Sulfur dioxide (SO_2)	1-hour	286[a]	10
	24-hour	57	2
Benzene	1-hour	29	0.9
Toluene	1-hour	360	9
Ethylbenzene	1-hour	8,000	180
Xylenes	1-hour	190	4
Deposited dust	Annual	2 g/m²/month (maximum increase in deposited dust level) 4 g/m²/month (maximum total deposited dust level)	

4.0 Receiving Environment

4.1 Surrounding Land Uses and Sensitive Receptors

The Site is currently subject to the land use and development control provisions of the Bayside Local Environmental Plan 2021. **Figure 3** illustrates the surrounding land zoning. The Site and the areas immediately east and west are zoned General industrial (E4). To the north, on the opposite side of Wentworth Avenue, the land is zoned Special Activities (SP1) for Mutch Park. To the northwest is Low Density Residential (R2) and Local Centre (E1). To the east Medium Density Residential (R3), and a mix of Local centre (E1) and Productivity Support (E3). Further to the northeast and southeast there are areas of Public Recreation (RE1).

The nearest residential areas are located approximately 130 m northwest of the Site on the western side of the Wentworth Avenue. There are industrial receptors on neighbouring lots to the west, east and south. The nearest receivers are shown in **Figure 4.**

Figure 3 Zoning of Surrounding Land

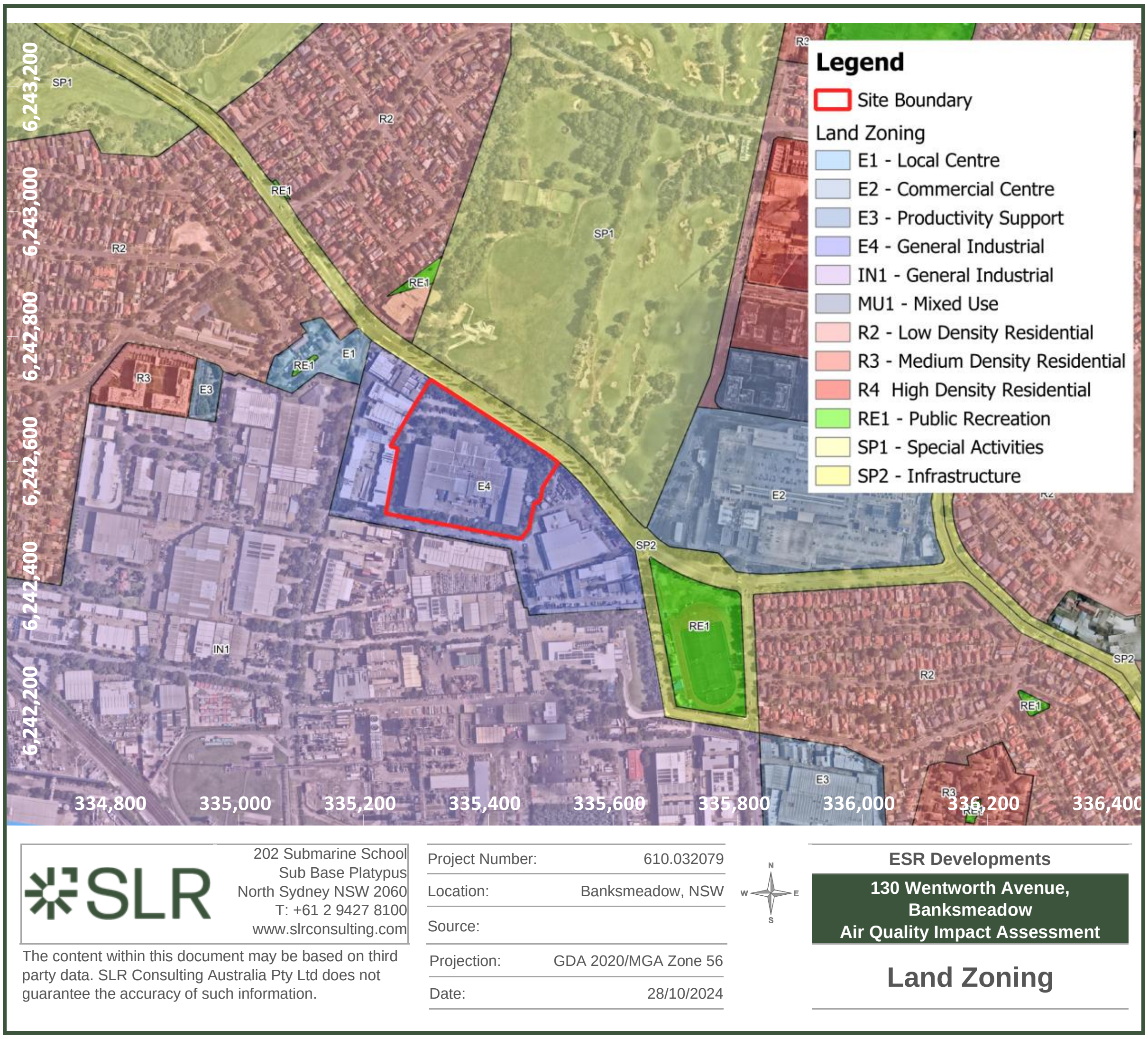


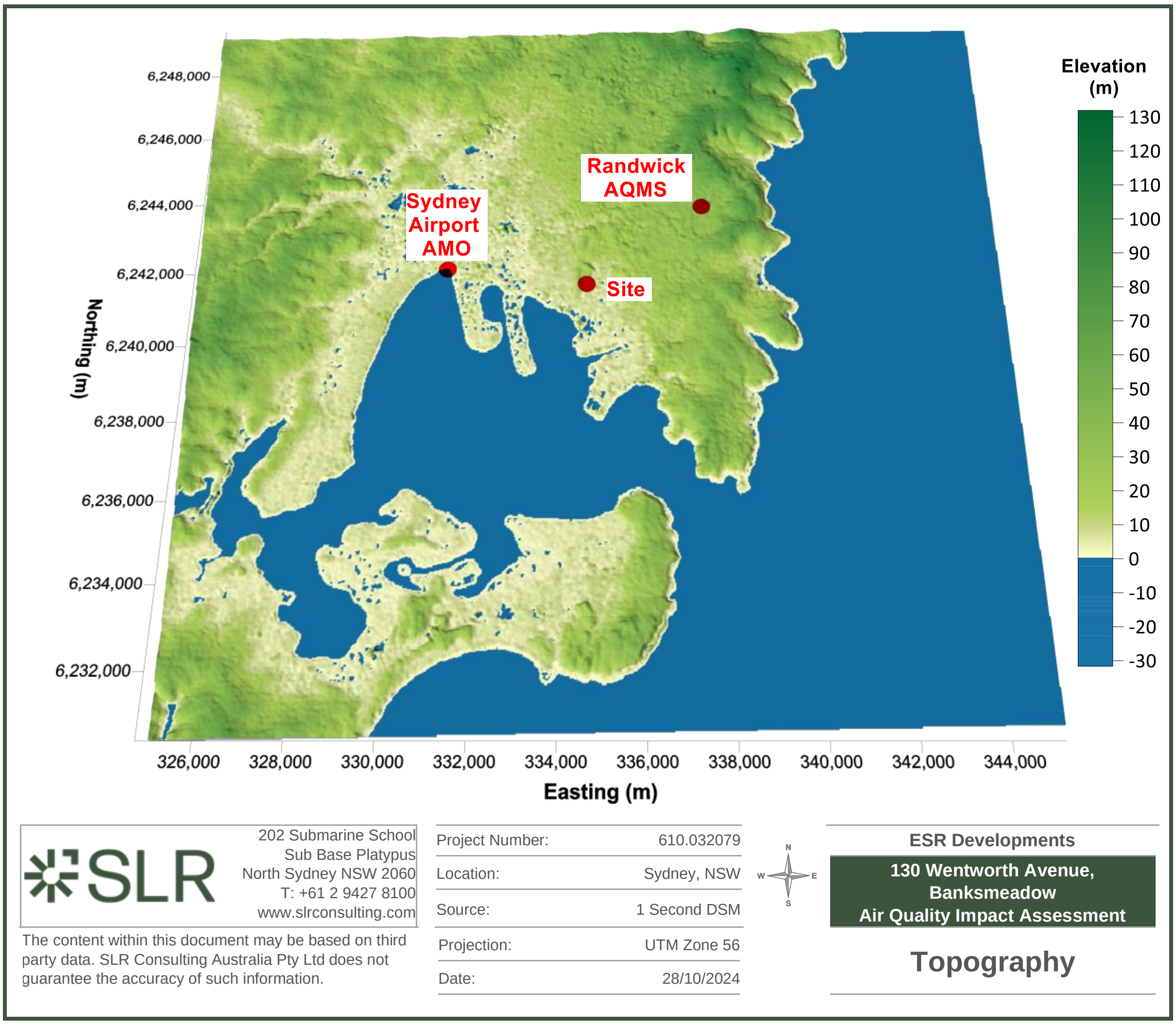
Figure 4 Surrounding Receptors

4.2 Local Topography

Topography is important in air quality studies as local atmospheric dispersion can be influenced by night-time katabatic (downhill) drainage flows from elevated terrain or channelling effects in valleys or gullies.

