REPORT

2-4 GIFFNOCK AVENUE

MACQUARIE PARK, NSW

AIR QUALITY IMPACT ASSESSMENT
RWDI # 2508944
16 April 2026

SUBMITTED TO

388 LCR Development
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EXECUTIVE SUMMARY

This Air Quality Impact Assessment report has been prepared by RWDI Australia Pty Ltd (RWDI) to support a State Significant Development Application (SSDA) for a proposed mixed-use development at 2-4 Giffnock Avenue, Macquarie Park within the Ryde Local Government Area (LGA) (the Site).

The assessment evaluates the potential construction-related dust impacts associated with the proposed development in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA, 2022). In addition, the potential impacts of vehicle emissions from Lane Cove Road and Hyundai Drive on the proposed development were assessed. As a part of cumulative assessment, emissions from the existing data centre to the northwest (NEXTDC S2 – 8 Giffnock Avenue) and future data centre to the southeast (NEXTDC S5 – 269 Lane Cove Road) are included in this assessment.

Construction Phase Assessment

A risk-based approach was adopted to assess dust emissions from the construction of the proposed development in accordance with the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) "Guidance on the Assessment of Dust from Demolition and Construction" (EPUK & IAQM, 2024). The assessment concluded that there would be a negligible risk of dust impact from demolition, and low risk from earthworks, construction and track out activities and with the implementation of recommended mitigation measures, no significant air quality impacts are expected to occur during the construction of the proposed development.

Operational Phase Assessment

A level 1 air quality screening assessment was undertaken for traffic-related emissions in accordance with the NSW EPA Approved Methods, using the Transport for NSW Road Air Quality Screening Tool (RAQST). The level 1 screening indicated potential exceedances of NO_2, $PM_{2.5}$ and PM_{10} associated with traffic at distances of 10m under slow traffic conditions

Given these results, a Level 2 air quality impact assessment was undertaken with a more advanced model, AERMOD, more detailed traffic conditions, and receptors located over the areas and facades of the proposed development, which predicted no exceedances of NO_2, $PM_{2.5}$ and PM_{10} due to traffic at any of the receptors (predicted exceedances of the 24-hour $PM_{2.5}$ and $PM_{1}0$ criteria associated with elevated background concentrations remained during region-wide high-smoke events)

Additionally, the cumulative AERMOD impact assessment considered the potential impact of back-up generator stack emissions at the two aforementioned data centres.

Emissions from the standby generators were taken from the Air Quality Impact Assessment reports for the data centres (NEXTDC S2- Air Quality Assessment - dated 19 May 2017 (Aurecon), and NEXTDC S5 – Revised Air Quality Assessment – dated 26 September 2025 (Arup)). Two (2) operational scenarios were considered for assessing the cumulative air quality impacts on the proposed development:

- *Maintenance/testing scenario* – Routine testing of standby generators at NEXTDC S2 (8 Giffnock Avenue) and NEXTDC S5 (269 Lane Cove Road) was modelled in accordance with the routine maintenance followed at these data centres i.e., it was anticipated one generator would be tested at any one time at each facility. As a conservative assumption, it was also assumed that the maintenance/testing at both t facilities could occur at the same time although it is unlikely to be the case.

- *Emergency scenario (full loss of main power)*– In the event of a full power outage, it was assumed that all generators at both S2 and S5 would operate concurrently at full load for the duration of the outage, conservatively assumed to be one hour.

Contemporaneous hourly varying background concentration data were used to assess cumulative impacts of nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO) and particulate matter (PM_{10} and $PM_{2.5}$) due to traffic and the data centres. Conversion of nitrogen oxides (NOx) to NO_2 for short-term averaging periods was undertaken using the Ozone Limiting Method (OLM) in accordance with the NSW EPA Approved Methods.

The modelling results indicate the following:

- Maintenance/Testing scenario - Predicted cumulative pollutant concentrations are below the relevant impact assessment criteria at all locations across the proposed development (including the proposed childcare centre) and along building façades for all assessed pollutants except for 24-hour average PM_{10} and $PM_{2.5}$ concentrations. Exceedances of the 24-hour PM_{10} and $PM_{2.5}$ criterion are predicted to occur only during widespread regional dust and smoke events (e.g. bushfires and hazard reduction burning), which are beyond the control of the proposed development. Accordingly, the overall air quality impact risk associated with routine generator maintenance and testing activities at the S2 and S5 data centres is considered negligible.
- For Emergency scenarios – Under highly conservative modelling assumptions, predicted pollutant concentrations, when combined with background levels, are below the relevant impact assessment criteria at all locations across the proposed development and along building façades for all assessed pollutants except for 1-Hour average NO_2 and SO_2 concentrations. Predicted exceedances of the 1-hour NO_2 criterion are shown to occur across the proposed development, while exceedances of the 1-hour SO_2 criterion are predicted to occur across approximately 0.8% of the proposed development area. This scenario assumes that all standby generators operate simultaneously at full load during a loss of mains power for a full hour, which would affect both data centres. The probability of such an event occurring is estimated to be less than 0.01%. Emergency generator operation is expected to be rare and of short duration. Ausgrid outage records for the Sydney metropolitan area indicate that both planned and unplanned outages are infrequent and typically short-lived (generally less than 1 hour). Consequently, the likelihood of emergency generator operation impact at the proposed development is considered very low.

Overall, the assessment concludes that:

- Construction air quality impacts associated with the proposed development are minor and manageable;
- Traffic and generator emissions will not result in unacceptable air quality impacts at the proposed development under routine generator maintenance and testing activities; and

Potential adverse air quality effects would be limited to exceptional regional events (such as widespread bushfire smoke) or rare, short-duration power outages, which are outside the control of the Project. In those rare instances, it is recommended that occupants remain indoors with windows closed.

1 INTRODUCTION

RWDI Australia Pty Ltd (RWDI) has been commissioned by "388 LCR Development" to conduct Air Quality Impact Assessment (AQIA). The State Significant Development Application (SSDA) seeks development consent for a mixed-use development at 2-4 Giffnock Avenue, Macquarie Park, within the Ryde Local Government Area (LGA) comprising two tower elements above podia, with retail premises, a childcare centre, two play areas. and residential uses within the building envelopes and recreation and road infrastructure uses on the reminder of the site (the Site).

1.1 Study Requirements

This report has been updated to address the requirements from City of Ryde Submissions for air quality, issued on 17th December 2025 (Council Reference: COR2025/265/1) and NSW Department of Planning, Housing and Infrastructure (DPHI) issued on 5th February 2026, with respect to the proposed development (SSD-79017211) and listed in Table 1-1.

Table 1-1: Air Quality Assessment Requirements as per City of Ryde and DPHI

Air Quality Assessment Requirements	Section reference (This Report)
City of Ryde Requirements – • The submitted air quality assessment considers Lane Cove Road as the sole pollution source. However, it fails to account for emissions from the existing data centre at 8 Giffnock Ave and the future large-scale data centre at 269 Lane Cove Road that also proposes a 4,000,000 Litre Sewer Mining operation per day, both of which are near the site. These are significant pollutant sources and is requested that the study be reflected to consider, assess and propose mitigation measures associated with these offensive sources and their impact on future residents and users of the park.	This report has been updated to include cumulative emissions from surrounding road traffic, the existing data centre at 8 Giffnock Avenue, and the proposed large-scale data centre at 269 Lane Cove Road. The assessment is based on the Level 2 Assessment, which involves detailed meteorological and air quality dispersion modelling using the AERMOD modelling system. Data on the sewer mining operations associated with the future data centre is not available and therefore not included in this report.
City of Ryde Requirements – • Council requests a Level 2 Air quality assessment using refined dispersion modelling and site-specific inputs to provide a Mitigation Schedule tied to the actual design elements be provided with any RtS. • A Level 2 Air quality assessment prepared by an appropriately qualified consultant that uses refined dispersion modelling and site-specific inputs to provide a Mitigation Schedule tied to the actual design elements is required. The assessment must consider sensitive receives such as the childcare centre.	Air quality with a Level 2 AQIA (detailed meteorological and air quality dispersion modelling) performed with using the AERMOD modelling system was performed. Detailed dispersion modelling was performed for the selected project scheme within the site with emissions from data centres and road for the maintenance and emergency scenario. Results of the detailed AQ assessment are presented in this report.

Air Quality Assessment Requirements	Section reference (This Report)
DPHI Requirements – • Update the Air Quality Impact Assessment (prepared by RWDI, dated 15 September 2025) to include emissions from both existing and proposed data centre s within the vicinity of the site as part of the cumulative air quality assessment.	This report has been updated to include cumulative emissions from surrounding road traffic, the existing data centre at 8 Giffnock Avenue, and the proposed large-scale data centre at 269 Lane Cove Road. The assessment is based on the Level 2 Assessment, which involves detailed meteorological and air quality dispersion modelling using the AERMOD modelling system.

1.2 Objectives

The purpose of this assessment is to document the process, objectives, and outcomes of the AQIA for the proposed development. This AQIA provides the following details:

- the existing environment; the land zoning of the site and neighbouring area;
- the closest existing sensitive receivers;
- relevant air quality criteria;
- construction air quality predictions for the proposed development and assumptions used in the assessment;
- predicted pollutant concentrations from vehicle emissions surrounding the area development and from the adjacent existing and future data centres (S2 and S5 respectively); and
- recommendations to minimise air quality impacts on affected receivers, if required.

The AQIA has been completed with reference to relevant guidelines and policies, namely:

- Air Quality relevant policies and guidelines from 'State Environmental Planning Policy (Infrastructure) 2021' (SEPP, 2021);
- Climate Averages Australia, Bureau of Meteorology (BOM, 2025);
- Environmental Protection Authority (EPA) guideline entitled "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (NSW EPA, 2022);
- Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) "Guidance on the Assessment of Dust from Demolition and Construction" (EPUK & IAQM, 2024);
- 'Good Practice Guide for The Assessment and Management of Air Pollution from Road Transport Projects' released by The Clean Air Society of Australia & New Zealand (CASANZ, 2023); and
- State of NSW and Environment Protection Authority, Air Emissions in My Community web tool Substance information (NSW EPA, 2013); and
- NSW Government Department of Planning – 'Development Near Rail Corridors and Busy Roads – Interim Guideline' (DoP, 2008);

To ensure a comprehensive and inclusive report, an air quality assessment was conducted to evaluate the Air Quality Impact Assessment (AQIA) for the mixed-use development at 2–4 Giffnock Avenue, Macquarie Park. The Secretary's Environmental Assessment Requirements (SEARs) were issued for this project (SSD-79017211) on 8 January 2025.

2 PROJECT DESCRIPTION

2.1 Project Location

The site is located at 2-4 Giffnock Avenue, Macquarie Park in the Ryde LGA. It is legally described as Lot 1 in DP1310550. 2-4 Giffnock Avenue is bound by Pocock Street to the northwest, Giffnock Avenue and Hyundai Drive to the northeast, Lane Cove Road (which is a classified road) to the east and Drake Avenue to the south.

As shown within the Figure 2-1 below, the proposal applies to part of Lot 1 in DP1310550 (the red outlined area in Figure 2-1) which is referred to as 'the site' throughout this report. The site excludes the recently developed 19-storey serviced apartment development in the eastern corner of the lot.

As shown within the figure below, the land being redeveloped as part of this SSD relates to part of Lot 235 in DP 1208568 and is referred to as 'the redevelopment site' throughout this report (see red shaded area below). The redevelopment site is irregular in shape and comprises an area of 12,720 m2. It is currently occupied by three commercial buildings, at- grade parking and vegetation. The site is zoned MU1 Mixed Use and E2 Commercial Centre pursuant to the Ryde Local Environmental Plan 2014 and is currently occupied by three commercial buildings, at grade parking and vegetation. The remaining area of the lot comprises the 'Veriu site' which comprises serviced apartments and is proposed to be subdivided from the redevelopment site.

Figure 2-1: Site Location and Surrounding Land Zoning

The site is strategically located within the Macquarie Park Transport Orientated Development Accelerated Precinct and is approximately 190 m walking distance from the Metro Station. It is also well serviced by buses which have stops on either side of Lane Cove Road. The site directly interfaces commercial uses along all boundaries, with the exception of the northeastern corner of the site which interfaces with a 19-storey serviced apartment building. As shown within the Figure 2-2 below, the broader locality is characterised by a mix of uses including established and newly developed commercial and residential buildings, the Macquarie Park Metro Station, Macquarie University, Macquarie University Hospital, shopping centres and recreational areas. The site is also located approximately 16 kms from the Sydney CBD.

Figure 2-2: Surrounding Locality Around the Site

2.2 Proposed Development

The SSDA seeks development consent for a mixed-use development at 2-4 Giffnock Avenue, Macquarie Park, comprising two tower elements above podiums, with retail premises, a childcare centre and residential uses within the building envelopes and recreation and road infrastructure uses on the reminder of the site:

Specifically, the SSDA seeks development consent for:

- demolition of two existing single storey buildings, one x two storey building and one car port
- site preparation and excavation works
- construction of two 44 storey tower elements, comprising a mix of uses including:
    - a single basement, comprising 6 parking levels to service the entire development
    - ground floor retail, childcare and residential amenities
    - a centre based childcare centre (located on both ground and level 1 of northeastern only)
    - residential accommodation on the remaining levels (comprising a total of 741 units and dedication of 5% affordable housing in perpetuity)

- Landscaping and communal open space
- associated infrastructure and services
- streetscape upgrades including road widening to Drake Avenue by 2.5m (equivalent to 273m^2) and Hyundai Drive by 4m (equivalent to 258m^2)
- dedication of land for road infrastructure and open space purposes (equivalent to 4025m^2) pursuant to Clause 7.13 of the (RLEP 2014) and the Macquarie Park Design Guide
- embellishment of the dedicated open space area
- Loading dock facility shared with the veriu driveway / loading area
- Subdivision to separate the redevelopment site and the Veriu site given they will comprise separate uses and can operate independently.
- Easements for access, drainage, and maintenance to the new substation and for the new pipe over the dedicated recreation area

The subject site forms part of the wider Macquarie Park Innovation Precinct (MPIP). The purpose of the project is to facilitate the delivery of high-quality residential and non-residential uses at a strategically located site, delivering a built form outcome that is consistent with the desired future character of Macquarie Park. The proposed ground level and elevations as shown in Figure 2-3 and Figure 2-4 respectively.

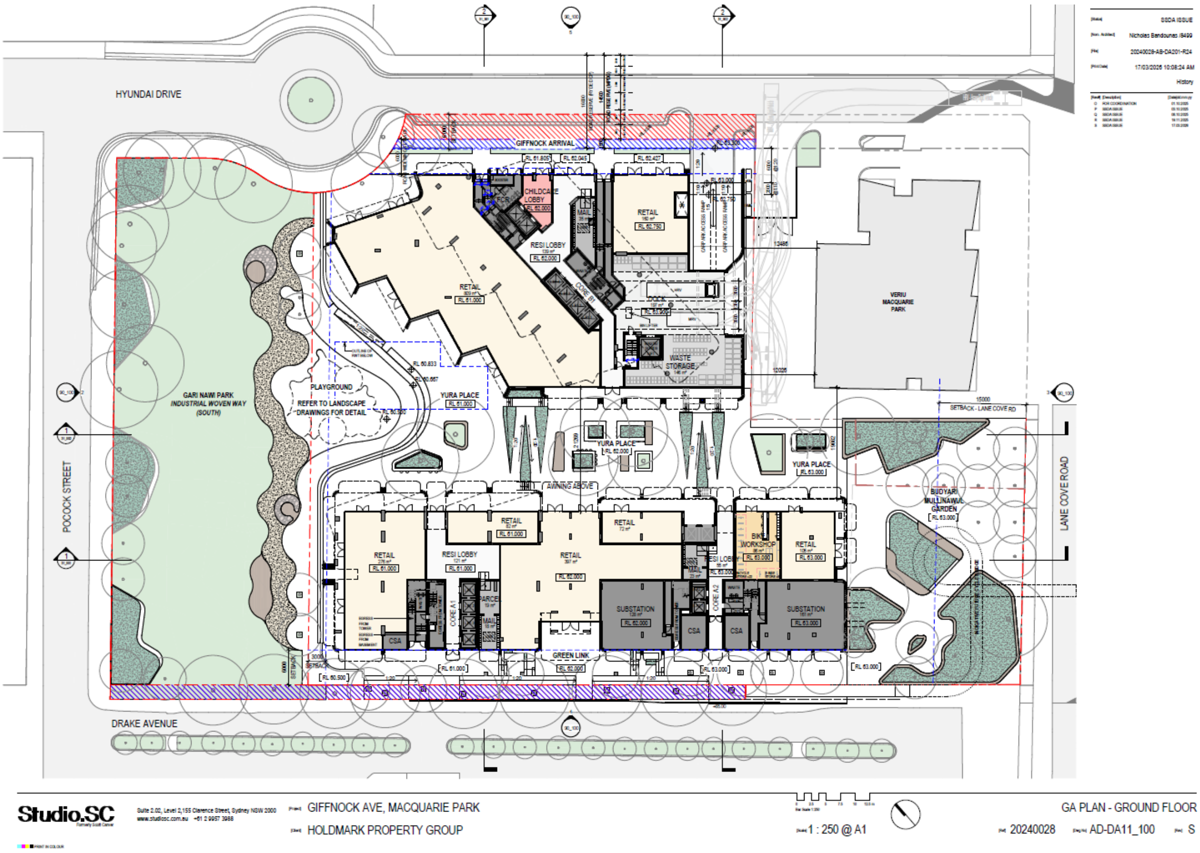

Figure 2-3: Proposed Site Layout – Ground Floor

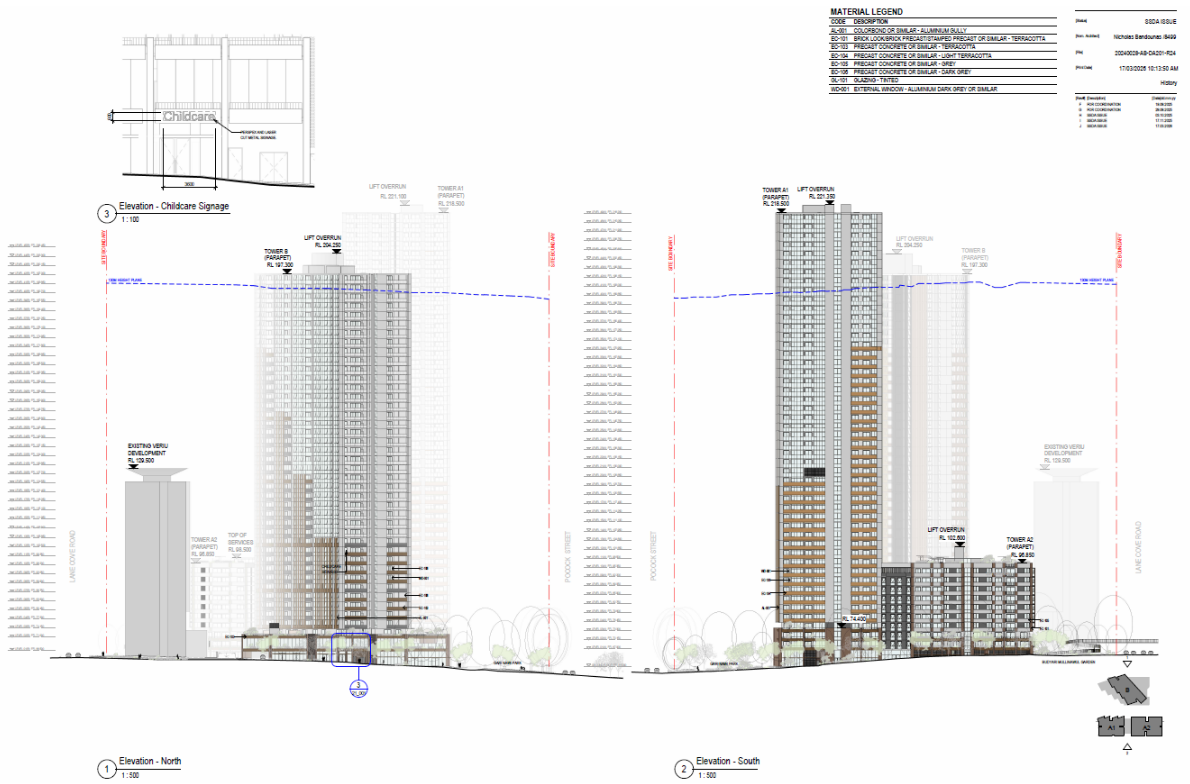

Figure 2-4: Proposed Elevations (North view to left and South view to right)

2.3 Potential Sources of Air Contaminant Emissions Associated with the Project

Air contaminant emissions are likely to occur during the construction and operation of the proposed Development at 2-4 Giffnock Avenue, Macquarie Park in the Ryde LGA. The most likely air contaminant sources for construction and operation are discussed in the following sections.

