Badgerys Creek DHL Development – Precinct 1

Air Quality Impact Assessment

DHL Supply Chain (Australia) Pty Ltd

Level 4, Building C, 1 Homebush Bay Drive
RHODES NSW 2138

Prepared by:

SLR Consulting Australia

SLR Project No.: 610.30951.00200

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Making Sustainability Happen

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
v1.0	1 October 2024	K Barker	J A Cox	J A Cox
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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 DHL Supply Chain (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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1.0 Introduction

This report supports a State Significant Development Application (**SSDA**) (**SSD-70818708**) submitted to the NSW Department of Planning, Housing and Industry (**DPHI**) on behalf of DHL Supply Chain (Australia) Pty Ltd (**DHL**).

The SSDA constitutes a detailed development application (**DA**) insofar that it is linked to and is consistent with concept plan (**SSD- 70316465**) by seeking consent for the construction and operation of two singular storey industrial buildings for use as a warehouse and logistics facility with 24 hour/ seven day a week operation plus car parking and associated landscaping within part (25 hectares) of Lot 1 in Deposited Plan 1306448 at 1953-2109 Elizabeth Drive, Badgerys Creek known as the DHL Masterplan site.

Assessments of potential air quality impacts associated with the Burrah Park SSDA, including those generated by Stage 2 site preparation and bulk earthworks (which encompass the DHL site), are addressed as part of that separate SSDA.

This air quality impact assesses the construction and operational air quality impacts associated with the warehouse buildings proposed under this SSDA and represents the first of two (2) SSDAs proposed by DHL and will apply to the southern half of the DHL Masterplan site (Precinct 1, consisting of Warehouse 3 and Warehouse 4),, known as “the site” (**the site**) refer to **Figure 3**.

Stage 2 relates to the northern half of the DHL Masterplan site, known as the DHL Stage 2 site and is subject to a separate SSDA (**SSD-70817958**).

The project vision is to develop a world-class warehouse and logistics facility which is fully integrated with its green infrastructure and Connection to Country. Having been informed by key landscape and Connecting to Country themes, the development of the site can deliver on the objectives that contribute to the Aerotropolis Vision, which is to:

- Achieve a landscape led approach and starting with Country- the project has been guided by Cultural Design Principals and local leaders in the Aboriginal community.
- Create a new global gateway which will be a regionally and nationally significant employment area by providing for warehouse and logistics land uses in a highly sought-after location adjacent to the new Western Sydney Airport.
- Design a cool, green new city with a landscape approach that increases urban tree canopy, provides usable open space areas throughout and restores key riparian corridors on the site.
- Transitioning to an Aerotropolis through a sustainable, orderly and transformational development in the Western Sydney Aerotropolis,
- Retaining a green, biodiverse landscape informed by Country and an indigenous lens on maintenance and land management.

2.0 Background

The DHL Masterplan site occupies approximately 25 hectares (ha) of the larger 171.84 ha site at 1953-2109 Elizabeth Drive, Badgerys Creek. The wider site is currently the subject of an existing SSDA (SSD- 70316465).

SSD- 70316465: 1953-2109 Elizabeth Drive 'Burra Park'

SSD- 70316465 is an SSDA which was issued SEARs on 22 May 2024 and is currently in the process of finalising the application for lodgement following the Test of Adequacy with the DPHI in September 2024.

SSD- 70316465 is seeking development consent for a concept plan including future development lots and building footprints. The development also seeks consent for the Stage 1 works, which will include bulk earthworks across the site, infrastructure delivery, road access/intersections, internal road construction, civil infrastructure and utilities, stormwater infrastructure works and the construction of three (3) warehouse buildings.

The applicant for SSD- 70316465 is the trustee for Burra Park Prop Trust 1 which is a joint venture entity, with ISPT Core Fund and UniSuper each holding an equal share.

DHL intend to develop part of the site for a logistics facility, the subject of this SSDA. The DHL Masterplan Site is known as Super lot 4a and 4b within the wider concept plan. Super lot 5B to the north of the DHL Logistics Facility SSDA lots have been sold to Canberra Data Centres (CDC) refer to **Figure 3**.

3.0 Site Description

The subject site is located within part of Lot 1 in Deposited Plan 1306448, at 1953-2109 Elizabeth Drive, Badgerys Creek. The site is approximately 25 hectares in size and situated north of the new Western Sydney Airport. It is located within the Penrith local government area (**LGA**) and is approximately 12.5km from Penrith Central Business District (**CBD**), 27km from Parramatta CBD, and 47km from Sydney CBD. The site is owned by Roberts Jones Development Pty Ltd.

The site is currently used for agricultural purposes and is largely cleared of vegetation with areas of dispersed grass and scattered natural and/or planted tree growth. The site contains several farm dams, primarily within the central and southern areas. The location context and aerial plans are depicted in **Figure 1** and **Figure 2**.

Figure 1 Location Context Area Plan

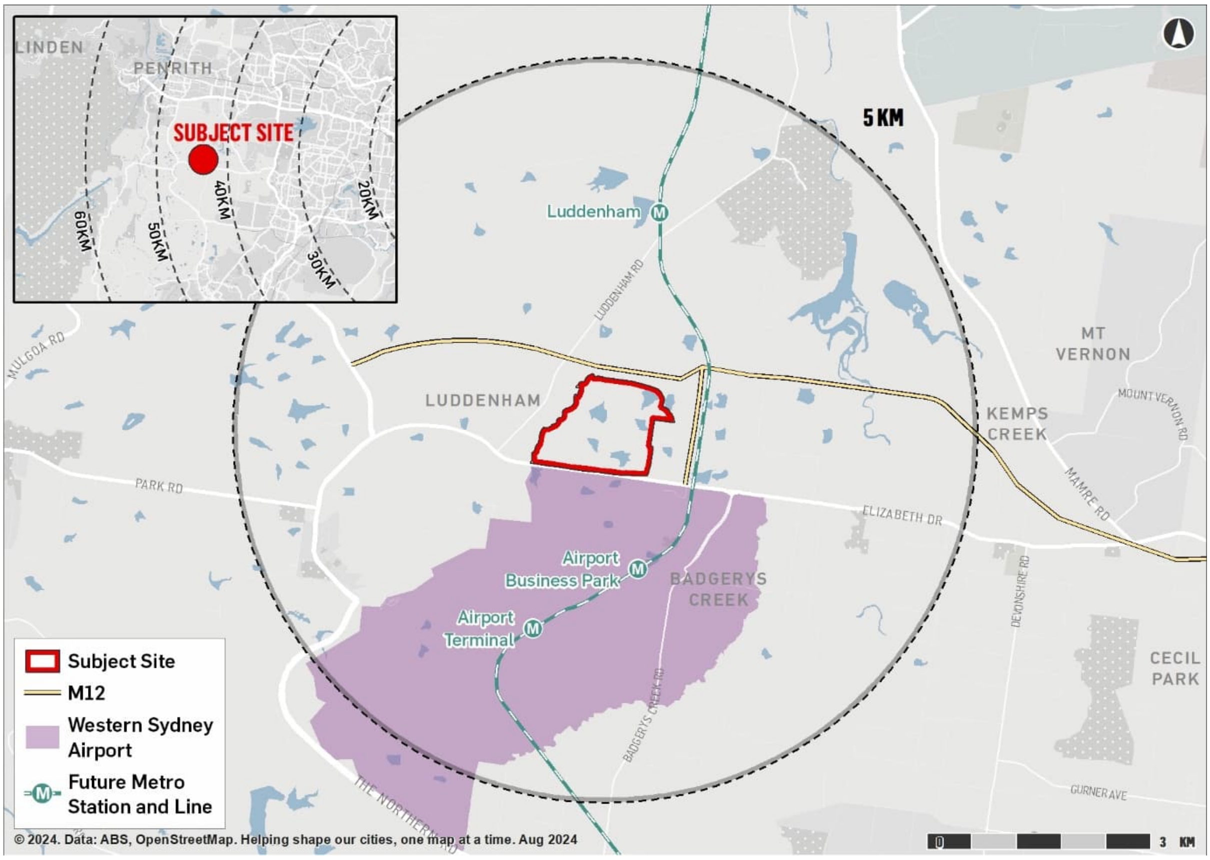


Figure 2 Site Location Plan

Figure 3 DHL Masterplan Site

4.0 Planning Approvals Strategy

Development consent is sought under Section 4.12(8) and Division 4.4. of the *Environmental Planning and Assessment Act 1979* (**EP&A Act**) and Division 5 of the *Environmental Planning and Assessment Regulation 2021* (**EP&A Regulation**) for the construction and operation of a warehouse and logistics facility (**the Project**) under Schedule 1 of *State Environmental Planning Policy (Planning Systems) 2021* (**Planning Systems SEPP**).