A three-dimensional representation of the region surrounding the Site is shown in **Figure 5**. The topography of the regional area ranges from an elevation of -30 m up to approximately 130 m. The Site is relatively flat. The locations of Sydney Airport Aeronautical Meteorological Observer (AMO; refer **Section 4.3**) and Randwick air quality monitoring station (AQMS; refer **Section 4.4**) are also indicated.

Figure 5 Local Topographical Features



4.3 Local Meteorological Conditions

The Bureau of Meteorology (BoM) maintains and publishes data from weather stations across Australia. The closest such station recording long term wind speed and wind direction data is the Sydney Airport AMO (Station 66037, elevation 6 m AHD) located approximately 4 km west of the Site.

Sydney Airport AMO, has data available from 1939 to present for the following parameters:

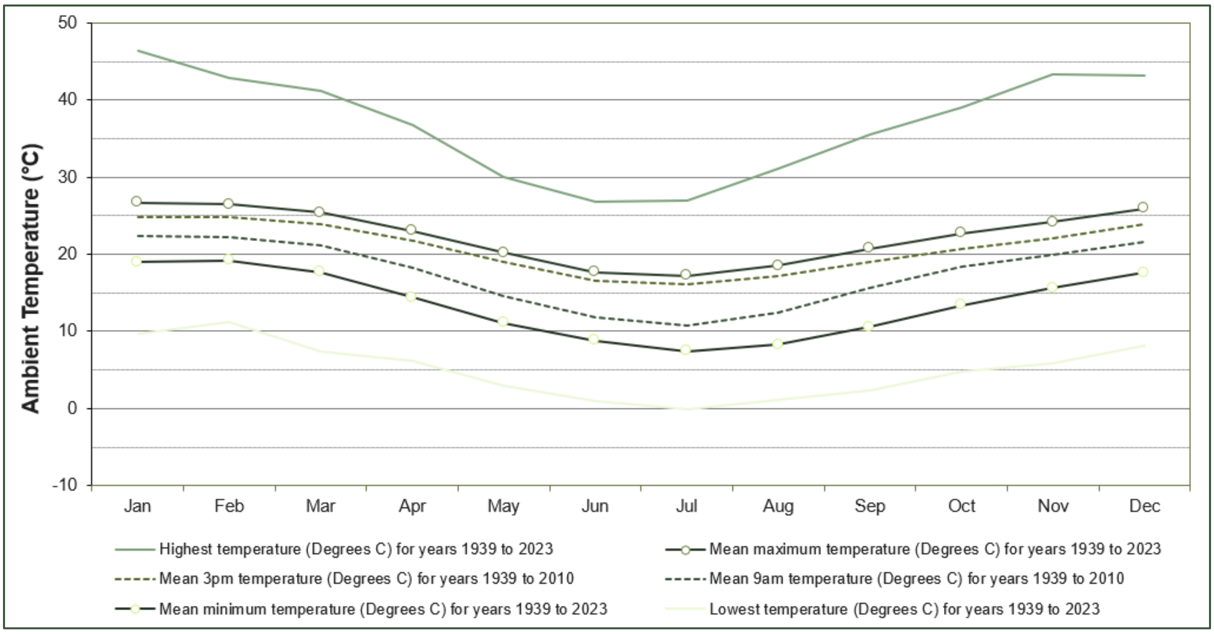
- temperature (°C)
- rainfall (mm)
- relative humidity (%)
- wind speed (m/s) and wind direction (degrees).

A review of the long-term data collected by this AMO is provided in the following sections.

4.3.1 Temperature

Temperature statistics for Sydney Airport AMO between 1939 and 2023 are summarised in **Figure 6.** Mean maximum temperatures range from 17.2°C in winter to 26.7°C in summer, while mean minimum temperatures range from 7.4°C in winter to 19.2°C in summer.

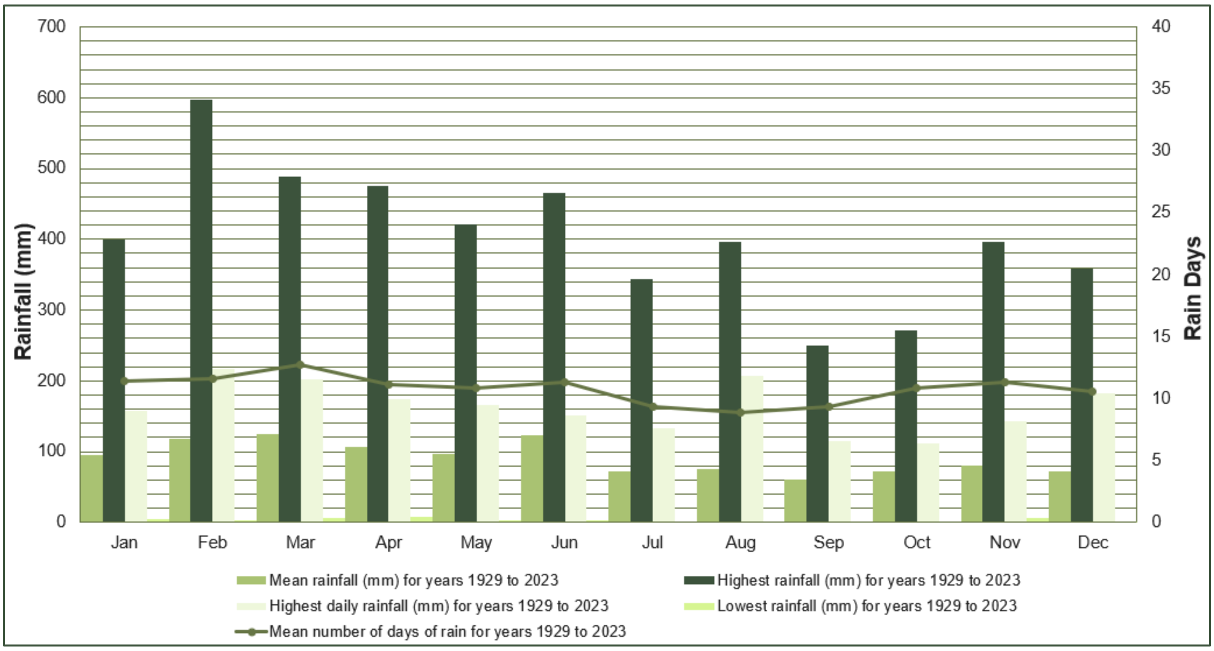
Figure 6 Temperature trends for Sydney Airport AMO (1939 - 2023)



4.3.2 Rainfall

Rainfall statistics for Sydney Airport AMO for the years 1929 to 2023 are summarised in **Figure 7**. The mean annual rainfall is 1,093 millimetres (mm). The average monthly rainfall is highest in summer with the highest average monthly rainfall of 124.7 mm/month in February and an average of 13 rain days. The lowest average rainfall is 59.8 mm/month in September, with an average of 9 days of rain. The highest monthly rainfall recorded over the time period examined was 596.9 mm recorded in February 1956. The maximum daily rainfall of 216.2 mm was recorded on 3rd February 1990.

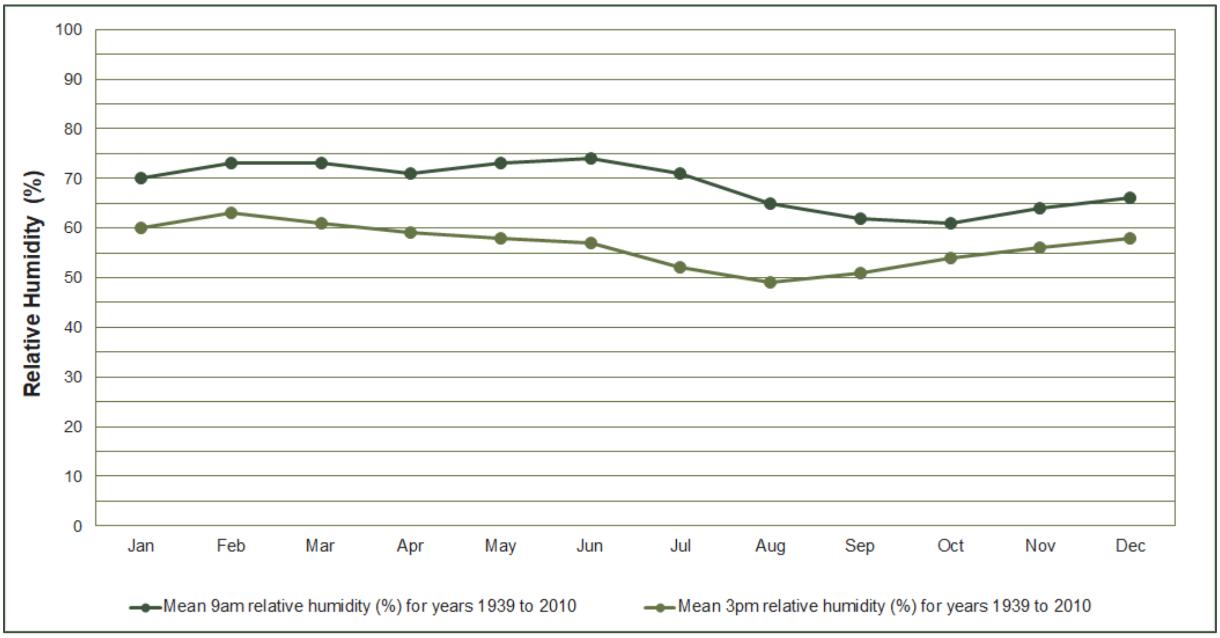
Figure 7 Monthly Rainfall Data for Sydney Airport AMO (1929 – 2023)



4.3.3 Humidity

Available humidity statistics (9 am and 3 pm monthly averages) for Sydney Airport AMO for the years 1939 to 2010 are summarised in **Figure 8**. Morning humidity levels range from an average of around 74% in June to around 61% in October. Afternoon humidity levels are lower, at around 63% in February and dropping to around 49% in August.

