FINAL REPORT

TOGA CENTRAL

SYDNEY, AUSTRALIA

AIR QUALITY ASSESSMENT
RWDI # 1902973
21 July 2022

SUBMITTED TO

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GLOSSARY OF AIR QUALITY TERMS

Air Pollution – The presence of contaminants or pollutant substances in the air that interfere with human health or welfare or produce other harmful environmental effects.

Air Quality Standards – The level of pollutants prescribed by regulations that are not to be exceeded during a given time in a defined area.

Air Toxics – Any air pollutant for which a national ambient air quality standard (NAAQS) does not exist (i.e. excluding ozone, carbon monoxide, PM-10, sulphur dioxide, nitrogen oxide) that may reasonably be anticipated to cause cancer; respiratory, cardiovascular, or developmental effects; reproductive dysfunctions, neurological disorders, heritable gene mutations, or other serious or irreversible chronic or acute health effects in humans.

Airborne Particulates – Total suspended particulate matter found in the atmosphere as solid particles or liquid droplets. Chemical composition of particulates varies widely, depending on location and time of year. Sources of airborne particulates include dust, emissions from industrial processes, combustion products from the burning of wood and coal, combustion products associated with motor vehicle or non-road engine exhausts, and reactions to gases in the atmosphere.

Area Source – Any source of air pollution that is released over a relatively small area, but which cannot be classified as a point source. Such sources may include vehicles and other small engines, small businesses and household activities, or biogenic sources, such as a forest that releases hydrocarbons, may be referred to as nonpoint source.

Concentration – The relative amount of a substance mixed with another substance. Examples are 5 ppm of carbon monoxide in air and 1 mg/l of iron in water.

Emission – Release of pollutants into the air from a source. We say sources emit pollutants.

Emission Factor – The relationship between the amount of pollution produced and the amount of raw material processed. For example, an emission factor for a blast furnace making iron would be the number of pounds of particulates per ton of raw materials.

Emission Inventory – A listing, by source, of the amount of air pollutants discharged into the atmosphere of a community; used to establish emission standards.

Flow Rate – The rate, expressed in gallons -or litres-per-hour, at which a fluid escapes from a hole or fissure in a tank. Such measurements are also made of liquid waste, effluent, and surface water movement.

Fugitive Emissions – Emissions not caught by a capture system.

Hydrocarbons (HC) – Chemical compounds that consist entirely of carbon and hydrogen.

Hydrogen Sulphide (H2S) – Gas emitted during organic decomposition. Also, a by-product of oil refining and burning. Smells like rotten eggs and, in heavy concentration, can kill or cause illness.

Inhalable Particles – All dust capable of entering the human respiratory tract.

Nitric Oxide (NO) – A gas formed by combustion under high temperature and high pressure in an internal combustion engine. NO is converted by sunlight and photochemical processes in ambient air to nitrogen oxide. NO is a precursor of ground-level ozone pollution, or smog.

Nitrogen Dioxide (NO2) – The result of nitric oxide combining with oxygen in the atmosphere; major component of photochemical smog.

Nitrogen Oxides (NOx) – A criteria air polluant. Nitrogen oxides are produced from burning fuels, including gasoline and coal. Nitrogen oxides are smog formers, which react with volatile organic compounds to form smog. Nitrogen oxides are also major components of acid rain.

Mobile Sources – Moving objects that release pollution; mobile sources include cars, trucks, buses, planes, trains, motorcycles, and gasoline-powered lawn mowers.

Particulates – Particulate matter includes dust, soot and other tiny bits of solid materials that are released into and move around in the air. Particulates are produced by many sources, including burning of diesel fuels by trucks and buses, incineration of garbage, mixing and application of fertilizers and pesticides, road construction, industrial processes such as steel making, mining operations, agricultural burning (field and slash burning), and operation of fireplaces and woodstoves. Particulate pollution can cause eye, nose and throat irritation and other health problems.

Parts Per Billion (ppb)/Parts Per Million (ppm) – Units commonly used to express contamination ratios, as in establishing the maximum permissible amount of a contaminant in water, land, or air.

PM_{10}/$PM_{2.5}$ – PM_{10} is measure of particles in the atmosphere with a diameter of less than 10 or equal to a nominal 10 micrometres. $PM_{2.5}$ is a measure of smaller particles in the air.

Point Source – A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; e.g., a pipe, ditch, ship, ore pit, factory smokestack.

Scrubber – An air pollution device that uses a spray of water or reactant or a dry process to trap pollutants in emissions.

Source – Any place or object from which pollutants are released.

Stack – A chimney, smokestack, or vertical pipe that discharges used air.

Stationary Source – A place or object from which pollutants are released and which does not move around. Stationary sources include power plants, gas stations, incinerators, houses etc.

Temperature Inversion – One of the weather conditions that are often associated with serious smog episodes in some portions of the country. In a temperature inversion, air does not rise because it is trapped near the ground by a layer of warmer air above it. Pollutants, especially smog and smog-forming chemicals, including volatile organic compounds, are trapped close to the ground. As people continue driving and sources other than motor vehicles continue to release smog-forming pollutants into the air, the smog level keeps getting worse

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EXECUTIVE SUMMARY

This Air Quality Assessment report has been prepared by RWDI Australia Pty Ltd (RWDI) to accompany a detailed State significant development (SSD) development application (DA) for the mixed-use redevelopment proposal at TOGA Central, located at 2 & 8A Lee Street, Haymarket (the site). The site is legally described as Lot 30 in Deposited Plan 880518, Lot 13 in Deposited Plan 1062447 and part of Lot 14 in Deposited Plan 1062447. The site is also described as 'Site C' within the Western Gateway sub-precinct at the Central Precinct.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the SSD DA (SSD 33258337).

This report concludes that the proposed mixed-use redevelopment is suitable and warrants approval. While not required to achieve specific outcomes, we recommend the following measures for the construction and operation of the Project:

- To ensure best practice management, the mitigation measures described in section 6 are recommended so that construction dust impacts are minimised and remain low risk.
- Install rooftop mechanical plant and building exhaust air extraction system in accordance with the Building Code of Australia requirements.
- Install appropriately sized range hoods and filtration devices over all commercial kitchens to collect cooking fumes.
- Practice good housekeeping, to avoid odours typically associated with a build-up of rancid fats and putrefaction of foods and food wastes (undertaken as per general practice).
- Make sufficient waste collection receptacles available for collection and proper storage of all waste.
- Empty waste collection receptacles regularly, do not allow them to overflow and keep their lids closed when not in use, to minimise the spread of odour.
- Oil and grease from kitchen sources must be removed either by filtration or scrubbing.

1 INTRODUCTION

This report has been prepared to accompany a SSD DA for the for the mixed-use redevelopment proposal at TOGA Central, located at 2 & 8A Lee Street, Haymarket.

The Minister for Planning, or their delegate, is the consent authority for the SSD DA and this application is lodged with the NSW Department of Planning and Environment (DPE) for assessment.

The purpose of the SSD DA is to complete the restoration of the heritage-listed building on the site, delivery of new commercial floorspace and public realm improvements that will contribute to the realisation of the Government's vision for an iconic technology precinct and transport gateway. The application seeks consent for the conservation, refurbishment and adaptive re-use of the Adina Hotel building (also referred to as the former Parcel Post building (fPPb)), construction of a 45-storey tower above and adjacent to the existing building and delivery of significant public domain improvements at street level, lower ground level and within Henry Deane Plaza. Specifically, the SSD DA seeks development consent for:

- Site establishment and removal of landscaping within Henry Deane Plaza.
- Demolition of contemporary additions to the fPPb and public domain elements within Henry Deane Plaza.
- Conservation work and alterations to the fPPb for retail premises, commercial premises, and hotel and motel accommodation. The adaptive reuse of the building will seek to accommodate:
    - Commercial lobby and hotel concierge facilities,
    - Retail tenancies including food and drink tenancies and convenience retail with back of house areas,
    - 4 levels of co-working space,
    - Function and conference area with access to level 7 outdoor rooftop space, and
    - Reinstatement of the original fPPb roof pitch form in a contemporary terracotta materiality.
- Provision of retail floor space including a supermarket tenancy, smaller retail tenancies, and back of house areas below Henry Deane Plaza (at basement level 1 (RL12.10) and lower ground (RL 16)).
- Construction of a 45-storey hotel and commercial office tower above and adjacent to the fPPb. The tower will have a maximum building height of RL 202.28m, and comprise:
    - 10 levels of hotel facilities between level 10 – level 19 of the tower including 204 hotel keys and 2 levels of amenities including a pool, gymnasium, and day spa to operate ancillary to the hotel premises. A glazed atrium and hotel arrival is accommodated adjacent to the fPPb, accessible from Lee Street.
    - 22 levels of commercial office space between level 23 – level 44 of the tower accommodated within a connected floor plate with a consolidated side core.
    - Rooftop plant, lift overrun, servicing and BMU.
- Provision of vehicular access into the site via a shared basement, with connection points provided to both Block A (at RL 5) and Block B (at RL5.5) basements. Primary access will be accommodated from the adjacent Atlassian site at 8-10 Lee Street, Haymarket, into 4 basement levels in a split-level arrangement. The basement will accommodate:
    - Car parking for 106 vehicles, 4 car share spaces and 5 loading bays.
    - Hotel, commercial and retail and waste storage areas.
    - Plant, utilities and servicing.