5.0 Project Description

Specifically, the SSDA seeks consent for:

Staged construction of warehouse buildings for use as a logistics centre with 24 hour/ day, seven days a week operation, comprising the following:

- Construction of two warehouses;
- Building fit out;
- Construction of hardstand, loading and carparking;
- Landscaping works; and
- Signage.

6.0 Secretary’s Environmental Assessment Requirements

The Department of Planning and Environment provided industry specific Secretary’s Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development on 22 May 2024.

This report has been prepared to accompany the EIS. It addresses the relevant requirements of the SEARs for the project. A summary of the relevant SEARs is listed below.

The Department of Planning and Environment provided industry specific Secretary’s Environmental Assessment Requirements (SEARs) to DHL for the preparation of an Environmental Impact Statement (EIS) for the proposed development on 23 May 2024.

This report has been prepared to accompany the EIS. It addresses the relevant air quality requirements of the SEARs for the project. A summary of the relevant SEARs is listed in **Table 1** below.

Table 1 Regulatory Requirements – Air Quality

Secretary’s Environmental Assessment Requirements	Section
Identify significant air emission sources at the proposed development (during construction and operation)	**Section 7.3.1** (Construction) **Section 7.3.2 (**Operation)
Assess their potential to cause adverse off-site impacts	**Section 12.0** (Construction) **Section 13.0** (Operation)
Detail proposed management and mitigation measures that would be implemented	**Section 12.1.4** (Construction)
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	N/A

7.0 Approach to Assessment

Detailed information on the operational activities within the proposed warehouse building (type of activities, potential emissions, locations of ventilation stacks, etc.) is not yet available. A large number of assumptions would therefore be required to be used as input to any quantitative (i.e. air dispersion modelling) assessment. Similarly, a quantitative modelling assessment of potential dust emissions associated with the construction activities would also 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 studies 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.

SLR has therefore performed a qualitative (risk-based) assessment of both construction and operational impacts, based on the information available, to identify those activities that have the potential for off-site air quality impacts if not adequately controlled, so that appropriate mitigation measures can be identified and incorporated into the project design and relevant environmental management plans.

7.1 Construction Impact Assessment Methodology

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 the significance of remaining activities after management measures have been considered.

7.2 Operational Impact Assessment Methodology

To estimate potential peak impacts associated with vehicle movements generated by 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 to 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.

7.3 Potential Sources of Emissions

7.3.1 Construction

The main air quality issue associated with construction works (including remediation works) relates 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:

- Demolition of the existing buildings;
- Grading;
- Loading and unloading of materials;
- Wheel-generated dust and combustion emissions from construction equipment;
- Wheel-generated dust from trucks travelling on unpaved surfaces; and
- 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 being used, localised elevations in ambient concentrations of combustion-related pollutants may also occur, however any potential for the relevant impact assessment criteria for these pollutants to be exceeded at surrounding sensitive areas will be minimal. Fugitive dust emissions are generally considered to have the greatest potential to give rise to downwind air quality impacts at construction sites and combustion emissions during construction have not been considered further.

7.3.2 Operations

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 warehouse 3 and warehouse 4 or idling at the Site during loading/unloading operations.

Emissions associated with the combustion of fuel (diesel, petrol, etc.) in road vehicles will include carbon monoxide (CO), oxides of nitrogen (NOx), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2) and volatile organic compounds (VOCs).

The 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, the number and speed of vehicles and the road gradient.

Based on car parking requirements in DCP 2021, the maximum and minimum parking rates for the current design are 1 space/100 m^2 and 1 space/250 m^2, respectively.

As shown in **Table 2**, The peak traffic movements for Warehouses 3 and 4 are anticipated to be 89 and 81 vehicles/hour in the AM period, and 65 and 56 vehicles/hour in the PM period, respectively.

Table 2 Peak Traffic Movements for the DHL Site (Warehouse 3,4)

	Peak hour traffic volume (vph[1])	
	AM	PM
Warehouse 3	89 trips	61 trips
Warehouse 4	81 trips	56 trips
Total	**170 trips**	**117 trips**
[1] vehicles per hour		

To put the above traffic generation rates in context, preliminary traffic modelling estimates provided by Stantec show that the peak traffic volumes along Elizabeth Drive for 2026 are expected to be approximately 500 vehicles/hour, increasing to approximately 850 vehicles/hr by 2041. The Project-related peak hourly traffic movements are therefore estimated to be approximately 34% of the Elizabeth Drive projection in 2026.

8.0 Pollutants of Concern

As identified in **Section 7.3.1** and **Section 7.3.2**, the key air pollutants of interest are considered to be the particulate matter from construction works, and traffic emissions (products of fuel combustion and wheel-generated particulate matter) from operations.

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 termed 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.

Nuisance Dust

In addition to the health effects of suspended particulate matter, nuisance impacts also need 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.

Products of Combustion

Emissions associated with road traffic and the combustion of fossil fuels (diesel, petrol, AVGAS, etc.) 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).

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 the 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.

Oxides of nitrogen (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 sulfur dioxide (SO_2) due to impurities in the fuel. The sulfur content of diesel fuel in Australia has been significantly reduced over the years, and ambient SO_2 concentrations in Australian cities are typically well below regulatory criteria.

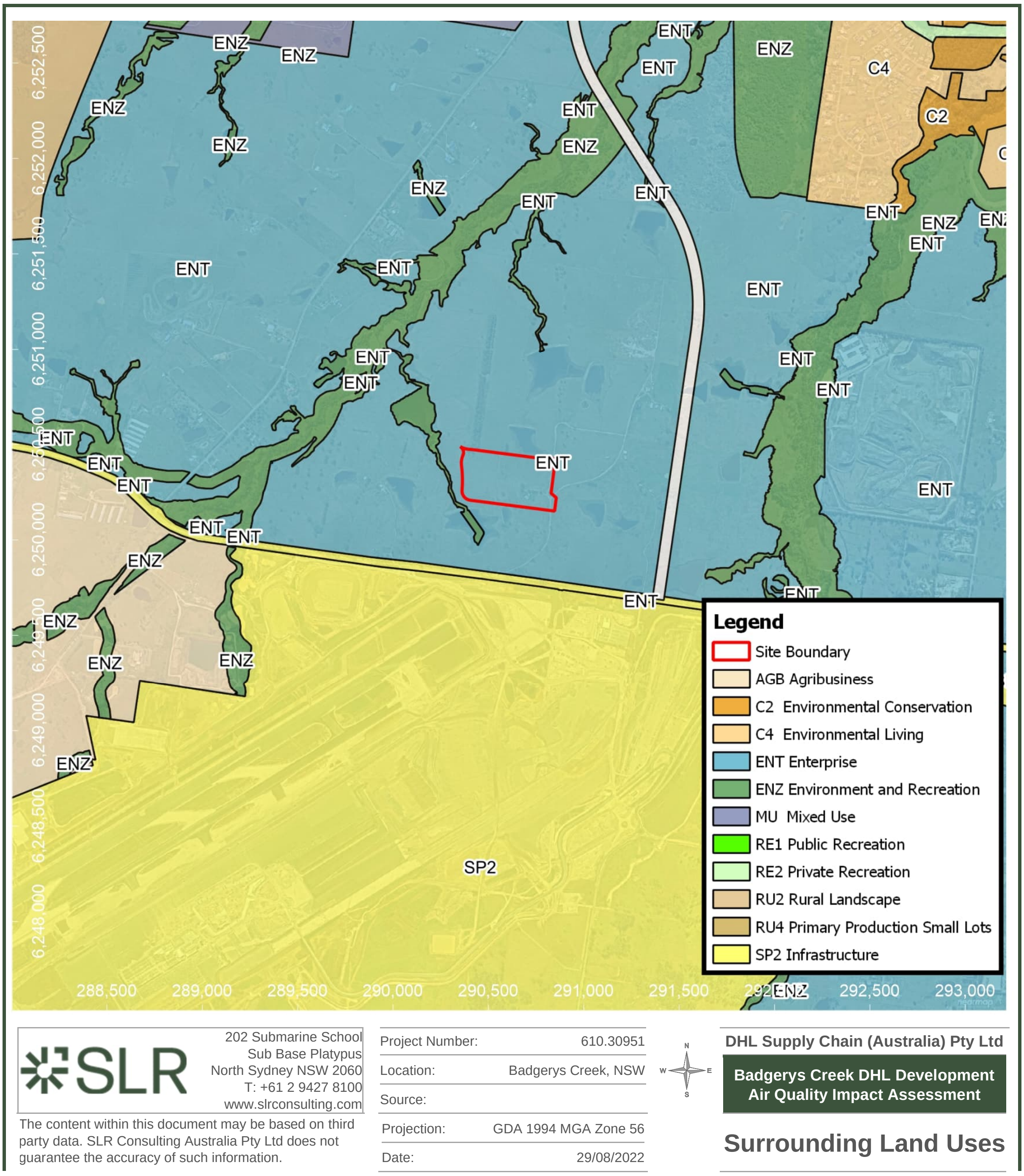
Volatile organic compounds (VOCs) may be emitted as a result of the incomplete combustion of fuel. VOC emissions are reducing significantly due to the improved combustion processes offered by modern engines.