Figure 8 Humidity Data for Sydney Airport AMO (1939 – 2010)



4.3.4 Wind

Local wind speed and direction influence the dispersion of air pollutants. Wind speed determines both the distance of downwind transport and the rate of dilution as a result of 'plume' stretching. Wind direction, and the variability in wind direction, determines the general path pollutants will follow and the extent of crosswind spreading. Surface roughness (characterised by features such as the topography of the land and the presence of buildings, structures and trees) will also influence dispersion.

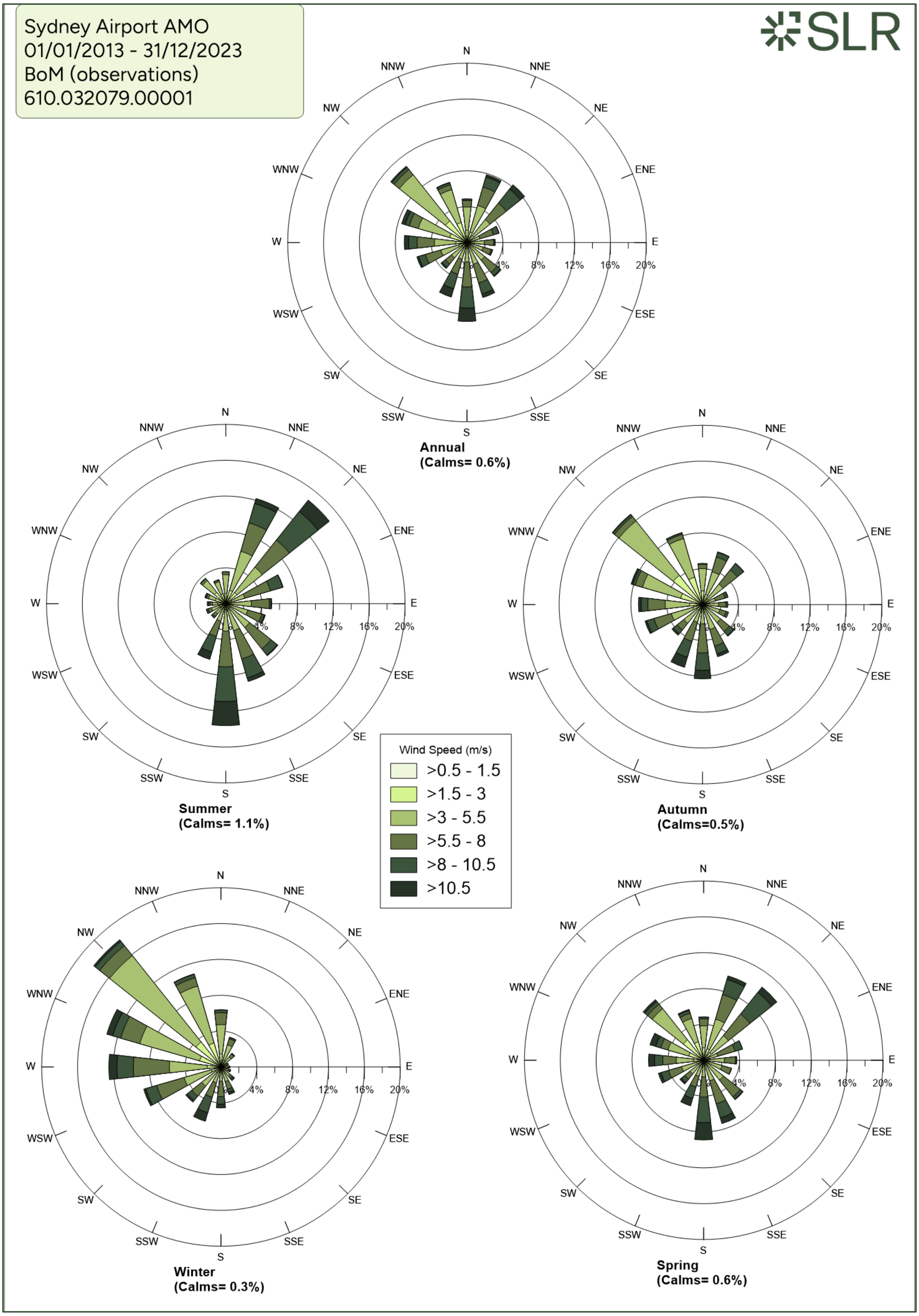
Annual and seasonal wind roses for years 2013-2023, compiled from data recorded by the Sydney Airport AMO is presented in **Figure 9**. Wind roses show the frequency of occurrence of winds by direction and strength. The bars correspond to the 16 compass points (degrees from North). The bar at the top of each wind rose diagram represents winds blowing from the north (i.e., northerly winds), and so on. The length of the bar represents the frequency of occurrence of winds from that direction, and the widths of the bar sections correspond to wind speed categories, the narrowest representing the lightest winds. Thus, it is possible to visualise how often winds of a certain direction and strength occur over a long period, either for all hours of the day, or for particular periods during the day.

The annual wind rose indicates that winds blow from all directions, with the lowest frequency of winds from the east and north, and the highest frequency of winds from the south, northwest, and northeast. Calm wind conditions (wind speed less than 0.5 m/s) were predicted to occur 0.6% of the time throughout the investigated period. The average seasonal wind roses for the years 2013 – 2023 indicate that:

- In summer, winds are mostly gentle to moderate (between 3 m/s and 8 m/s) predominantly from the northeast and southeast quadrants, with very few winds from the west quadrant and the east. Calms were recorded 1.1% of the time.
- In autumn, winds are mostly light to gentle (between 0.5 m/s and 5.5 m/s) and blow from all directions, with the lowest frequency of winds from the east and the highest frequency of winds from the south and northwest. Calms were recorded 0.5% of the time.
- In winter, winds are mostly light to gentle (between 0.5 m/s and 5.5 m/s) and predominantly blow from the west quadrant, with very few winds from the southeast and northeast quadrants. Calms were recorded 0.3% of the time.
- In spring, winds are mostly gentle to moderate (between 3 m/s and 8 m/s) and blow from all directions, with the lowest frequency of winds from the east and the highest frequency of winds from the south and northeast. Calms were recorded 0.6% of the time.

As identified in **Section 4.1**, the closest sensitive receptors are located northwest of the Site boundary. Winds from the east-southeast to south-southeast, which would blow air emissions from the Site towards the nearest residences to the west, occur 14% of the time.

Figure 9 Sydney Airport Annual and Seasonal Wind Roses 2013-2023



4.4 Review of Ambient Air Quality Monitoring Data

The closest NSW EPA Air Quality Monitoring Station (AQMS) is the Randwick AQMS. It was commissioned in 1994 and is located at the Randwick Barracks NSW, approximately 2.5 km northeast of the Site. It is situated in a residential area and is at an elevation of 28 m. The Randwick AQMS is located at the Randwick Army Barracks grounds, near Avoca and Bundock Streets. It measures air quality in a residential area in the eastern suburbs of Sydney:

- Oxides of nitrogen (NO, NO_2 and NO_X)
- Sulfur Dioxide (SO_2)
- Fine particles ($PM_{2.5}$ and PM_{10})

A summary of the monitored pollutant concentrations for the last five years (2019-2023) is presented in **Table 3** and the data are presented graphically in **Figure 10** to **Figure 14**.

A review of the data shows that exceedances of the 24-hour average PM_{10} criterion were recorded by the Randwick AQMS in three years, 2019-2021, and exceedances of the 24-hour average and $PM_{2.5}$ criteria were recorded in all years except 2022.