- Provision of end of trip facilities and 165 employee bicycle spaces within the fPPb basement, and an additional 72 visitor bicycle spaces within the public realm.
- Delivery of a revitalised public realm across the site that is coordinated with adjacent development, including an improved public plaza linking Railway Square (Lee Street), and Block B (known as 'Central Place Sydney'). The proposal includes the delivery of a significant area of new publicly accessible open space at street level, lower ground level, and at Henry Deane Plaza, including the following proposed elements:
    - Provision of equitable access within Henry Deane Plaza including stairways and a publicly accessible lift.
    - Construction of raised planters and terraced seating within Henry Deane Plaza.
    - Landscaping works within Henry Deane Plaza.
- Utilities and service provision.
- Realignment of lot boundaries.

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 17 December 2021 and issued for the SSD DA. Specifically, this report has been prepared to respond to the SEARs requirement issued below.

Item	Description of requirement	Section reference (this report)
5. Integration with surrounding area	• Consider the stand alone and cumulative impacts from the concurrent construction and/or ongoing operation, maintenance and potential future expansion requirements of the adjacent sites in the Central Precinct (including transport services rail, metro, light rail) including noise, vibration, **air quality**, amenity, safety and access. • Demonstrate how the site and development will be designed and staged to integrate with and not constrain the future development of surrounding sites, having regard to amenity impacts, wind impacts, visual and view impacts, servicing and loading arrangements.	Sections 2.0 to 7.0

1.1 Description Of Site

The site is located within the City of Sydney Local Government Area (LGA). The site is situated 1.5km south of the Sydney CBD and 6.9km north-east of the Sydney International Airport within the suburb of Haymarket.

The site is located within the Western Gateway sub-precinct, an area of approximately 1.65ha that is located immediately west of Central Station within Haymarket on the southern fringe of the Sydney CBD. Immediately north of Central Station is Belmore Park, to the west is Haymarket (including the University of Technology, Sydney and Chinatown), to the south and east is rail lines and services and Prince Alfred Park and to the east is Elizabeth Street and Surry Hills.

Central Station is a public landmark, heritage building, and the largest transport interchange in NSW. With regional and suburban train services, connections to light rail, bus networks and to Sydney Airport, the area around Central Station is one of the most-connected destinations in Australia.

The site is located at 2 & 8A Lee Street, Haymarket and is legally described as Lot 30 in Deposited Plan 880518, Lot 13 in Deposited Plan 1062447, and part of Lot 14 in Deposited Plan 1062447.

The land that comprises the site under the Proponent's control (either wholly or limited in either height or depth) comprises a total area of approximately 4,159sqm.

The location of the TOGA Central site is illustrated in Figure 1.

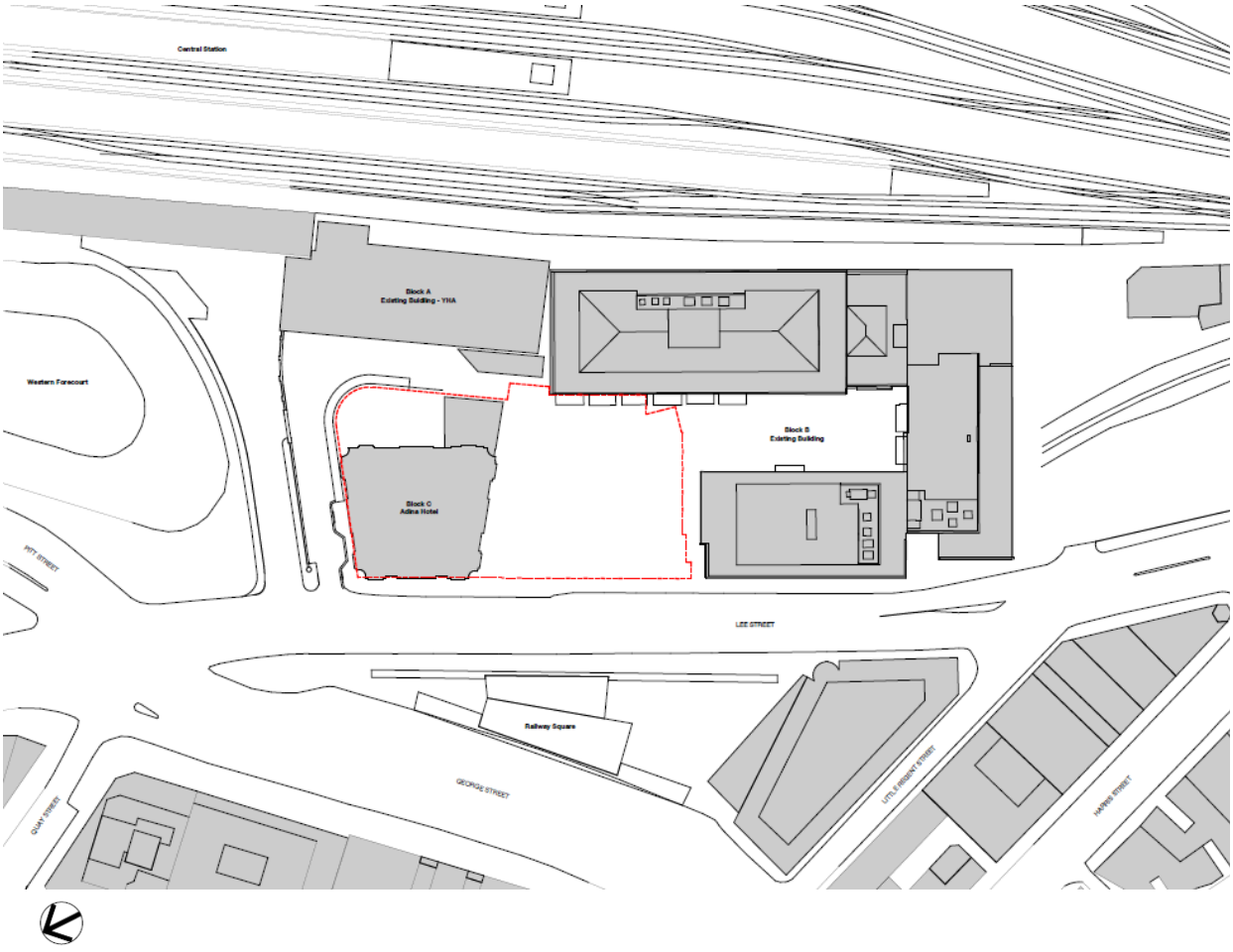

Image 1: Site Identification Plan (Source: Bates Smart)

The site currently comprises the following existing development:

- Lot 30 in Deposited Plan 880518 (Adina Hotel building): the north-western lot within the Western Gateway sub-precinct accommodates a heritage-listed building which was originally developed as the Parcels Post Office building. The building has been adaptively re-used and is currently occupied by the Adina Hotel Sydney Central. The eight-storey building provides 98 short-stay visitor apartments and studio rooms with ancillary facilities including a swimming pool and outdoor seating at the rear of the site.
- Lot 13 in Deposited Plan 1062447 and part of Lot 14 in Deposited Plan 1062447 (Henry Deane Plaza): the central lot within the Western Gateway sub-precinct adjoins Lot 30 to the south. It accommodates 22 specialty food and beverage, convenience retail and commercial service tenancies. The lot also includes publicly accessible space which is used for pop-up events and a pedestrian thoroughfare from Central Station via the Devonshire Street Tunnel. At the entrance to Devonshire Street Tunnel is a large

public sculpture and a glazed structure covers the walkway leading into Railway Square. This area forms part of the busy pedestrian connection from Central Station to Railway Square and on to George and Pitt Streets, and pedestrian subways.

The site is listed as an item of local significance under Schedule 5 of the Sydney Local Environmental Plan 2012 'Former Parcels Post Office including retaining wall, early lamp post and building interior', Item 855.