9.0 Receiving Environment

9.1 Surrounding Land Uses and Sensitive Receptors

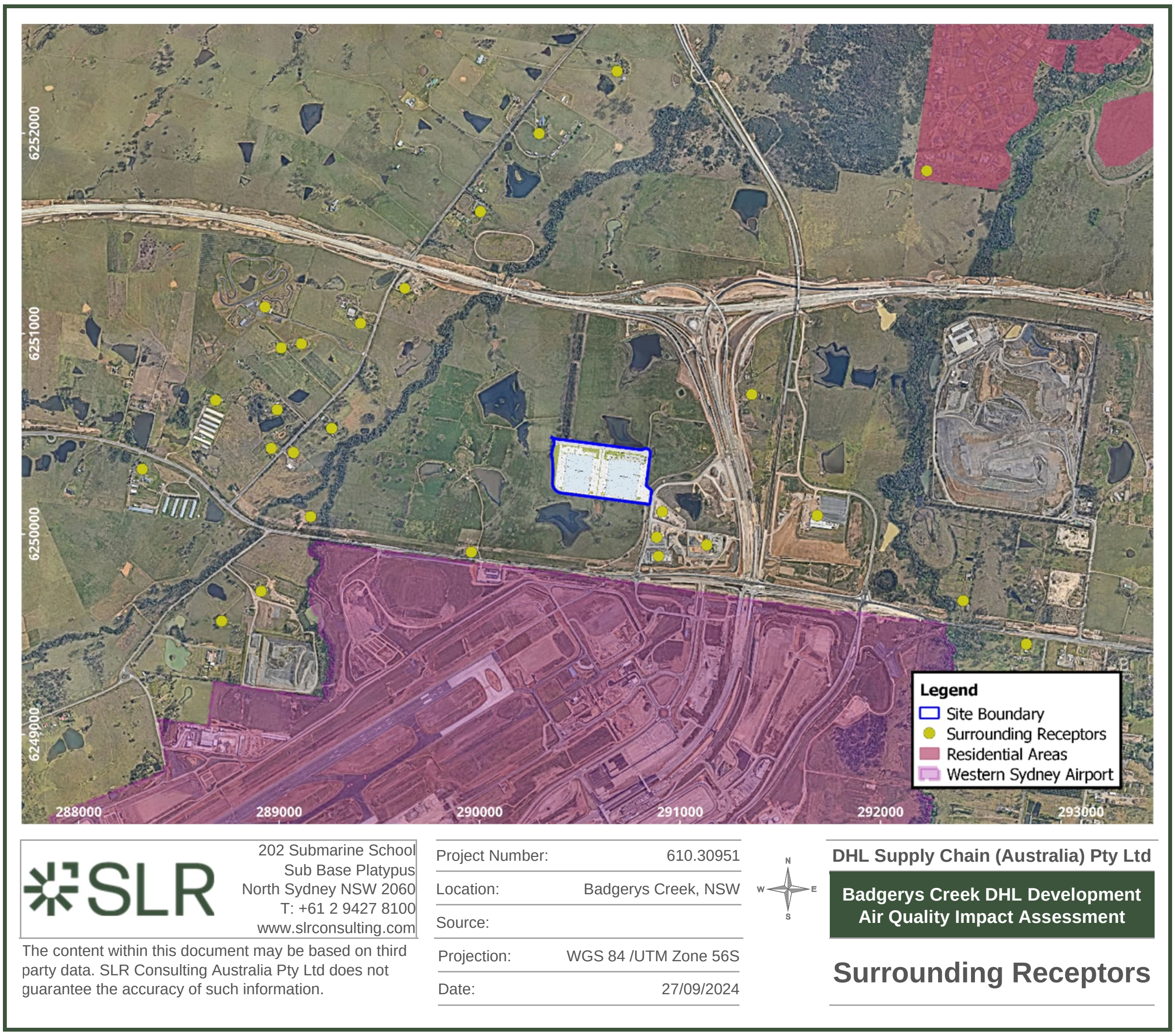
As shown in **Figure 4**, the Site and its adjacent areas are zoned as Enterprise (ENT). Areas west of the Site along Cosgrove Creek and to the east along Badgery's Creek are zoned as Environment and Recreation (ENZ). The area to the south of the Site, on the other side of Elizabeth Drive zoned as Infrastructure (SP2), is the site of the Western Sydney International Airport.

Figure 4 Surrounding Land Uses



The closest residential receptor is located approximately 900 meters (m) to the west of the Site, with the next closest ranging between 980 m to 1.5 km to the west and northwest along Luddenham Road (see **Figure 5**). However, the closest receptor to the road used by vehicles is approximately 20 m from the kerbside of Elizabeth Drive to the southeast of the Site.

Figure 5 Surrounding Receptors

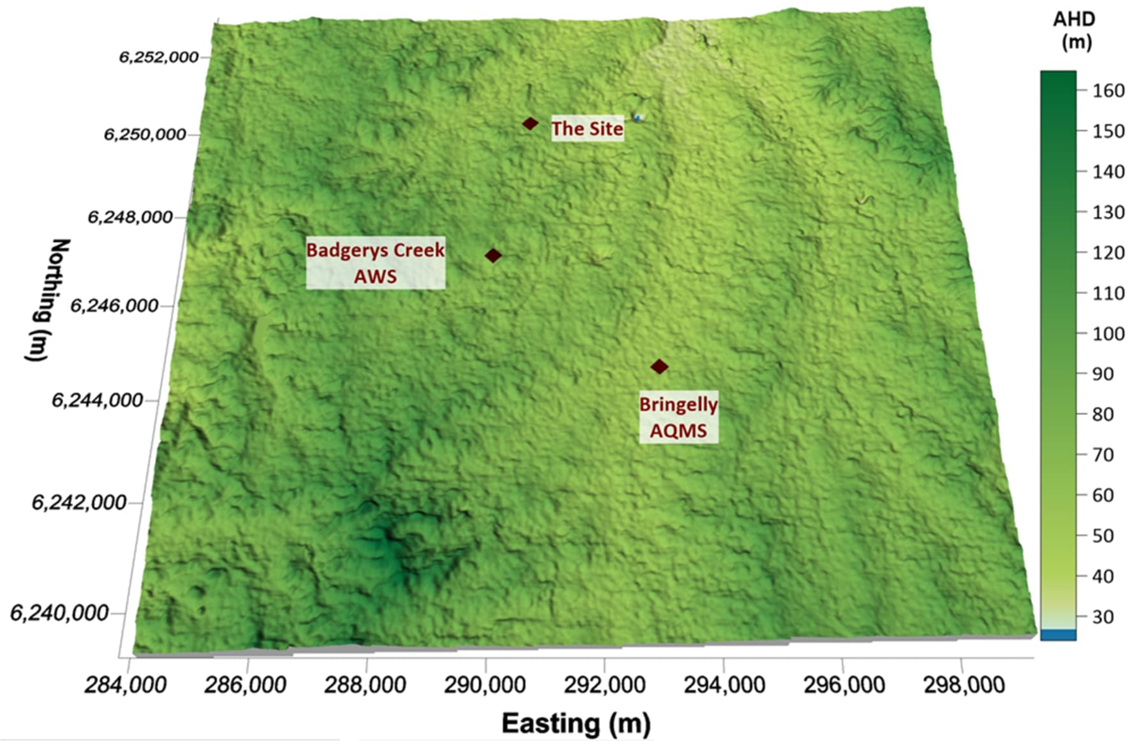


9.2 Topography

Local 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.

The topography of the Site and near surrounds is relatively flat with an elevation of approximately 60 m Australian Height Datum (AHD). A three-dimensional representation of the region surrounding the Site is presented in **Figure 6**. The locations of the Badgerys Creek automatic weather station (AWS; refer to **Section 9.3**) and the Bringelly air quality monitoring station (AQMS; refer to **Section 11.0**) are also indicated.