SLR has reviewed of the available compliance monitoring reports for these year, which indicates that PM_{10} and $PM_{2.5}$ exceedances across east coast NSW were primarily due to exceptional events such as bushfire emergencies, dust storms and hazard reduction burns (NSW DPIE 2019) (NSW DPIE 2020) (NSW DPE 2021). The high number of exceedances recorded in 2019 were due to bushfire smoke that affected Sydney and the surrounding areas for a significant number of days in late 2019 and early 2020 (the 'Black Summer' bushfire event).

Exceedances of the annual average $PM_{2.5}$ criterion were recorded in 2019. The annual average PM_{10} criterion was not exceeded during the five years reviewed.

Ambient concentrations of the gaseous pollutants NO_2, CO and SO_2 were all below the relevant criteria for all years investigated.

Three exceedances of the 24-hour average $PM_{2.5}$ criterion were recorded in 2023. The NEPM compliance report for 2023 has not been published at the time of this assessment, but a review of the available data shows that during mid-September when air quality impacts saw exceedances at multiple AQM stations due to large hazard reduction burns reported across Sydney. [1]

1 Exceedances of the 24-hour average $PM_{2.5}$ criteria occur on 11th, 12th, 14th September 2023. '*Sydney smoke: air quality among worst in world due to hazard-reduction burns'* | Bushfires | The Guardian.' https://www.theguardian.com/australia-news/2023/sep/14/sydney-air-quality-smoke-haze-today-back-burning-schedule-hazard-reduction-burns, Accessed 4 April 2024.

Table 3 Summary of Randwick AQMS Data (2019-2023)

Pollutant	PM_{10}		$PM_{2.5}$		NO_2		SO_2	
Averaging Period	Maximum 24-hour	Annual	Maximum 24-hour	Annual	Maximum 1-hour	Annual	Maximum 1-hour	Maximum 24-hour
Units	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
2019	128	24	95	9.8	105	13	82.9	14
2020	137	19	115	7.0	75.9	10	40.0	11
2021	38	16	31	6.1	59.5	11	62.9	14
2022	37	15	15	4.7	65.6	13	80.1	11
2023	89	16	68	6.0	82.0	15	68.6	11
Average	86	18	65	6.7	77.5	12	66.9	13
Criterion	**50**	**25**	**25**	**8**	**164**	**31**	**186**	**57**

Figure 10 Measured 24-Hour Average PM_{10} Concentrations at Randwick AQMS Data (2019-2023)

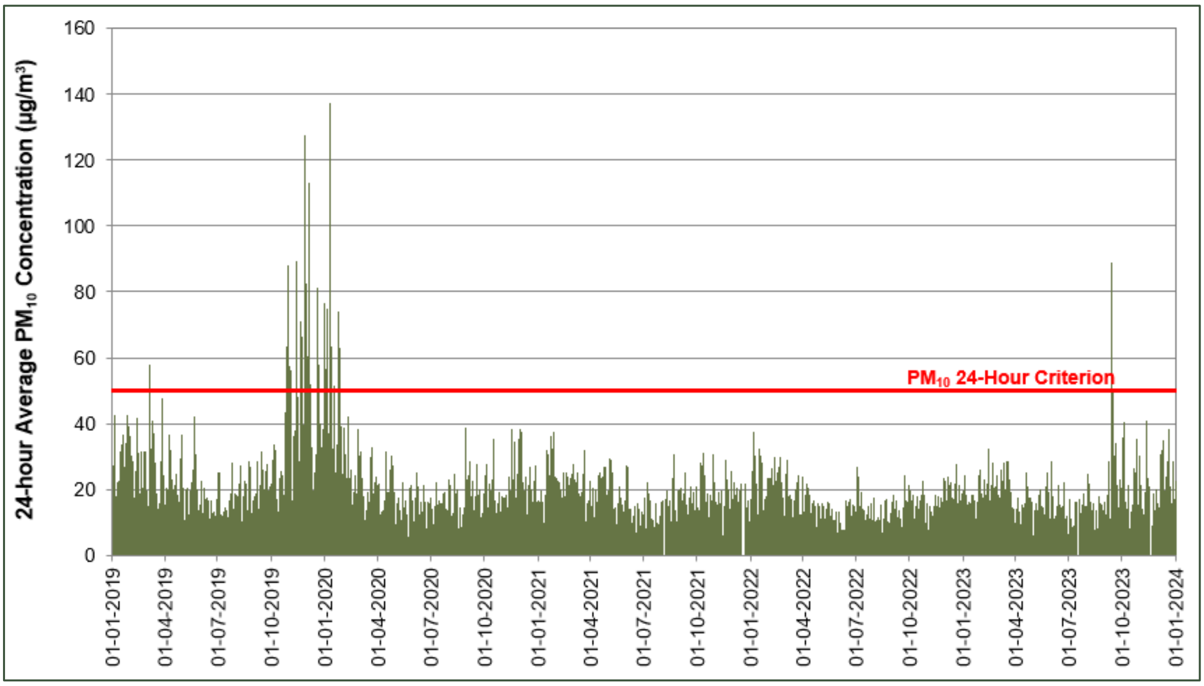


Figure 11 Measured 24-Hour Average $PM_{2.5}$ Concentrations at Randwick AQMS Data (2019-2023)

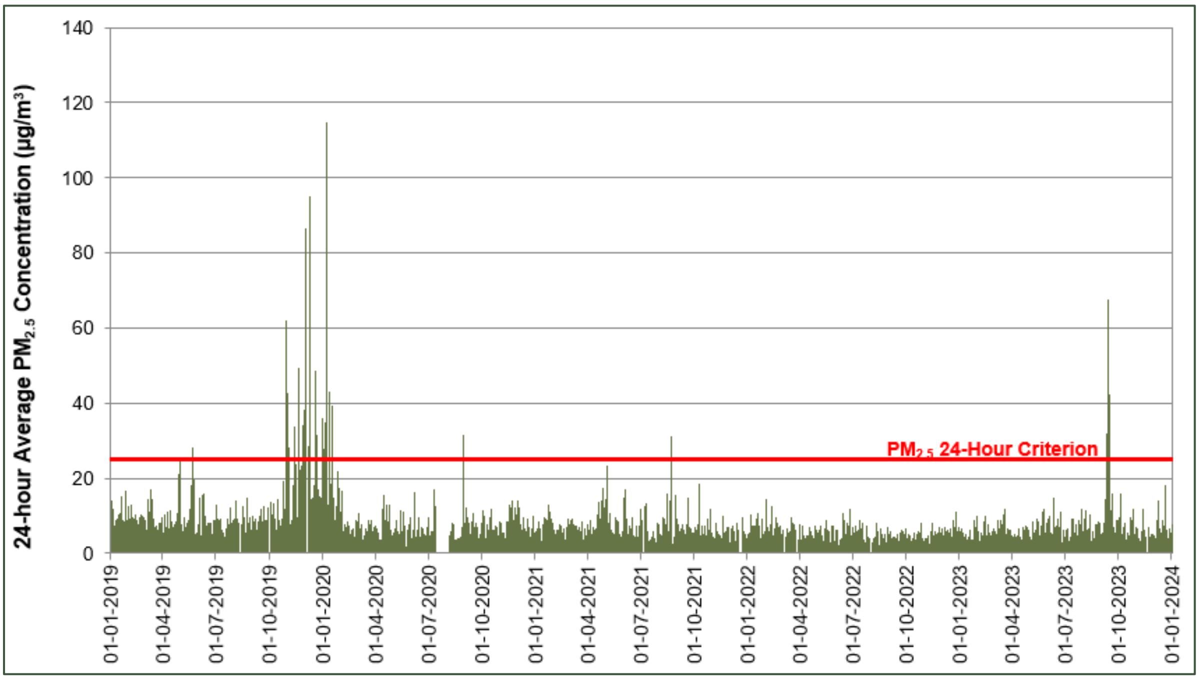


Figure 12 Measured 1-Hour Average NO_2 Concentrations at Randwick AQMS Data (2019-2023)