The site is also included within the Central Railway Station State heritage listing. This is listed on the State Heritage Register 'Sydney Terminal and Central Railway Station Group', Item SHR 01255, and in Schedule 5 of the Sydney Local Environmental Plan 2012 'Central Railway Station group including buildings, station yard, viaducts and building interiors' Item 824.

The site is not however listed independently on the State Heritage Register. There is an array of built forms that constitute Central Station, however the Main Terminal Building (particularly the western frontage) and associated clocktower constitute key components in the visual setting of the Parcel Post building.

1.2 Assessment Requirements

The Department of Planning and Environment (DPE) has issued Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement (EIS) for the proposed development. This report responds to the SEARs as they relate to air quality. The SEARs relevant to this report have been considered and are addressed as outlined in Table 1-1.

Table 1-1: Air Quality Criteria as per SEARs

Condition No. & Description	Issue & Assessment Requirements	How It Is Addressed	Section of This Report
5. Integration with Surrounding Area	Consider the stand alone and cumulative impacts from the concurrent construction and/or ongoing operation, maintenance, and potential future expansion requirements of the adjacent sites in the Central Precinct (Including transport services rail, metro, light rail) including noise, vibration, air quality, amenity, safety, and access.	This air quality report has identified the significant air emission sources and assessed their potential impacts from the concurrent construction and/or ongoing operation, maintenance, and potential future expansion requirements.	Sections 3 - 7

2 POTENTIAL SOURCES OF AIR EMISSIONS ASSOCIATED WITH THE DEVELOPMENT

Air emissions are likely during both the construction and the operation of the proposed Toga Central new building development. The most likely air quality sources for construction and operation are summarised in the following sections.

2.1.1 Construction phase

At the time of preparing this assessment a detailed construction programme has not been developed, however the following stages and typical activities can be expected. 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
Staging	• Minor dust emissions from Staging works
Demolition work consists of HDP retail and awning, fPPb, Devonshire St Tunnel Works Methodology, Heritage façade, Leisure Deck with loading platform and Heritage eastern wall	• Minor dust emissions from Demolition works • Minor exhaust emissions from diesel power plant, equipment, and vehicles
Excavation work consists of HDP Excavation and Piling, Access link with tunnelling solution HDP to the Leisure deck, Leisure deck excavation & piling	• Dust emissions from bulk earthworks and piling • Exhaust emissions from diesel power plant, equipment, and vehicles • Potential odour emissions if contaminants are encountered during bulk earthworks
Structure work consists of fPPb temporary works & Façade retention, Jump form & Core FRP, HDP and fPPb Mega Columns, Level 6 & 9 transfer decks, hotel typical levels,	• Minor dust emissions from construction of tower structure • Minor exhaust emissions from diesel power plant, equipment, and vehicles
Façade, fit out & Building services, Public Domain, and handover	• Minor exhaust emissions from diesel power plant, equipment, and vehicles

Dust Emissions

Demolition of contemporary additions to the fPPb and Piling, excavation, and retention were identified as the only construction stages with potential to release dust emissions. Minor dust emission (non-significant quantities) is expected from all other construction stages.

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:

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

PM_{10} and $PM_{2.5}$ particles are typically invisible to the naked eye. Larger particulates are typically visible to the naked eye.

A qualitative assessment of potential dust emissions impacts is provided in Section 5 and recommended mitigation measures are supplied in Section 6.

Exhaust emissions

It is likely that all stages of the construction would involve the use of diesel fuelled plant or equipment. Typical examples of diesel fuelled plant and equipment include excavators, piling rigs, haulage trucks, cranes, and light vehicles.

The use of diesel fuelled plant and equipment generates various pollutants including oxides of nitrogen, carbon monoxide and particulate matter (mainly $PM_{2.5}$). Exhaust emissions from construction equipment are expected to move around the Site and resulting emissions will be discontinuous, transient, and mobile.

A qualitative assessment of potential dust emissions impacts is provided in Section 5 and recommended mitigation measures are supplied in Section 6.

Odour

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

2.1.2 Operational phase

Potential sources of operational air quality emissions from the Project would be generated from rooftop plant, building exhaust, chemical/waste storage, kitchen emissions and combustion emissions from increased traffic movements. These operational emissions are typical of all Highrise buildings.

A summary of potential operational air quality emissions is provided in Table 2-2. A more detailed discussion regarding each air quality emissions is provided below.

Table 2-2: Operational Air Quality Emissions

Operational Air Quality emission source	Key Air Quality Emissions
Rooftop Plant and building exhaust	• Warm/cool air from building ventilation heat pumps • Ducted exhaust from toilets • Smoke exhaust from commercial office fire mode • Ducted exhaust from kitchens • Heated humid air for cooling towers • Diesel Tank Room Exhaust (Level 8) • Flue discharges from stand diesel generators (Level 9)
Exhaust discharge points around public domain area	• Exhaust from retail kitchen • Carpark exhaust
Commercial Kitchens, café, and tenant kitchens	• Dust emissions from bulk earthworks and piling • Exhaust emissions from diesel power plant, equipment, and vehicles • Potential odour emissions kitchen exhausts
Traffic emissions	• Combustion exhaust emissions including oxides of nitrogen, carbon monoxide and particulate matter (fugitive from nearby roadways and carpark)

Rooftop plant and building exhaust

Rooftop plant and building exhaust are the primary source of operational air quality emissions from the Project. The majority of building exhaust is ducted and released from the rooftop. A detailed breakdown of all mechanical service air quality emissions including expected flow rates is provided in Appendix A.

A qualitative assessment of rooftop plant and building exhaust emissions is provided in Section 7.1.

Waste storage

There is potential for odour emissions to be generated from the buildings waste storage facilities, which are located in the basement. It is anticipated that the majority of waste generated odour emissions would be contained within the building and would not result in external impacts. Waste management infrastructure and practices will be adopted to ensure appropriate waste management measures are adopted including suitable types and quantities of waste storage receptacles. Organic wastes would be removed from site at least daily, reducing the possibility of odours.

Café and kitchen emissions

The internal café and tenant kitchens are a source of mixed air quality emissions with the potential to produce various cooking odours and smoke emissions. The café and kitchens would be equipped with range hoods to capture cooking odour and fumes. The commercial kitchen would be equipped with a commercial kitchen hood to ventilate fumes at a rate of 3,000 L/s. Once captured by the range hood, the majority of exhaust fumes from

cooking areas would be ducted to the rooftop and released via a stack. Café and kitchen emissions are highly variable and would depend on the type, frequency, and duration of use.

Café and kitchen emissions have been qualitatively assessed in Section 7.4.

Traffic emissions

Increased patronage to the area due to the Project may increase the number of vehicle movements on nearby roads which in turn would increase vehicle air quality emissions. This is considered unlikely, and it is expected that there would be negligible changes in traffic flows due to the Project compared to the current situation, as it is anticipated that tenants and staff would access the Site via existing public transport routes and not contribute to traffic emissions. However, traffic emissions have been qualitatively assessed in Section 7.5.

3 AIR QUALITY CRITERIA

3.1 Introduction

The NSW EPA's Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (the Approved Methods) sets out applicable impact assessment criteria for a number of air pollutants.

3.2 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 sections below identify the pollutants of interest in this study and the applicable air quality criteria for each pollutant.

The criteria presented in the Approved Methods are consistent with the National Environment Protection Council's (NEPC), National Environment Protection (Ambient Air Quality) Measure, 2021 (NEPM).

Table 3-1 summarises the air quality goals for NO_2 and particulate matter that are relevant to this study. The air quality goals relate to the total concentrations of dust and particulate matter in the air and not just that from the project. Therefore, some consideration of background levels needs to be made when using these goals to assess impacts.

Table 3-1 : Impact assessment criteria – dust and particulate matter

Pollutant	Averaging period	Criteria
Total suspended particulates (TSP)	Annual	62.5 µg/m³
Particulate matter ≤10 µm (PM_{10})	Annual	25 µg/m³
	24-hour	50 µg/m³
Particulate matter ≤2.5 µm ($PM_{2.5}$)	Annual	8 µg/m³
	24-hour	25 µg/m³
NO_2	1-hour	150 µg/m³
	Annual	28 µg/m³

3.3 Odour Assessment Criteria

Odours from the proposed development, associated with kitchen exhaust have the potential to cause nuisance. In a regulatory context, odour needs to be considered in two ways, depending on the situation. NSW legislation prohibits emissions that cause offensive odour to occur at any off-site receptor.

Offensive odour is evaluated in the field by authorised officers, who are obliged to consider the odour in the context of its receiving environment, frequency, duration, character and so on and to determine whether the odour would unreasonably interfere with the comfort and repose of the normal person. In this context, the concept of offensive odour is applied to operational facilities and relates to actual emissions in the air.