2.3.1 Construction Phase

At the time of preparing this assessment, a detailed construction programme was not developed, but the following stages and typical activities can be expected from this project. A summary of potential construction emissions is provided in Table 2-1.

Table 2-1: Construction Air Quality Emissions

Construction Stage	Key Air Quality Emissions
Land clearing/ demolition	• Dust emissions from the clearing site. • Exhaust emissions from diesel power plant, equipment, and vehicles.
Excavation	• Dust emissions from bulk earthworks. • Exhaust emissions from diesel power plant, equipment, and vehicles.

Construction Stage	Key Air Quality Emissions
	• Potential odour emissions if contaminants are encountered during bulk earthworks. • Topsoil/material handling, including stockpiling, material loading and material haulage
Construction of Structures	• Dust emissions from the construction of buildings to the northern, western and eastern lot in stages. • Exhaust emissions from diesel power plant, equipment, and vehicles.
Track out Construction of Roads	• Dust emissions from bulk earthworks. • Exhaust emissions from diesel power plant, equipment, and vehicles.

Dust Emissions:

Dust emissions are expected from all the construction stages as identified in Table 2-1.

Dust or airborne particles present in the air at elevated levels can be hazardous to human health or cause a nuisance. Potential health effects of airborne particles are closely related to particle size. The most common particle size distributions considered in air quality studies are:

- $PM_{2.5}$: Particulate matter (PM) consisting of particles less than 2.5 µm (micrometres) in diameter – for assessment against health-based criteria;
- PM_{10}: PM consisting of particles less than 10 µm in diameter – for assessment against health-based criteria;
- TSP: total suspended particulates, generally up to 100 µm in diameter – for assessment against predominantly nuisance-based criteria; and
- Deposited dust particles – for assessment of dust nuisance.

PM_{10} and $PM_{2.5}$ are typically invisible, while larger particulates are typically visible to the naked eye.

During the temporary phase of construction earthwork activities, including the moving of material and truck movements along haul roads (wheel-generated dust), short-term elevated levels of PM_{10} and $PM_{2.5}$ are likely to occur.

Exhaust Emissions:

It is likely that all stages of the construction would involve the use of diesel-fuelled equipment such as excavators, haulage trucks, cranes and light vehicles.

The use of diesel-fuelled equipment generates air pollutants including oxides of nitrogen (NO_x), carbon monoxide (CO) and particulate matter (mainly $PM_{2.5}$). Construction equipment is expected to move around the Site, and resulting exhaust emissions would be discontinuous, transient and mobile.

A qualitative assessment of potential dust emissions impacts is provided in Section 5 and mitigation measures are recommended in Section 5.2.

Odour:

If air contaminants are encountered during excavation works, odour emissions may occur. At this stage, no air contaminants are expected to be encountered during earthworks and therefore, odour emissions have not been assessed further for the construction phase.

2.3.2 Operational Phase

Potential sources of operational air contaminants from the Project would be combustion from increased traffic movements.

A summary of potential operational air contaminant emissions is provided in Table 2 2. A more detailed discussion of each emissions source is provided below.

Table 2-2: Operational Air Contaminant Emissions

Source Type	Key Air Contaminant Emissions
Traffic Emissions	• Combustion exhaust emissions including oxides of nitrogen (NOx) and particulate matter (PM). • Fugitive particulate matter emissions resulting from vehicle movements on surrounding roadways.

Traffic emissions

Increased patronage associated with the Project is expected to result in an increase in vehicle movements on surrounding road networks. This may lead to a corresponding increase in traffic-related air pollutant emissions, primarily from vehicle exhaust and resuspension of road dust. Traffic emissions are therefore considered the principal operational air quality impact associated with the proposed development.

Adjacent Data Centres

This assessment also considers the potential air quality impacts on the proposed development arising from the emissions associated with the adjacent NEXDTC Data centres (existing S2 and proposed S5) and evaluates whether these emissions are likely to result in any adverse impacts on the proposed development.

The data centres are equipped with diesel generators, with emission stacks located at roof level. Air pollutants typically associated with generator operation include:

- Particulate matter emissions (PM_{10}, $PM_{2.5}$);
- Nitrogen dioxide (NO_2);
- Sulphur dioxide (SO_2); and
- Carbon monoxide (CO)

Generator emissions were assessed under the following operating scenarios:

- Maintenance/testing scenario – Routine testing of standby generators at NEXTDC S2 and S5 were considered (in addition to traffic) and modelled in accordance with the routine maintenance followed at these data centres i.e., it is anticipated that up to one generator would be tested at any one time at each facility. As a conservative assumption, it is also assumed that the maintenance/testing at both the facilities would occur at the same time although it is not likely to be the case.

- An emergency scenario (full loss of main power)– In the event of a full power outage, it was assumed that all generators at both S2 and S5 would operate concurrently at full load for the duration of the outage, conservatively assumed to be one hour.

The assessment of the air quality impacts resulting from generator operations with respect to the proposed development is discussed further in Section 6.3.

3 AIR QUALITY CRITERIA

3.1 Introduction

Land-use planning has an important influence on air quality and, therefore, air quality should be a prime consideration for long-term planning, so that land is used and allocated in ways that minimise emissions and reduce the exposure of people to air pollution.

The Environmental Protection Authority (EPA) developed a guideline ("the Approved Methods") that sets out applicable impact assessment criteria for several air pollutants (NSW EPA, 2022).

Transport and Infrastructure SEPP 2021 refers to guidelines that must be considered where development has a frontage to classified road is proposed in, or adjacent to, specific roads and railway corridors under Clause 2.119 – Development with Frontage to a Classified Road. The objective of clause is:

1. The objective of this section are:
   - to ensure that new development does not compromise the effective and ongoing operation and function of classified roads, and
   - to prevent or reduce the potential impact of traffic noise and vehicle emissions on development adjacent to classified roads.
2. The consent authority must not grant consent to development on land that has a frontage to a classified road unless it is satisfied that:
   - where practicable and safe, vehicular access to the land is provided by a road other than the classified road, and
   - the safety, efficiency and ongoing operation of the classified road will not be adversely affected by the development as a result of--
     - (i) the design of the vehicular access to the land, or
     - (ii) the emission of smoke or dust from the development, or
     - (iii) the nature, volume or frequency of vehicles using the classified road to gain access to the land, and
   - the development is of a type that is not sensitive to traffic noise or vehicle emissions, or is appropriately located and designed, or includes measures, to ameliorate potential traffic noise or vehicle emissions within the site of the development arising from the adjacent classified road.

In addition, major roads can impact air quality due to the volume of traffic they carry. Therefore, NSW DoP, 2008 (the Guideline) assists in reducing the health impacts of adverse air quality from road traffic on sensitive adjacent development. The Guideline assists in the planning, design, and assessment of development in, or adjacent to, rail corridors and busy roads.

When air quality should be a design consideration:

- Within 10 m of a congested collector road (traffic speeds of less than 40 km/h at peak hour) or a road grade > 4% or heavy vehicle percentage flows > 5%;
- Within 20 m of a freeway or main road (with more than 2,500 vehicles per hour, moderate congestion levels of less than 5% idle time and average speeds of greater than 40 km/h);
- Within 60 m of an area significantly impacted by existing sources of air pollution (road tunnel portals, major intersection/roundabouts, overpasses, or adjacent major industrial sources); or

- As considered necessary by the approval authority based on consideration of site constraints and associated air quality issues.

Section 4.0 of the guideline provides the following guidance on developments located next to busy roads, which have challenges in terms of how to provide an acceptable level of air quality for the occupants and users of the development. Therefore, the following principles should be taken into consideration during the design stage to achieve improved air quality:

- Minimising the formation of urban canyons that reduce dispersion. Having buildings of different heights interspersed with open areas and setting back the upper stories of multi-level buildings, helps to avoid urban canyons.
- Incorporating an appropriate separation distance between sensitive uses and the road using broad scale site planning principles such as building siting and orientation. The location of living areas, outdoor space and bedrooms and other sensitive uses (such as childcare centres) should be as far as practicable from the major source of air pollution.
- Ventilation design and openable windows should be considered in the design of development located adjacent to roadway emission sources. When the use of mechanical ventilation is proposed, the air intakes should be sited as far as practicable from the major source of air pollution.
- Using vegetative screens, barriers, or earth mounds where appropriate to assist in maintaining local ambient air amenity. Landscaping has the added benefit of improving aesthetics and minimising visual intrusion from an adjacent roadway.

3.2 Pollutants of Interest

The primary sources of air emissions in the area immediately surrounding the proposed development are expected to be vehicles travelling along the Lane Cove and Epping Road. Air pollutant emissions emitted by motor vehicle exhausts include:

- Carbon Monoxide (CO);
- Nitrogen Oxides (NO_x);
- Particulate matter less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$);
- Particulate matter less than 10 µm in aerodynamic diameter (PM_{10});
- Sulphur dioxide (SO_2); and
- Volatile Organic Compounds (VOCs).

3.3 Impact Assessment Criteria

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The criteria presented in the Approved Methods (NSW EPA, 2022) are consistent with the National Environment Protection Council's National Environment Protection (Ambient Air Quality) Measure (NEPC, 2021). The below section summarises the air quality criteria for the pollutants relevant to the study.

3.3.1 Carbon Monoxide

As per NSW EPA 2013, Carbon monoxide (CO) is a colourless, odourless gas and is a product of the incomplete combustion of fuels in motor vehicles. CO can have harmful effects on human health. These effects (which depend on exposure time and concentration in ambient air) are related to the formation of carboxy haemoglobin in the blood, which reduces the capacity of the blood to carry oxygen. People suffering from heart disease are most at risk.

Elevated concentrations of CO in ambient air mainly occur in areas with high traffic density and poor dispersion. Highest concentrations of CO are found at the kerbside with concentrations decreasing rapidly with increasing distance from the road. Table 3-1 summarises the air quality criteria for CO as per NSW EPA the Approved Methods.

Table 3-1: Impact Assessment Criteria – Carbon Monoxide (CO)

Pollutant	Averaging Period	Concentration
Carbon Monoxide (CO)	15 minutes	100 mg/m³ (87 ppm)
	1 hour	30 mg/m³ (25 ppm)
	8 hours	10 mg/m³ (9 ppm)

3.3.2 Nitrogen Dioxide (NO_2)

As per NSW EPA 2013, Oxides of nitrogen (NO_x) mainly consist of nitric oxide (NO) and nitrogen dioxide (NO_2), which are collectively referred to as NO_x. NO is a colourless gas with a sweet odour, while NO_2 is a reddish-brown gas with a biting acrid odour.

The reactive nature of NO_2 makes it a particular concern for human health. It can cause inflammation of the respiratory system and increase susceptibility to respiratory infection. Exposure to elevated concentrations of NO_2 has also been associated with increased mortality, particularly related to respiratory disease, and increased hospital admissions for asthma and heart disease patients.

NO will be converted to NO_2 in the atmosphere after leaving a car exhaust. Table 3-2 summarises the air quality criteria for NO_2 as per NSW EPA the Approved Methods.

Table 3-2: Impact Assessment Criteria – Nitrogen Dioxide (NO_2)

Pollutant	Averaging Period	Concentration
Nitrogen Dioxide (NO_2)	1 hour	164 µg/m³ (8 pphm)
	Annual	31 µg/m³ (1.5 pphm)

Note pphm = parts per hundred million

3.3.3 Particulate Matter (PM)

As per NSW EPA 2013, Particulate matter refers to matter suspended in ambient air, including solid particles, liquid droplets and aggregates of particles and liquids. 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). Emissions of particulate matter less than 10 µm and 2.5 µm in diameter (referred to as PM_{10} and $PM_{2.5}$ respectively) are considered important pollutants due to their ability to penetrate into the respiratory system.

In the case of the $PM_{2.5}$ category, recent health research has shown that this penetration can occur deep into the lungs. Potential adverse health impacts associated with exposure to PM_{10} and $PM_{2.5}$ include impact on cardiovascular health. People with heart or lung diseases, children and older adults are the most likely to be affected by exposure to particle pollution.

Combustion sources such as road transport are the major sources of PM_{10} and $PM_{2.5}$ emissions. Table 3-3 summarises the air quality criteria for PM_{10} and $PM_{2.5}$ as per NSW EPA the Approved Methods.

Table 3-3: Impact Assessment Criteria – Particulate Matter

Pollutant	Averaging Period	Concentration
Particulate Matter (PM_{10})	24 hours	50 µg/m³
	Annual	25 µg/m³
Particulate Matter ($PM_{2.5}$)	24 hours	25 µg/m³
	Annual	8 µg/m³

3.3.4 Sulphur Dioxide (SO_2)

As per NSW EPA 2013, Sulphur dioxide (SO_2) is a colourless gas with a pungent irritating smell. SO_2 emissions can mix with water vapour to form acids (acid rain) that can damage vegetation, alter the mineral content in soils, and corrode materials. Current scientific evidence links short-term exposure to SO_2 (ranging from 5 minutes to 24 hours) with an array of adverse respiratory effects including bronchoconstriction and increased asthma symptoms. Studies show a connection between short-term exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly, and asthmatics.

The main sources of SO_2 in the air are industries that process materials containing sulphur (i.e. wood pulping, paper manufacturing, metal refining and smelting, textile bleaching, wineries etc.). SO_2 is also present in motor vehicle emissions, however since Australian fuels are relatively low in sulphur, high ambient concentrations are not common. Table 3-4 summarises the air quality criteria for SO_2 as per NSW EPA the Approved Methods.

Table 3-4: Impact Assessment Criteria – Sulphur Dioxide (SO_2)

Pollutant	Averaging Period	Concentration
Sulphur Dioxide (SO_2)	1 hour	215 µg/m³ (7.5 pphm)
	24 hours	57 µg/m³ (2 pphm)

3.3.5 Volatile Organic Compounds (VOCs)

As per NSW EPA 2013, VOCs can simply be considered as the sum of hydrocarbons (excluding methane) and oxygenated hydrocarbons. VOCs are emitted by a wide range of both natural and human-made sources including trees and grass, aerosols and solvents, paints, road transport and residential wood heaters. VOCs that are often typical of these sources include Benzene, Toluene, Ethylbenzene and Xylenes (often referred to as 'BTEX').

VOCs have a range of health impacts including irritation of the eyes, nose and throat, headaches, and damage to the organs and central nervous system. Benzene is a known carcinogen, and a key VOC linked with the combustion of motor vehicle fuels. Table 3-4 summarises the air quality criteria for the 4 VOCs known as BTEX (Benzene, Toluene, Ethylbenzene and Xylene), as per NSW EPA the Approved Methods.

Table 3-5: Impact Assessment Criteria – BTEX

Pollutant	Averaging Period	Concentration
Benzene	1 hour	29 µg/m³ (0.009 ppm)
Toluene	1 hour	360 µg/m³ (0.09 ppm)
Ethylbenzene	1 hour	8,000 µg/m³ (1.8 ppm)
Xylene	1 hour	190 µg/m³ (0.04 ppm)

4 EXISTING ENVIRONMENT

4.1 Local Meteorology

Meteorological conditions strongly influence air quality. Most significantly, wind speed, wind direction, temperature, relative humidity and rainfall affect the dispersion of air pollutants. The following sub-sections discuss the local meteorology near the Project site.

4.1.1 Long-Term Climate

Long-term meteorological data for the area surrounding the site is available from the Parramatta North (Mason Drive) (Site Number: 066124) operated by the Bureau of Meteorology (BoM). The Parramatta North (Mason Drive) is located approximately 10 km west of the Site and records wind speed, wind direction, temperature, humidity and rainfall.

Long-term climate statistics are presented in Table 4-1. Temperature data recorded at the Parramatta North (Mason Drive) indicate that January is the hottest month of the year, with a mean daily maximum temperature of 28.6°C. July is the coolest month with a mean daily minimum temperature of 6.3°C. February is the wettest month with an average rainfall of 126 mm falling over 10 days. There are, on average, 91 rain days per year, delivering 977 mm of rain.

Table 4-1: Climate Averages for Parramatta North (Mason Drive)

Obs.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
9am Mean Observations													
Temp (°C)	22.5	22.0	20.5	18.0	14.5	11.7	10.8	12.5	15.8	18.6	19.7	21.7	17.4
Hum (%)	74	79	80	76	79	78	75	67	63	62	69	70	73
3pm Mean Observations													
Temp (°C)	26.8	26.3	24.7	22.3	19.2	16.6	16.2	17.8	20.0	21.9	23.6	25.7	21.8
Hum (%)	57	59	59	58	60	59	55	46	46	49	54	55	55
Daily Minimum and Maximum Temperatures													
Min (°C)	17.8	17.7	16.0	12.9	9.8	7.5	6.3	7.2	9.4	12.1	14.2	16.4	12.3
Max (°C)	28.6	27.9	26.3	23.9	20.6	17.8	17.5	19.2	21.8	24.1	25.5	27.6	23.4
Rainfall													
Rain (mm)	106.6	125.8	121.4	89.3	69.0	88.1	50.3	57.3	50.0	67.8	82.6	70.4	977.1
Rain (days)	9.2	9.1	10.1	7.2	7.0	7.4	5.7	5.4	5.8	7.5	8.6	7.6	90.7

Figure 4-1 presents the annual wind-roses for 9 am and 3 pm from the Parramatta North (Mason Drive) (from 1967 to 2024). The wind-rose diagram indicates a notable emphasis of north-westerly and westerly winds at 9 am and east-southeasterly and north-easterly winds at 3 pm.

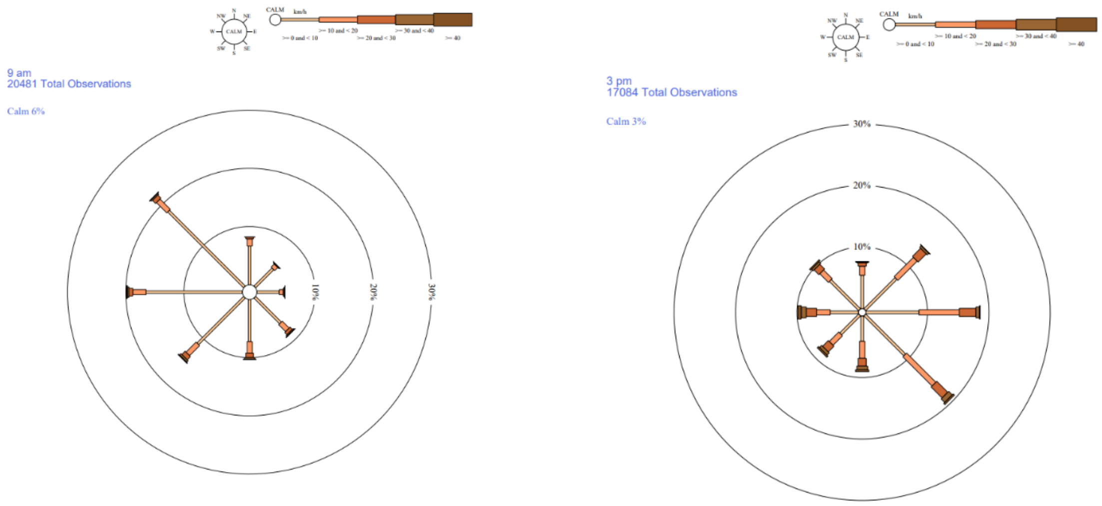

Figure 4-1: Parramatta North (Mason Drive) 9 am and 3 pm Annual Wind Roses – Wind Speed in km/h (01 June 1967 to 10 Aug 2024)

4.1.2 Wind

The dispersion of dust emissions is primarily influenced by the following meteorological factors:

- wind speed and direction;
- wind profile and turbulence intensity (which are affected by terrain);
- temperature gradient, which affects atmospheric stability and is determined from wind speed, cloud cover and solar radiation; and
- mixing height, which is the depth of the atmospheric boundary layer, where most of the dispersion occurs.

Wind speed and atmospheric stability are examined with respect to flow direction to investigate typical flow regimes and directions of poor dispersion.

Observations of wind speed and direction recorded at the Sydney Olympic Park Station (Archery Centre) AWS – Station# 066212, have been used to describe typical wind patterns in the area surrounding the Site.