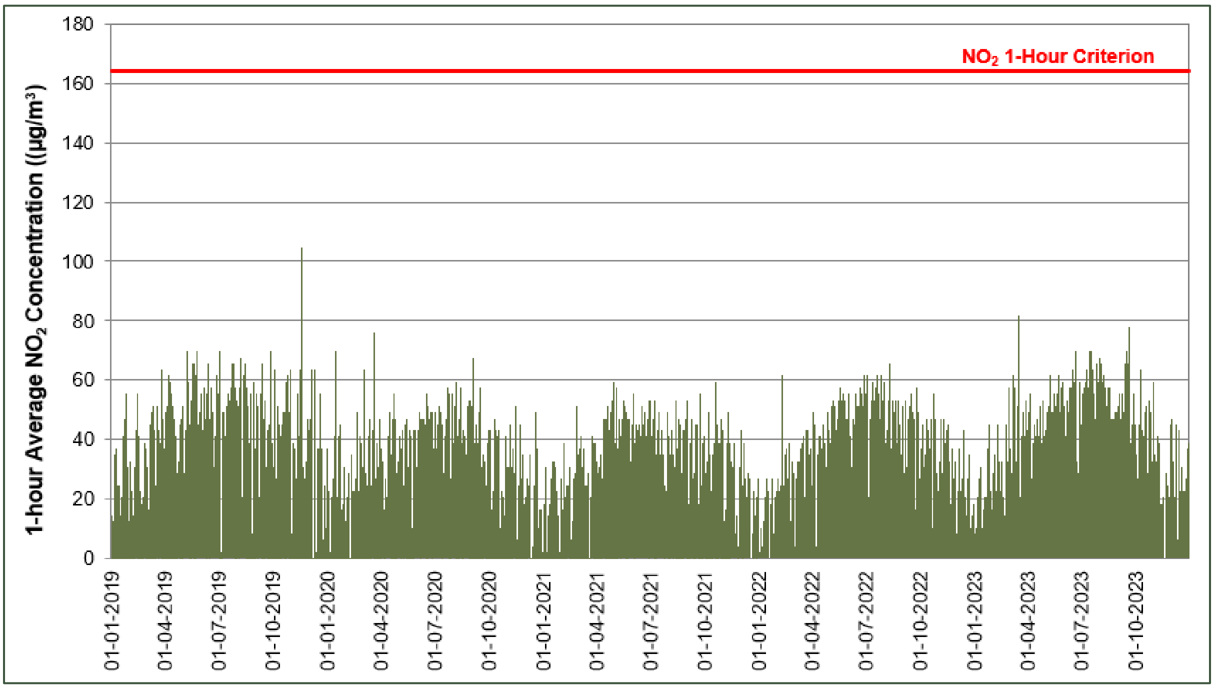


Figure 13 Measured 24-Hour Average SO_2 Concentrations at Randwick AQMS Data (2019-2023)

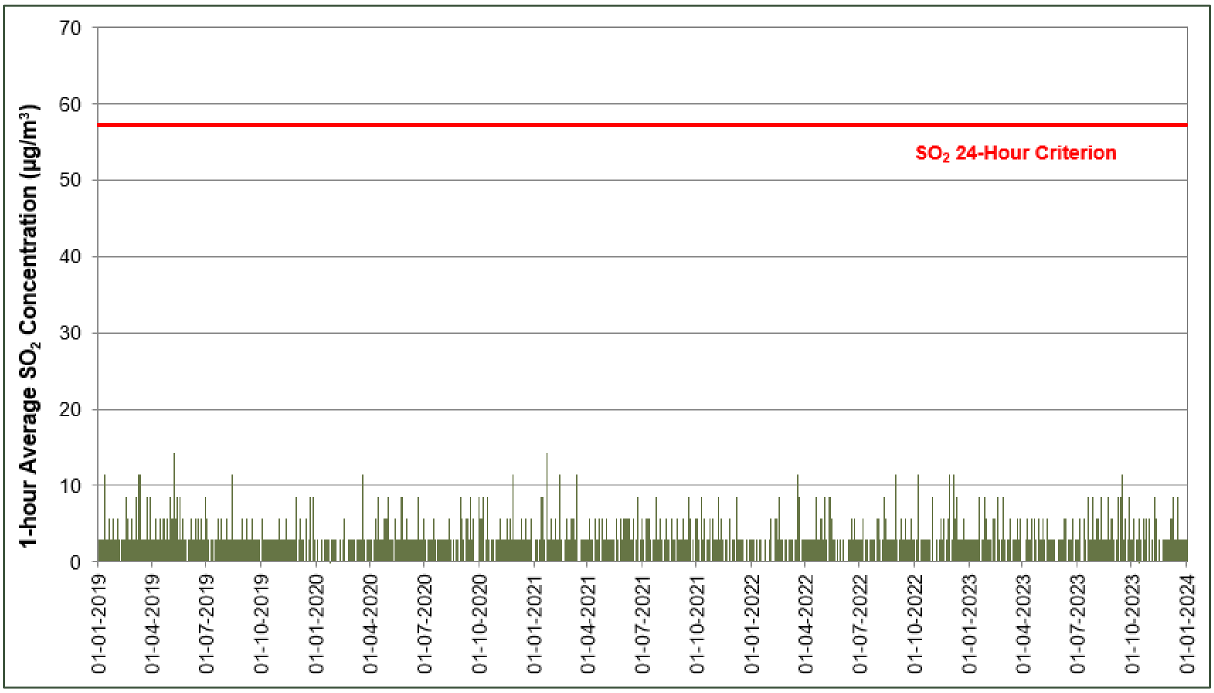
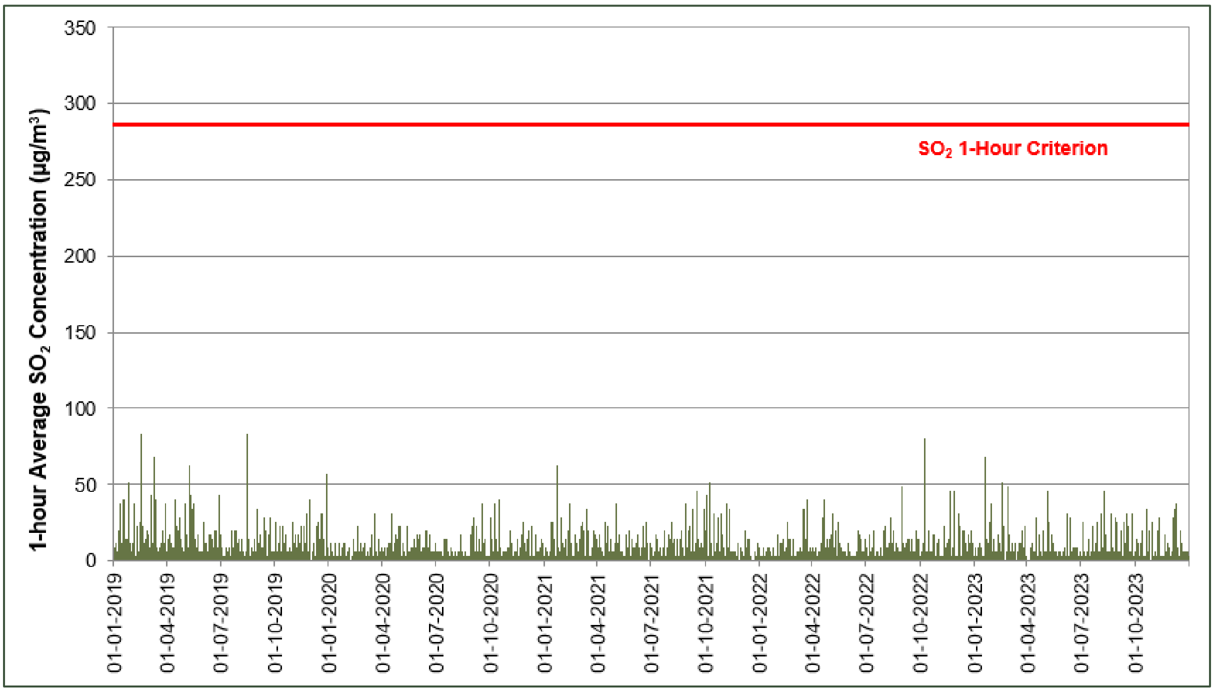


Figure 14 Measured 1-Hour Average SO_2 Concentrations at Randwick AQMS Data (2019-2023)



5.0 Construction Air Quality Assessment

For this assessment, the IAQM Guidance on the Assessment of Dust from Demolition and Construction developed in the United Kingdom by the Institute of Air Quality Management (IAQM 2024) has been used to provide a qualitative assessment method (refer to **Appendix A** for full methodology).

The adopted qualitative assessment approach identifies the appropriate mitigation measures based on the level of risk during each phase of the construction works and is considered to be a more appropriate methodology than quantitative modelling given the temporary and highly variable nature of construction activities.

5.1.1 Step 1 – Screening Based on Separation Distance

The IAQM screening criteria for further assessment is the presence of a 'human receptor' within:

- 250 m of the boundary of the site; or
- 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s).

There are residential receptors 140 m northeast of the Site and recreational use receptors across Wentworth Avenue. There are also other industrial receptors to the east, south, and west that could be adversely impacted by dust emissions from the construction works if they are not adequately controlled, although they can be expected to be of lower sensitivity than the wider community or residential dwellings.

Figure 15 figure shows any development lots where receptors maybe present within the buffer distances used in the IAQM method. It shows where all, or part, of the receptor lot is within the defined buffer distance.

Figure 15 Sensitive Receptor Lots Within Buffer Distances

5.1.2 Step 2a – Assessment of Scale and Nature of the Works

Based upon the above assumptions and the IAQM definitions presented in **Appendix A**, the dust emission magnitudes for each phase of the construction works have been categorised as presented in **Table 4**.

Table 4 Categorisation of Dust Emission Magnitude

Activity	Dust Emission Magnitude	Basis
Demolition	Large	*Total building volume >75,000 m3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >12 m above ground level.* *Project basis:* There are several existing buildings onsite that will be demolished, it is anticipated that this will exceed 75,000 m^3.