However, in the approval and planning process for proposed new operations or modifications to existing projects, no actual odour exists, and it is necessary to consider hypothetical odour. In this context, odour concentrations are used and are defined in odour units. The number of odour units represents the number of times that the odour would need to be diluted to reach a level that is just detectable to the human nose. Thus, by definition, odour less than one odour unit (1 OU), would not be detectable to most people.

The range of a person's ability to detect odour varies greatly in the population, as does their sensitivity to the type of odour. Therefore, there can be a wide range of variability in the way odour response is interpreted.

It should be noted that odour refers to complex mixtures of odours, and not “pure" odour arising from a single chemical. Odour from a single, known chemical very rarely occurs (when it does, it is best to consider that specific chemical in terms of its concentration in the air). In most situations, odour will be comprised of a cocktail of many substances that is referred to as a complex mixture of odorous pollutants, or more simply odour.

For developments with potential for odour it may be necessary to predict the likely odour impact that may arise. This is done by using air dispersion modelling which can calculate the level of dilution of odours emitted from the source at the point that it reaches surrounding receptors. This approach allows the air dispersion model to produce results in terms of odour units. However, in the Local Government Air Quality Toolkit (DECC, 2007), the NSW EPA acknowledges that air dispersion modelling is often an expensive exercise, and that suitable odour mitigation can often be installed for comparable costs.

The NSW criteria for acceptable levels of odour range from 2 to 7 OU, with the more stringent 2 OU criteria applicable to densely populated urban areas and the 7 OU criteria applicable to sparsely populated rural areas, as outlined below.

Table 3-2 presents the relevant impact assessment criteria for complex mixtures of odorous pollutants.

Table 3-2 : Impact assessment criteria – Complex Mixture of Odourous Pollutants

Population of affected community	Impact assessment criteria (OU)*
Urban (≥~2000) and/or schools and hospitals	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence (≤ ~2)	7.0

Note: * 99th percentile nose-response time.

The Site is located in a highly density populated area, therefore, in accordance with the criteria in Table 3-2, an impact assessment criterion would be 2.0 OU/m^3. However as indicated above, at this stage, no odour is expected from site therefore odour emissions have not been assessed further.

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.

Observations of wind speed and direction from the Department of Planning Industry and Environment (DPIE) air quality monitoring station (AQMS) at Rozelle have been selected to represent typical wind patterns in the area surrounding the site. The Rozelle AQMS is located approximately 4.29 kilometres northwest from the Proposal site. The AQMS is located in the grounds of Rozelle Hospital, off Balmain Road, Rozelle. It is situated in a residential area in the Parramatta River valley.

Figure 4-1 through Figure 4-6 presents annual and seasonal “wind rose” plots for the Rozelle AQMS, for the period 2017 to 2021, respectively. As can be seen from the plots, southern winds, north west and north east winds are most common throughout the year.