Figure 4-2 to Figure 4 7 show the annual and seasonal "wind rose" plots from Sydney Olympic Park Station (Archery Centre) AWS for the period from 2021 to 2025. As can be seen, winds from the north-west, east and south-east octants are most common in the annual wind roses. The 2025 wind roses are in good agreement with the multi-year average wind roses and have therefore been adopted for modelling purposes.

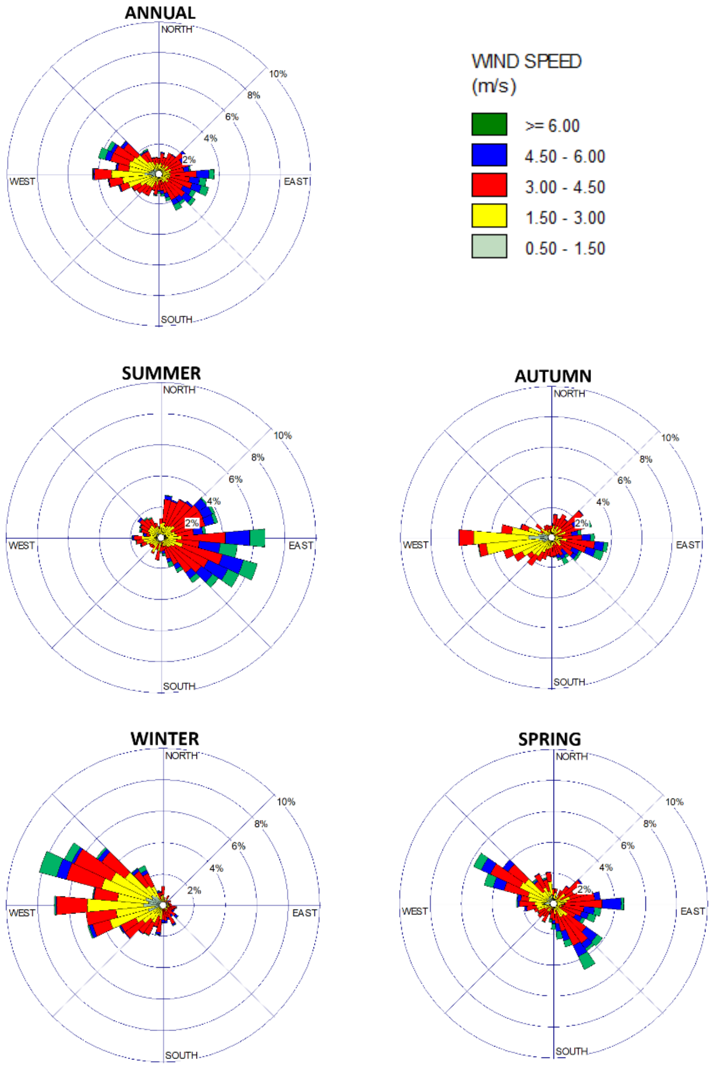

Figure 4 2: Sydney Olympic Park AWS Wind Roses, 2021

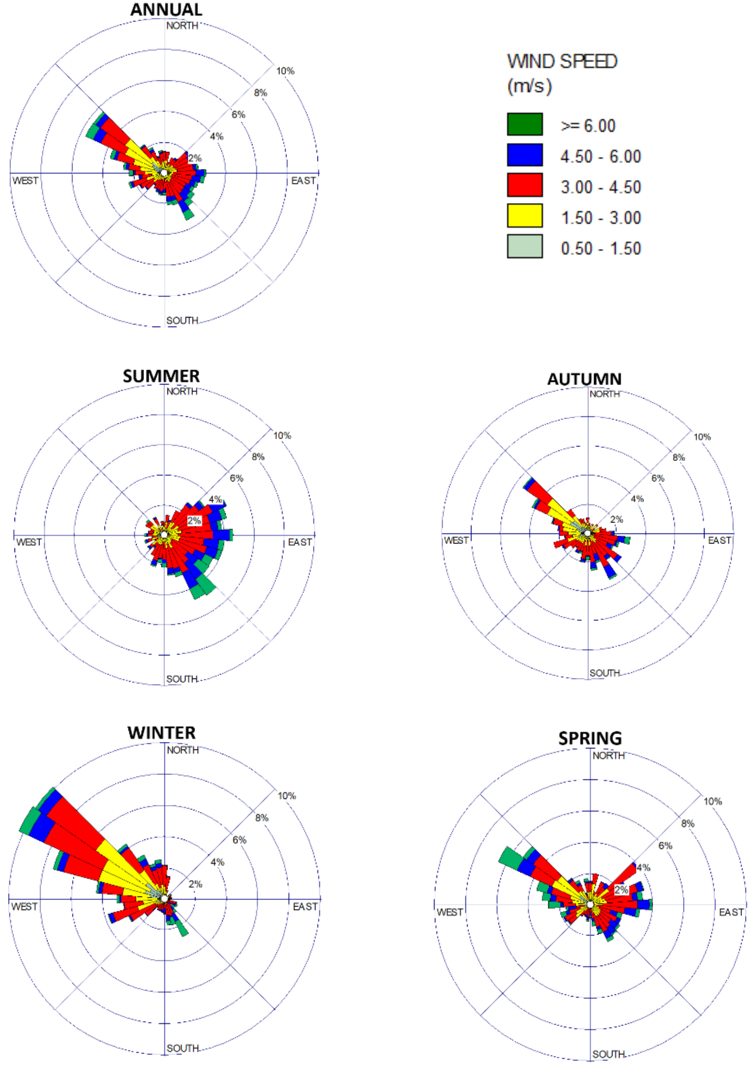

Figure 4-2: Sydney Olympic Park AWS Wind Roses, 2022

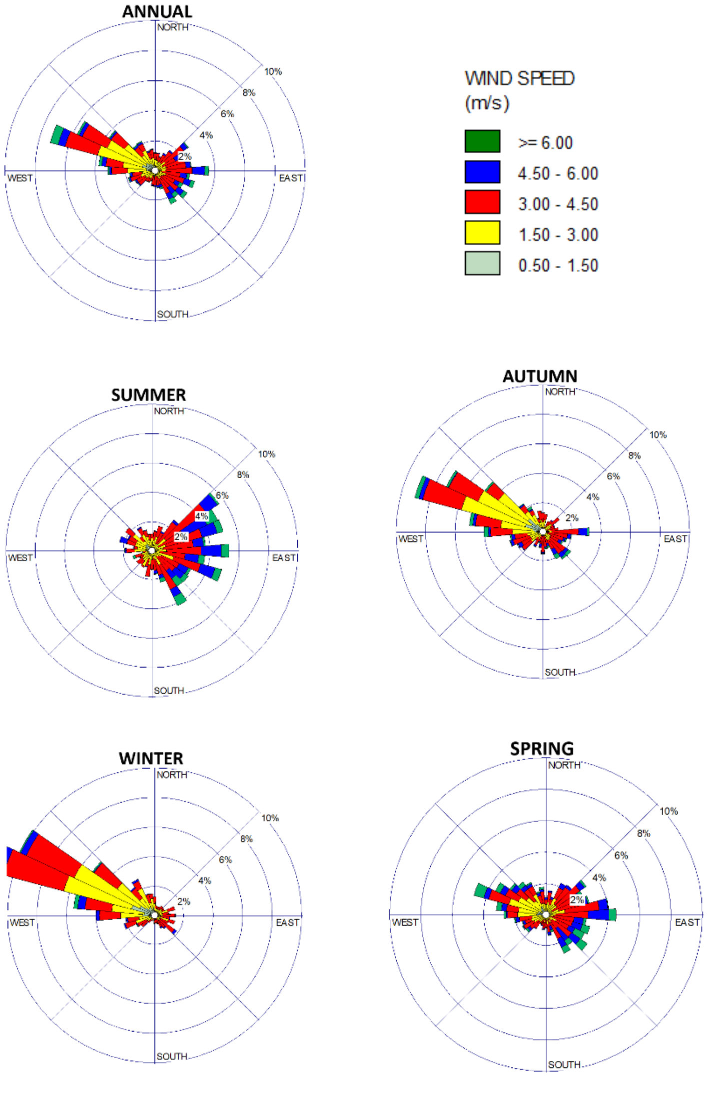

Figure 4-3: Sydney Olympic Park AWS Wind Roses, 2023

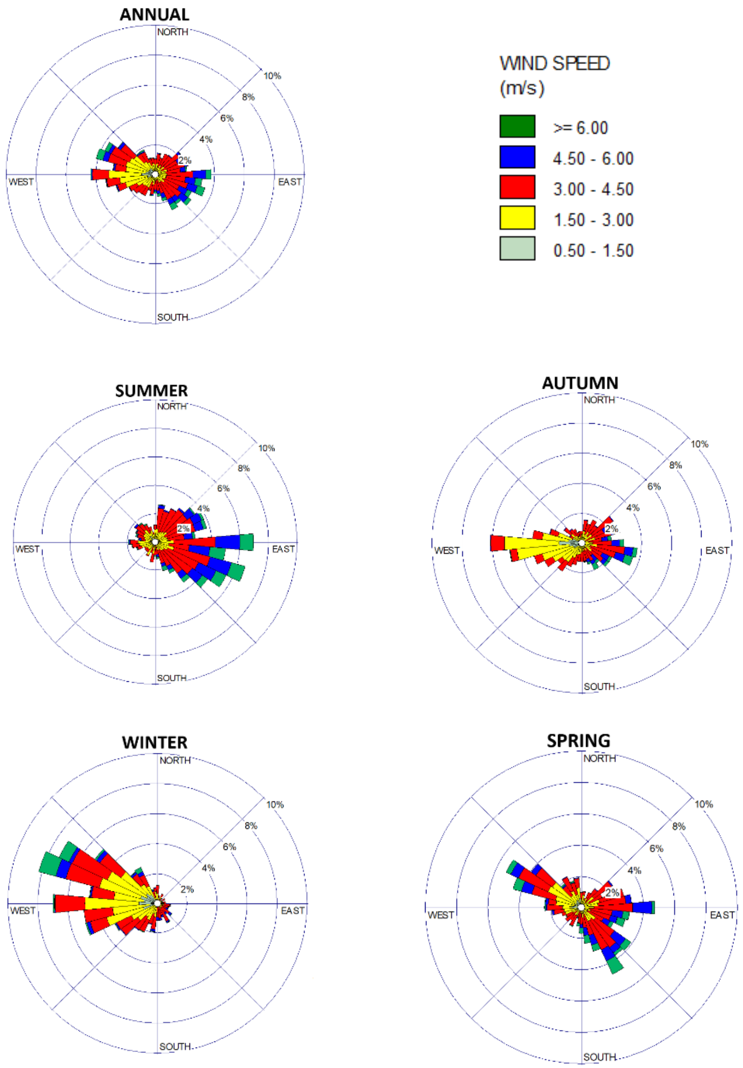

Figure 4-4: Sydney Olympic Park AWS Wind Roses, 2024

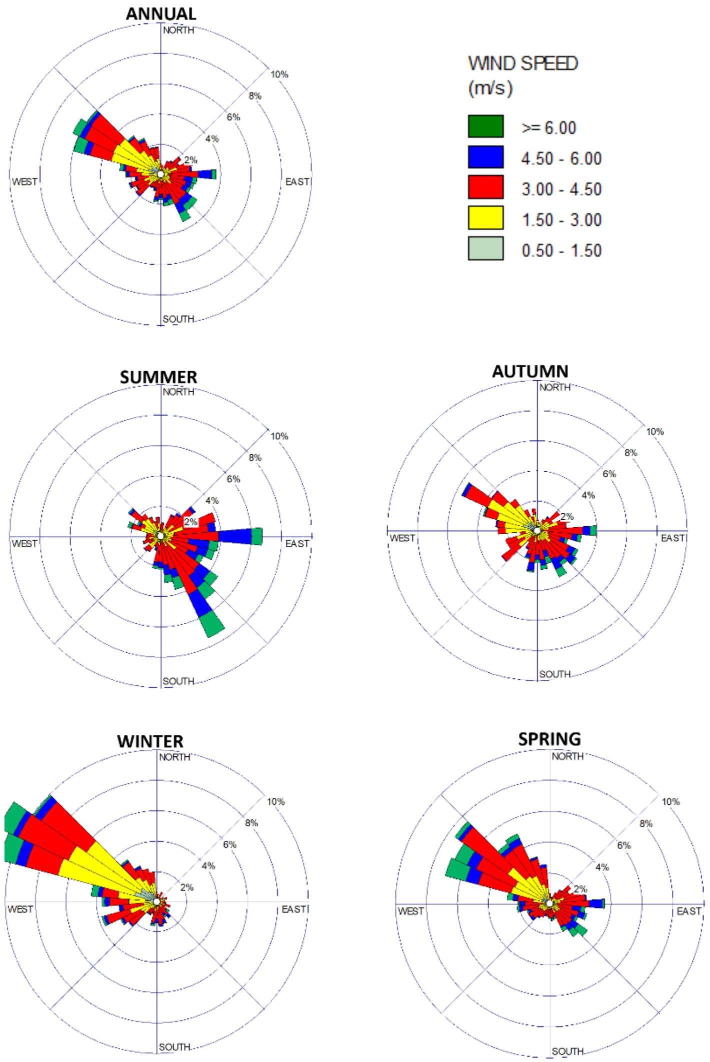

Figure 4-5: Sydney Olympic Park AWS Wind Roses, 2025

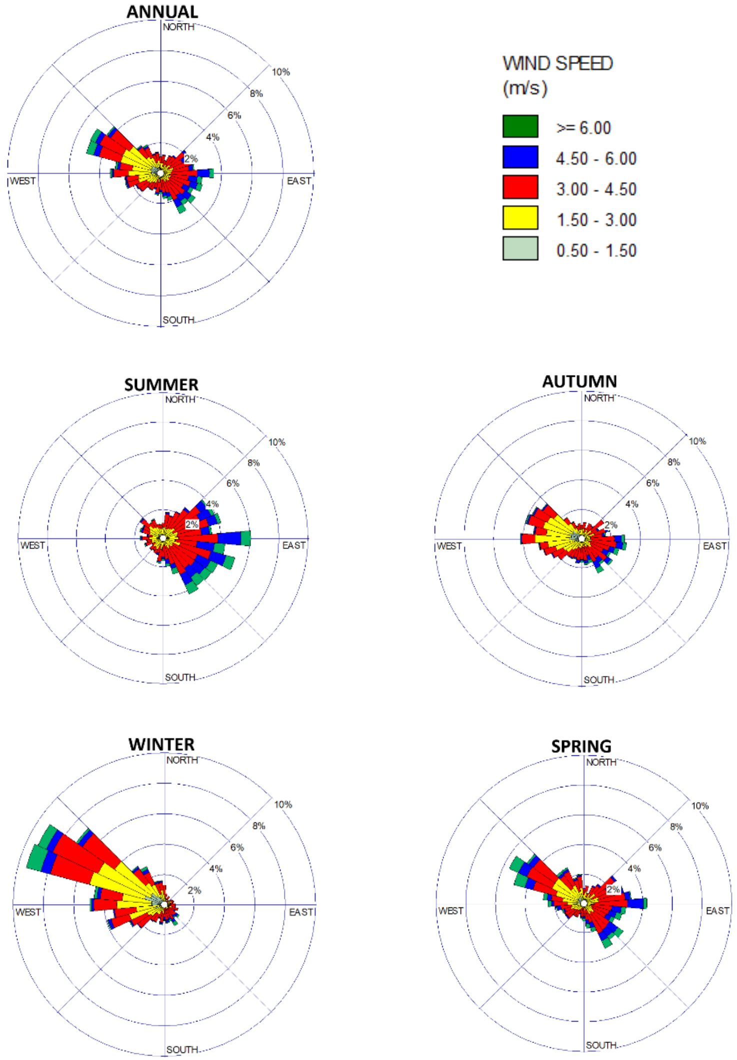

Figure 4-6: Sydney Olympic Park AWS Wind Roses, 2021 - 2025

4.2 Local Ambient Air Quality

No site-specific data are available to determine the existing concentrations of air pollutants at sensitive receptors near the proposed development. Data on existing background pollution concentrations were obtained from the NSW Department of Planning and Environment (DPE) air quality monitoring network. The DPE operates a network of AQMS across NSW. The nearest AQMS measuring the selected pollutants is located approximately 2.5 km northwest of the proposed development, at Macquarie Park AQMS. The Macquarie Park AQMS station commissioned in 2017 and is part of the Sydney East air quality monitoring region.

The following air pollutants are currently measured at Macquarie Park AQMS:

- Carbon monoxide (CO);
- Particulate matter less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$);
- Particulate matter less than 10 µm in aerodynamic diameter (PM_{10});
- Oxides of nitrogen (NO_2);
- Ozone (O_3); and
- Sulphur dioxide (SO_2)

A summary of the ambient air quality monitoring data collected over the five-year period from 2021-2025 at Macquarie Park AQMS is presented in Table 4-2. It also presents the applicable air quality criteria for each pollutant of interest.

Table 4-2: Ambient Air Quality Monitoring Concentrations in Proximity to the Project Development (Macquarie Park)

Pollutant	Averaging Period	Concentrations					Impact Criteria
		2021	2022	2023	2024	2025	
Particulate matter ≤2.5 µm ($PM_{2.5}$)	24-hours[1]	**213.1** µg/m³	17.6 µg/m³	**33.3** µg/m³	**38.1** µg/m³	**25.5** µg/m³	25 µg/m³
	Annual[2]	7.3 µg/m³	4.4 µg/m³	6 µg/m³	6.2 µg/m³	5.4 µg/m³	8 µg/m³
Particulate matter ≤10 µm (PM_{10})	24-hours[1]	**125.2** µg/m³	25.9 µg/m³	44.7 µg/m³	38.1 µg/m³	**76.9** µg/m³	50 µg/m³
	Annual[2]	13.2 µg/m³	11.4 µg/m³	14.6 µg/m³	14.5 µg/m³	14.2 µg/m³	25 µg/m³
Nitrogen Dioxide (NO_2)	1-hour[3]	7.3 pphm	2.3 pphm	2.6 pphm	2.8 pphm	3.2 pphm	8 pphm
	Annual[2]	0.4 pphm	0.3 pphm	0.4 pphm	0.5 pphm	0.2 pphm	1.5 pphm
Carbon Monoxide (CO)	1-hour[3]	10 ppm	2.3 ppm	0.9 ppm	5 ppm	4.1 ppm	25 ppm
Sulphur Dioxide (SO_2)	1-hour[3]	3.4 pphm	3.1 pphm	2.3 pphm	3.6 pphm	2.3 pphm	7.5 pphm
	24-hours[1]	0.6 pphm	0.3 pphm	0.4 pphm	0.5 pphm	0.4 pphm	2 pphm

Note Bold Indicates Exceedances

1. Maximum of 24-hour data over the year
2. Average of 24-hour data over the year
3. Maximum of 1-hour data over the year

As seen in Table 4-2, existing background PM concentrations are high, and exceedances of the 24-hour average $PM_{2.5}$ criterion were recorded in 2021, 2023, 2024 and 2025. Exceedances of the 24-hour average PM_{10} criteria were recorded in 2021 and 2025. A review of the available compliance monitoring reports indicates that the exceedances were primarily due to exceptional events such as bushfire emergencies, dust storms and hazard reduction burns.

Background NO_2 concentrations are typically less than half of the Impact criteria values except for 2021, SO_2 background concentrations about a third of the impact criteria and background CO concentrations about 5% of the impact criteria in recent years.

Figure 4-7 to Figure 4-11 graphically present the air pollutant data recorded at Macquarie Park AQMS for the calendar years 2021 – 2025. As can be seen from Figure 4-9 through to Figure 4-11, ambient concentrations of NO_2, CO and SO_2 were well below their respective criteria for that period.