Figure 6 Regional Topography



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Project Number:	610.30951
Location:	Badgerys Creek, NSW
Source:	
Projection:	UTM Zone 56
Date:	29/08/2022

DHL Supply Chain (Australia) Pty Ltd
Badgerys Creek DHL Development
Air Quality Impact Assessment
Topography

9.3 Local Meteorological Conditions

Wind Speed and Wind Direction

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, determine 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 the past five years, 2019-2023, compiled from data recorded by the Badgerys Creek AWS (which is located 3.2 km to the south-southwest of the Site, see **Section 9.2**) are presented in **Figure 7**. 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 average annual wind rose for the years 2019-2023 indicates that winds at Badgerys Creek AWS are predominantly between 1.5 m/s and 8.0 m/s. Calm wind conditions were predicted to occur 8.9% of the time over the 5-year period reviewed.

The seasonal wind roses indicate that typically:

- In spring and summer, there are winds present from each direction with less frequent winds from the north-western quadrant but a higher frequency of wind to the south-eastern quadrant in summer. On average, calm winds are experienced 9.8% of the time during spring and 7.3% of the time during summer.
- In autumn, winds predominantly blow from the south-western quadrant, with the lowest frequency of winds from the northwest. On average, calm winds are experienced 9.3% of the time during autumn.
- In winter, winds predominantly blow from between southwest directions, with the lowest frequency of winds from the south-eastern quadrant. On average, calm winds are experienced 9.1% of the time during winter.

As identified in **Section 9.1** the closest sensitive receptors are located to the west of the Site. The conductive winds, which would blow air emissions from the Site towards the nearest receptors (from northeast to southeast), occur less than 30% of the time.

The Site has the potential to be downwind of the Western Sydney Airport for a relatively significant percentage of the time, particularly during autumn and winter. Winds that would blow dust and odours from the Kemps Creek Resource Recovery Park occur most commonly during spring and summer. Westerly winds that would transport odours from the poultry farms to the west are relatively infrequent, but most likely to occur during winter.

Figure 7 Annual and Seasonal Wind Roses – Badgerys Creek AWS (2019-2023)

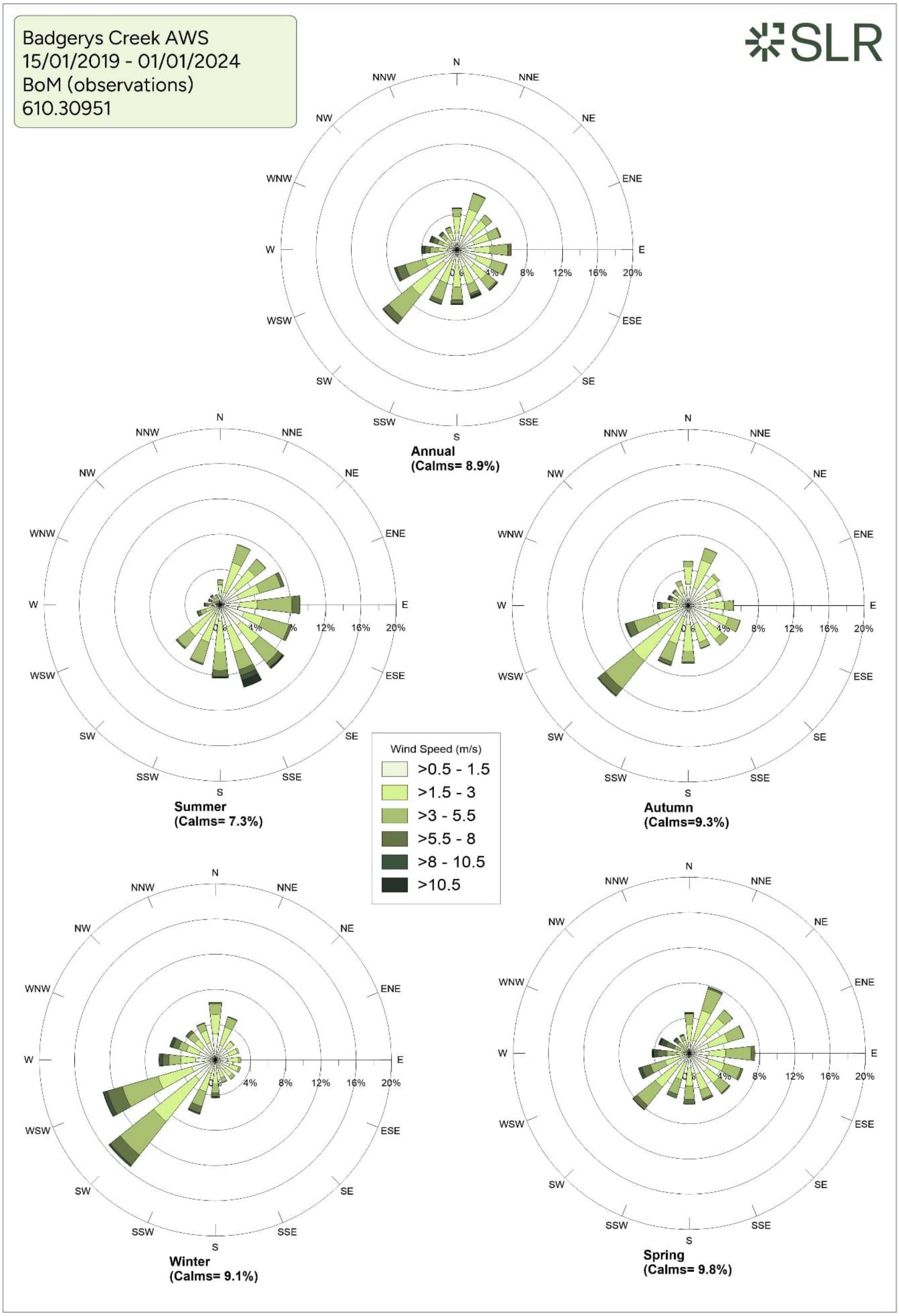
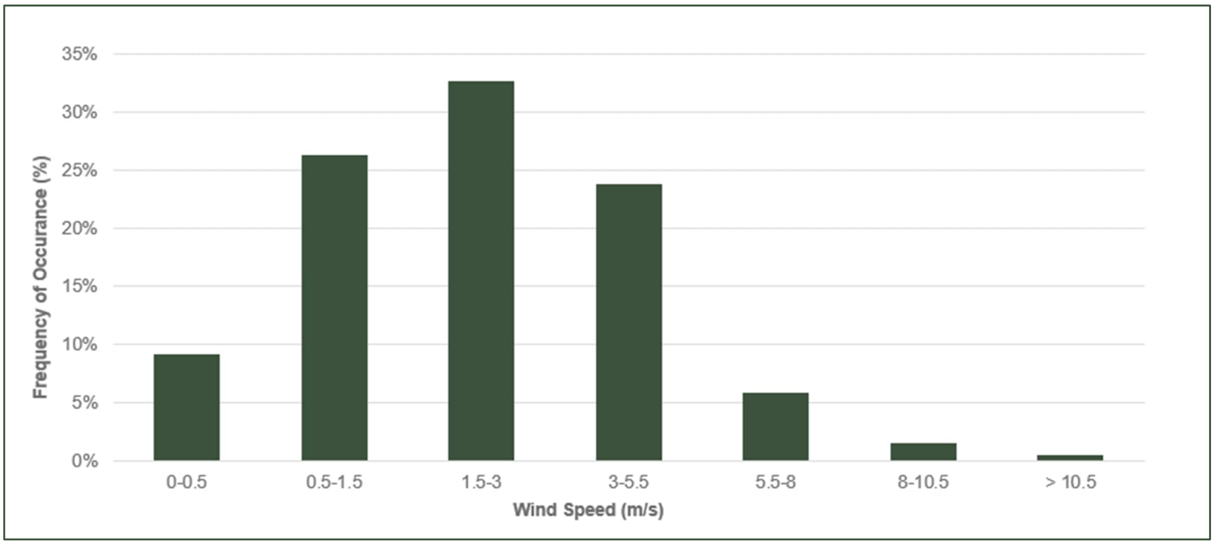