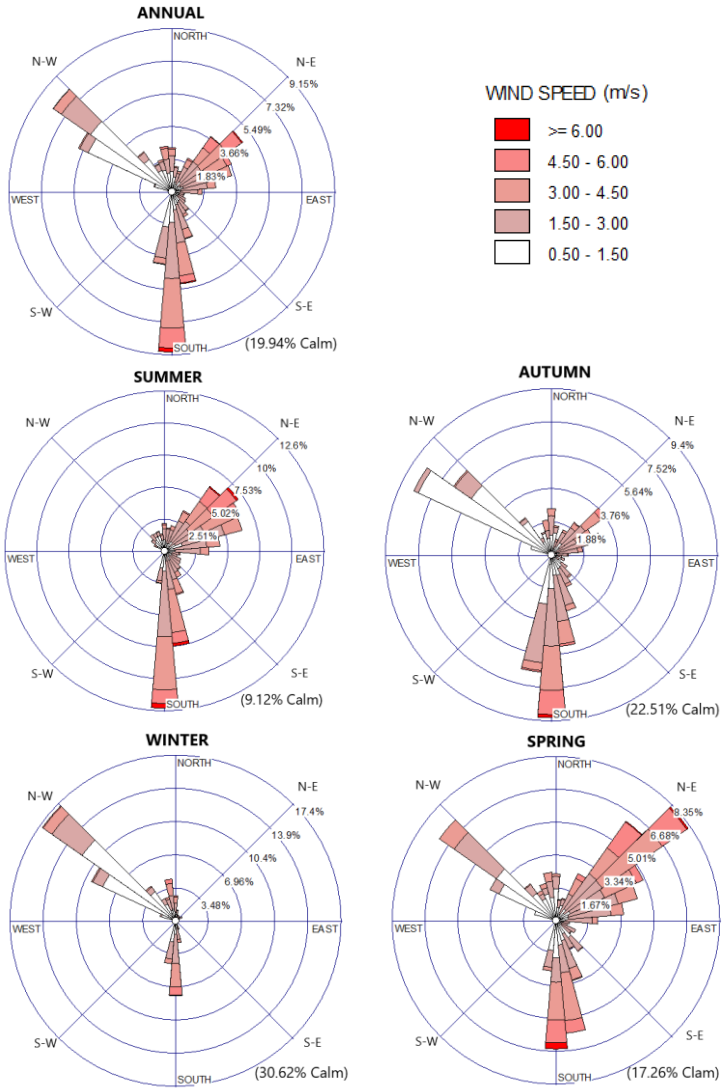

Figure 4-1: Rozelle AQMS Wind Roses, 2017

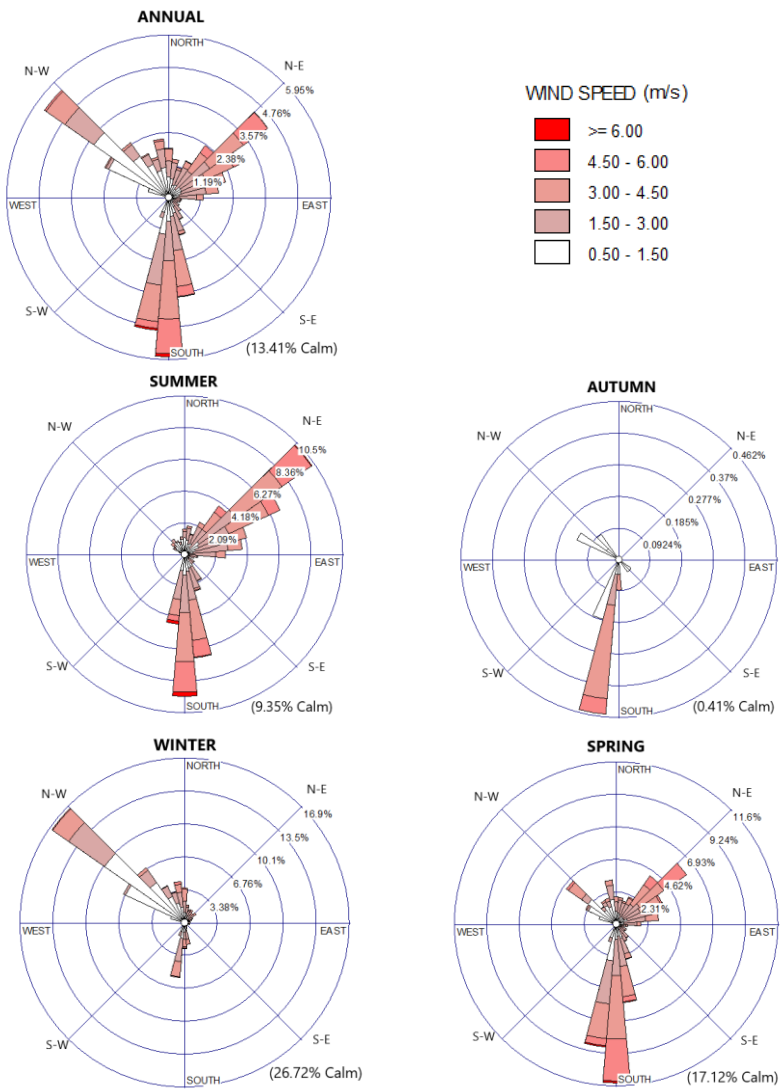

Figure 4-2: Rozelle AQMS Wind Roses, 2018

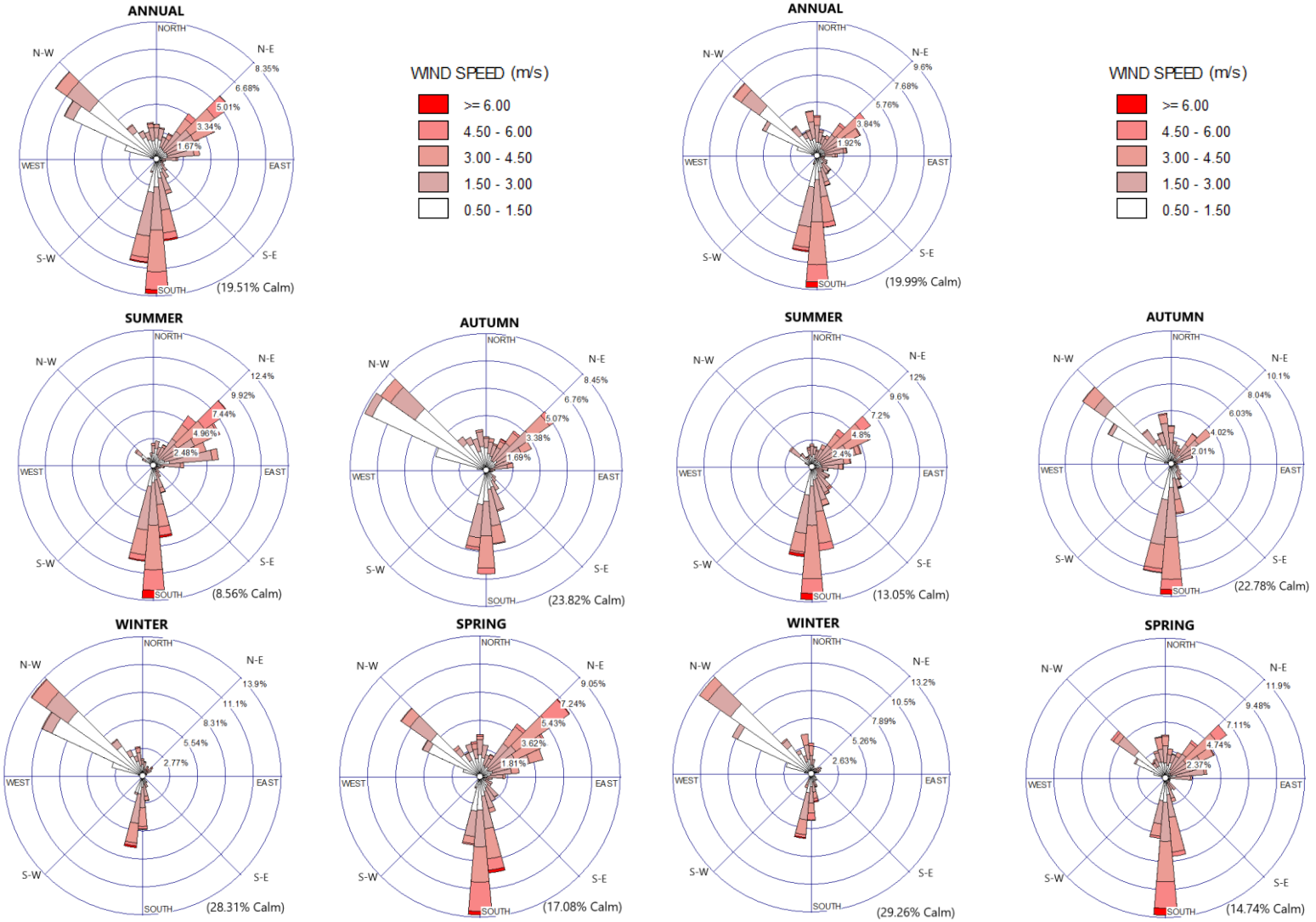

Figure 4-3: Rozelle AQMS Wind Roses, 2019

Figure 4-4: Rozelle AQMS Wind Roses, 2020

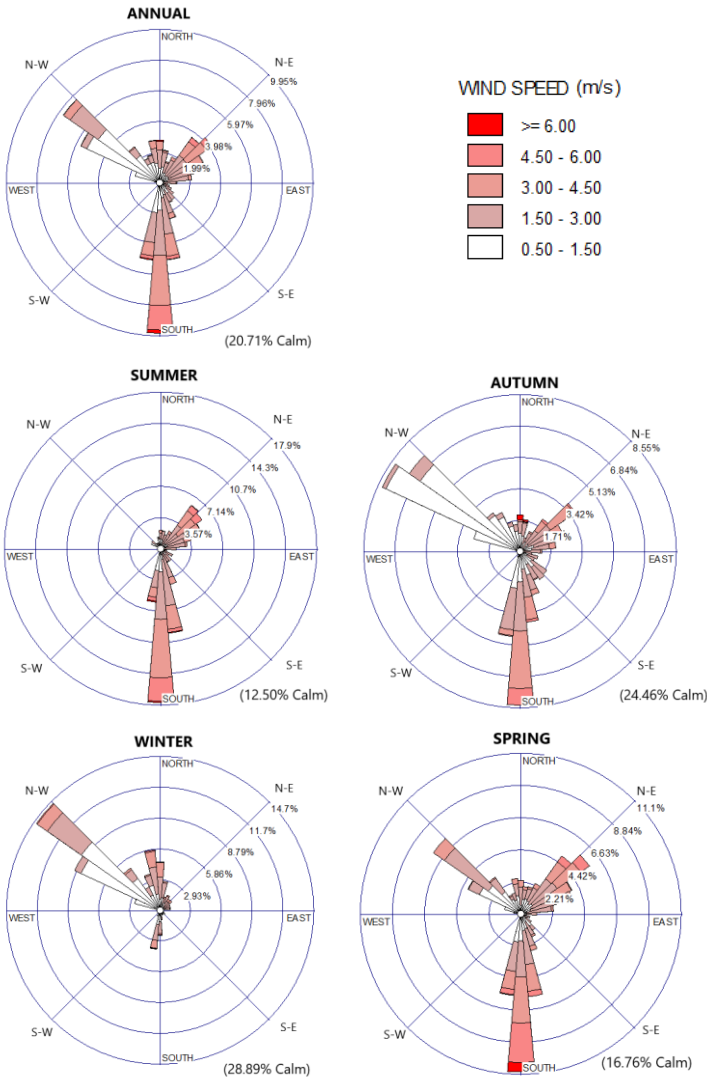

Figure 4-5: Rozelle AQMS Wind Roses, 2021

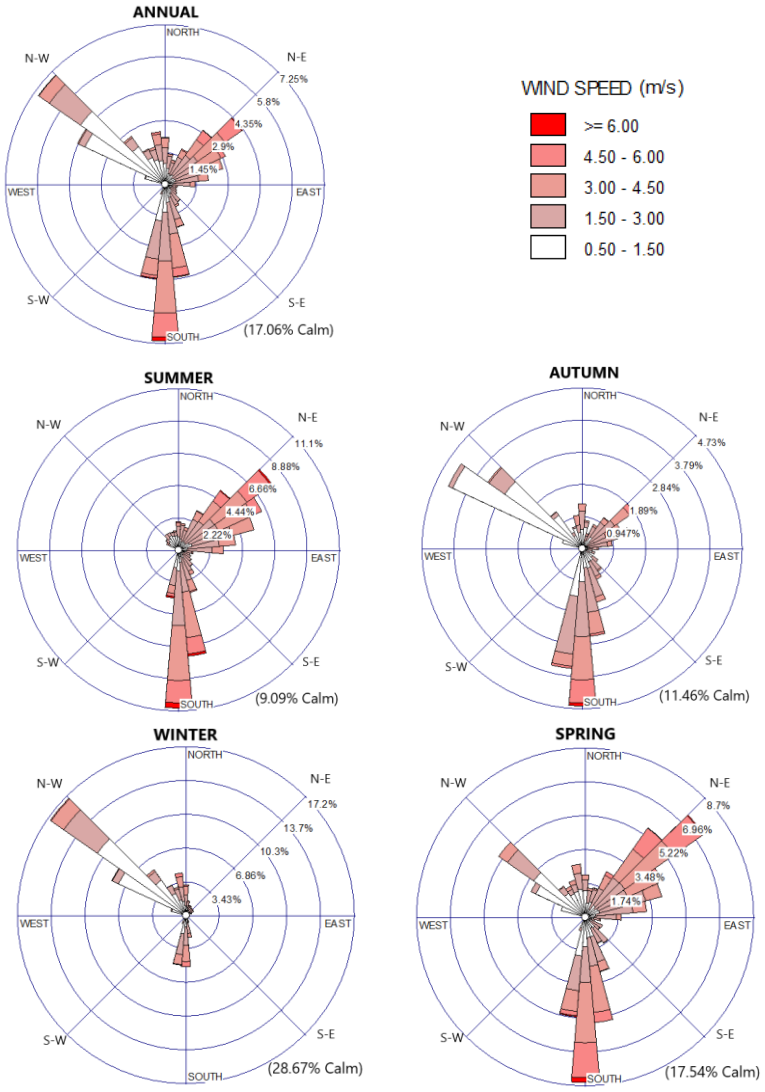

Figure 4-6: Rozelle AQMS Wind Roses, 2017-2021

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 Proposal. The NSW Planning, Industry & Environment operate ambient air quality monitoring stations in selected areas around NSW. The nearest station to the Site is the Cook and Phillip monitoring which is located approximately 1.5 km to the northeast of the Site. However, the Cook and Philip station began operating on 07/09/2019 so historic monitoring data is limited, the next closed monitoring site is Rozelle monitoring station approximately 4.29 kilometres northwest of the Proposal site.