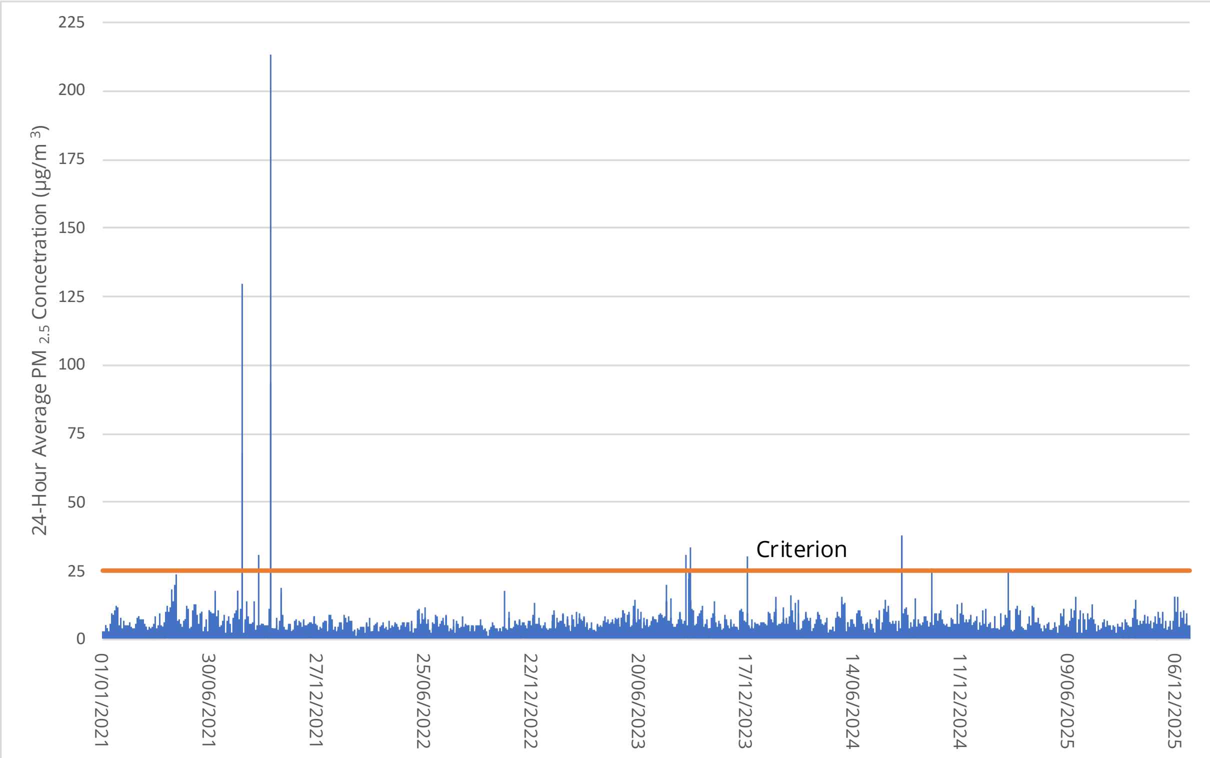

Figure 4-7: 24-Hour Average $PM_{2.5}$ Concentrations at Macquarie Park AQMS (2021-2025)

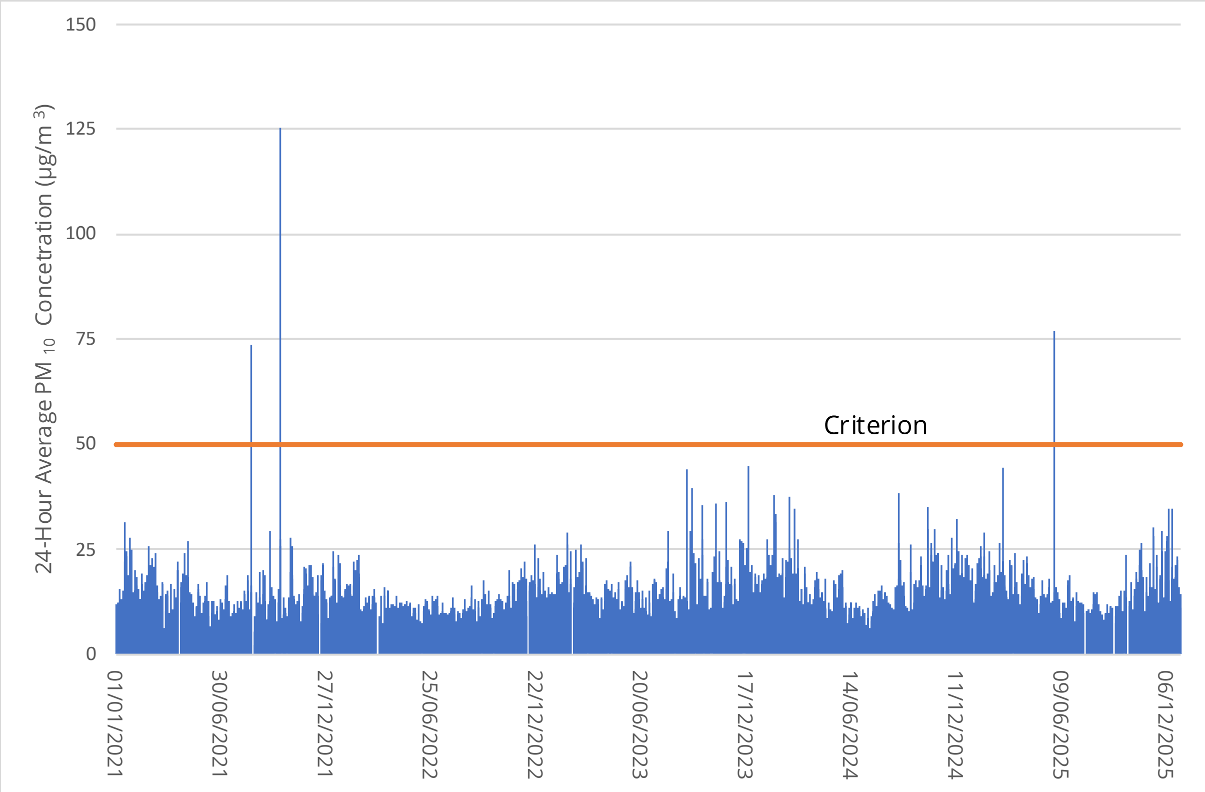

Figure 4-8: 24-Hour Average PM_{10} Concentrations at Macquarie Park AQMS (2021-2025)

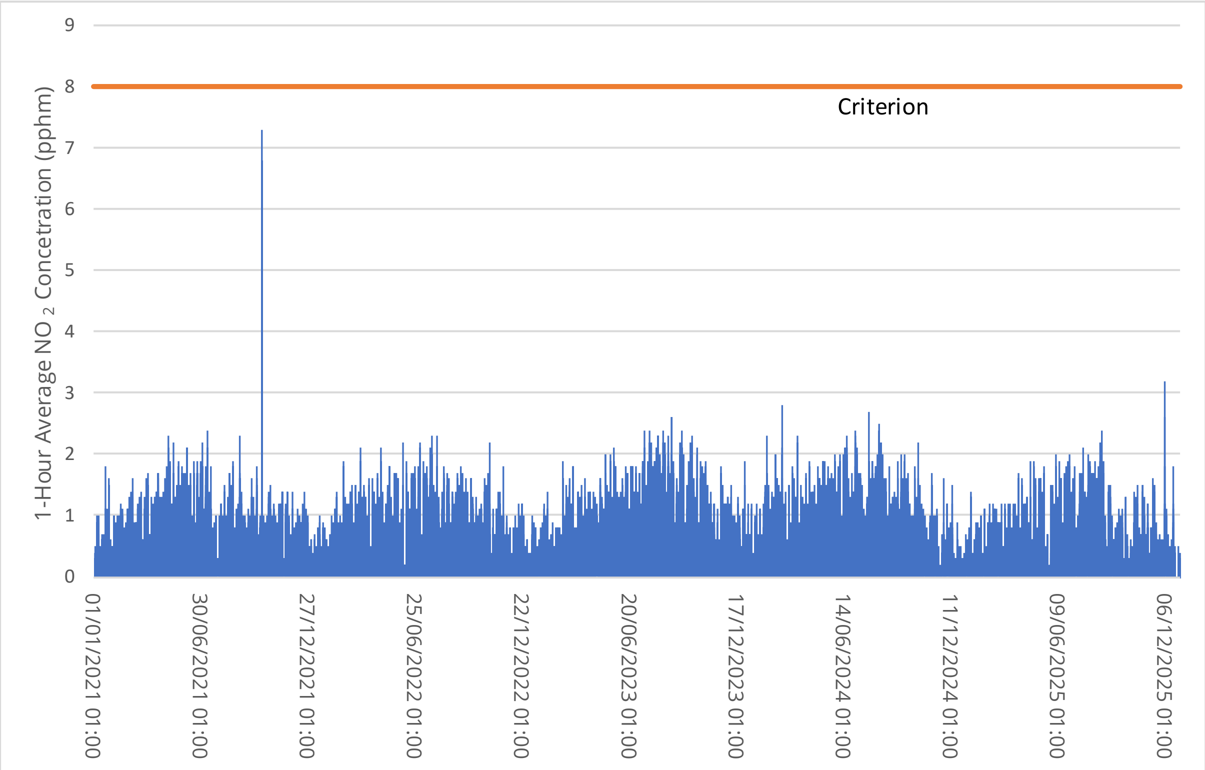

Figure 4-9: 1-Hour Average NO_2 Concentrations at Macquarie Park AQMS (2021-2025)

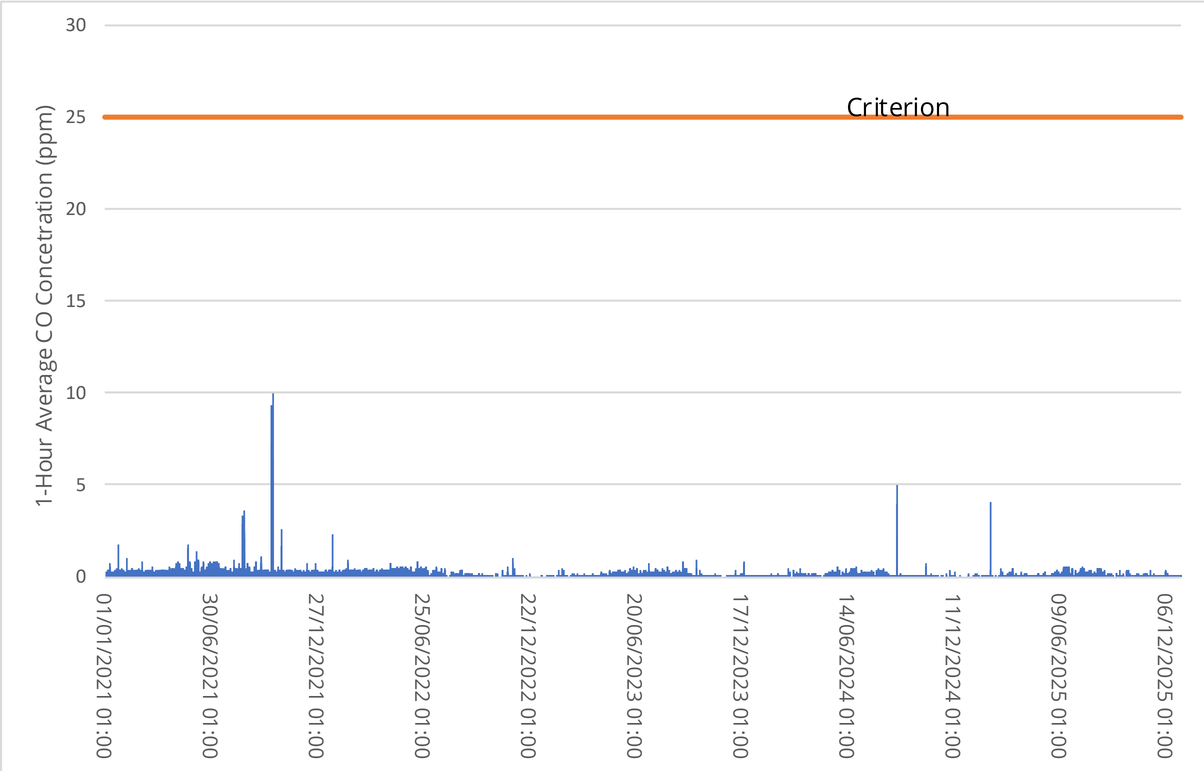

Figure 4-10: 1-Hour Average CO Concentrations at Macquarie Park AQMS (2021 - 2025)

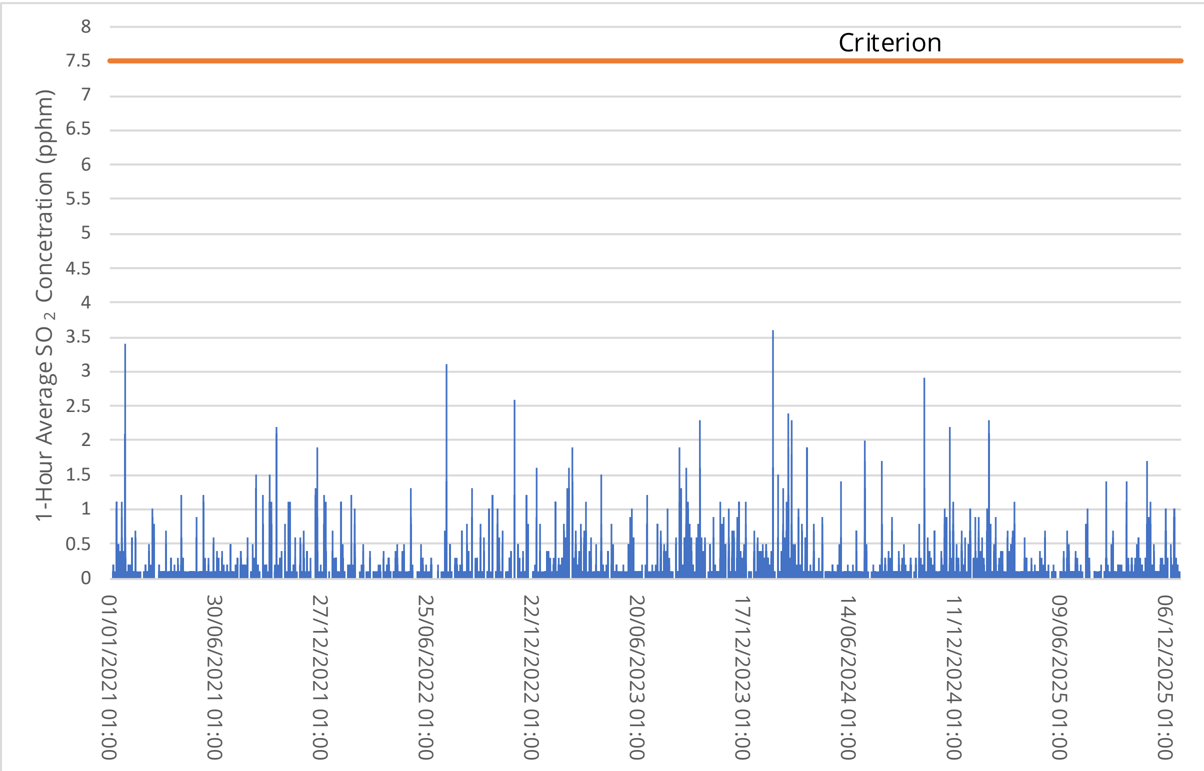

Figure 4-11: 1-Hour Average SO_2 Concentrations at Macquarie Park AQMS (2021 - 2025)

5 ASSESSMENT OF AIR QUALITY DURING CONSTRUCTION WORKS

5.1 Risk Assessment of Dust Impacts from Proposed Construction Works

The following qualitative risk assessment of potential dust impacts has been conducted for the proposed construction works.

5.1.1 Step 1 – Screen the Need for a Detailed Assessment

The IAQM guidance recommends that a risk assessment of potential dust impacts from construction activities be undertaken when human receptors are 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(s).
- The addresses for the sensitive receptors near the site are included below in Table 5-1.

- **Table 5-1: Representative Sensitive Receptors**

Receptor	Address	Receiver Type	Distance to Site (m)	UTM Coordinates (Zone 56 H)	
				X (m E)	Y (m S)
EDU1	63-71 Waterloo Road Macquarie Park	Educational	380	326,478	6,260,447
COM2	269 Lane Cove Road Macquarie Park	Commercial	60	326,659	6,259,902
COM3	394 Lane Cove Road macquarie Park	Commercial	30	326,622	6,260,054
COM4	6 Giffnock Avenue Macquarie Park	Commercial	30	326,480	6,259,900
RES5	376 Lane Cove Road North Ryde	Residential	155	326,401	6,259,831
RES6	2/134 Epping Road North Ryde	Residential	175	326,323	6,259,881
COM7	8 Giffnock Avenue Macquarie Park	Commercial	25	326,421	6,260,086
REC8	144 Wicks Road Macquarie Park	Recreational	390	326,883	6,259,665
EDU9	61-65 Epping Road Macquarie Park	Educational	275	326,743	6,259,714
RES10	1 Allengrove Crescent North Ryde	Residential	185	326,496	6,259,739
COM11	376 Lane Cove Road North Ryde	Commercial	155	326,429	6,259,807
COM12	75 Epping Road Macquarie Park	Commercial	100	326,597	6,259,829

Receptor	Address	Receiver Type	Distance to Site (m)	UTM Coordinates (Zone 56 H)	
				X (m E)	Y (m S)
HOT13	71 Epping Road Macquarie Park	Hotel	180	326,651	6,259,775
COM14	75 Epping Road Macquarie Park	Commercial	250	326,679	6,259,742
CC15	61-65 Epping Road Macquarie Park	Childcare	325	326,783	6,259,717
CC16	16 Waterloo Road Macquarie Park	Childcare	480	327,023	6,259,752
COM17	33 Waterloo Road Macquarie Park	Commercial	205	326,815	6,260,065
COM18	1 Eden Park Drive Macquarie Park	Commercial	285	326,907	6,259,997
RES19	35 Waterloo Road Macquarie Park	Residential	180	326,701	6,260,180
EDU20	44 Waterloo Road Macquarie Park	Educational	130	326,461	6,260,217
COM21	89-91 Epping Road Macquarie Park	Commercial	110	326,307	6,260,032
RES22	142 Epping Road North Ryde	Residential	230	326,241	6,259,913

As can be seen in Figure 5-1, the nearest residential receivers are located within 250 m of the proposed site and therefore, an assessment of dust impacts is considered necessary under the guideline.

Figure 5-1: Locations of Identified existing and proposed buildings, Sensitive Receptors and Land uses

5.1.2 Step 2A – Potential Dust Emission Magnitude

In accordance with the IAQM guidance (Section 7, Step 2: Assess the Risk of Dust Impacts), dust emission magnitudes for the proposed site are:

- **Demolition:** the demolished building volume is less than 12,000 m^3, and demolition activities are less than 12 m above ground. The potential magnitude of demolition is therefore assessed as ***Small***;
- **Earth Works**: the area affected by the proposed earthworks is more than 18,000 m^2 but less than 110,000m^2, and at any one time, however there may be 5 - 10 heavy earth-moving vehicles to be active during this stage. It is therefore conservatively assumed that the potential magnitude of earthworks is ***Medium***;
- **Construction**: the constructed building volume is greater than 12,000 m^3 but less than 75000 m^3; therefore, the potential magnitude of construction is assessed as ***Medium***
- **Track Out**: track out is expected to result in between 20 – 50 heavy vehicle movements per day leaving the site (this would not occur for the entire duration), and all on-site haulage would include unpaved sections of road less than 50 m long. The potential magnitude of Track out is therefore assessed as **Medium**.

The estimated dust emission magnitudes are summarized in Table 5-2:

Table 5-2: Summary of Dust Emission Magnitudes

Activity	Dust Emission Magnitude
Demolition	Small
Earthworks	Medium
Construction	Medium
Trackout	Medium

5.1.3 Step 2B – Sensitivity of Surrounding Area

The sensitivity of the surrounding area to dust impacts considers several factors, including:

- specific receptor sensitivities;
- the number of receptors and their proximity to the works;
- existing background dust concentrations; and
- site-specific factors that may reduce impacts, such as trees that may reduce wind-blown dust.

5.1.3.1 Receptor sensitivities

The following subsections provide the descriptions for sensitivities of different types of receptors to dust soiling and human health effects.

Dust Soiling Effects

High sensitivity receptor:

- Users can reasonably expect an enjoyment of 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.
- Indicative examples include dwellings, museum, and other culturally important collections, medium- and long-term car parks and car showrooms.

Medium sensitivity receptor:

- 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.
- Indicative examples include parks and places of work.

Low sensitivity receptor:

- 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.

Indicative examples include playing fields, farmland (unless commercially sensitive horticultural), footpaths, short-term car parks, and roads. Human Health Effects

For the sensitivity of people to the health effects of PM_{10}, the IAQM provides the following assessment criteria.

High sensitivity receptor:

- Locations where members of 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).
- Indicative examples include residential properties. Hospitals, schools, and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.

Medium sensitivity receptor:

- 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).
- Indicative examples may include office and shop workers but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.

Low sensitivity receptor:

- Locations where human exposure is transient.
- Indicative examples include public footpaths, playing fields, parks and shopping streets.