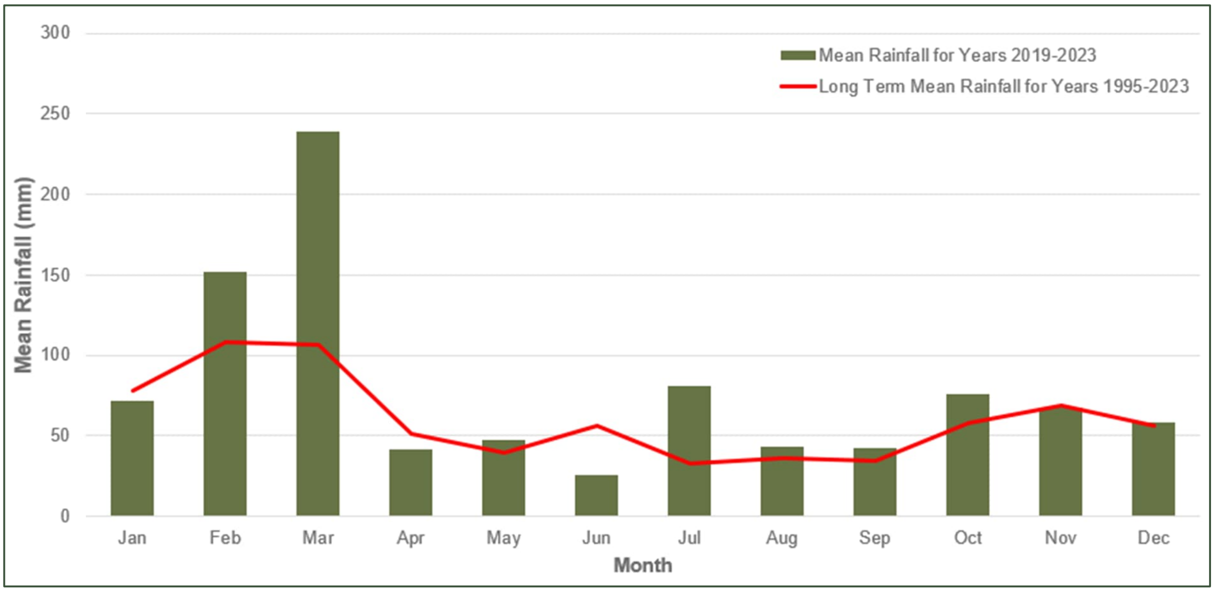
Figure 8 Wind Speed Frequency Chart for Badgerys Creek AWS – 2019-2023



Rainfall

Dry periods (no rainfall) have the greatest potential for fugitive dust emissions during construction works. The long-term monthly rainfall averages recorded by the Badgerys Creek AWS rain gauge are shown in **Figure 9**. This plot shows that generally rainfall is lower from mid-autumn to early-winter and late-spring to early-summer. This rainfall pattern suggests that dust emissions from the construction works at the Site have the greatest potential to impact on off-site receptors during those times.

Figure 9 Long term Mean Rainfall for Badgerys Creek AWS – 1995 to 2023



10.0 Air Quality Criteria

State air quality guidelines specified by the NSW Environmental Protection Agency (EPA) for the pollutants identified in **Section 8.0** are published in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA 2022) [hereafter 'Approved Methods']. The ground level 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 particulate matter and nuisance dust are shown in **Table 3**. A summary of the relevant impact assessment criteria for products of combustion is provided in **Table 4**.

Table 3 NSW EPA Impact Assessment Criteria for Particulate Matter and Nuisance Dust

Pollutant	Averaging Period	Assessment Criteria(µg/m^3)
Total Suspended Particulate (TSP)	Annual	90
Particulate Matter (PM_{10})	Annual	50
	24-hour	25
Particulate Matter ($PM_{2.5}$)	Annual	25
	24-hour	8
Deposited Dust	Annual	2 (maximum increase in deposited dust level)
		4 (maximum total deposited dust level)

Table 4 NSW EPA Impact Assessment Criteria for Combustion Gases

Pollutant	Averaging Period	Assessment Criteria
CO	15 minutes	100 mg/m^3
	1 hour	30 mg/m^3
	8 hours	10 mg/m^3
NO_2	1 hour	164 µg/m^3
	Annual	31 µg/m^3
SO_2	1 hour	215 µg/m^3
	24 hours	57 µg/m^3

11.0 Background Air Quality

11.1 Regional Air Quality

Air quality monitoring is performed by the NSW Department of Planning and Environment (DPE) at a number of monitoring stations across NSW. The closest station to the Site is the Bringelly Air Quality Monitoring Station (AQMS), located approximately 6 km to the southeast (see **Section 9.2**). The following air pollutants are monitored at this station:

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

A summary of the monitored pollutant concentrations for the last five years (2019-2023) is presented in **Table 5** and the data are presented graphically in **Figure 10** to **Figure 14.**

Table 5 Summary of Air Quality Monitoring Data at Bringelly AQMS (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	134.0 (24)	23.3	178.0 (27)	11.1	69.7	11.2	80.1	11.4
2020	241.8 (11)	18.1	78.1 (12)	8.2	61.5	6.3	62.9	8.6
2021	69.0 (1)	15.0	57.4 (3)	7.2	49.2	7.1	25.7	5.7
2022	28.7	11.9	17.8	5.0	45.1	5.9	28.6	5.7
2023	53.2 (1)	15.7	45.4 (3)	6.7	51.3	6.2	25.7	8.6
Criteria	**50**	**25**	**25**	**8**	**164**	**31**	**215**	**57**

numbers in brackets represent number of exceedances of relevant criteria recorded each year.

Exceedances of the 24-hour average PM_{10} and $PM_{2.5}$ criteria were recorded by the Bringelly AQMS each year over the period analysed except for 2023. Exceedances of the annual average $PM_{2.5}$ criterion were also recorded for the years 2019 and 2020.

A review of the available compliance monitoring reports indicates that the PM_{10} and $PM_{2.5}$ exceedances during these years 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). 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 the exceedances occurred during mid-September, when air quality impacts from large hazard reduction burns were 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.

As discussed in **Section 7.3.1**, the Western Sydney Airport is currently under construction approximately 450 m to the south. Given the very large scale of the airport construction works, there is potential for fugitive dust from that site to contribute to background particulate levels at and around the Project Site, and to result in potential cumulative impacts with any dust from the proposed Project construction activities.

Figure 10 Measured Daily Maximum 1-Hour Average NO_2 Concentrations at Bringelly AQMS (2019-2023)

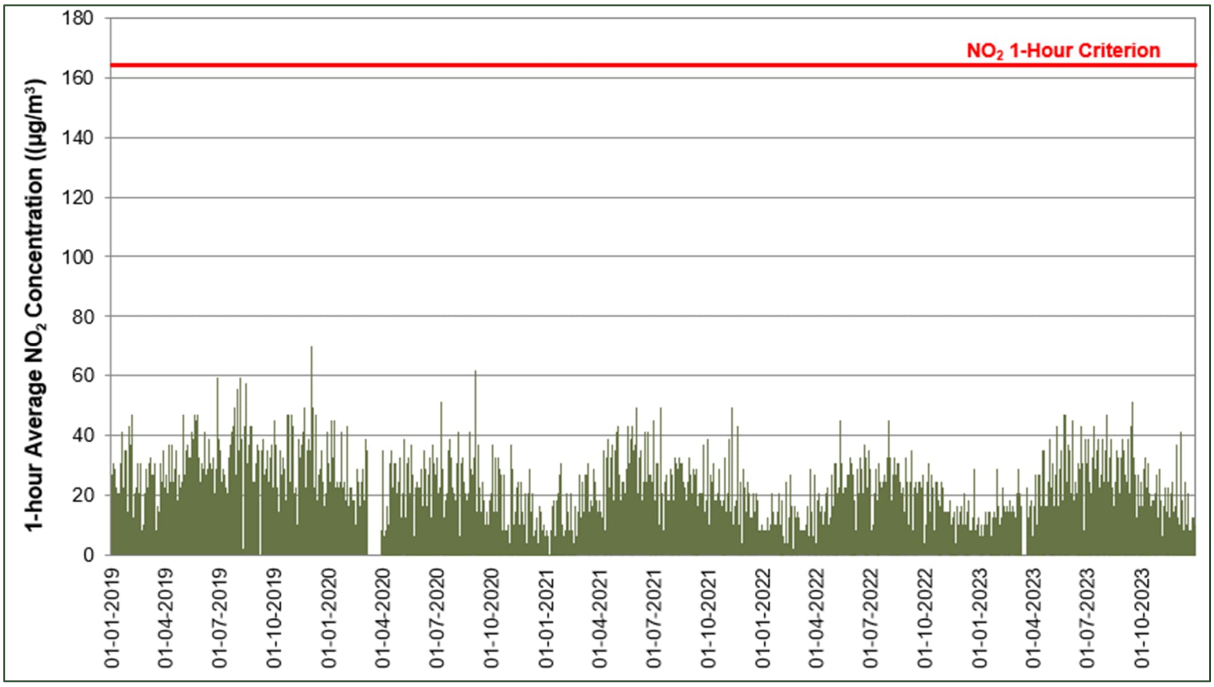


Figure 11 Measured Daily Maximum 1-Hour Average SO_2 Concentrations at Bringelly AQMS (2019-2023)