A summary of the ambient air quality monitoring data collected for year 2017, 2018, 2019, 2020 and 2021 at the Rozelle AQMS is presented in Table 4-1. The TSP background concentrations were determined based on a relationship between measured PM_{10} concentrations.

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. From the table below, it is possible to conclude that the monitoring data in the proximity to the Proposal site are lower than the air quality criteria.

Table 4-1: Ambient air quality monitoring concentrations in proximity to the proposal site

Year	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	NO_2 (µg/m^3)
2017	18.1	7.2	20.68
2018*	-	-	-
2019	22.7	10.3	18.8
2020	18.1	7.5	15.04
2021	15.5	6.3	13.16
Average	18.6	7.8	16.92
Impact Criteria	25	8.0	28

* - 2018 data not available

A review of the data from Rozelle AQMS and comparison to the impact criteria indicates the following:

PM_{10}

- Measured annual average has been steady between 15.5 and 18.1 µg/m^3 with the exception of a sharp rise to 22.7 µg/m^3 for the 2019 year. The 2019 data is impact by bushfires and local dust storms contributing to this sharp rise particulate levels.
- Considering this data period, the annual impact criteria of 25 µg/m^3 has not been exceeded and the arithmetic average of the period is calculated to be 18.6 µg/m^3 which is at **74%** of the annual impact criteria.

$PM_{2.5}$

- Measured annual average has ranged between 7.5 and 6.3 µg/m^3 with the exception of a sharp rise to 10.3 µg/m^3 for the 2019 year. The 2019 data is impact by bushfires and local dust storms contributing to this sharp rise particulate levels.
- Considering this data period, the annual impact criteria of 7.8 µg/m^3 has not been exceeded and the arithmetic average of the period is calculated to be 8.0 µg/m^3 which is at **98%** of the annual impact criteria.

NO_2

- Measured annual average has been quite steady between 18.8 and 13.16 µg/m^3.
- Considering this data period, the annual impact criteria of 28 µg/m^3 has not been exceeded and the arithmetic average of the period is calculated to be 16.92 µg/m^3 which is at **60%** of the annual impact criteria.

4.3 Emissions within Sydney Airshed

The NSW Environment Protection Authority (EPA) has produced an air emissions inventory for both human-made and natural sources in NSW. The inventory extends to the greater metropolitan region (GMR) which is further categorised into three urban regions (Sydney, Newcastle, and Wollongong).

Ultimo, NSW is within the Sydney region and the general airshed around Ultimo region is currently controlled by human-made sources including road traffic noise from the many arterial roads, general industry (mostly warehouse distribution) as well as a small number of quarry and manufacturing sites. Wood burning and earthworks/construction are also contributors (particle pollution) to the general airshed.

The most current inventory report is for the 2013 calendar year, the previous report covered 2008. For this project, the following information from these reports has been summarised for the Sydney region and can be used to approximate the proportion within Ultimo region.

Table 4-2 : Proportion of total estimated annual emissions (%)

Year	PM_{10}		$PM_{2.5}$		NO_x Note 1	
	Natural	Human	Natural	Human	Natural	Human
2008	19.1	80.9	8.1	91.9	1.7	98.3
2013	27.3	72.7	27.7	72.3	4.3	95.7

Note 1: It has been conservatively assumed that 100% of the NO_x emissions are NO_2.

For the three pollutants, Table 4-2 shows a reduction in the proportion of human-made emissions between the 2008 calendar year and 2013 calendar year.

The inventory further provides the proportion of total emissions by human-made source type (refer Table 4-2 for 2013 data). Considering this data and the proportions within Table 4-2, Table 4-3 summarises the contribution from road traffic.

Table 4-3 : Proportion of total estimated annual emissions – road traffic (%)

Year	PM10	PM2.5	NO_x[1]
2008	12.8	14.4	61.8
2013	11.9	12.9	55.4

Note 1: It has been conservatively assumed that 100% of the NO_x emissions are NO_2.

The table shows a reduction in the proportion of emissions from road traffic between the 2008 calendar year and 2013 calendar year despite an increase in traffic.

It is critical to note that since 2013 there have been many additional measures to improve exhaust emissions from road traffic including emission controls for new vehicles (Euro 5 standards to all light vehicles manufactured from November 2016) and improvements in fuel quality standards (February 2019). Furthermore, Australia is currently reviewing vehicle emission controls further, considering Euro 6 for light vehicles and Euro VI for heavy vehicles.

On this basis, it is considered conservative to assume the road traffic emissions for 2013 as per Table 4-3 apply to the current environment.

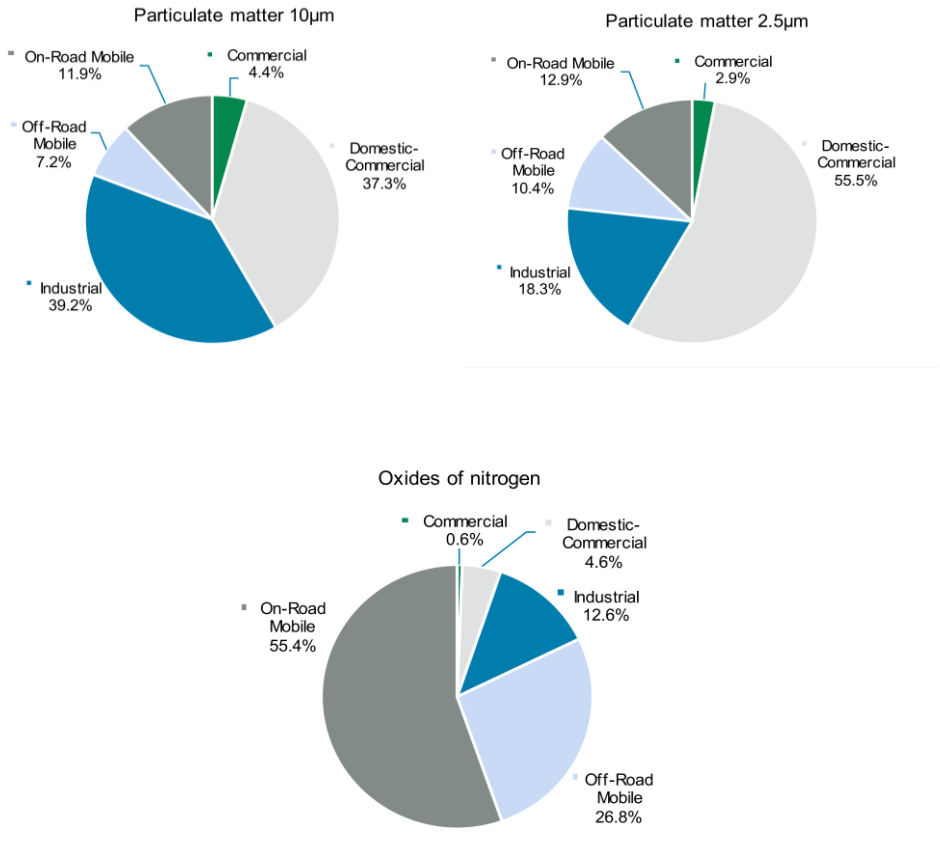

Figure 4-7 : Proportions of total estimated annual emissions for human-made source types (PM_{10}, $PM_{2.5}$ and NO_x) – Sydney Region – 2013

5 CONSTRUCTION DUST ASSESSMENT

5.1 Assessment Methodology

The EPA does not at this stage have specific guidelines to consider dust from construction sites in terms of a risk assessment and management approach. It has developed a guideline entitled 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW"' (2017), however, this guideline considers detailed modelling approaches and is not specifically relevant to construction dust impacts. A detailed modelling approach is not necessary for short term construction impacts that can be managed.

A risk-based approach has however been developed in the United Kingdom by the Institute of Air Quality Management (IAQM). The guideline is entitled "IAQM Guidance on the Assessment of Dust from Demolition and Construction" (IAQM, 2014).

This approach has been widely used for performing qualitative assessments of dust emissions from construction sites and has been used in NSW by RWDI and other consultants.

Furthermore, it has been accepted as a suitable approach in the absence of any guidance by Australian regulatory authorities.