Summary of receptor Sensitivities located in the Surrounding Area

In accordance with the IAQM guideline, the following receptor sensitivities have been determined:

Commercial, Educational and Hotel Receivers:

- **Medium** sensitivity to dust soiling and Human Health, as the site is surrounded by commercial and industrial developments.

Childcare, Residential and Recreational Receivers

- **Low** sensitivity to dust soiling and Human Health, as the site is surrounded by Childcare establishments to south and few educational to the north greater than 250m away, whereas for residential and recreational areas, potential air quality impacts are moderately affected.

5.1.3.2 Overall Sensitivity of the Surrounding Area

Dust Soiling Effects

Considering the above receptor sensitivities, the number of sensitive receptors in the vicinity of the site their distance to the Site, and the IAQM decision matrix reproduced in Table 5-4, the overall sensitivity of the area with respect to dust soiling is found to be **Low**. See summary in Table 5-3

Table 5-4: Area Sensitivity Decision Matrix – Dust Soiling

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

Commercial and Industrial Receivers

Educational, Residential and Recreational Receivers

Human Health Effects

For human health impacts, besides receptor sensitivities, numbers and distances to the site, the mean background PM_{10} concentration was also taken into account (14.2 µg/m^3 as per Table 4-2.).The resulting IAQM decision matrix is shown in Table 5-5 and indicates a **Low** sensitivity for human health effect

Table 5-5: Area Sensitivity Decision Matrix – Human Health

Receptor Sensitivity	Annual Mean PM_{10} Concentration[1]	No. of Receptors	Distance from the Source (m)			
			<20	<50	<100	<250
High	> 20 µg/m³	>100	High	High	High	Medium
		10-100	High	High	Medium	Low
		1-10	High	Medium	Low	Low
	17.5 - 20 µg/m³	>100	High	High	Medium	Low
		10-100	High	Medium	Low	Low
		1-10	High	Medium	Low	Low
	15 – 17.5 µg/m³	>100	High	Medium	Low	Low
		10-100	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	< 15 µg/m³	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	> 20 µg/m³	>10	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	17.5 - 20 µg/m³	>10	Medium	Low	Low	Low
		1-10	Low	Low	Low	Low
	15 – 17.5 µg/m³	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
	< 15 µg/m³	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low		≥ 1	Low	Low	Low	Low

Commercial and Industrial Receivers

Educational, Residential and Recreational Receivers

Note 1: The PM_{10} values have been adjusted from the IAQM guidance according to the ratio between the Australian and UK annual mean standards (25 and 40 µg/m³ respectively). There is some inherent uncertainty in this adjustment. The upper PM_{10} threshold in the IAQM guidance is based on an annual mean concentration at which an exceedance of the UK's 24-hour objective of 50 µg/m³ is likely, allowing for 35 exceedances per year. In other words, for the UK the annual average approximately corresponds to the 90th percentile of the 24-hour values. However, there are far fewer allowed exceedances in Australia and New Zealand and therefore, there is no direct comparison. Nevertheless, experience with the adjusted values has shown that they work reasonably well for Australian conditions. The values are also taken to be appropriate for New Zealand. Although New Zealand has a lower annual mean guideline than the Australian standard, the 24-hour standards are numerically equivalent.

Overall Sensitivities of the Surrounding Area

The sensitivity of the surrounding area (for all identified receivers) is summarized in Table 5-6 for the various activities.

Table 5-6: Summary of Surrounding Area Sensitivity

Potential Impact	Sensitivity of the Surrounding Area			
	Clearing	Earthworks	Construction	Trackout
Dust Soiling	Low	Low	Low	Low
Human Health	Low	Low	Low	Low

5.1.4 Step 2C – Define the Risk of Impacts

To define the risk of impacts, the dust emission magnitude evaluated in Step 2A is combined with the sensitivity of the area, (Step 2B) using the IAQM risk matrices. The resulting impact matrices are summarised in Table 5-7, Table 5-8, Table 5-9 and Table 5-10 for demolition, earthworks, construction and trackout, respectively.

Table 5-7: Risk of Dust Impacts – Land Clearing (Demolition)

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 5-8: Risk of Dust Impacts – Earthworks

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 5-9: Risk of Dust Impacts – Construction

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 5-10: Risk of Dust Impacts – Trackout

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

In accordance with Table 5-7 through Table 5-10, earthworks, construction and trackout activities are considered to have low risk and land clearing /demolition is considered to have a negligible risk of dust soiling and human health impacts. It is important to note that the above risks assume that dust mitigation measures are not implemented.

5.1.5 Step 3 – Site-Specific Mitigation

The IAQM guidance document identifies a range of appropriate dust mitigation measures that should be implemented as a function of the risk of impacts. These measures are presented in Section 5.2.

5.1.6 Step 4 – Significance of Residual Impacts

In accordance with the IAQM guidance document, the final step in the assessment is to determine the significance of any residual impacts, following the implementation of mitigation measures. To this end, the guidance states:

> *For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be "not significant".*

Based on the proposed works, and the advice in the IAQM guidance document, it is considered unlikely that these works would result in unacceptable air quality impacts. However, the mitigation measures outlined in Section 5.2 should be considered to implement best management practices.

5.2 Construction Dust Mitigation Measures

The assessment of potential dust impacts from the proposed construction activities indicate that the proposed project will have a **low risk** of dust soiling or human health impacts from earthwork, construction and trackout whereas there is a **negligible risk** from land clearing/demolition if dust mitigation measures are not implemented.

To ensure best practice management, the following mitigation measures are recommended so that construction dust impacts are minimised.

- **Communications:**
  - Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
  - Display the name and contact details of the Responsible Person accountable for air quality and dust issues on the site boundary.
  - Display the head or regional office contact information.
  - Develop and implement a Dust Management Plan (DMP) that considers, as a minimum, the measures identified herein.
- **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.
  - Make the complaints log available to relevant authorities (Council, EPA, etc).
  - Record exceptional incidents that cause dust and/or air emissions, on or off site, and the actions taken to resolve the situation in the logbook.
  - 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.
- **Monitoring:**
  - Undertake daily on-site and off-site inspections at nearby receptors to monitor dust. Record inspection results and make available to relevant authorities. This should include regular dust soiling checks of surfaces such as street furniture, cars, and windows. Continuous real-time dust monitoring is not necessary for this project.
  - 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.
- **Preparing & Maintaining the Site:**
  - Plan site layout so that dust generating activities are located as far away as possible from receptors.
  - Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
  - Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
  - Avoid site runoff of water or mud.
  - Keep site fencing, barriers and scaffolding clean using wet methods.

- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If being re-used, keep materials covered or contained in a way which prevents dust, for example dust suppression.
- Cover, seed, or fence stockpiles to prevent wind erosion.

- **Construction Vehicles and Sustainable Travel:**
  - Ensure all vehicles switch off engines when stationary – no idling vehicles.
  - Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
  - Impose and signpost a maximum-speed-limit of 25 km/h on surfaced and 15 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).
  - Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
  - Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
- **Measures for General Construction Activities:**
  - Ensure an adequate water supply on the site for effective dust/PM suppression/mitigation, using non-potable water where possible and appropriate.
  - 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.
- **Measures Specific to Demolition:**
  - Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
  - Ensure effective water suppression is used during demolition operations. Handheld 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.
  - Avoid explosive blasting, using appropriate manual or mechanical alternatives.
  - Bag and remove any biological debris or damp down such material before demolition.
- **Measures Specific to Earthworks:**
  - Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
  - Only remove the cover in small areas during work and not all at once.
- **Measures Specific to Construction:**
  - Avoid scabbling (roughening of concrete surfaces) if possible.
  - 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.
  - 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.
  - For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
- **Measures Specific to Haulage:**
  - Use water-assisted dust sweeper(s) on the access and local roads, as necessary.

- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Access gates to be located at least 10 m from receptors where possible.

6 OPERATIONAL PHASE ASSESSMENT

6.1 Modelling Methodology

The NSW EPA's "Approved Methods" (NSW EPA 2022) outlines the approach to AQIA, using two 'Levels':

- Level 1: a simple 'screening' assessment using worst-case modelling assumptions;
- Level 2: a detailed assessment using refined modelling techniques and site-specific input data.

If a Level 1 assessment demonstrates that adverse impacts will not occur, then there is no need to progress to Level 2. At a screening level (called "Level 1 assessment" in NSW EPA, 2022), air quality impacts are modelled as a function of distance from the road for worst cases of emissions, background concentrations and meteorological conditions. The initial screening model indicated potential issues. Therefore, a detailed Level 2 assessment was undertaken and is described in the next sections.

The approach taken for the air quality impact assessment is as follows:

- Meteorological Modelling: with TAPM and AERMET models (Section 6.2);
- Emission Inventory: Estimate peak emissions of the primary pollutants (NO_2, PM_{10}, $PM_{2.5}$, SO_2 and CO) associated with the standby generators located at the existing NEXTDC S2 and future proposed NEXTDC S5 data centre along with road traffic emissions from Lane Cove Road and Hyundai Drive (Section 6.3).
- Dispersion Modelling: with AERMOD, per the NSW EPA Approved Methods (NSW EPA, 2022). to predict pollutant concentrations on the proposed development (Section 6.4).
- Assessment: Compare predicted concentrations with relevant air quality criteria (Section 7).

6.2 Meteorological Modelling

6.2.1 TAPM

No meteorological observation data is available for the Proposal Site. Therefore, site-specific meteorological data was generated using a prognostic model, The Air Pollution Model (TAPM), developed and distributed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

TAPM is an incompressible, non-hydrostatic, primitive equations prognostic model with a terrain-following vertical coordinate for three-dimensional simulations. It predicts the flows important to local scale air pollution, such as sea breezes and terrain induced flows, against a background of large-scale meteorology provided by synoptic analyses. TAPM benefits from having access to databases of terrain, vegetation and soil type, leaf area index, sea-surface temperature, and synoptic scale meteorological analyses for various regions around the world.

The prognostic modelling domain was centred at 33.783°S, 151.125°E and involved four nesting grids of 30 km, 10 km, 3 km and 1 km with 41 grid points in the lateral dimensions and 25 vertical levels.

The TAPM model included assimilation of wind data collected at the Sydney International Airport and Sydney Olympic Park (Archery Centre) for the year 2025.

6.2.2 AERMET

The TAPM outputs, including predictions of wind speed, wind direction, temperature, humidity, cloud cover, solar radiation and rainfall, were processed through AERMET, the meteorological pre-processor for AERMOD. AERMET uses the TAPM data in combination with land use parameters, to derive boundary layer characteristics mixing heights and velocity scaling parameters.

The NSW EPA Approved Methods recognize the use of prognostic meteorological models, such as TAPM, to generate site-specific meteorological datasets. TAPM is particularly suited for this purpose as it incorporates regional synoptic influences, local terrain, land-use characteristics and surface energy balance processes, providing a physically consistent and spatially representative meteorological dataset for dispersion modelling.

The wind-rose plots generated by AERMET using TAPM modelling results are shown in Figure 6-1. The modelled annual wind roses produced by AERMET have predominately winds from the westerly, north-west, northeast and southeast octants which are similar to winds observed at the Sydney International Airport and Sydney Olympic Park (Archery Centre) during 2025. Wind speeds tend to be somewhat lower than observed, providing a conservative basis for dispersion assessment. Overall, the meteorological dataset used for dispersion modelling is considered representative of conditions at the Proposed Site.

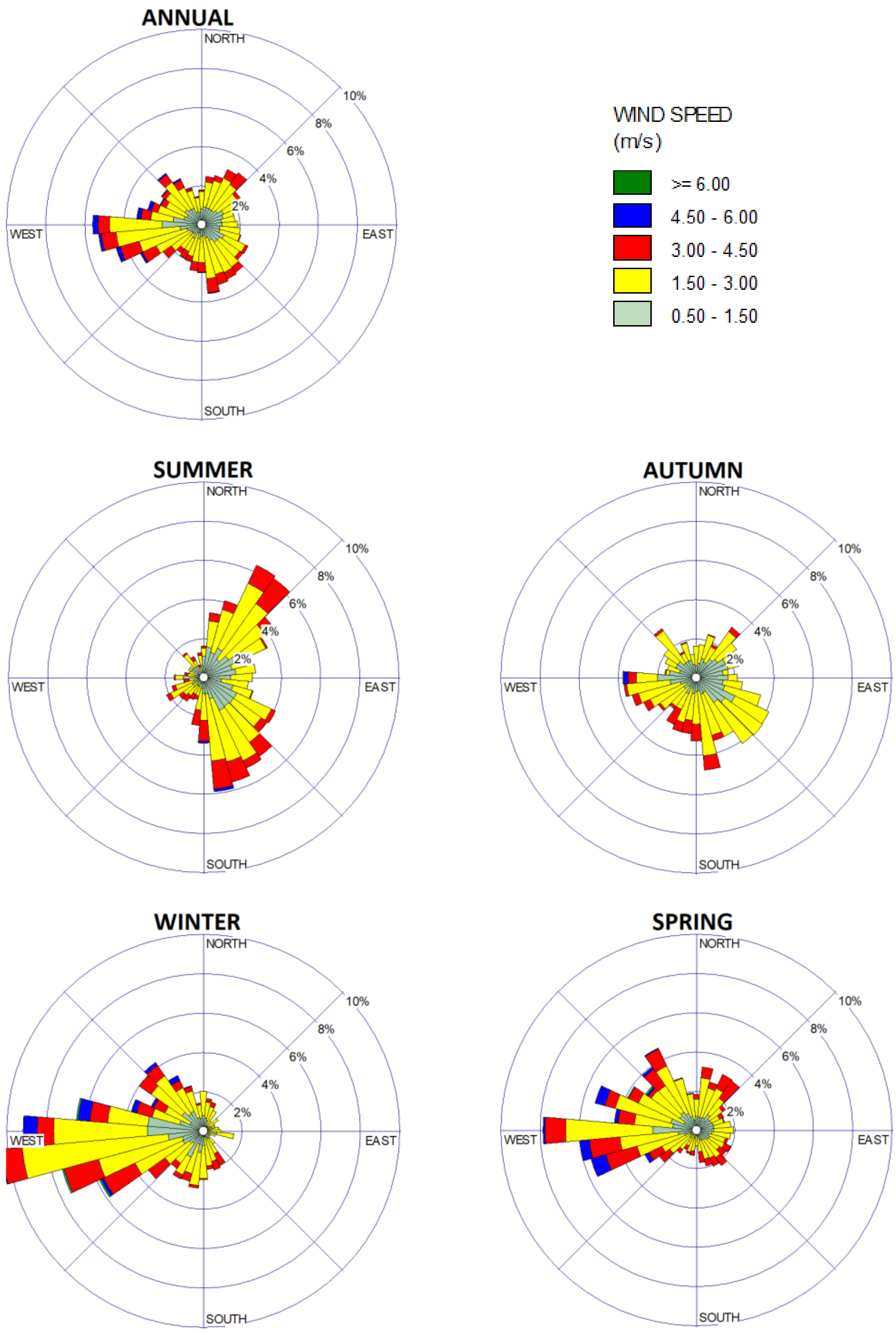

Figure 6-1: AERMET Wind Roses Based on TAPM Output, 2025

6.3 Emissions

6.3.1 Traffic Emissions

The Traffic emissions from vehicles travelling along the Lane Cove Road and Hyundai Drive have the most potential to significantly impact air quality in the Study Area.

Atmospheric pollutants emitted from road traffic include NO_X, $PM_{2.5}$, PM_{10}, SO_2 and VOCs. Due to the introduction of lead-replacement fuels in 2002, emissions of lead from motor vehicles are no longer considered to be significant and therefore, not included in this assessment. Similarly, due to the introduction of low sulphur fuels in 2009, motor vehicles are no longer significant sources of SO2. Also, the emissions of CO and VOCs are no longer a concern from current vehicles fleets, given the relatively low level of CO and VOC emissions from vehicles and the low background concentrations (see Section4.2), it is thus considered appropriate to assume that CO, SO_2 and VOC emissions from road traffic are negligible.

Peak emissions from traffic were determined using the NSW Roadside Air Quality Screening Tool (RAQST), which has replaced the outdated Tool for Roadside Air Quality (TRAQ) (NSW Transport 2023). RAQST uses the number of lanes of traffic, road type, average road gradient, width of any median strip, and width of each lane. For each lane, RAQST calculates emissions based on the corresponding traffic data (volume, composition, and speed).

Background traffic volumes, expressed as Annual Average Daily Traffic (AADT), were sourced from the Transport for NSW Traffic Volume Viewer for Lane Cove Road and from the Traffic Impact Assessment Report dated 31 October 2025 (TTPP, 2025). Emissions were estimated for the worst-case vehicle speed scenario i.e. a low vehicle speed of 10 km/h that would be representative of congested traffic conditions. Detailed Information on the parameters used as input to RAQST is presented in Appendix A.

The resulting peak-hour emission rates were further modulated by the diurnal traffic cycle: i.e. we applied a diurnal multiplier for each hour of day reflecting the ratio of traffic volume for that hour to the peak hour traffic volume). Figure 6-2 shows the diurnal multiplier for Lane Cove Road used in this study, which is based on the Transport NSW, Traffic Volume Viewer data. For Hyundai Drive Road, a conservative worst case peak hour traffic is assumed throughout the day.

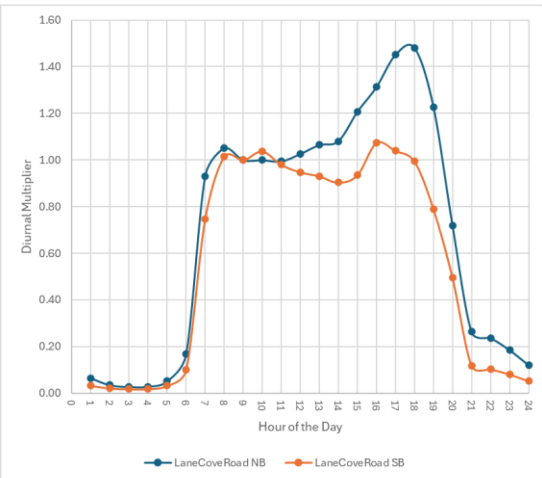

Figure 6-2: Diurnal Multipliers Adopted for this Study

6.3.2 Generator Emissions

The existing data centre, NEXTDC S2, located to the northwest of the proposed development, comprises of 33 generator exhaust stacks, while the proposed data centre, NEXTDC S5, located to the southeast of the proposed development, will comprise 48 generator exhaust stacks. The emission inventory for these generators is based on emissions data presented in the previously approved and/or submitted Air Quality Impact Assessments (NEXTDC S2- Air Quality Assessment - dated 19 May 2017 (Aurecon) and NEXTDC S5 – Revised Air Quality Assessment – dated 26 September 2025 (Arup)), which in turn are derived from the generator manufacturers' specified emission rates. The detailed stack parameters and the emission rates are presented in Appendix B.

Two (2) operational scenarios of these standby generators were considered for assessing the air quality impacts on the proposed development:

- Maintenance/testing scenario (realistic operations) – Routine testing of standby generators at NEXTDC S2 and S5 were considered and are modelled in accordance with the routine maintenance followed at these data centres i.e., it is anticipated that up to one generator would be tested at any one time on a monthly basis . As a conservative assumption, it is also assumed that the maintenance/testing of both the facilities is expected occur at the same time although it is not expected to occur simultaneously.
- An emergency scenario (full loss of main power)– In the event of a full power outage, it was assumed that all generators at both S2 and S5 would operate concurrently at full load for the duration of the outage, conservatively assumed to be one hour.

6.4 Dispersion Modelling

The dispersion model chosen for this assessment is AERMOD – the US EPA regulatory Gaussian plume air dispersion model. AERMOD is a steady state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts. The model is capable of representing dispersion from both surface and elevated sources, and it accounts for simple and complex terrain effects. AERMOD is accepted by NSW EPA for use in air quality impact assessments.

The proposed development and relevant existing buildings that may influence pollutant dispersion through building downwash effects were explicitly incorporated into the modelling. This includes buildings that may affect emissions from the standby generator exhaust stacks. Generator stack emissions were modelled as point sources, while road traffic emissions were represented as line volume sources along Lane Cove Road and Hyundai Drive. All relevant emission sources and buildings included in the modelling are illustrated in Figure 6-3.

6.4.1 Receptors

Discrete receptors were established along the façades of the proposed buildings, which reach heights of approximately 37 m and 143 m. Receptors were placed along the building facades at multiple vertical levels to capture potential worst-case exposure. Additional discrete receptors were also located on the ground level within proposed development accounting for a total of 1746 receptors across the proposed development. The receptor locations are presented in Figure 6-3.