Activity	Dust Emission Magnitude	Basis
Earthworks	Medium	*Total site area between 18,000 m2 - 110,000 m², moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds between 3 m - 6 m in height.* *Project basis:* The Site is ~64,000 m² and will require removal of hardstand across the site.
Construction	Large	*Total building volume > 75,000 m³, on site concrete batching; sandblasting.* *Project basis:* Construction will provide three warehouses with a ground floor and level one. The total Ground Leasable Area of the warehouses (including ground floor, floor 1, and offices) is ~45,000m² therefore the total building volume will exceed 75,000m³.
Trackout	Medium	*Between 20 - 50 heavy vehicle movements in any one day, surface materials with a moderate potential for dust generation, between 50 m and 100 m of unpaved road length* *Project basis:* The longest direct path on the Site is approximately 250m however it is not anticipated that construction vehicles will frequently travel that full length of the site but it is expected that they will regularly travel >50 m. It is anticipated that more than 10 but less than 50 heavy vehicle movements will occur in any one day.

5.1.3 Step 2b – Risk Assessment

Receptor sensitivity is based on the criteria listed in **Table A-1** of **Appendix A**. The sensitivity of the identified residential receptors in this study is concluded to be *high* for health impacts and *high* for dust soiling. The sensitivity of the industrial/commercial receptors in this study is concluded to be ***medium*** for both health impacts and dust soiling.

Sensitivity of an Area

Based on the classifications shown in **Table A2** and **Table A3** in **Appendix A**, the sensitivity of the area to dust soiling may be classified as ***medium*** and to health effects may be classified as ***low***. This categorisation has been made taking into account the individual receptor sensitivities derived above, the density or receptors in buffer distances, the 5-year mean background PM_{10} concentration of 18 µg/m³ recorded at Randwick AQMS (see **Section 4.4**) and the existing number of sensitive receptors present in the vicinity of the Site. (there are more than 10 medium sensitivity receptors within 20 m of the site and 10-100 high sensitivity receptors within 250 m of the Site).

Risk Assessment

Given the sensitivity of the general area is classified as '***low'*** for dust soiling and ***'medium*** for health effects, and the dust emission magnitudes for the various construction phase activities as shown in **Table 4**, the resulting risk of air quality impacts (with no mitigation) is as presented in **Table 5**.

The results indicate that if no mitigation measures were to be applied to control emissions during the construction works:

- there is a ***high*** risk of adverse dust soiling and a ***medium*** risk of human health impacts during the demolition phase at the off-site sensitive receptor locations.

- there is a ***medium*** risk of adverse dust soiling and a ***low*** risk of human health impacts during earthworks, construction, and trackout phases occurring at the off-site sensitive receptor locations.

Table 5 Preliminary Risk of Air Quality Impacts from Construction Activities (Uncontrolled)

Impact	Sensitivity of Area	Dust Emission Magnitude				Preliminary Risk			
		Demolition	Earthworks	Construction	Trackout	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Large	Medium	Large	Medium	High	Medium	Medium	Medium
Human Health	Low					Medium	Low	Low	Low
N/A = Not Applicable									

5.1.4 Step 3 - Mitigation Measures

Table 6 lists the relevant general mitigation measures designated as *highly recommended* (H) or *desirable* (D) by the dust IAQM method for a development shown to have a *high risk* of unmitigated adverse impacts, as this was the highest level of risk identified. **Table 7** to **Table 10** provides the mitigation measures targeting the potential impacts from demolition, earthworks, construction, and trackout respectively.

Not all these measures would be practical or relevant to the Project therefore a detailed review of the recommendations should be performed, and the most appropriate measures be adopted as part of the Construction Air Quality Management Plan (CAQMP).

Table 6 IAQM - Guidance for Categorising Receptor Sensitivity

Mitigation Measure	High Risk Site Recommendation
Communications	
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	H
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H
Display the head or regional office contact information.	H
Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the relevant regulatory authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in the IAQM Guidance. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, real-time PM_{10} continuous monitoring and/or visual inspections.	H
Site Management	

Mitigation Measure	High Risk Site Recommendation
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken	H
Make the complaints log available to the relevant regulatory authority when asked.	H
Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.	H
Hold regular liaison meetings with other high risk construction sites within 250 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.	H
Monitoring	
Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the relevant regulatory authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of the site boundary, with cleaning to be provided if necessary.	H
Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the relevant regulatory authority when asked.	H
Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	H
Agree dust deposition or real-time PM_{10} continuous monitoring locations with the relevant regulatory authority. Where possible, commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences.	H
Preparing and Maintaining the Site	
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	H
Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period.	H
Avoid site runoff of water or mud.	H
Keep site fencing, barriers and scaffolding clean using wet methods.	H
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	H
Cover, seed or fence stockpiles to prevent wind whipping.	H
Operating vehicle/machinery and sustainable travel	
Ensure all vehicles switch off engines when stationary - no idling vehicles.	H
Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	H

Mitigation Measure	High Risk Site Recommendation
Impose and signpost a maximum-speed-limit of 24 km/h on surfaced and 16 km/h on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the relevant regulatory authority, where appropriate).	H
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	H
Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	H
Operations	
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.	H
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using non-potable water where possible and appropriate	H
Use enclosed chutes and conveyors and covered skips.	H
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	H
Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	H
Waste Management	
Avoid bonfires and burning of waste materials.	H
H = Highly recommended; D = Desirable	

Table 7 Mitigation Measures Specific to High-Risk Demolition

Mitigation Measure	Highly recommended or Desirable
Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	HD
Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	H
Avoid explosive blasting, using appropriate manual or mechanical alternatives.	H
Bag and remove any biological debris or damp down such material before demolition.	H
H = Highly recommended; D = Desirable	

Table 8 Mitigation Measures Specific to Medium-Risk Earthworks

Mitigation Measure	Highly recommended or Desirable
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	D
Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.	D
Only remove the cover in small areas during work and not all at once.	D
H = Highly recommended; D = Desirable	

Table 9 Mitigation Measures Specific to Medium-Risk Construction

Mitigation Measure	Highly recommended or Desirable
Avoid scabbling (roughening of concrete surfaces) if possible.	D
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	H
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	D
For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.	D
H = Highly recommended; D = Desirable	

Table 10 Mitigation Measures Specific to Medium-Risk Trackout

Mitigation Measure	Highly recommended or Desirable
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.	H
Avoid dry sweeping of large areas.	H
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	H
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	H
Record all inspections of haul routes and any subsequent action in a site log book.	H
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	H
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	H
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	H

Mitigation Measure	Highly recommended or Desirable
Access gates to be located at least 10 m from receptors where possible.	H
H = Highly recommended; D = Desirable	

5.1.5 Step 4 - Residual Impacts

For almost all construction activity, the IAQM Guidance notes that the aim should be to prevent significant effects on receptors through the use of effective mitigation, and that experience shows that this is normally possible. Hence the residual effects will normally be *negligible*, providing the appropriate level of dust control is effectively implemented. Based on SLR's experience, for almost all construction activities, provided effective mitigation is adopted, the residual air quality impact can be managed to acceptable levels.

To confirm that the controls are adequately controlling dust emissions from the site, it is recommended that visual inspections of dust levels be performed on a daily basis. These daily inspections should include, but not be limited to:

- Visual inspection of any airborne dust being generated on-site or being observed blowing off-site
- Ensuring roads leaving the Site are free of soil and dust, and that there is no observable soil or dust tracking onto the road network
- Inspection of any the erosion and sediment control systems for silt build-up
- Inspection of any stockpiles and waste storage areas to ensure no significant wind erosion is observable.

Any inspection reports should include the above observations, with remedial or corrective actions noted (as appropriate). Any remedial or corrective actions must be reported to the Site Manager as soon as is practicable.

A reappraisal of the predicted unmitigated air quality impacts on receptors has been performed to demonstrate the minimisation of risks associated with the use of mitigation strategies and is presented below in **Table 11**. These are termed 'residual impacts'.

Table 11 Residual Risk of Air Quality Impacts from Construction

Impact	Sensitivity of Area	Residual Risk			
		Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	Negligible Risk	Negligible Risk	Negligible Risk	Negligible Risk
Human Health	Low	Negligible Risk	Negligible Risk	Negligible Risk	Negligible Risk

The mitigated dust deposition and human health impacts risks for demolition, earthworks, construction, and trackout phases are anticipated to be ***negligible*** provided appropriate mitigation measures are implemented.

Monitoring using dust gauges or real-time PM_{10} monitoring equipment is not considered to be required given the industrial nature of the surrounding area unless complaints regarding dust nuisance are received. However, in the event of a dust complaint being received then a targeted dust monitoring campaign should be implemented to verify the issues raised and to assist in managing the effectiveness of dust controls being applied.