This section presents a qualitative assessment of potential air quality impacts associated with the proposed works and has been conducted in general accordance with the methodology described in the previously mentioned IAQM Guideline.

This approach presents the risk of dust soiling and human health impacts associated with four types of activities that occur on construction sites (demolition, earthworks, construction and trackout) and involves the following steps:

- Step 1: Screen the need for a detailed assessment;
- Step 2: Assess the risk of dust impacts arising, based on:
  - The potential magnitude of dust emissions from the works; and
  - The sensitivity of the surrounding area.
- Step 3: Identify site-specific mitigation; and
- Step 4: Consider the significance of residual impacts, after the implementation of mitigation measures.

For this project, the process outlined above will be applied to the worst-case on-site and off-site activities that are likely to result in the highest generation of dust. This approach will result in a conservative assessment of the potential risks for human health and dust soiling impacts.

For this project, the earthworks phase (and associated trackout) is considered to have the greatest potential to generate short-term high levels of dust. This report has focused on the assessment of this worst-case scenario.

5.2 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.

5.2.1 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:

- 350m of the boundary of the site; or,
- 50m of the route(s) used by construction vehicles on public roads up to 500m from the site entrance(s).

Due to the density of nearby commercial premises, there are many sensitive receptors. Rather than identifying all sensitive receptors, representative receptors closest to the Site in various directions have been selected. It is expected that the closest receptors would experience the worst-case air quality impacts. If potential air quality impacts from the development comply with the adopted assessment criteria at the nearest receptors, then those situated at a greater distance would also comply.

The locations of the representative sensitive receptors relative to the Site are presented in Table 5-1with a description, address, and approximate distance from Site. The locations of representative sensitive receptors in the study area are shown in **Figure 5-1.** As per the table and figure the nearest residential receivers/receptors R01 are located within 100m south of the proposed site and another residential receiver/receptor R02 is located within 30m from the site. Therefore, an assessment of dust impacts is considered necessary under the guideline. Moreover, commercial areas are located in the vicinity of the Proposal site with some buildings being adjacent to the Proposal site.

Table 5-1 : Representative Sensitive Receptor Locations

Receptor	Description	Address	Approximate distance from Site
R01	Henry Deane Plaza	18 Lee St, Haymarket NSW 2000	Adjacent to Site, within 10 m
R02	Sydney Railway Square YHA (Former Inwards Parcel Yard)	8 - 10 Lee St, Haymarket NSW 2000	Adjacent to Site, within 30 m
R03	Mercure Sydney	818-820 George St, Sydney NSW 2000	100 m
R04	TAFE NSW – Ultimo, Building W	827 George St, Ultimo NSW 2007	100 m
R05	Endeavour College of Natural Heath (Sydney Campus)	815-825 George St, Haymarket NSW 2000	100 m
R06	Rendezvous Hotel	Corner of George and Quay	100 m

Receptor	Description	Address	Approximate distance from Site
	Sydney Central	St, Sydney NSW 2000	
R07	Wake Up! Sydney	509 Pitt St, Sydney NSW 2000	150 m
R08	NSW Train Link	15 Railway Colonnade Dr, Haymarket NSW 2000	200 m
R09	Haven Specialty Coffee	34 Chalmers St, Surry Hills NSW 2010	325 m

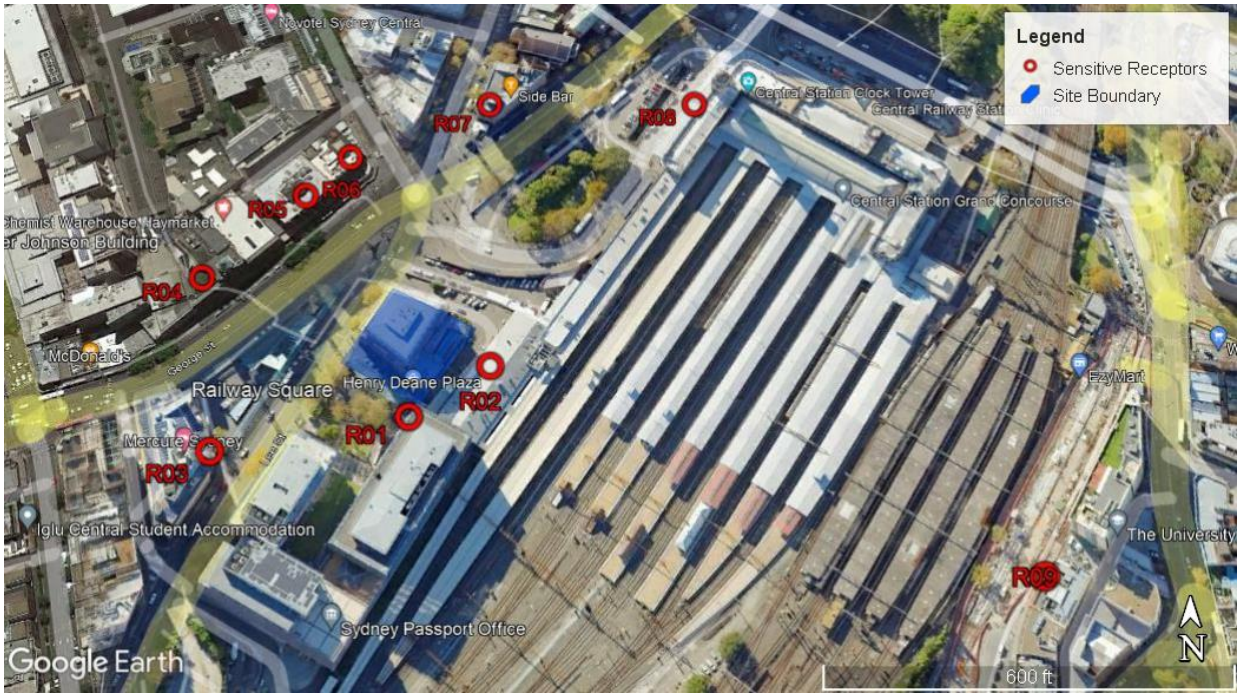

Figure 5-1 Locations of Identified Residential and Industrial/Commercial Areas

The closest sensitive receptors are located adjacent to the Site, within approximately 10 metres of the Site boundary and therefore are located within the screening distance (350 from site boundary or 50 m from route used by construction vehicles up to 500 m from site entrance) stipulated by the IAQM. Therefore, further assessment is required in accordance with IAQM guidance.

5.2.2 Step 2A – Potential Dust Emission Magnitude

In accordance with the IAQM guidance (Section 7, Step 2: Assess the Risk of Dust Impacts), dust emissions from "Demolition" are defined as:

- Large: Total building volume >50,000 m^3, potentially dusty construction material (e.g., concrete), on-site crushing and screening, demolition activities >20 m above ground level

- Medium: Total building volume 20,000 m^3 – 50,000 m^3, potentially dusty construction material, demolition activities 10-20 m above ground level; and
- Small: Total building volume <20,000 m^3, construction material with low potential for dust release (e.g., metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

Proposed demolition works consists of interior demolition of the building only.

Dust emission magnitudes from "Earthworks" are defined as:

- Large: total site area >10,000 sqm, potentially dusty soil type (e.g., clay), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100,000 tonnes;
- Medium: total site area 2,500 sqm – 10,000 sqm, moderately dusty soil type (e.g., silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4m – 8m in height, total material moved 20,000 tonnes – 100,000 tonnes; and,
- Small: total site area <2,500 sqm, soil type with large grain (e.g., sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <20,000 tonnes.

The total area of the Proposal site which will be excavated is estimated to be 3,400 sqm.

Dust emission magnitude from "Construction" activities are defined as:

- Large: Total building volume >100, 000 m^3, on site concrete batching, sandblasting
- Medium: Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g., concrete), on site concrete batching; and
- Small: Total building volume <25,000 m^3, construction material with low potential for dust release (e.g., metal cladding or timber)

The total proposed building volume is greater than 100, 000 m^3, however it is understood that onsite concrete batching or sand blasting would not occur.

Regarding dust "Trackout" associated with haulage activities, dust emission magnitudes are defined as:

- Large: >50 heavy vehicle outward movements per day, potentially dusty surface material, unpaved road length >100m;
- Medium: 10 – 50 heavy vehicle outward movements per day, moderately dusty surface material, unpaved road length 50m – 100m; and,
- Small: <10 heavy vehicle outward movements per day, surface material with low potential for dust release, unpaved road length <50m

Earthworks will result in the medium number of heavy vehicle movements, expected to be in the order of 25 - 30 heavy vehicles movements per day leaving the site. However, this number reduces to up to 10 heavy vehicle movements per day for the remaining of the construction activities, and all on-site haulage would include unpaved sections of road less than 50m long.