In addition to the discrete receptor locations, AERMOD was configured to predict ground-level concentrations across the full modelling domain using a nested grid receptor network at ground level. This approach enables identification of maximum predicted concentrations at both sensitive locations and across the broader study area.

Figure 6-3: Locations of Identified existing and proposed buildings, Data centre Stack Locations and receptors

6.4.2 Post Processing

NOx to NO_2 Conversion

Nitrogen oxide (NOx) emissions from combustion sources are predominantly in the form of nitric oxide (NO), which is rapidly converted to nitrogen dioxide (NO_2) in the presence of sufficient ambient ozone (O_3). As ozone availability is typically the limiting factor in this conversion process, the Ozone Limiting Method (OLM) was used in the AERMOD model to estimate the maximum NO_2 concentrations arising from the NOx emissions.

The application of OLM follows the NSW guidance (Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales). Specifically, the OLM was applied to predicted hourly NOx concentrations, using contemporaneous hourly ozone background concentrations at the Macquarie Park AQMS in the following equation (per guidance):

$$[NO_2]_{total} = 0.1 \times [NOx]_{pred} + MIN\{0.9 \times [NOx]_{pred}, (46/48) \times [O_3]_{bkgd}\} + [NO_2]_{bkgd}$$

where:

$[NO_2]_{total}$ = predicted cumulative concentration of NO_2 in µg/m^3

[NOx]pred = ground-level concentration of NOx predicted by AERMOD in µg/m^3

[O_3] bkgd = background ambient O_3 concentration at the Rouse Hill AQMS in µg/m^3

[NO_2] bkgd = background ambient NO_2 concentration at the Rouse Hill AQMS in µg/m^3

Cumulative Impact

For the cumulative impact assessment, contemporaneous hourly (or daily) background concentrations obtained from the Macquarie Park Air Quality Monitoring Station (AQMS) were added to the corresponding predicted hourly (or daily) concentrations from both vehicular traffic emissions and generator emissions at all assessed receptors. The resulting cumulative concentrations were compared against the relevant air quality assessment criteria, in accordance with NSW regulatory guidance.

7 ASSESSMENT OF AIR QUALITY IMPACTS

This section presents an assessment of the potential air quality impacts associated with the proposed development, arising from vehicular traffic emissions and operational emissions from standby generators at nearby data centres. The assessment considers predicted pollutant concentrations at relevant receptors and evaluates compliance with applicable air quality impact assessment criteria.

7.1 Scenario 1 – Generator Maintenance

The on-duty standby generators would undergo routine maintenance and testing to make sure they are operational if required during a power outage. For this scenario, it is anticipated that a maximum of one generator would be tested at any one time on a monthly basis.

7.1.1 Particulate matter ≤ 10 μm (PM_{10})

The maximum predicted incremental and cumulative 24-hour and annual average PM_{10} concentrations were modelled at receptors located along the facades of the proposed buildings, including the proposed childcare centre. Table 7-1 summarizes the maximum predicted incremental, and cumulative results for 24-hour and annual average PM_{10} concentrations. The spatial distribution of predicted impacts is further presented in Table 7-2 and Table 7-3, which show the percentage of receptors across the proposed development site and along building façades where the maximum incremental and cumulative PM_{10} concentrations fall within defined concentration ranges for the 24-hour and annual averaging periods, respectively.

Table 7-1: Maximum Predicted 24-hour and Annual Average PM_{10} Concentrations at Sensitive Receptors

Impact	Predicted Maximum 24-hour Average Concentration at the Proposed Site (µg/m³)	Predicted Maximum Annual Average Concentration at the Proposed Site (µg/m³)
Criteria	50	24
Maximum Background Concentration	**76.9**	14.2
Traffic	0.3	0.13
Existing Data Centre NEXTDC S2 Generators	0.4	1.59 E-04
Proposed Data Centre NEXTDC S5 Generators	0.6	2.10 E-04
Cumulative including Background concentration	**77.1**	14.4
% of modelled receptors exceeding the criteria	100.0%	0.0%

Table note: Results in **bold** indicate exceedances of the adopted criteria

Table 7-2: 24-hour Average PM_{10} Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 50 µg/m³	0.0 %	0.0 %	0.0 %	100.0%
Below Criteria, 10 – < 50 µg/m³	0.0 %	0.0 %	0.0 %	0.0%
< 10 µg/m³	100.0 %	100.0 %	100.0 %	0.0%

Table 7-3: Annual Average PM_{10} Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 25 µg/m³	0.0 %	0.0 %	0.0 %	0.0 %
Below Criteria, 5 – < 25 µg/m³	0.0 %	0.0 %	0.0 %	100.0 %
< 5 µg/m³	100.0 %	100.0 %	100.0 %	0.0 %

A review of the maintenance-scenario results presented in Table 7-1, Table 7-2, and Table 7-3 indicate the following:

- The maximum predicted incremental PM_{10} concentrations (combined traffic and generator contributions), for both 24-hour and annual averaging periods, do not exceed the relevant air quality criteria at any location on the façades of the proposed buildings, including the childcare centres, or anywhere within the proposed development. The total incremental contribution represents less than 2% of the 24-hour criterion and less than 1% of the annual criterion.
- Due to elevated background 24-hour PM_{10} concentrations, which already exceed the applicable criterion, the maximum cumulative 24-hour average PM_{10} concentration is predicted to exceed the criterion along the full façades of the proposed buildings. These background exceedances are attributable to regional events, including hazard reduction burns, summer bushfires, and localized dust events.

- The maximum predicted cumulative annual PM_{10} concentrations do not exceed the relevant annual criteria at any receptor, including the façades of the proposed buildings, childcare centres, or elsewhere within the proposed development.

Overall, PM_{10} -related air quality impacts on future residents of the proposed development, including sensitive receptors such as the childcare centres, are expected to be minor. Exceedances of the 24-hour PM_{10} criterion are predicted to occur only during widespread regional dust and smoke events (e.g. bushfires and hazard reduction burning), which are beyond the control of the proposed development.

7.1.2 Fine Particulate matter ($PM_{2.5}$)

The maximum predicted incremental and cumulative 24-hour and annual average $PM_{2.5}$ concentrations were modelled at receptors located along the facades of the proposed buildings, including the proposed child care centre. Table 7-4 summarizes the maximum predicted incremental, and cumulative results for 24-hour and annual average $PM_{2.5}$ concentrations. The spatial distribution of predicted impacts is further presented in Table 7-5 and Table 7-6, which show the percentage of receptors across the proposed development site and along building façades where the maximum incremental and cumulative $PM_{2.5}$ concentrations fall within defined concentration ranges for the 24-hour and annual averaging periods, respectively.

Table 7-4: Maximum Predicted 24-hour and Annual Average $PM_{2.5}$ Concentrations at Sensitive Receptors

Impact	Predicted Maximum 24-hour Average Concentration at the Proposed Site (µg/m³)	Predicted Maximum Annual Average Concentration at the Proposed Site (µg/m³)
Criteria	25	8
Maximum Background Concentration	**25.5**	5.4
Traffic	0.2	0.09
Existing Data Centre NEXTDC S2 Generators	0.4	1.59 E-04
Proposed Data Centre NEXTDC S5 Generators	0.6	2.10 E-04
Cumulative including Background concentration	**25.8**	5.9
% of modelled receptors exceeding the criteria	100.0%	0.0%

Table note: Results in **bold** indicate exceedances of the adopted criteria

Table 7-5: 24-hour Average $PM_{2.5}$ Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 25 µg/m³	0.0 %	0.0 %	0.0 %	100.0%
Below Criteria, 5 – < 25 µg/m³	0.0 %	0.0 %	0.0 %	0.0%
< 5 µg/m³	100.0 %	100.0 %	100.0 %	0.0%

Table 7-6: Annual Average $PM_{2.5}$ Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 8 µg/m³	0.0 %	0.0 %	0.0 %	0.0 %
Below Criteria, 1 – < 8 µg/m³	0.0 %	0.0 %	0.0 %	100.0 %
< 1 µg/m³	100.0 %	100.0 %	100.0 %	0.0 %

A review of the maintenance-scenario results presented in Table 7-4, Table 7-5, and Table 7-6 indicate the following:

- The maximum predicted incremental $PM_{2.5}$ concentrations (combined traffic and generator contributions), for both 24-hour and annual averaging periods, do not exceed the relevant air quality criteria at any location on the façades of the proposed buildings, including the childcare centres, or anywhere within the proposed development. The total incremental contribution represents less than 4% of the 24-hour criterion and less than 1% of the annual criterion.
- Due to elevated background 24-hour $PM_{2.5}$ concentrations, which already exceed the applicable criterion, the maximum cumulative 24-hour average $PM_{2.5}$ concentration is predicted to exceed the criterion along the full façades of the proposed buildings. These background exceedances are attributable to regional events, including hazard reduction burns, summer bushfires, and localized dust events.
- The maximum predicted cumulative annual $PM_{2.5}$ concentrations do not exceed the relevant annual criteria at any receptor, including the façades of the proposed buildings, childcare centres, or elsewhere within the proposed development.

Overall, $PM_{2.5}$ -related air quality impacts on future residents of the proposed development, including sensitive receptors such as the childcare centres, are expected to be minor. Exceedances of the 24-hour $PM_{2.5}$ criterion are predicted to occur only during widespread regional dust and smoke events (e.g. bushfires and hazard reduction burning), which are beyond the control of the proposed development.

7.1.3 Nitrogen Dioxide (NO_2)

The maximum predicted incremental and cumulative 1-hour and annual average NO_2 concentrations modelled at receptors located along the facades of the proposed buildings, including the proposed child care centre. Table 7-7 summarizes the maximum predicted incremental, and cumulative results for 1-hour and annual average NO_2 concentrations. The spatial distribution of predicted impacts is further presented in Table 7-8 and Table 7-9, which show the percentage of receptors across the proposed development site and along building façades where the maximum incremental and cumulative concentrations NO_2 fall within defined concentration ranges for the 1-hour and annual averaging periods, respectively. The NO_2 concentrations are predicted using the OLM method, as described in the NSW guidance. This approach represents a worst-case assumption and is consistent with NSW EPA accepted NO_2 impact assessments.

Table 7-7: Maximum Predicted 1-hour and Annual Average NO_2 Concentrations at Sensitive Receptors

Impact	Predicted Maximum 1-hour Average Concentration at the Proposed Site (µg/m³)	Predicted Maximum Annual Average Concentration at the Proposed Site (µg/m³)
Criteria	164	31
Maximum Background Concentration	47.8	4.1
Traffic [1]	11.0	1.61
Existing Data Centre NEXTDC S2 Generators [1]	101.6	0.32
Proposed Data Centre NEXTDC S5 Generators [1]	107.0	0.55
Cumulative including Background concentration	122.6	6.1
% of modelled receptors exceeding the criteria	0.0%	0.0%

Table note: [1] **Using the Ozone Limiting Method**
Results in **bold** indicate exceedances of the adopted criteria

Table 7-8: 1-hour Average NO_2 Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 164 µg/m³	0.0 %	0.0 %	0.0 %	0.0%
Below Criteria, 140 – < 164 µg/m³	0.0 %	0.0 %	0.0 %	0.0%
Within Criteria, 50 – < 140 µg/m³	0.0 %	58.9 %	100.0 %	100.0 %
< 50 µg/m³	100.0 %	41.1 %	0.0 %	0.0%

Table 7-9: Annual Average NO_2 Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 31 µg/m³	0.0 %	0.0 %	0.0 %	0.0 %
Below Criteria, 25 – < 31 µg/m³	0.0 %	0.0 %	0.0 %	0.0 %
Within Criteria, 5 – < 25 µg/m³	0.0 %	0.0 %	0.0 %	9.2 %
< 5 µg/m³	100.0 %	100.0 %	100.0 %	90.8 %

A review of the maintenance-scenario results presented in Table 7-7, Table 7-8, and Table 7-9 indicate the following:

- The maximum predicted incremental and cumulative NO_2 concentrations, for both 1-hour and annual averaging periods, do not exceed the relevant air quality criteria at any location on the façades of the proposed buildings, including the childcare centres, or anywhere within the proposed development.
- The maximum highest predicted cumulative NO_2 concentrations (i.e. inclusive of background concentrations) is 122.6 µg/m³ at receiver located at a height of 110 m above ground level and is 75% of the NO_2 impact assessment criterion.
- The maximum predicted 1-hour impacts from traffic emission are mostly at lower levels (less than 5 m above the ground level) towards the lane cove road and is less than 7% of the NO_2 impact assessment criterion.
- The maximum predicted 1-hour impacts from generator emissions are mostly at higher levels (above 95 m above the ground level) and is less than 65% of the NO_2 impact assessment criterion.

Under all routine maintenance activities, the predicted 1-hour and annual NO_2 concentrations will meet the impact assessment criteria. Overall, NO_2 -related air quality impacts on future residents of the proposed development, including sensitive receptors such as the childcare centres, are expected to be minor. The Contour Plots of 1-hour NO_2 cumulative impacts at ground level are presented in Appendix C.

7.1.4 Sulphur Dioxide (SO_2)

The maximum predicted incremental and cumulative 1-hour and 24-hour average SO_2 concentrations modelled at receptors located along the facades of the proposed buildings, including the proposed childcare centre. Table 7-10 summarizes the maximum predicted incremental, and cumulative results for 1-hour and 24-hour average SO_2 concentrations. The spatial distribution of predicted impacts is further presented in Table 7-11and Table 7-12 which show the percentage of receptors across the proposed development site and along building façades where the maximum incremental and cumulative concentrations SO_2 fall within defined concentration ranges for the 1-hour and 24-hour averaging periods, respectively.

Table 7-10: Maximum Predicted 1-hour and 24-Hour Average SO_2 Concentrations at Sensitive Receptors

Impact	Predicted Maximum 1-hour Average Concentration at the Proposed Site (µg/m³)	Predicted Maximum 24-Hour Average Concentration at the Proposed Site (µg/m³)
Criteria	215	57
Maximum Background Concentration	65.8	10.2
Traffic	Negligible	Negligible
Existing Data Centre NEXTDC S2 Generators	2.0	0.02
Proposed Data Centre NEXTDC S5 Generators	5.1	1.80
Cumulative including Background concentration	65.9	10.5
% of modelled receptors exceeding the criteria	0.0%	0.0%

Table note: Results in **bold** indicate exceedances of the adopted criteria

Table 7-11: 1-hour Average SO_2 Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 215 µg/m³	0.0 %	0.0 %	0.0 %	0.0%
Below Criteria, 100 – < 215 µg/m³	0.0 %	0.0 %	0.0 %	0.0%
< 100 µg/m³	100.0 %	100.0 %	100.0 %	100.0 %

Table 7-12: 24-Hour Average SO_2 Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 57 µg/m³	0.0 %	0.0 %	0.0 %	0.0 %
Below Criteria, 10 – < 57 µg/m³	0.0 %	0.0 %	0.0 %	100.0 %
< 10 µg/m³	100.0 %	100.0 %	100.0 %	0.0 %

A review of the maintenance-scenario results presented in Table 7-10Table 7-11, and Table 7-11 indicate the following:

- The maximum predicted incremental and cumulative SO_2 concentrations, for both 1-hour and 24-hour averaging periods, do not exceed the relevant air quality criteria at any location on the façades of the proposed buildings, including the childcare centres, or anywhere within the proposed development.

Under all routine maintenance activities, the predicted 1-hour and annual SO_2 concentrations will meet the impact assessment criteria. Overall, SO_2 -related air quality impacts on future residents of the proposed development, including sensitive receptors such as the childcare centre are expected to be negligible. The Contour Plots of 1-hour SO_2 cumulative impacts at ground level are presented in Appendix C.

7.1.5 Carbon Monoxide (CO)

Predicted incremental ground-level CO concentrations are a small fraction of the existing background CO concentrations, and cumulative and incremental concentrations of CO for the 1-hour, 8 hour and 15minutes averaging periods are well below their respective criteria over the proposed development.

7.2 Scenario 2 – Generator Backup Power/Emergency

This section addresses the potential air quality impact from a highly unlikely scenario where all generators would run simultaneously (peak emissions) to provide the full back up power required. This scenario has a very low likelihood of occurring and would only happen if there is complete power outage.

7.2.1 Particulate matter ≤ 10 µm (PM$_{10}$)

The maximum predicted incremental and cumulative 24-hour and annual average PM$_{10}$ concentrations were modelled at receptors located along the facades of the proposed buildings, including the proposed child care centre. Table 8-13 summarizes the maximum predicted incremental, and cumulative results for 24-hour and annual average PM$_{10}$ concentrations. The spatial distribution of predicted impacts is further presented in Table 8-14 and Table 8-15, which show the percentage of receptors across the proposed development site and along building façades where the maximum incremental and cumulative PM$_{10}$ concentrations fall within defined concentration ranges for the 24-hour and annual averaging periods, respectively.

Table 7-13: Maximum Predicted 24-hour and Annual Average PM$_{10}$ Concentrations at Sensitive Receptors

Impact	Predicted Maximum 24-hour Average Concentration at the Proposed Site (µg/m³)	Predicted Maximum Annual Average Concentration at the Proposed Site (µg/m³)
Criteria	50	24
Maximum Background Concentration	**76.9**	14.2
Traffic	0.3	0.13
Existing Data Centre NEXTDC S2 Generators	0.5	3.21 E-04
Proposed Data Centre NEXTDC S5 Generators	1.2	4.38 E-04
Cumulative including Background concentration	**78.4**	14.3
% of modelled receptors exceeding the criteria	100.0%	0.0%

Table note: Results in **bold** indicate exceedances of the adopted criteria

Table 7-14: 24-hour Average PM_{10} Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 50 µg/m³	0.0 %	0.0 %	0.0 %	100.0%
Below Criteria, 10 – < 50 µg/m³	0.0 %	0.0 %	0.0 %	0.0%
< 10 µg/m³	100.0 %	100.0 %	100.0 %	0.0%

Table 7-15: Annual Average PM_{10} Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 25 µg/m³	0.0 %	0.0 %	0.0 %	0.0 %
Below Criteria, 5 – < 25 µg/m³	0.0 %	0.0 %	0.0 %	100.0 %
< 5 µg/m³	100.0 %	100.0 %	100.0 %	0.0 %

A review of the emergency-scenario results presented in Table 7-13, Table 7-14 and Table 7-15indicate the following:

- The maximum predicted incremental PM_{10} concentrations (combined traffic and generator contributions), for both 24-hour and annual averaging periods, do not exceed the relevant air quality criteria at any location on the façades of the proposed buildings, including the childcare centres, or anywhere within the proposed development. The total incremental contribution represents less than 4% of the 24-hour criterion and less than 1% of the annual criterion.
- Due to elevated background 24-hour PM_{10} concentrations, which already exceed the applicable criterion, the maximum cumulative 24-hour average PM_{10} concentration is predicted to exceed the criterion along the full façades of the proposed buildings. These background exceedances are attributable to regional events, including hazard reduction burns, summer bushfires, and localized dust events.
- The maximum predicted cumulative annual PM_{10} concentrations do not exceed the relevant annual criteria at any receptor, including the façades of the proposed buildings, childcare centres, or elsewhere within the proposed development.

Overall, PM_{10} -related air quality impacts on future residents of the proposed development, including sensitive receptors such as the childcare centres, are expected to be minor. Exceedances of the 24-hour PM_{10} criterion are predicted to occur only during widespread regional dust and smoke events (e.g. bushfires and hazard reduction burning), which are beyond the control of the proposed development.

7.2.2 Fine Particulate matter ($PM_{2.5}$)

The maximum predicted incremental and cumulative 24-hour and annual average $PM_{2.5}$ concentrations were modelled at receptors located along the facades of the proposed buildings, including the proposed childcare centre. Table 7-16 summarizes the maximum predicted incremental, and cumulative results for 24-hour and annual average $PM_{2.5}$ concentrations. The spatial distribution of predicted impacts is further presented in Table 7-17and Table 7-18, which show the percentage of receptors across the proposed development site and along building façades where the maximum incremental and cumulative $PM_{2.5}$ concentrations fall within defined concentration ranges for the 24-hour and annual averaging periods, respectively.