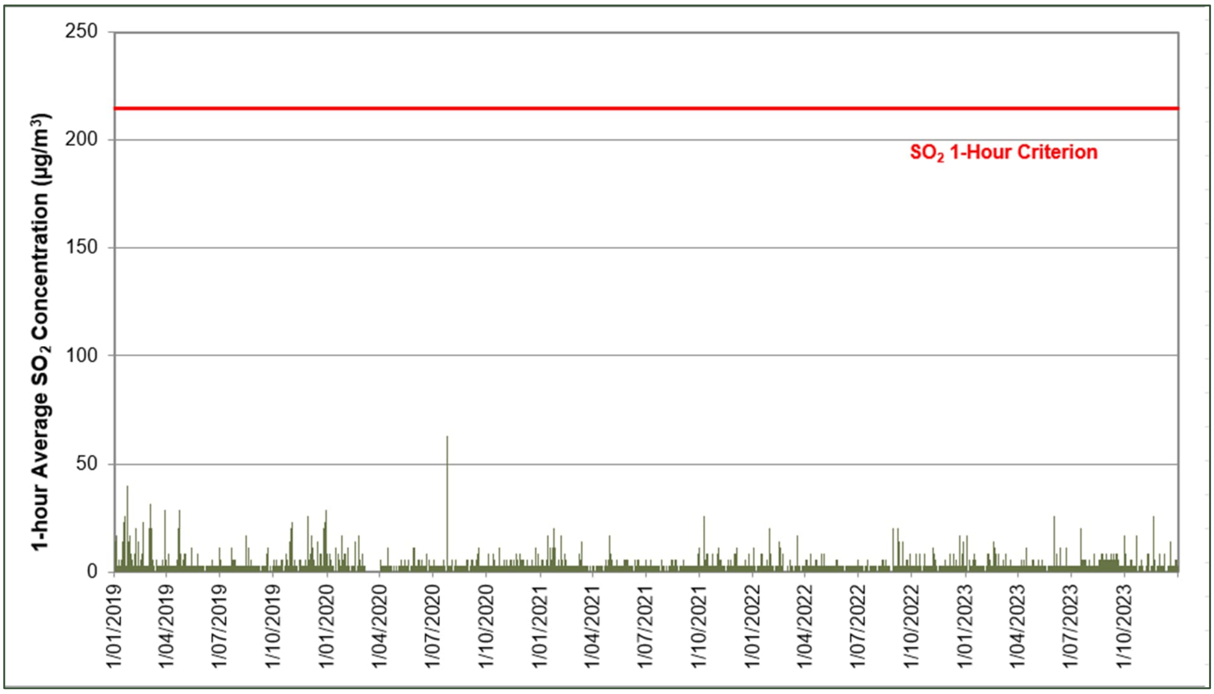


Figure 12 Measured 24-Hour Maximum SO_2 Concentrations at Bringelly AQMS (2019-2023)

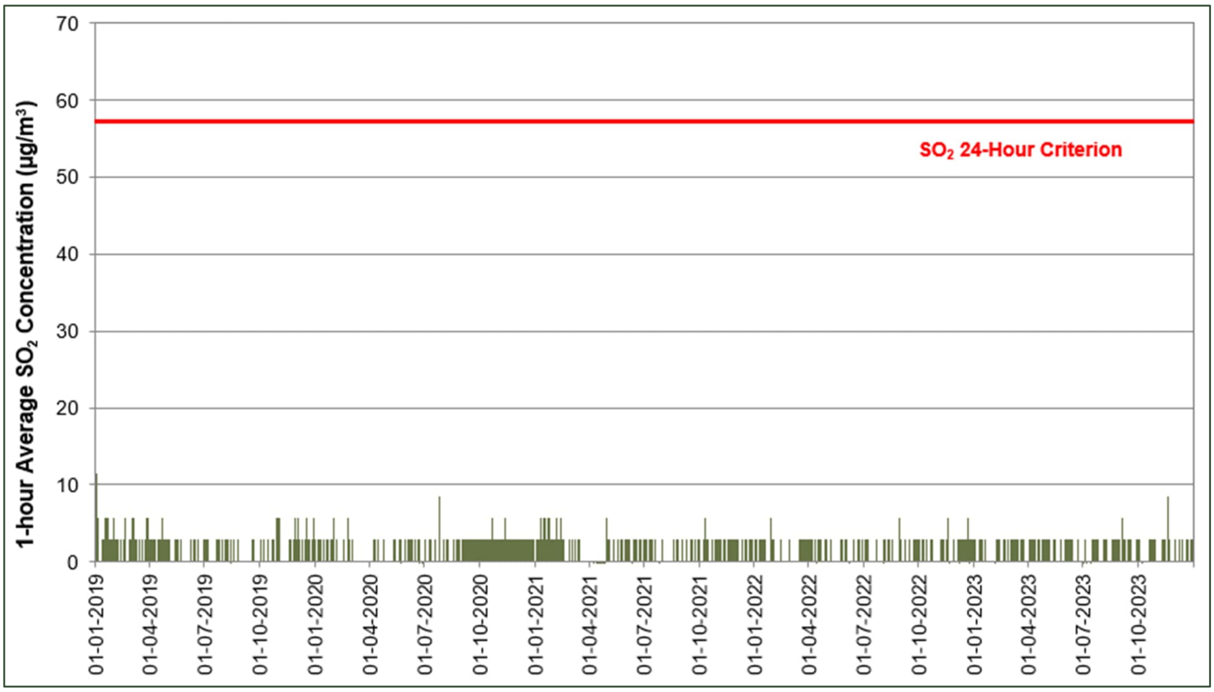


Figure 13 Measured 24-Hour Average PM_{10} Concentrations at Bringelly AQMS (2019-2023)