6.0 Operational Air Quality Assessment

6.1 Pollutants Assessed

RAQST provides predictions of NO_2, PM_{10} and $PM_{2.5}$ concentrations at various distances from the road kerb. It does not provide predictions of the other traffic-related pollutants identified in **Section 2.3.2**, namely CO, SO_2 and VOCs. Given the low level of CO and SO_2 emissions from vehicles and the low ambient concentrations recorded in the region (see **Section 4.4**), it is reasonable to assume that CO and SO_2 emissions from road traffic are unlikely to result in any exceedances of the relevant criteria at locations beyond the road kerb. SLR's experience in modelling VOC emissions from roads has also shown that kerbside concentration of VOCs is typically well below the relevant air quality guidelines.

Given the above, CO, SO_2 and VOC traffic emissions have not been considered further in this assessment.

6.2 Modelling Assumptions

As described in **Section 2.2** peak incremental traffic movements generated by the project are anticipated to be 58 vph. **Table 12** summarises the existing and anticipated future traffic generation rates for the Site.

Table 12 Peak Hour Traffic Generation

Peak Hour Traffic Generation (2 PM)	Light Vehicles (vph)	Rigid Trucks (vph)	Semis (vph)	All Vehicles (vph)
Existing Site	45	11	5	61
Proposed Site	87	22	10	119
Increase Compared to Current Flows	42	11	5	58

6.3 Dispersion Model Configuration

RAQST requires a number of inputs to describe the Site environment and emissions to air, including:

- Background pollutant concentrations
- Daily or peak hour traffic volumes and vehicle speeds
- Traffic mix (heavy vehicle percentage)
- Road type, number of lanes and gradient
- Year of assessment (vehicle fleet).

The sources of the required data and assumptions made for the purpose of this assessment are summarised in **Table 13**.

Table 13 RAQST Input Data

Parameter	Value	Description
Assessment Year	2025	Assumed project completion
Electric vehicle projections	Included	-
Number of Lanes	1 in each direction	-

Parameter	Value	Description
Road type	Arterial	Based on land use of the area
Road gradient	+/- 3%	Average road gradients calculated based on terrain elevations.
Lane width (m)	3.5 m	Assumed
Level for traffic composition	Level 2	No detailed information on traffic composition is available.
Traffic speed	10 km/hr	Conservative assumption representative of emissions during high congestion periods
Traffic volume	58 vph (29 vph per lane)	Peak incremental change
Peak hour traffic as percentage of AADT	10%	RAQST default value
Heavy vehicle percentage	28%	Anticipated project traffic data provided by the Project's traffic consultants (JMT Consulting)
Background Concentrations		
Background site	Randwick AQMS	Nearest air quality monitoring station
Background year	2021	-
1-hour metric for NO_x	Maximum	Per the Approved Methods, if the existing ambient air pollutant concentrations exceed the impact assessment criteria, the assessment demonstrate that no additional exceedances of the impact assessment criteria will occur.-
24-hour metric for PM_{10} and $PM_{2.5}$	Maximum below the criterion	

6.4 Modelling Results

The nearest receptors to the Moore Street kerbside which is the main access point for the Project are located approximately 10 m from the kerb. Therefore, predicted air pollutant concentrations at 10 m from the kerbside have been quantified.

As shown in **Table 14**, the incremental predicted concentrations due to vehicles travelling along Moore Street to the Site are insignificant (0.4% to 2.6% of the relevant criteria) and none of the predicted concentrations would be expected to contribute significantly to the potential for exceedances of the relevant criteria.

Furthermore, all cumulative concentrations comply with the relevant criteria, therefore the potential impact of the development is considered negligible. It is noted that impact of residential receptors which are located further away from the Site and unlikely to be impacted by the peak traffic generation rates (as vehicles will be using a variety of routes to access the Site), would be less that those presented in **Table 14** for the closest receptors.

Table 14 RAQST Model Results – Peak Hour

Pollutant and Averaging Period	Background Concentration (µg/m³)	Incremental Impact (µg/m³)	Cumulative Impact (µg/m³)	Criteria
Maximum 1-hour NO_2 concentrations	Not Applicable [a]	Not applicable [a]	144	**164**
Annual NO_2 concentrations	12.4	0.8	13.2	**31**
Maximum 24-hour PM_{10} concentrations	37.6	0.2	37.8	**50**
Annual PM_{10} concentrations	16.3	0.1	16.4	**25**
Maximum 24-hour $PM_{2.5}$ concentrations	23.6	0.2	23.8	**25**
Annual $PM_{2.5}$ concentrations	6.4	0.1	6.5	**8**

6.5 Mitigation Measures

In addition to dust and air emission mitigation measures for the construction phase provided in **Section 5.1.4**, recommended air quality management measures for the operational phase of the Project include:

- Mobile heavy lift equipment and other vehicles operated on site are maintained and operated as per manufacturer specifications or best practice requirements.
- Mobile heavy lift equipment and other vehicles are turned off when not in use, where safe to do so. All unnecessary engine idling is avoided.
- Any spillages are cleaned up in a timely manner.
- Where possible sealed access roads and hardstand areas are maintained and the surface kept free of significant dust-generating materials.

Given the negligible risk of off-site air quality impacts identified for the operational phase, no air quality monitoring is considered to be necessary.

7.0 Closure

SLR Consulting Australia Pty Ltd was commissioned by ESR Developments to prepare an air quality impact assessment report for a proposed development consisting of two warehouses, associated hardstands and car parking and an internal access road at 130 Wentworth Avenue, Banksmeadow.

The main potential sources of air emissions were identified as fugitive particulate matter during the construction phase and products of combustion from traffic during the operational phase of the Project.

The potential for off-site dust impacts during construction phase was assessed using a qualitative risk-based approach prescribed by the IAQM. The results of this assessment indicate that dust impacts due to the construction works can be adequately managed with the implementation of site-specific mitigation measures, and that the residual impacts are likely to be of negligible risk for the surrounding receptors during the construction phase.

The screening-level assessment of operational stage emissions found that the incremental impact associated with the vehicles travelling along the surrounding roads was negligible at the closest receptors such that project vehicles are unlikely to result in any significant measurable increase in cumulative air quality impacts at these locations. Given this, a detailed assessment was not deemed to be required.

In summary, with proper mitigation measures in place, air quality at the surrounding receptors should not be considered as a constraint during the construction and operation of the Project.

8.0 References

IAQM. 2024. *Guidance on the assessment of dust from demolition and construction, Version 2.2.* London: Institutre of Air Quality Management.

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NSW EPA. 2022. *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.* New South Wales Environment Protection Authority.

Appendix A Construction Phase Risk Assessment Methodology

130 Wentworth Avenue, Banksmeadow

Air Quality Assessment

ESR Developments (Australia) Pty Ltd

SLR Project No.: 610.032079.00001

8 November 2024

A.1 Step 1 – Screening Based on Separation Distance

The Step 1 screening criteria provided by the IAQM Guidance (IAQM 2024) suggests an assessment may be required where:

- a 'human receptor' is located within:
  - 250 m of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on public roads, up to 250 m from the site entrance.
- an 'ecological receptor' is located within:
  - 50 m of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on public roads, up to 250 m from the site entrance.

This step is noted as having deliberately been chosen to be conservative and will require assessments for most projects. A planning authority may require dust assessment despite the proposed site falling outside the distances above for specific (high risk) projects.

A.2 Step 2a – Assessment of Scale and Nature of the Works

Step 2a of the assessment provides "dust emissions magnitudes" for each of four dust generating activities; demolition, earthworks, construction, and track-out (the movement of site material onto public roads by vehicles). The magnitudes are: Large; Medium; or Small, with suggested definitions for each category. The definitions given in the IAQM guidance for demolition, earthworks, construction activities and track-out, are as follows:

- Demolition *(Any activity involved with the removal of an existing structure [or structures]. This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time)*:
  - **Large**: Total building volume greater than 75,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities higher than 12 m above ground level.
  - **Medium**: Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material, demolition activities 6-12 m above ground level.
  - **Small**: Total building volume less than12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities less than 6 m above ground, demolition during wetter months.
- Earthworks *(Covers the processes of soil-stripping, ground-levelling, excavation and landscaping)*:
  - **Large**: Total site area greater than 110,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), more than 10 heavy earth moving vehicles active at any one time, formation of bunds greater than 6 m in height.
  - **Medium**: Total site area 18,000 m^2 to 110,000 m^2, moderately dusty soil type (e.g. silt), 5 to 10 heavy earth moving vehicles active at any one time, formation of bunds 3 m to 6 m in height.
  - **Small**: Total site area less than 18,000 m^2, soil type with large grain size (e.g. sand), less than 5 heavy earth moving vehicles active at any one time, formation of bunds less than 3 m in height.

- Construction (*Any activity involved with the provision of a new structure (or structures), its modification or refurbishment. A structure will include a residential dwelling, office building, retail outlet, road, etc.)*:
  - **Large**: Total building volume greater than 75,000 m^3, on site concrete batching; sandblasting.
  - **Medium**: Total building volume 12,000 m^3 to 75,000 m^3, potentially dusty construction material (e.g. concrete), on site concrete batching.
  - **Small**: Total building volume less than 12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).
- Track-out *(The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network)*:
  - **Large**: More than 50 heavy vehicle (>3.5 t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), greater than 100 m of unpaved road length.
  - **Medium**: Between 20 and 50 heavy vehicle (>3.5 t) outward movements in any one day, moderately dusty surface materials (e.g. high clay content), between 50 m and 100 m of unpaved road length.
  - **Small**: Less than 20 heavy vehicle (>3.5 t) outward movements in any one day, surface materials with a low potential for dust release, less than 50 m of unpaved road length.