Table 7-16: Maximum Predicted 24-hour and Annual Average $PM_{2.5}$ Concentrations at Sensitive Receptors

Impact	Predicted Maximum 24-hour Average Concentration at the Proposed Site (µg/m³)	Predicted Maximum Annual Average Concentration at the Proposed Site (µg/m³)
Criteria	25	8
Maximum Background Concentration	**25.5**	5.4
Traffic	0.2	0.09
Existing Data Centre NEXTDC S2 Generators	0.5	3.21 E-04
Proposed Data Centre NEXTDC S5 Generators	1.2	4.38 E-04
Cumulative including Background concentration	**27.0**	5.9
% of modelled receptors exceeding the criteria	100.0%	0.0%

Table note: Results in **bold** indicate exceedances of the adopted criteria

Table 7-17: 24-hour Average $PM_{2.5}$ Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 25 µg/m³	0.0 %	0.0 %	0.0 %	100.0%
Below Criteria, 5 – < 25 µg/m³	0.0 %	0.0 %	0.0 %	0.0%
< 5 µg/m³	100.0 %	100.0 %	100.0 %	0.0%

Table 7-18: Annual Average $PM_{2.5}$ Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 8 µg/m³	0.0 %	0.0 %	0.0 %	0.0 %
Below Criteria, 1 – < 8 µg/m³	0.0 %	0.0 %	0.0 %	100.0 %
< 1 µg/m³	100.0 %	100.0 %	100.0 %	0.0 %

A review of the emergency-scenario results presented in Table 7-16, Table 7-17, and Table 7-18 indicate the following:

- The maximum predicted incremental $PM_{2.5}$ concentrations (combined traffic and generator contributions), for both 24-hour and annual averaging periods, do not exceed the relevant air quality criteria at any location on the façades of the proposed buildings, including the childcare centres, or anywhere within the proposed development. The total incremental contribution represents less than 8% of the 24-hour criterion and less than 1% of the annual criterion.
- Due to elevated background 24-hour $PM_{2.5}$ concentrations, which already exceed the applicable criterion, the maximum cumulative 24-hour average $PM_{2.5}$ concentration is predicted to exceed the criterion along the full façades of the proposed buildings. These background exceedances are attributable to regional events, including hazard reduction burns, summer bushfires, and localized dust events.
- The maximum predicted cumulative annual $PM_{2.5}$ concentrations do not exceed the relevant annual criteria at any receptor, including the façades of the proposed buildings, childcare centres, or elsewhere within the proposed development.

Overall, $PM_{2.5}$ -related air quality impacts on future residents of the proposed development, including sensitive receptors such as the childcare centre, are expected to be minor. Exceedances of the 24-hour $PM_{2.5}$ criterion are predicted to occur only during widespread regional dust and smoke events (e.g. bushfires and hazard reduction burning), which are beyond the control of the proposed development. It is highly unlikely that standby generators would need to operate for a continuous 24-hour period in an event of loss of mains power scenario. On this basis, it is very likely that the 24-hour average $PM_{2.5}$ concentrations would be below the impact assessment criterion during a short power outage.

7.2.3 Nitrogen Dioxide (NO_2)

The maximum predicted incremental and cumulative 1-hour and annual average NO_2 concentrations modelled at receptors located along the facades of the proposed buildings, including the proposed childcare centre. Table 7-19summarizes the maximum predicted incremental, and cumulative results for 1-hour and annual average NO_2 concentrations. The spatial distribution of predicted impacts is further presented in Table 7-20and Table 7-21, which show the percentage of receptors across the proposed development site and along building façades where the maximum incremental and cumulative concentrations NO_2 fall within defined concentration ranges for the 1-hour and annual averaging periods, respectively. The NO_2 concentrations are predicted using the OLM method, as described in the NSW guidance. This approach represents a worst-case assumption and is consistent with NSW EPA accepted NO_2 impact assessments.

Table 7-19: Maximum Predicted 1-hour and Annual Average NO_2 Concentrations at Sensitive Receptors

Impact	Predicted Maximum 1-hour Average Concentration at the Proposed Site (µg/m³)	Predicted Maximum Annual Average Concentration at the Proposed Site (µg/m³)
Criteria	164	31
Maximum Background Concentration	47.8	4.1
Traffic [1]	11.0	1.61
Existing Data Centre NEXTDC S2 Generators [1]	**1248.2**	0.01
Proposed Data Centre NEXTDC S5 Generators [1]	**2129.2**	0.01
Cumulative including Background concentration	**2129.7**	5.2
% of modelled receptors exceeding the criteria	100.0%	0.0%

Table note: [1] Using the Ozone Limiting Method
Results in **bold** indicate exceedances of the adopted criteria

Table 7-20: 1-hour Average NO_2 Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 164 µg/m³	0.0 %	94.6 %	100.0 %	100.0 %
Below Criteria, 140 – < 164 µg/m³	0.0 %	3.3 %	0.0 %	0.0 %
Within Criteria, 50 – < 140 µg/m³	0.0 %	2.1 %	0.0 %	0.0 %
< 50 µg/m³	100.0 %	0.0 %	0.0 %	0.0 %

Table 7-21: Annual Average NO_2 Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 31 µg/m³	0.0 %	0.0 %	0.0 %	0.0 %
Below Criteria, 25 – < 31 µg/m³	0.0 %	0.0 %	0.0 %	0.0 %
Within Criteria, 5 – < 25 µg/m³	0.0 %	0.0 %	0.0 %	0.6 %
< 5 µg/m³	100.0 %	100.0 %	100.0 %	99.4 %

A review of the emergency-scenario results presented in Table 7-19, Table 7-20, and Table 7-21 indicate the following:

- The maximum predicted incremental and cumulative NO_2 concentrations for 1-hour averaging periods, exceeds the relevant air quality criteria anywhere within the proposed development. These concentrations are nearly 8 to 12 times of the impact assessment criteria and represents the highest possible concentrations during a loss of mains power, with all generators operating and coinciding with worst-case meteorological conditions, which provides conservatism in the assessment. The likelihood of this scenario occurring is expected to be extremely rare.
- The maximum highest predicted incremental and cumulative annual NO_2 concentrations (i.e. inclusive of background concentrations) is well below the impact assessment criteria.
- The maximum predicted 1-hour impacts from traffic emission are mostly at lower levels (less than 5 m above the ground level) towards the lane cove road and is less than 7% of the NO_2 impact assessment criterion.

In the event of a full power outage, and assuming that all generators at both S2 and S5 would operate concurrently at full load for the duration of the outage, the predicted 1-hour NO_2 concentrations will exceed the impact assessment criteria. However, based on the Ausgrid Distribution and Transmission Annual Planning Report (DTAPR[1]) annual summary reports, these types of typical outages are extremely very rare, and the likelihood of this happening is less than 0.01%. Therefore, it is highly unlikely that the standby generators would ever need to be used in their capacity to provide back-up power generation. Therefore, the air quality impact risk from the highly unlikely worst-case scenario (power outage) activity would be very low. The Contour Plots of 1-hour NO_2 cumulative impacts at ground level are presented in Appendix C.

7.2.4 Sulphur Dioxide (SO_2)

The maximum predicted incremental and cumulative 1-hour and 24-hour average SO_2 concentrations modelled at receptors located along the facades of the proposed buildings, including the proposed childcare centre. TTable 7-22mmarizes the maximum predicted incremental, and cumulative results for 1-hour and 24-hour average SO_2 concentrations. The spatial distribution of predicted impacts is further presented in Table 7-23and Table 7-24, which show the percentage of receptors across the proposed development site and along building façades where the maximum incremental and cumulative concentrations SO_2 fall within defined concentration ranges for the 1-hour and 24-hour averaging periods, respectively.

Table 7-22: Maximum Predicted 1-hour and 24-Hour Average SO_2 Concentrations at Sensitive Receptors

Impact	Predicted Maximum 1-hour Average Concentration at the Proposed Site (µg/m³)	Predicted Maximum 24-Hour Average Concentration at the Proposed Site (µg/m³)
Criteria	215	57
Maximum Background Concentration	65.8	10.2
Traffic [1]	0.5	0.2
Existing Data Centre NEXTDC S2 Generators [1]	2.0	0.02
Proposed Data Centre NEXTDC S5 Generators [1]	**235.1**	3.49
Cumulative including Background concentration	**235.5**	13.7
% of modelled receptors exceeding the criteria	**0.8%**	0.0%

Table note: Results in **bold** indicate exceedances of the adopted criteria

[1] Ausgrid, 2025. Distribution and Transmission Annual Planning Report Summary, December 2025

Table 7-23: 1-hour Average SO_2 Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 215 µg/m³	0.0 %	0.0 %	0.8 %	0.8 %
Below Criteria, 100 – < 215 µg/m³	0.0 %	0.0 %	28.6 %	28.9 %
< 100 µg/m³	100.0 %	100.0 %	70.6 %	70.3 %

Table 7-24: 24-Hour Average SO_2 Concentrations as % of Receptors

Air Quality Concentration Level	% of Receptors across the proposed development			
	Incremental Results			Cumulative Results
	Road Emissions	Existing Data Centre NEXTDC S2	Proposed Data Centre NEXTDC S5	
Above Criteria, > 57 µg/m³	0.0 %	0.0 %	0.0 %	0.0 %
Below Criteria, 10 – < 57 µg/m³	0.0 %	0.0 %	0.0 %	100.0 %
< 10 µg/m³	100.0 %	100.0 %	100.0 %	0.0 %

A review of the emergency-scenario generator emission results presented in Table 7-22, Table 7-23, and Table 7-24 indicate the following:

- The maximum predicted incremental and cumulative SO_2 concentrations, for 24-hour averaging periods, do not exceed the relevant air quality criteria at any location on the façades of the proposed buildings, including the childcare centre, or anywhere within the proposed development.
- The maximum predicted incremental and cumulative SO_2 concentrations for 1-hour averaging periods, exceeds the relevant air quality criteria at a very few locations on the proposed development. These receptors are located on the north east corner of the proposed building at locations higher than 115 m above the ground level. These exceedances represents the highest possible concentrations during a loss of mains power, with all generators operating and coinciding with worst-case meteorological conditions, which provides conservatism in the assessment. The likelihood of this scenario occurring is expected to be extremely rare.

In the event of a full power outage, and assuming that all generators at both S2 and S5 would operate concurrently at full load for the duration of the outage, the predicted 1-hour SO2 concentrations will exceed the impact assessment criteria at 0.8% of the proposed development. However, based on the Ausgrid Distribution and Transmission Annual Planning Report (DTAPR) annual summary reports, these types of typical outages are extremely very rare, and the likelihood of this happening is less than 0.01%. Therefore, it is highly unlikely that the standby generators would ever need to be used in their capacity to provide back-up power generation. Therefore, the air quality impact risk from the highly unlikely worst-case scenario (power outage) activity would be very low. The Contour Plots of 1-hour SO_2 cumulative impacts at ground level are presented in Appendix C.

7.2.5 Carbon Monoxide (CO)

In the event of a full power outage, predicted incremental ground-level CO concentrations are a small fraction of the existing background CO concentrations, and cumulative and incremental concentrations of CO for the 1-hour, 8 hour and 15 minutes averaging periods are below their respective criteria over the proposed development.

8 CONCLUSION

RWDI was engaged by “388 LCR Development” to conduct a preliminary air quality impact assessment to accompany a State Significant Development Application (SSDA) for a mixed-use development at 2-4 Giffnock Avenue, Macquarie Park within the Ryde Local Government Area (LGA) (the Site).

A risk-based approach in accordance with the IAQM guidance was adopted to assess dust emissions from the construction of the Site. The assessment concluded that there would be a negligible risk of dust impacts from clearing the site, low risks from all other activities (earthworks, construction and track out) if no dust mitigation is applied (earthworks, construction and track-out). Mitigation measures to minimise potential air quality impacts during the construction were recommended. Assuming the recommended mitigation measures are implemented, no significant air quality impacts are expected to occur during the construction of the Project.

A level 1 air quality screening assessment was undertaken for traffic-related emissions in accordance with the NSW EPA Approved Methods, using the Transport for NSW Road Air Quality Screening Tool (RAQST). The level 1 screening indicated potential exceedances of NO_2, $PM_{2.5}$ and PM_{10} associated with traffic at distances of 10m under slow traffic conditions

Given these results, a Level 2 air quality impact assessment was undertaken with a more advanced model, AERMOD, more detailed traffic conditions, and receptors located over the areas and facades of the proposed development, which predicted no exceedances of NO_2, $PM_{2.5}$ and PM_{10} due to traffic at any of the receptors (predicted exceedances of the 24-hour $PM_{2.5}$ and $PM_{1}0$ criteria associated with elevated background concentrations remained during region-wide high-smoke events)

Additionally, the cumulative AERMOD impact assessment considered the potential impact of back-up generator stack emissions at the existing NEXTDC S2and proposed NEXTDC S5 datacentres.

Emissions from the standby generators were taken from the Air Quality Impact Assessment reports for the data centres (NEXTDC S2- Air Quality Assessment - dated 19 May 2017 (Aurecon), and NEXTDC S5 – Revised Air Quality Assessment – dated 26 September 2025 (Arup)). Two (2) operational scenarios were considered for assessing the cumulative air quality impacts on the proposed development:

- *Maintenance/testing scenario* – Routine testing of standby generators at NEXTDC S2 (8 Giffnock Avenue) and NEXTDC S5 (269 Lane Cove Road) was modelled in accordance with the routine maintenance followed at these data centres i.e., it was anticipated one generator would be tested at any one time at each facility. As a conservative assumption, it was also assumed that the maintenance/testing at both t facilities could occur at the same time although it is unlikely to be the case.
- *Emergency scenario (full loss of main power)*– In the event of a full power outage, it was assumed that all generators at both S2 and S5 would operate concurrently at full load for the duration of the outage, conservatively assumed to be one hour.

Two operational scenarios were assessed, with the following outcomes:

- For Maintenance/Testing scenario – Predicted cumulative pollutant concentrations, are below the relevant impact assessment criteria at all locations across the proposed development and along building façades for all assessed pollutants except for 24-hour average PM_{10} and $PM_{2.5}$ concentrations. Exceedances of the 24-hour PM_{10} and $PM_{2.5}$ criterion are predicted to occur only during widespread regional dust and smoke events (e.g. bushfires and hazard reduction burning), which are beyond the control of the proposed development. Accordingly, the overall air quality impact risk on the proposed development, including the childcare centre, from routine generator maintenance and testing activities is considered negligible.

- For Emergency scenario – Under highly conservative modelling assumptions, predicted cumulative pollutant concentrations, , are below the relevant impact assessment criteria at all locations across the proposed development and along building façades for all assessed pollutants except for es 1-Hour average NO_2 and SO_2 concentrations. Predicted exceedances of the 1-hour NO_2 criterion are shown to occur across the proposed development, while exceedances of the 1-hour SO_2 criterion are predicted to occur across approximately 0.8% of the proposed development area. This scenario assumes that all standby generators operate simultaneously at full load during a loss of mains power. The probability of such an event occurring is estimated to be less than 0.01%. However, emergency generator operation is expected to be rare and of short duration. Ausgrid outage records for the Sydney metropolitan area indicate that both planned and unplanned outages are infrequent and typically short-lived (generally less than 1 hour). Accordingly, the risk associated with this is considered very low

Overall, the assessment concludes that construction-phase air quality impacts are minor, temporary, and manageable with the implementation of standard mitigation measures. Operational traffic and generator emissions are not expected to result in unacceptable air quality impacts at the proposed development, including the childcare centre, during routine maintenance and testing activities. Any potential adverse air quality effects are limited to exceptional regional events (such as widespread bushfire smoke) or rare, short-duration power outages, which are outside the control of the Project. In those rare instances, It is recommended that occupants remain indoors with windows closed.

9 REFERENCES

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10 STATEMENT OF LIMITATIONS

This report entitled *2-4 Giffnock Avenue – Preliminary Air Quality Impact Assessment*, dated 16 April 2026, was prepared by RWDI Australia Pty Ltd ("RWDI") for 388 LCR Development ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

APPENDIX A

RAQST Traffic Emissions For Lane Cove Road and Hyundai Drive

User input

1. General set-up

† Changing parameters in bold will reset traffic data.

Assessment year†	**2025**
Electric vehicle projections	YES

2. Road characteristics

Lanes per direction†	**4**
Road type†	**Arterial**
Road gradient in direction A	2.3%
Median strip width (m)	0.5
Lane width (m)	3

3. Traffic data - general

Level for traffic composition†	**Level 1**
Fill with default composition†	**NO**
Traffic period†	**AADT**
Traffic speed (km/h)	10
Peak hour traffic as % of AADT‡	10%

‡ Used to calculate peak-hour traffic if only AADT is known.

4. Traffic data - by lane

Direction	Lane	Road gradient	Traffic volume (annual - vpd)
A	Lane A1 ►	2.3%	12,649
A	Lane A2 ►	2.3%	12,649
A	Lane A3 ►	2.3%	12,649
A	Lane A4 ►	2.3%	12,649
B	◄ Lane B4	-2.3%	8,218
B	◄ Lane B3	-2.3%	8,218
B	◄ Lane B2	-2.3%	8,218
B	◄ Lane B1	-2.3%	8,218

5. Background concentrations

(a) Values from DPE monitoring stations (2021 only)

Background site for NO_X	Default
Background site for PM_{10}	Default
Background site for $PM_{2.5}$	Default
1-hour metric for NO_X	Maximum
24-hour metric for PM_{10}	Maximum
24-hour metric for $PM_{2.5}$	Maximum

(b) User-defined values (overrides DPE data)

Apply user-defined values			YES
	NOx (µg/m^3)	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)
1-hour	57.4	-	-
24-hour	-	38.1	38.1
Annual	10.3	14.5	6.2

6. Closest receptor

Distance from kerb of lane A1 (m)	10

Results - emissions

Direction	Lane	NOx (g/vehicle-km)	PM10 (g/vehicle-km)	PM2.5 (g/vehicle-km)	CO2 (exhaust) (g/vehicle-km)	CO2 (equivalent) (g/vehicle-km)	NOx (g/km/day)	PM10 (g/km/day)	PM2.5 (g/km/day)	CO2 (exhaust) (g/km/day)	CO2 (equivalent) (g/km/day)
		Period:	Day				Period:	Day			
		Weighted average vehicle emission rate for period (g/vehicle-km)					Average traffic emission rate for period (g/km/day)				
		NO_X	PM_{10}	$PM_{2.5}$	CO_2 (exhaust)	CO_2 (equivalent)	NO_X	PM_{10}	$PM_{2.5}$	CO_2 (exhaust)	CO_2 (equivalent)
A	Lane A1 ►	1.14	0.06	0.04	482.25	489.11	1,442.18	74.61	52.95	6,10,000.44	6,18,675.59
A	Lane A2 ►	1.14	0.06	0.04	482.25	489.11	1,442.18	74.61	52.95	6,10,000.44	6,18,675.59
A	Lane A3 ►	1.14	0.06	0.04	482.25	489.11	1,442.18	74.61	52.95	6,10,000.44	6,18,675.59
A	Lane A4 ►	1.14	0.06	0.04	482.25	489.11	1,442.18	74.61	52.95	6,10,000.44	6,18,675.59
B	◄ Lane B4	0.83	0.05	0.03	482.25	488.50	680.05	42.73	28.66	3,96,314.62	4,01,448.63
B	◄ Lane B3	0.83	0.05	0.03	482.25	488.50	680.05	42.73	28.66	3,96,314.62	4,01,448.63
B	◄ Lane B2	0.83	0.05	0.03	482.25	488.50	680.05	42.73	28.66	3,96,314.62	4,01,448.63
B	◄ Lane B1	0.83	0.05	0.03	482.25	488.50	680.05	42.73	28.66	3,96,314.62	4,01,448.63
For all lanes		**1.02**	**0.06**	**0.04**	**482.25**	**488.87**	**8,488.93**	**469.35**	**326.45**	**40,25,260.22**	**40,80,496.91**
		Weighted average emission rate					Total emission rate				

User input

1. General set-up

† Changing parameters in bold will reset traffic data.

Assessment year†	**2025**
Electric vehicle projections	YES

2. Road characteristics

Lanes per direction†	**1**
Road type†	**Residential**
Road gradient in direction A	0.0%
Median strip width (m)	0.5
Lane width (m)	3

3. Traffic data - general

Level for traffic composition†	**Level 1**
Fill with default composition†	**NO**
Traffic period†	**Peak hour**
Traffic speed (km/h)	10
Peak hour traffic as % of AADT‡	10%

‡ Used to calculate peak-hour traffic if only AADT is known.