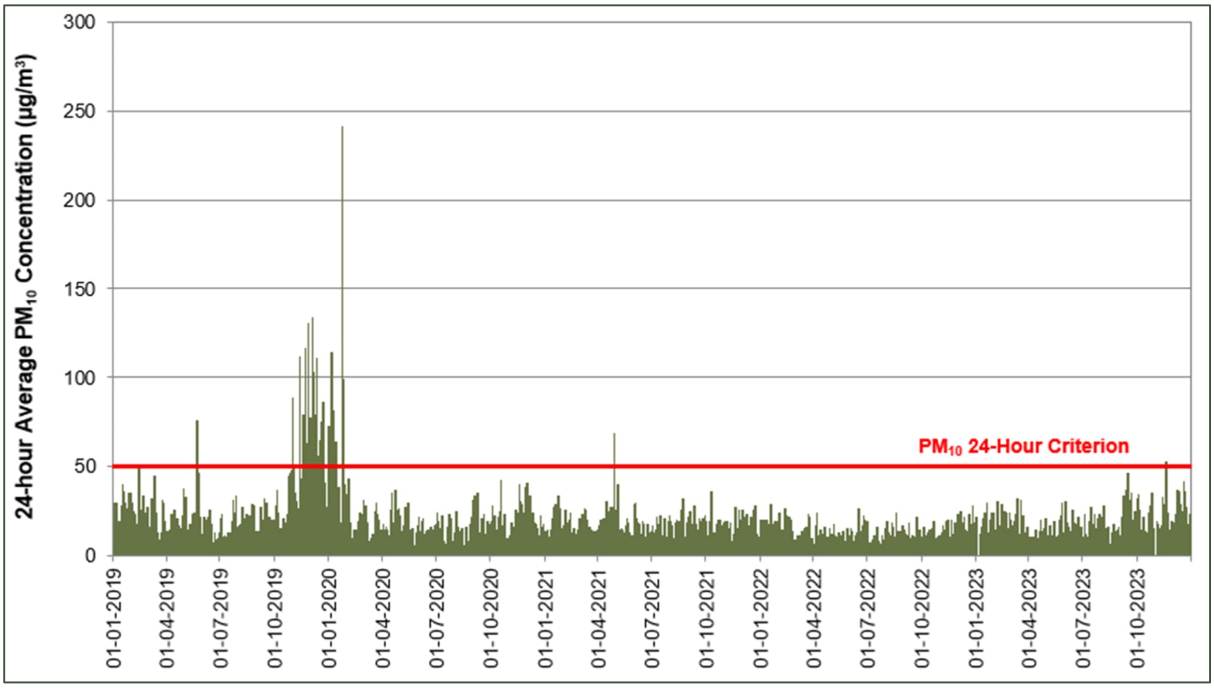
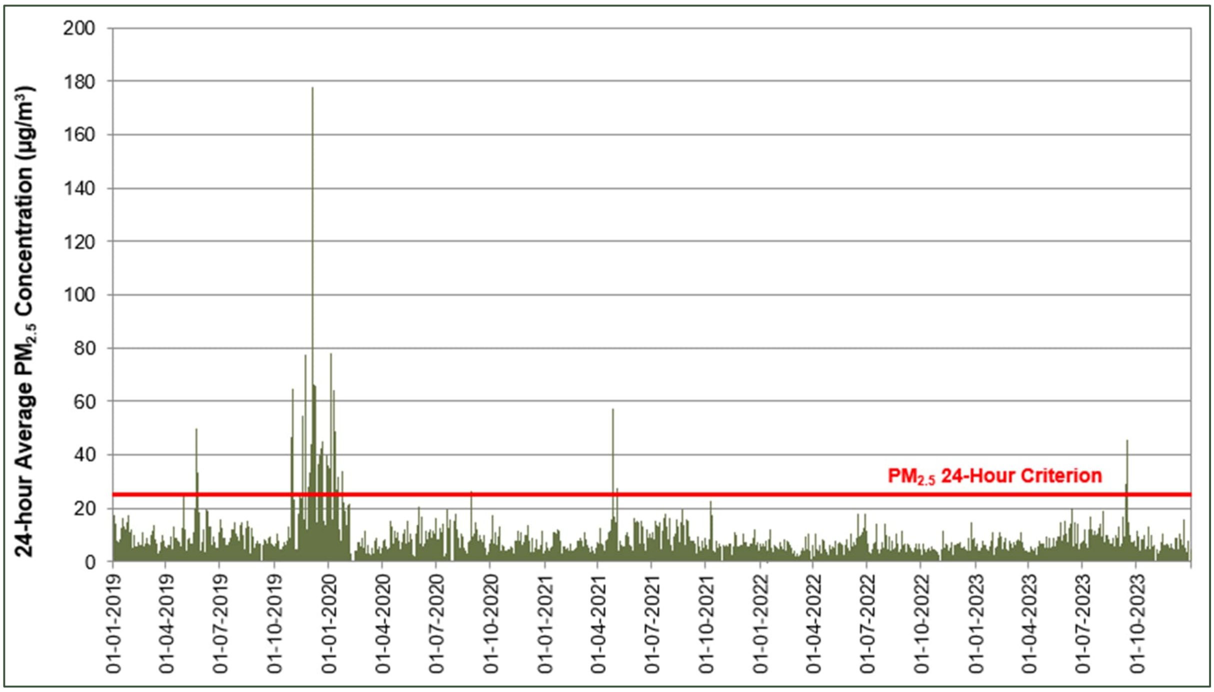


Figure 14 Measured 24-Hour Average $PM_{2.5}$ Concentrations at Bringelly AQMS (2019-2023)



11.2 Surrounding Sources of Air Pollution

The Cleanaway Kemps Creek Resource Recovery Park is located approximately 1.5 km to the east-northeast. This facility will be a potential source of dust and odour emissions. Poultry farms are currently located around 1.7 km to the west, which are another potential source of dust and odour emissions. Western Sydney Airport, which will be a source of fuel combustion and VOC emissions, is located 400 m south of the Site. Currently the airport site is a potentially significant source of fugitive dust due to the construction activities.

The application of minimum recommended separation distances (or ‘buffer’ distances) provides a valuable screening tool to judge whether a detailed assessment is required to evaluate the potential risk of conflicting land uses. Separation distances provide guidance on the appropriate level of separation between a source of emissions and sensitive land uses in order to mitigate the impacts of intended and unintended emissions on people. This approach relies on the knowledge that impacts on the environment generally decrease with increasing distance from the source of emissions. Separation distances are based on an understanding of the types of emissions associated with various industries and their potential impacts on people. These distances can vary based on the scale and size of the industry, location topography, prevailing winds and other factors.

Where there are no separation guidelines issued by NSW EPA, this assessment refers to guidelines set by other regulatory agencies in Australia including:

- Separation distance guidelines for air emissions (ACT Government 2018)
- Recommended land use separation distances - (NT EPA 2017)
- Evaluation distances for effective air quality and noise management (EPA SA 2023)
- Recommended separation distances for industrial residual air emissions (EPA WA 2015)

Poultry Farms

Table 6 shows the recommended separation distance for poultry farms. A separation distance of 1,000 m is conservatively considered for the surrounding poultry farms. Given the distance between the Site and the closest poultry farm, the buffer distance for the poultry farms do not encroach upon the Site boundaries.

Table 6 Separation Distances for Poultry Farms

Authority	Activity Definition	Separation Distance (m)
ACT Government	Keeping of poultry involving an enclosed shed area exceeding 1,000 m^2	750
EPA WA	Intensive Farming	300 – 1,000

Landfills

Table 7 shows the recommended separation distance for landfill facilities. Given the activities within the Cleanaway Kemps Creek Resource Recovery Park, a separation distance of 1,500 m is conservatively considered. Considering the distance between the Cleanaway Kemps Creek Resource Recovery Park and the Site, the buffer distance for the facility does not encroach upon the Site boundaries.

Table 7 Separation Distances for Waste Management Facilities

Authority	Activity Definition	Sub Class	Separation Distance (m)
ACT Government	Municipal solid waste and commercial and industrial waste landfill activities	Landfill	500
EPA NT	Landfills used for the discharge, or deposit of solid wastes onto land	Landfill Site Facility	500
	From an aerodrome for piston engine propeller driven aircraft		1,500
	From an aerodrome for jet aircraft		3,000
	From surface waters		Case by case
EPA SA	Waste or recycling depot	Landfill	500
EPA WA	Inert landfill site (Class I)	Landfill	300
	Putrescible landfill site (Class II & III)		1,000
	Secure landfill site (Class IV)		1,000
	Intractable waste landfill site (Class V)		1,000

12.0 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 IAQM method uses a four-step process for assessing 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.

As outlined above, the adopted quantitative 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.

12.1.1 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).

As a conservative approach and to ensure that sufficient mitigation measures are put in place, the assessment will be conducted in lieu of the use of the screening criteria.

12.1.2 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 8**.

Table 8 Categorisation of Dust Emission Magnitude

Activity	Dust Emission Magnitude	Basis
Demolition	Medium	**IAQM Definition:** Total building volume 12,000 m3 – 75,000 m3, potentially dusty construction material, demolition activities 6-12 m above ground level. **Relevance to this Project:** *There is a single existing residential building and associated sheds located in the southeastern corner of the Site that will be removed prior to construction. On this basis, the scale of demolition works is conservatively considered to be Medium.*
Earthworks	Large	**IAQM Definition:** 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. **Relevance to this Project:** *Total area of the Site is estimated to be approximately >110,000 m^2 and more than 10 heavy earth moving vehicles are expected to be operating on site at the peak construction period.*
Construction	Large	**IAQM Definition:** Total building volume greater than 100,000 m^3, piling, on site concrete batching; sandblasting. **Relevance to this Project:** *It is anticipated the building volume will exceed 100,000 $m^{3.}$*
Trackout	Large	**IAQM Definition:** More than 50 heavy vehicle movements per day, surface materials with a high potential for dust generation, greater than 100 m of unpaved road length. **Relevance to this Project:** *It is anticipated that more than 50 heavy vehicles movements per day will occur during the peak construction period.*

12.1.3 Step 2b – Risk Assessment

Receptor Sensitivity

Based on the criteria listed in **Table A1** in **Appendix A**, the sensitivity of the identified residential receptors in this study is conservatively concluded to be ***high*** for health impacts and ***high*** for dust soiling, as they are located where people may be reasonably expected to be present continuously as part of the normal pattern of land use.

Sensitivity of an Area

Based on the classifications shown in **Table A2** and **Table A3** in **Appendix A**, the sensitivity of the area to both dust soiling and health effects may be classified as ***low***. This categorisation has been made taking into account the individual receptor sensitivities derived above, the 5-year mean background PM_{10} concentration of 16.8 µg/m^3 recorded by the Bringelly AQMS (see **Section 11.0**) being between < 17 µg/m^3, and the number of sensitive receptors present in the vicinity of the Site (there are less than 10 sensitive receptors within 100 m of the site and no medium sensitive receptors within 20 m of the Site).