In order to provide a conservative assessment of potential impacts, it has been assumed that if at least one of the parameters specified in the 'large' definition is satisfied, the works are classified as large, and so on.

A.3 Step 2b – Assessment of the Sensitivity of the Area

Step 2b of the assessment process requires the sensitivity of the area to be defined. The sensitivity of the area takes into account:

- The specific sensitivities that identified sensitive receptors have to dust deposition and human health impacts
- The proximity and number of those receptors
- In the case of PM_{10}, the local background concentration
- Other site-specific factors, such as whether there are natural shelters such as trees to reduce the risk of wind-blown dust.

Individual human receptors are classified as having high, medium or low sensitivity to either dust deposition or human health impacts. The IAQM method provides guidance on the sensitivity of different human receptor types to dust soiling and health effects as summarised in **Table A-1**. The definitions and examples given in the IAQM Guidance for ecological receptors have been modified in **Table A-1** to be relevant to the Australian context based on advice from SLR's ecological specialist team.

It is noted in the IAQM Guidance that people's expectations of amenity levels (dust soiling) is also dependent on existing deposition levels.

Table A-1 IAQM - Guidance for Categorising Receptor Sensitivity

Value	High Sensitivity Receptor	Medium Sensitivity Receptor	Low Sensitivity Receptor
Dust soiling	• Users can reasonably expect a high level of amenity; or • The appearance, aesthetics or value of their property would be diminished by soiling, and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land.	• Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • The appearance, aesthetics or value of their property could be diminished by soiling; or • The people or property would not reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.	• The enjoyment of amenity would not reasonably be expected; or • Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.
	Examples: Dwellings, museums other culturally important collections, medium and long term car parks and car showrooms.	*Examples: Parks and places of work.*	*Examples: Playing fields, farmland (unless commercially sensitive horticultural), footpaths, short term car parks and roads.*
Health effects	• Locations where the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	• Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	• Locations where human exposure is transient.
	Examples: Residential properties, hospitals, schools and residential care homes.	*Examples: Office and shop workers, but will generally not include workers occupationally exposed to PM_{10}.*	*Examples: Public footpaths, playing fields, parks and shopping streets.*
Ecological	• Locations that support International or National (EPBC) level species or ecological communities of conservation significance that may be affected by dust soiling; or	• Locations that support National or State level species or ecological communities of conservation significance, where its dust sensitivity is uncertain or unknown; or • Locations that are protected under the EPBC Act or State	• Locations that support State or Local Government level species of conservational significance where the features may be affected by dust deposition.

Value	High Sensitivity Receptor	Medium Sensitivity Receptor	Low Sensitivity Receptor
	• Locations that are protected under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), that will require approval from the Commonwealth Government Minister for the Environment (the minister) if the action has, will have, or is likely to have, a significant impact on Matters of National Environmental Significance (MNES).	legislation (e.g. Biodiversity Conservation Act), that will require approval from the Commonwealth or State Government Minister for the Environment (the minister) if the action has, will have, or is likely to have, a significant impact on MNES or State listed conservation significant species or communities.	• Locations that are protected under State legislation (e.g. Biodiversity Conservation Act) or Local Government Environmental Management Plans, that will require approval from the State Government Minister for the Environment (the minister) if the action has, will have, or is likely to have, a significant impact on State listed conservation significant species or communities.
	Examples: Threatened avifauna that are impacted from air pollution through the ingestion of fine dust particles into the liver and lungs due to their high metabolic rate and special respiratory systems.	*Examples: Threatened or Priority Ecological Communities that are sensitive to dust by inhibiting photosynthesis and respiration of species.*	*Examples: a local Nature Reserve with dust sensitive vegetation communities.*

According to the IAQM methods, the sensitivity of the identified individual receptors (as described above) is then used to assess the *sensitivity of the area* surrounding the active construction area, taking into account the proximity and number of those receptors, and the local background PM_{10} concentration (in the case of potential health impacts) and other site-specific factors. Additional factors to consider when determining the sensitivity of the area include:

- Any history of dust generating activities in the area
- The likelihood of concurrent dust generating activity on nearby sites
- Any pre-existing screening between the source and the receptors
- Any conclusions drawn from analysing local meteorological data which accurately represent the area and if relevant
- The season during which the works will take place
- Any conclusions drawn from local topography
- The duration of the potential impact (as a receptor may become more sensitive over time)
- any known specific receptor sensitivities which go beyond the classifications given in the IAQM document.

The IAQM guidance for assessing the sensitivity of an area to dust soiling is shown in **Table A-2**. The sensitivity of the area should be derived for each of activity relevant to the Project (i.e. construction and earthworks).

Table A-2 IAQM - Categorising the Sensitivity of an Area to Dust Soiling Impacts

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Note: Estimate the total number of receptors within the stated distance. Only the *highest level* of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors < 20m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors < 50 m is 102. The sensitivity of the area in this case would be high.

A modified version of the IAQM guidance for assessing the *sensitivity of an area* to health impacts is shown in **Table A-3**. For high sensitivity receptors, the IAQM methods takes the existing background concentrations of PM_{10} (as an annual average) experienced in the area of interest into account and is based on the air quality objectives for PM_{10} in the UK. As these objectives differ from the ambient air quality criteria adopted for use in this assessment (i.e. an annual average of 25 µg/m^3 for PM_{10}) the IAQM method has been modified slightly.

This approach is consistent with the IAQM guidance, which notes that in using the tables to define the *sensitivity of an area*, professional judgement may be used to determine alternative sensitivity categories, taking into account the following factors:

- any history of dust generating activities in the area
- the likelihood of concurrent dust generating activity on nearby sites
- any pre-existing screening between the source and the receptors
- any conclusions drawn from analysing local meteorological data which accurately represent the area, and if relevant the season during which the works will take place
- any conclusions drawn from local topography
- duration of the potential impact
- any known specific receptor sensitivities which go beyond the classifications given in the IAQM document.

Table A-3 IAQM - Categorising the Sensitivity of an Area to Dust Health Impacts

Receptor sensitivity	Annual Mean PM_{10}	Number of receptors [a,b]	Distance from the source (m)			
			<20	<50	<100	<250
High	>25 µg/m³	>100	High	High	High	Medium
		10-100	High	High	Medium	Low
		1-10	High	Medium	Low	Low
	21-25 µg/m³	>100	High	High	Medium	Low
		10-100	High	Medium	Low	Low
		1-10	High	Medium	Low	Low
	17-21 µg/m³	>100	High	Medium	Low	Low
		10-100	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	<17 µg/m³	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	>25 µg/m³	>10	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	21-25 µg/m³	>10	Medium	Low	Low	Low
		1-10	Low	Low	Low	Low
	17-21 µg/m³	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
	<17 µg/m³	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low

Notes: (a) Estimate the total within the stated distance (e.g. the total within 250 m and not the number between 100 and 250 m); noting that only the highest level of area sensitivity from the table needs to be considered.

(b) In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties.

The IAQM Guidance matrix used to categorise the sensitivity of the area to ecological impacts from dust is presented in **Table A-4**.

Table A-4 IAQM - Categorising the Sensitivity of an Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Notes: (a) The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout and for each designated site.

(b) Only the highest level of area sensitivity from the table needs to be considered.

(c) For trackout, the distances should be measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site.

A.4 Step 2c – Risk Assessment

The dust emission magnitude from Step 2a and the receptor sensitivity from Step 2b are then used in the matrices shown in **Table A-5** (demolition), **Table A-6** (earthworks and construction) and **Table A-7** (track-out) to determine the risk category with no mitigation applied.

Table A-5 Risk Category from Demolition Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table A-6 Risk Category from Earthworks Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A-6 Risk Category from Construction Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A-7 Risk Category from Track-out Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Large
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

A.5 Step 3 - Site-Specific Mitigation

Once the risk categories are determined for each of the relevant activities, general management measures and management measures for the four dust generating activities (demolition, earthworks, construction, trackout) can be identified based on whether the Site is a low, medium or high risk site.

A.6 Step 4 – Residual Impacts

After Step 3, it should then be determined whether there are residual significant impacts. For almost all construction activity, the IAQM Guidance notes that the aim should be to prevent significant effects on receptors through the use of effective mitigation, and that experience shows that this is normally possible. Providing that the appropriate level of dust control is effectively implemented, the residual effects will normally be *negligible* or not significant.

It is noted though that there all situations are assessed on a case-by-case basis as certain site restrictions may limit the ability to effectively implement mitigation measures, such as inadequate access to water for dust suppression. It is important that the specific characteristics of the site and the surrounding area are considered to ensure that the conclusion of *negligible* residual impacts is robust.

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