4. Traffic data - by lane

Direction	Lane	Road gradient	Traffic volume (peak hour - vph)
A	Lane A1 ►	0.0%	34
B	◄ Lane B1	0.0%	54

5. Background concentrations

(a) Values from DPE monitoring stations (2021 only)

Background site for NO_X	Default
Background site for PM_{10}	Default
Background site for $PM_{2.5}$	Default
1-hour metric for NO_X	Maximum
24-hour metric for PM_{10}	Maximum
24-hour metric for $PM_{2.5}$	Maximum

(b) User-defined values (overrides DPE data)

Apply user-defined values			YES
	NOx (µg/m^3)	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)
1-hour	57.4	-	-
24-hour	-	38.1	38.1
Annual	10.3	14.5	6.2

6. Closest receptor

Distance from kerb of lane A1 (m)	10

Results - emissions

Direction	Lane	Period: Weighted average vehicle emission rate for period (g/vehicle-km) — Peak hour NO_X	PM_{10}	$PM_{2.5}$	CO_2 (exhaust)	CO_2 (equivalent)	Period: Average traffic emission rate for period (g/km/h) — Peak hour NO_X	PM_{10}	$PM_{2.5}$	CO_2 (exhaust)	CO_2 (equivalent)
A	Lane A1 ►	0.84	0.05	0.04	451.63	457.36	28.68	1.75	1.20	15,355.35	15,550.34
B	◄ Lane B1	0.84	0.05	0.04	451.63	457.36	45.55	2.79	1.90	24,387.90	24,697.60
For all lanes		**0.84**	**0.05**	**0.04**	**451.63**	**457.36**	**74.23**	**4.54**	**3.10**	**39,743.25**	**40,247.95**

Weighted average emission rate

Total emission rate

APPENDIX B

EMISSION INVENTORY – Generator and Traffic Emissions

Appendix B1: Summary of Generator Point Source Emissions - NEXTDC S2 Data Centre (33 BackUp Emergency Generators)

Project# 2508944

2-4 Giffnock Avenue, MacQuaire Park, NSW

Activity	Point Source	Activity	STACK Location(UTM Coordinates, Zone 56S)		Emission Rates Based on the Previous Approved AQIA					Stack Height	Inside Diameter	Exit Velocity (1)	Exit Flow Rate	Exit Temperature	Operational Hours
ID	ID's		X (m E)	Y (m E)	NOx (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	CO (g/s)	SO_2 (g/s)	(m)	(m)	(m/s)	(m^3/s)	(k)	(Hours/Year)
GENS2	GENS2_1	S2 Data Centre; 33 back-up diesel generators (reciprocating engines) Generators are in the building on 3 different floors (3 x 11) but all 33 stacks come out above roof	326410.67	6260058.85	2.3 (For Emergency Scenario) 0.070 (For Maintenance Scenario)	0.01 (For Emergency Scenario) 0.0003 (For Maintenance Scenario)	0.01 (For Emergency Scenario) 0.0003 (For Maintenance Scenario)	0.079 (For Emergency Scenario) 0.002 (For Maintenance Scenario)	0.0004 (For Emergency Scenario) 1.212 E-05 (For Maintenance Scenario)	43.00	0.4	41.00	5.2	752.00	Maintenace Scenario - it is anticipated that up to one generator would be tested at any one time on a monthly basis. Emergency Scenario - conservatively assumed to be one hour.
	GENS2_2		326402.40	6260059.90											
	GENS2_3		326409.41	6260053.95											
	GENS2_4		326406.58	6260064.50											
	GENS2_5		326407.30	6260065.81											
	GENS2_6		326414.29	6260059.24											
	GENS2_7		326410.41	6260069.58											
	GENS2_8		326411.12	6260070.60											
	GENS2_9		326418.42	6260064.56											
	GENS2_10		326415.13	6260075.14											
	GENS2_11		326415.79	6260076.04											
	GENS2_12		326422.36	6260070.12											
	GENS2_13		326419.53	6260080.27											
	GENS2_14		326420.26	6260081.27											
	GENS2_15		326427.39	6260075.35											
	GENS2_16		326424.28	6260085.67											
	GENS2_17		326424.80	6260086.36											
	GENS2_18		326431.50	6260080.58											
	GENS2_19		326433.72	6260096.78											
	GENS2_20		326434.38	6260097.69											
	GENS2_21		326441.44	6260091.49											
	GENS2_22		326438.08	6260101.92											
	GENS2_23		326438.92	6260102.57											
	GENS2_24		326445.62	6260097.01											
	GENS2_25		326442.81	6260107.36											
	GENS2_26		326443.79	6260108.31											
	GENS2_27		326449.74	6260102.34											
	GENS2_28		326446.58	6260112.08											
	GENS2_29		326447.35	6260112.86											
	GENS2_30		326454.05	6260107.36											
	GENS2_31		326451.54	6260117.70											
	GENS2_32		326452.02	6260118.50											
	GENS2_33		326458.77	6260113.28											

Note (1):

Stack emissions parameters are based on NEXTDC S2- Air Quality Assessment - Generators. 19 May 2017 (Aurecon). For maintenance scenario, emission rates are divided by total number of generators.

Generator   Model: 16V 4000 G23

Power Rating (kW)   1798

Appendix B2: Summary of Generator Point Source Emissions - NEXTDC S5 Data Centre (48 BackUp Emergency Generators)

Project# 2508944

2-4 Giffnock Avenue, MacQuaire Park, NSW

Activity ID	Point Source ID's	Activity	STACK Location(UTM Coordinates, Zone 56S) X (m E)	Y (m E)	Emission Rates Based on the Previous Approved AQIA NOx (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	CO (g/s)	SO_2 (g/s)	Stack Height (m)	Inside Diameter (m)	Exit Velocity [1] (m/s)	Exit Flow Rate (m^3/s)	Exit Temperature (k)	Operational Hours (Hours/Year)
GENS5	GENS5_1	S5 Data Centre; 48 back-up diesel generators Generators are in the building on 6 different floors (6 x 8) but all 48 stacks come out above roof	326654.33	6259872.42	7.882 (For Emergency Scenario) 0.164 (For Maintenance Scenario)	0.028 (For Emergency Scenario) 0.0006 (For Maintenance Scenario)	0.028 (For Emergency Scenario) 0.006 (For Maintenance Scenario)	0.505 (For Emergency Scenario) 0.011 (For Maintenance Scenario)	0.093 (For Emergency Scenario) 0.001875 (For Maintenance Scenario)	61.00	0.60	42.10	11.90	755.15	Maintenace Scenario - it is anticipated that up to one generator would be tested at any one time on a monthly basis. Emergency Scenario - conservatively assumed to be one hour.
	GENS5_2		326654.90	6259873.04											
	GENS5_3		326655.60	6259873.86											
	GENS5_4		326654.97	6259871.73											
	GENS5_5		326655.60	6259872.42											
	GENS5_6		326656.26	6259873.21											
	GENS5_7		326664.16	6259883.47											
	GENS5_8		326664.73	6259884.21											
	GENS5_9		326665.41	6259884.97											
	GENS5_10		326664.85	6259882.83											
	GENS5_11		326665.47	6259883.55											
	GENS5_12		326666.13	6259884.36											
	GENS5_13		326673.92	6259894.68											
	GENS5_14		326674.59	6259895.41											
	GENS5_15		326675.22	6259896.12											
	GENS5_16		326674.73	6259894.10											
	GENS5_17		326675.27	6259894.78											
	GENS5_18		326676.02	6259895.57											
	GENS5_19		326683.80	6259905.79											
	GENS5_20		326684.41	6259906.52											
	GENS5_21		326685.07	6259907.24											
	GENS5_22		326684.39	6259905.25											
	GENS5_23		326685.07	6259905.92											
	GENS5_24		326685.68	6259906.67											

Appendix B2: Summary of Generator Point Source Emissions - NEXTDC S5 Data Centre (48 BackUp Emergency Generators)

Project# 2508944

2-4 Giffnock Avenue, MacQuaire Park, NSW

Activity	Point Source	Activity	STACK Location(UTM Coordinates, Zone 56S)		Emission Rates Based on the Previous Approved AQIA					Stack Height	Inside Diameter	Exit Velocity (1)	Exit Flow Rate	Exit Temperature	Operational Hours
ID	ID's		X (m E)	Y (m E)	NOx (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	CO (g/s)	SO_2 (g/s)	(m)	(m)	(m/s)	(m^3/s)	(k)	(Hours/Year)
GENS5	GENS5_25	S5 Data Centre; 48 back-up diesel generators Generators are in the building on 6 different floors (6 x 8) but all 48 stacks come out above roof	326703.40	6259928.12	7.882 (For Emergency Scenario) 0.164 (For Maintenance Scenario)	0.028 (For Emergency Scenario) 0.0006 (For Maintenance Scenario)	0.028 (For Emergency Scenario) 0.006 (For Maintenance Scenario)	0.505 (For Emergency Scenario) 0.011 (For Maintenance Scenario)	0.093 (For Emergency Scenario) 0.001875 (For Maintenance Scenario)	66.00	0.60	42.10	11.90	755.15	Maintenace Scenario - it is anticipated that up to one generator would be tested at any one time on a monthly basis. Emergency Scenario - conservatively assumed to be one hour.
	GENS5_26		326704.04	6259928.83											
	GENS5_27		326704.68	6259929.53											
	GENS5_28		326704.09	6259927.46											
	GENS5_29		326704.72	6259928.24											
	GENS5_30		326705.37	6259928.95											
	GENS5_31		326713.20	6259939.27											
	GENS5_32		326713.83	6259939.97											
	GENS5_33		326714.47	6259940.67											
	GENS5_34		326713.88	6259938.70											
	GENS5_35		326714.54	6259939.42											
	GENS5_36		326715.17	6259940.11											
	GENS5_37		326723.02	6259950.35											
	GENS5_38		326723.67	6259951.08											
	GENS5_39		326724.28	6259951.77											
	GENS5_40		326723.74	6259949.81											
	GENS5_41		326724.36	6259950.47											
	GENS5_42		326724.97	6259951.17											
	GENS5_43		326732.84	6259961.51											
	GENS5_44		326733.48	6259962.25											
	GENS5_45		326734.11	6259962.95											
	GENS5_46		326733.52	6259960.95											
	GENS5_47		326734.12	6259961.68											
	GENS5_48		326734.78	6259962.36											

Note (1):

Stack emissions parameters are based on NEXTDC S5-Revised Air Quality Assessment - Generators. 26 September 2025 (Arup). For maintenance scenario, emission rates are divided by total number of generators.

Generator Model: MTU 20V4000G94LF generator

Power Rating (kW) 3307

Appendix B3: Summary of Road Emissions

Project# 2508944

2-4 Giffnock Avenue, MacQuaire Park, NSW

Activity ID	Line Volume Source ID's	Activity	Peak Hour Traffic	Road length (m)	Contaminant	Emission Rates (g/km/day)	Emission Rates (g/s)
Lane Cove Road	North Bound	Combustion emissions from vehicles	5060	349.6	NOx	5768.720	2.33E-02
					Pm10	298.440	1.21E-03
					Pm2.5	211.800	8.57E-04
	South Bound	Combustion emissions from vehicles	3287	353.5	NOx	2720.200	1.11E-02
					Pm10	170.920	6.99E-04
					Pm2.5	114.640	4.69E-04
Hyundai Drive	TwoWay	Combustion emissions from vehicles	54	155.1	Nox	1781.520	3.20E-03
					Pm10	108.960	1.96E-04
					Pm2.5	74.400	1.34E-04

APPENDIX C

Contour Plots of 1-Hour NO_2 and SO_2 Cumulative Concentration for Maintenance and Emergency Scenario

2-4 Giffnock Avenue

Contour Plots 1 Hour Average Cumulative NO2 Concentration - Maintenance Scenario

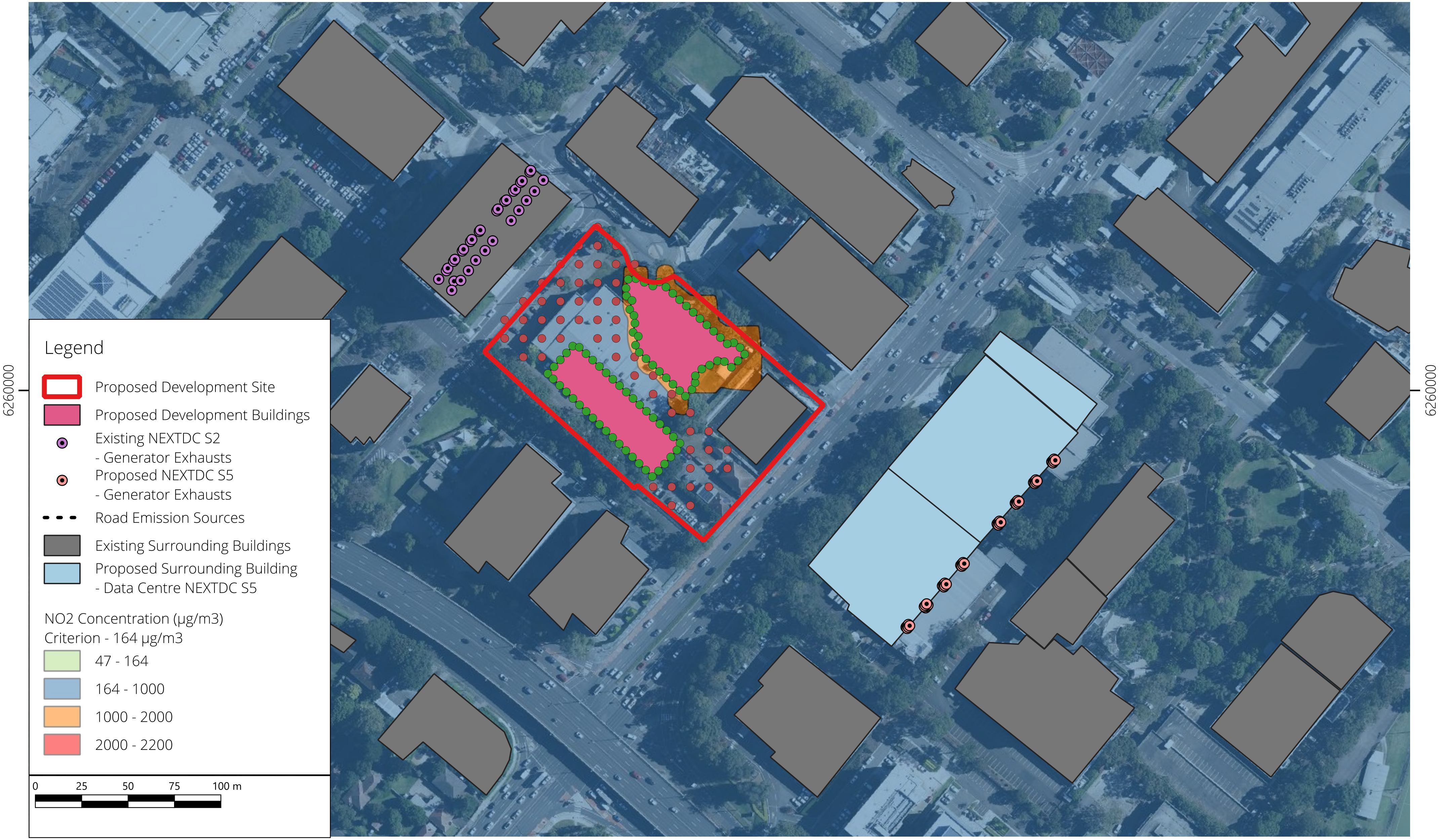
Macquarie Park, NSW

Sources:
1. Basemap: NSW Six maps

Map Projection: GDA2020 / MGA zone 56 / (EPSG:7856)

N

Revised on: 15/04/2026	
Project #: 2508944	Figure: Appendix C-1
Drawn by: RAMA.ROBBI	Checked by: FRR



2-4 Giffnock Avenue
Contour Plots 1 Hour Average Cumulative NO_2 Concentration - Emergency Scenario
Macquarie Park, NSW

Sources:
1. Basemap: NSW Six maps

Map Projection: GDA2020 / MGA zone 56 / (EPSG:7856)

Revised on: 15/04/2026	
Project #: 2508944	Figure: Appendix C-2
Drawn by: RAMA.ROBBI	Checked by: FRR

2-4 Giffnock Avenue

Contour Plots 1 Hour Average Cumulative SO_2 Concentration - Maintenance Scenario

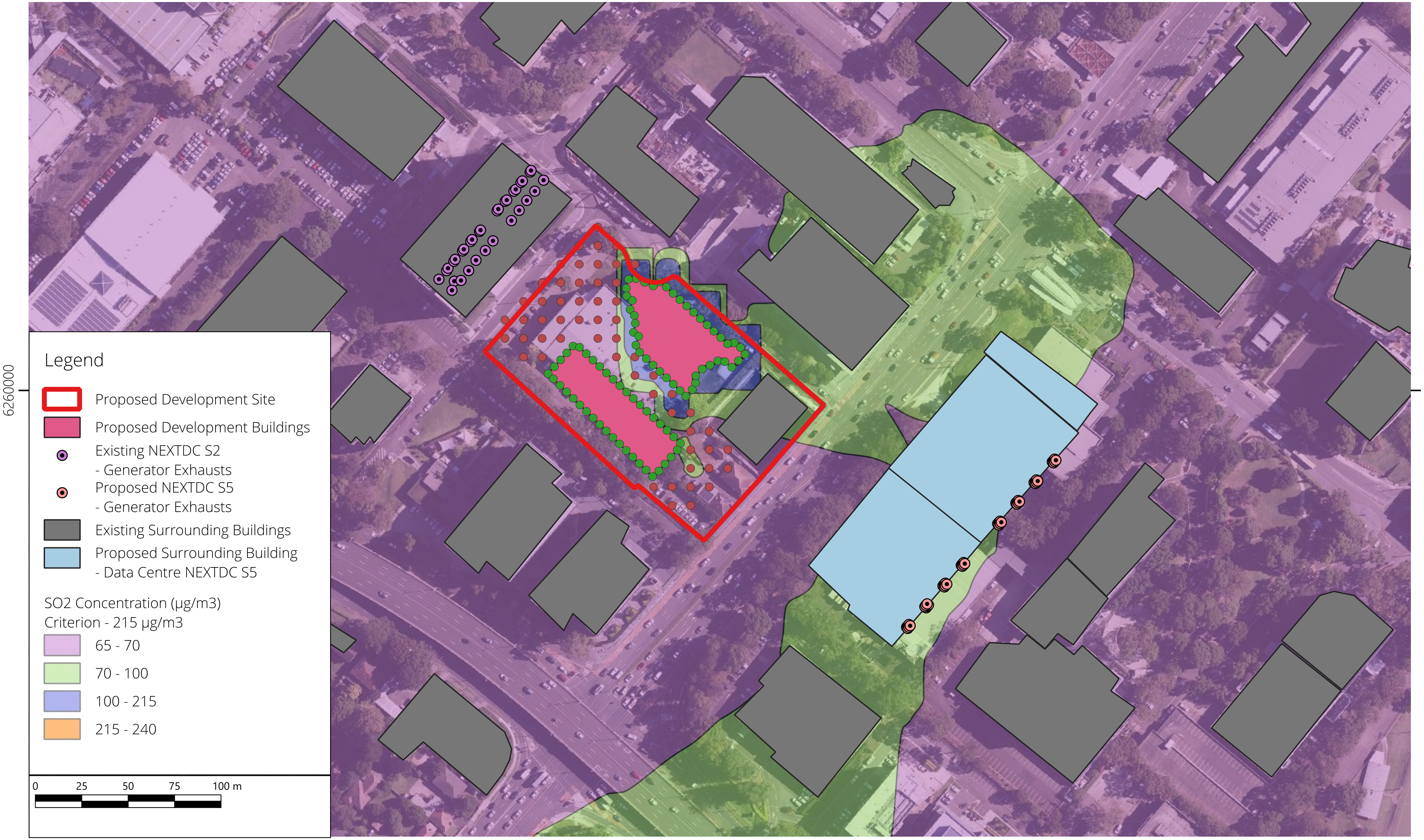
Macquarie Park, NSW

Sources:
1. Basemap: NSW Six maps

Map Projection: GDA2020 / MGA zone 56 / (EPSG:7856)

N

Revised on: 15/04/2026	
Project #: 2508944	Figure: Appendix C-3
Drawn by: RAMA.ROBBI	Checked by: FRR



2-4 Giffnock Avenue

Contour Plots 1 Hour Average Cumulative SO_2 Concentration - Emergency Scenario

Macquarie Park, NSW

Sources:
1. Basemap: NSW Six maps

Map Projection: GDA2020 / MGA zone 56 / (EPSG:7856)

N

Revised on: 15/04/2026	
Project #: 2508944	Figure: Appendix C-4
Drawn by: RAMA.ROBBI	Checked by: FRR