Risk Assessment

Given the sensitivity of the general area is classified as '***low'*** for dust soiling and for health effects, and the dust emission magnitudes for the various construction phase activities as shown in **Table 8**, the resulting risk of air quality impacts (with no mitigation) is as presented in **Table 9**.

The results indicate that there is a ***low*** risk of adverse dust soiling and human health impacts during earthworks, construction, and trackout phases occurring at the off-site sensitive receptor locations if no mitigation measures were to be applied to control emissions during the construction works.

Table 9 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	Low	Small	Large	Large	Large	Low Risk	Low Risk	Low Risk	Low Risk
Human Health	Low					Low Risk	Low Risk	Low Risk	Low Risk

12.1.4 Step 3 - Mitigation Measures

Due to the potential for cumulative impacts due to the surrounding development, it is recommended that the Site adopts dust control mitigation measures relevant to ***high risk*** to ensure potential cumulative impacts are reduced.

Table 10 lists the mitigation measures designated as highly recommended (H) or desirable (D) by the IAQM methodology for a development shown to have a high risk of adverse impacts. Not all these measures would be practical or relevant to the Project therefore a detailed review of these mitigation measures should be performed, and the most appropriate measures be adopted as part of the Construction Environmental Management Plan (CEMP).

Mitigation measures targeting potential impacts from demolition, earthworks, construction and trackout activities are provided in **Table 11** to **Table 14** for a development shown to have a high risk of adverse impacts.

For almost all construction activity, the IAQM method notes that the aim should be to prevent significant effects on receptors through the use of effective mitigation and experience shows that this is normally possible.

Table 10 Site-Specific Management Measures Recommended by the IAQM

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	
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

Mitigation Measure	High Risk Site Recommendation
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
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 11 Mitigation Measures Specific to 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 12 Mitigation Measures Specific to Earthworks

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

Table 13 Mitigation Measures Specific to Construction

Mitigation Measure	Highly recommended or Desirable
Avoid scabbling (roughening of concrete surfaces) if possible.	H
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.	H
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 14 Mitigation Measures Specific to 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
Access gates to be located at least 10 m from receptors where possible.	H
H = Highly recommended; D = Desirable	

12.1.5 Step 4 - Residual Impacts

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 15**. These are termed 'residual impacts'.

Table 15 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 for demolition, earthworks, construction, and trackout phases are anticipated to be ***negligible*** provided appropriate mitigation measures are 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.

13.0 Operational Air Quality Assessment

As discussed in **Section 7.3.2,** air quality issues associated with the proposed warehouse operations predominantly relate to emissions of products of combustion and particulate matter from trucks and other vehicles accessing and idling at the site.

These emissions will be of a similar nature to existing emissions from traffic on Elizabeth Drive, Luddenham Road, and other local roads connecting the industrial operations in the area.

For this assessment, the Roadside Air Quality Screening Tool (RAQST) is employed to assess 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.

13.1 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 8.0**, 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 11.0**), 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.

13.2 Modelling Assumptions

As described in **Section 7.3.2** the peak traffic movements related to Warehouse 3 and Warehouse 4 are anticipated to be 89 vehicles/hour (AM) and 81 vehicles/hour (AM), and 61 vehicles/hour (PM) and 56 vehicles/hour (PM), respectively (**Table 2**).

For this assessment, it was conservatively assumed that the peak traffic volumes would be 170 vehicles/hour eastbound and westbound for both Warehouse 3 and Warehouse 4.

13.3 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 16**.

Table 16 RAQST Input Data

Parameter	Value	Description
Assessment Year	2026	Assumed project completion
Electric vehicle projections	Included	-
Number of Lanes	1 in each direction	-
Road type	Arterial	Based on the land use of the area
Road gradient	0%	Average road gradients are calculated based on terrain elevations.
Lane width (m)	3.5 m	Assumed
Level for traffic composition	Level 1	No information on traffic composition is available.
Traffic speed	10 km/hr	Conservative assumption representative of emissions during high congestion periods
Traffic volume (For warehouse 3,4)	Eastbound:170 vph Westbound:170 vph	provided by Client
Background Concentrations		
Background site	Bringelly 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 demonstrates 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	

13.4 Modelling Results

As shown in **Section 9.1**, the nearest building within the Site is approximately 20 m from the kerb of Elizabeth Drive. Therefore, predicted air pollutant concentrations at 20 m from the kerbside have been quantified.

As shown in **Table 17**, the incremental predicted concentrations due to vehicles travelling along Elizabeth Drive to the Site are insignificant (less than 2% 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.

However, the cumulative 24-hour PM_{10} concentration (69.6 µg/m^3) exceeds the applicable criterion of 50 µg/m^3, and the cumulative 24-hour $PM_{2.5}$ concentration (57.8 µg/m^3) exceeds the criterion of 25 µg/m^3. These exceedances are driven primarily by the existing background concentrations, with the project contributing only a very small additional increment of less than 1 µg/m^3. All annual cumulative concentrations (NO_2, PM_{10} and $PM_{2.5}$) remain below their respective criteria.

Given that the exceedances occur under existing conditions and the project's incremental contribution is minimal, the potential impact of the development itself is considered negligible, although cumulative 24-hour particulate concentrations in the area are already elevated.

Table 17 RAQST Model Results – Peak Hour

Pollutant and Averaging Period	Background Concentration (µg/m^3)	Incremental Impact (µg/m^3)	Cumulative Impact (µg/m^3)	Criteria
Maximum 1-hour NO_2 concentrations	Not Applicable	Not applicable	132.9	**164**
Annual NO_2 concentrations	8.7	1.2	9.8	**31**
Maximum 24-hour PM_{10} concentrations	69.0	0.6	69.6	**50**
Annual PM_{10} concentrations	15.3	0.2	15.5	**25**
Maximum 24-hour $PM_{2.5}$ concentrations	57.4	0.4	57.8	**25**
Annual $PM_{2.5}$ concentrations	7.2	0.1	7.3	**8**

14.0 Monitoring

Given the nature and scale of the Project, it is not anticipated that any impacts upon human health or amenity values would be experienced during the operational phase of the project and as such, air quality monitoring is not deemed to be necessary.

As outlined in **Section 12.1.4** regular site walkovers and boundary inspections are recommended to be performed during the construction phase to ensure that dust emissions are being appropriately managed. Instrument-based monitoring of particulate levels is not considered to be required unless air quality related complaints are received.

15.0 Conclusions

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by DHL to undertake an Air Quality Impact Assessment (AQIA) for the development of Precinct 1 (the Project) located within its Badgerys Creek site on Elizabeth Drive.

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

The potential for off-site dust impacts were assessed using a qualitative risk-based approach prescribed by the IAQM. The results of this assessment indicate that the site is located away from any potentially sensitive receptors and no adverse off-site impacts are expected. Nonetheless, local background dust levels may be impacted by the Sydney airport construction site, and regional particulate matter levels can be high at times due to events such as hazard reduction burs, bushfires, etc, so the Site should implement good practice dust control to ensure they don’t contribute to cumulative impacts. It is therefore concluded that dust impacts due to the construction works can be adequately managed with the implementation of industry-standard dust mitigation measures, and that the residual impacts are likely to be of negligible risk for all construction activities (ie demolition, earthworks, construction and trackout) at neighbouring sensitive receptors.

Incremental concentrations of combustion-related pollutants predicted due to traffic movements associated with the operation of the Project are anticipated to be negligible. Further, no other significant air emission-generating activity (emergency diesel generator systems, fuel storage, refuelling facilities, etc.) is proposed. SLR therefore concludes that the Project would not result in any significant increases in cumulative air quality impacts at the nearest sensitive receptors.

Based on the above, air quality issues are not considered to represent a constraint for the proposed development.

16.0 References

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17.0 Feedback

At SLR, we are committed to delivering professional quality service to our clients. We are constantly looking for ways to improve the quality of our deliverables and our service to our clients. Client feedback is a valuable tool in helping us prioritise services and resources according to our client needs.

To achieve this, your feedback on the team's performance, deliverables and service are valuable and SLR welcome all feedback via https://www.slrconsulting.com/en/feedback. We recognise the value of your time and we will make a $10 donation to our Charity Partner - Lifeline, for every completed form.

Appendix A Construction Risk Assessment Methodology

Badgerys Creek DHL Development – Precinct 1

Air Quality Impact Assessment

DHL Supply Chain (Australia) Pty Ltd

SLR Project No.: 610.30951.00200

12 December 2025

Construction Phase Risk Assessment Methodology

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.

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.

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 support State or Local Government level species of conservational significance where the features may be

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).	• Locations that are protected under the EPBC Act or State 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.	affected by dust deposition. • 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.

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

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.

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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