For conservative purposes (worst-case scenario), this assessment assumed that 25 heavy vehicles movements per day will be expected during the entirety of construction and demolition operations.

The dust emission magnitude is therefore:

- **Small** for Demolition
- **Medium** for earthworks.
- **Large** for Construction
- **Small** for Trackout.

5.2.3 Step 2B – Sensitivity of Surrounding Area

The sensitivity of the surrounding area to dust impacts considers a number of 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.

The IAQM guideline provides the following description for sensitivities to **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 a 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.*

The IAQM guideline provides the following description for sensitivities to **human health effects**:

High sensitivity receptor:

- *Locations where members of the public are exposed over a time period relevant to the air quality objective for PM10 (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 PM10 (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 PM10, as protection is covered by Health and Safety at Work legislation.*

In accordance with the IAQM guideline, the following receptor sensitivity has been determined:

- **High** sensitivity to dust soiling.
- **High** sensitivity to human health.

5.2.3.1 Sensitive Receptors in R01 and R02

Considering the above receptor sensitivities, Table 5-2 and Table 5-3 have been reproduced from the IAQM (only showing the "high and medium" receptor sensitivity) so that the sensitivity of the area can be determined.

For human health impacts, the mean background PM_{10} concentration of below 18.8 µg/m^3 has been used given the local ambient air quality measured from Table 4-1.

Table 5-2: Area Sensitivity Decision Matrix – Dust Soiling

Receptor sensitivity	Number of receptors	Distance from the source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	> 1	Medium	Low	Low	Low

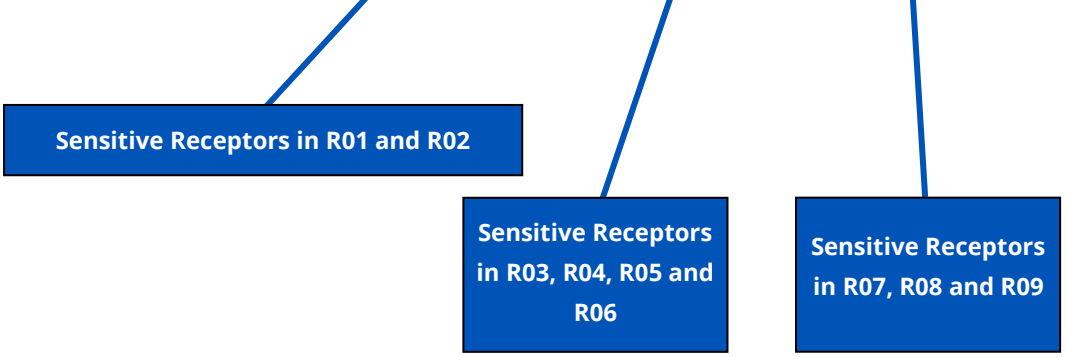

Table 5-3: Area Sensitivity Decision Matrix – Human Health

Receptor sensitivity	Annual Mean PM_{10} concentration	No. of receptors	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	> 32 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	< 24 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	> 32 µg/m³	> 10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m³	> 10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m³	> 10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	< 24 µg/m³	> 10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low

The sensitivity of the surrounding area including the sensitive receptors (both residential and commercial receivers) has been determined to be:

- For Demolition:
  - Low sensitivity to dust soiling.
  - Low sensitivity to health impacts.
- For earthworks:
  - Medium sensitivity to dust soiling.
  - Low sensitivity to health impacts.
- For Construction:
  - Medium sensitivity to dust soiling.
  - Low sensitivity to health impacts.
- For trackout:
  - Low sensitivity to dust soiling.
  - Low sensitivity to health impacts.

5.2.4 Step 2C – Define the Risk of Impacts

To define the risk of impacts, the dust emission magnitude ("large" for this site) is combined with the sensitivity of the area, as per Table 5-4, Table 5-5, Table 5-6 and Table 5-7 for demolition, earthworks, construction and trackout, respectively.

Table 5-4: Risk of Dust Impacts – Demolition

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 5-5: Risk of Dust Impacts – Earthworks

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

Table 5-6: Risk of Dust Impacts – Construction

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

Table 5-7: Risk of Dust Impacts – Trackout

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

In accordance with Table 5-4, the proposed demolition works are considered to have a low risk of both dust soiling and human health impacts. In accordance with Table 5-5, the earthwork activities are considered to have a medium risk of both dust soiling and human health impacts. In accordance with Table 5-6, the construction activities are considered to have a medium risk of both dust soiling and human health impacts. In accordance with Table 5-7, the haulage activities are also considered to have a low risk of both dust soiling and human health impacts.

It is important to note that the above risks assume that dust mitigation measures are not implemented.

5.2.5 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 6.

5.2.6 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, subject to the implementation of the mitigation measures outlined in Section 6.

6 DUST MITIGATION MEASURES

The assessment of potential dust impacts from the proposed works indicate that the proposed project will have a **low risk** of both dust soiling and human health impacts from demolition, and haulage (track out) activities and **medium** risk for earthworks and construction activities, if dust mitigation measures are not implemented. The potential risk for the other stages of construction will be either low or negligible given that the worst-case scenario (demolition, earthworks, construction, and associated haulage) has been considered.

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

6.1.1 Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site, and:
- Displays the name and contact details of the Responsible Person accountable for air quality and dust issues on the site boundary.
- Displays the head or regional office contact information.
- Develop and implement a Dust Management Plan (DMP) that considers, as a minimum, the measures identified herein.

6.1.2 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 any exceptional incidents that cause dust and/or air emissions, either on or off site, and the action taken to resolve the situation in the logbook.

6.1.3 Monitoring

- Undertake daily on-site and off-site inspections, where receptors are nearby, 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 window. Specific 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.

6.1.4 Preparing & Maintaining the Site

- Plan site layout so that dust generating activities are located away from receptors, as far as possible.
- Avoid site runoff of water or mud.
- 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.

6.1.5 Construction Vehicles and Sustainable Travel

- Ensure all vehicles switch off engines when stationary – no idling vehicles.
- Impose and signpost a maximum-speed-limit of 25km/h on surfaced and 15km/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).

6.1.6 Measures for General Construction Activities

- Ensure an adequate water supply on the site for effective dust/particulate matter 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.

6.1.7 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 10m from receptors where possible.

7 OPERATION PHASE ASSESSMENT

7.1 Assessment Methodology

The Proposal site will operate as new mixed-use development comprising 'tourist and visitor accommodation' (in the form of a 'hotel'), commercial office space (both co-working and office premises), retail premises and ancillary parking, servicing, and loading. During operation, the site is not expected to generate any impacts on the surrounding area. The Project is committed to achieving best practice sustainability and environmental performance measures and initiatives to manage and control air quality emissions. A qualitative approach was adopted to assess all potential air quality impacts during the operation of the Project as presented below.

7.2 Rooftop plant and building exhaust

Rooftop mechanical plant and all exhaust air from the building would be ducted and discharged in accordance with the Building Code of Australia (National Construction Code Building Code of Australia, The Australian Building Codes Board) requirements. Emissions from the rooftop plant and exhaust are released from the 42nd floor and would consequently be well mixed and dispersed with ambient air by the time they reach the ground level.

The standby generators would be for emergency use only and would not be operated under normal circumstances. Therefore, the primary operational air quality emission is warm/cool air from building ventilation systems which is not expected to have a significant impact human health or environmental amenity. Due to the land use and high-rise nature of surrounding environment, rooftop plant and building exhaust emissions are considered minor and would not significantly contribute to ambient pollutant concentration.

Therefore, assuming all building exhaust discharge points are installed and operated in accordance with the Building Code of Australia requirements and the recommended mitigation measures provided in Section 6 are implemented, no operational air quality impacts from rooftop plant and building exhaust are expected.

7.3 Waste storage

Potential air quality and odour emissions from waste storage would be negligible as long as proper storage methods and adequate management measures are implemented.

7.4 Café and kitchen emissions

The source of odour, associated with the proposed development, with the greatest potential to cause nuisance odour is the exhaust from the kitchens.

The following section presents a risk assessment of potential odour impacts associated with the kitchen exhaust, conducted in general accordance with Appendix C "Risk Assessment for Odour" Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems, prepared by the UK Department of Environment, Food and Rural Affairs (DEFRA).

The risk assessment methodology recommended by DEFRA involves attributing risk to factors such as dispersion, proximity of receptors, the size of the kitchen, and the type of food served. These risks are summed,

and the resultant risk is used to indicate the level of odour control required to ameliorate the risk of odour impacts.

It is noted that this guideline has specifically been developed to assess the risk of nuisance odours from commercial kitchens. The guideline considers impacts from both gaseous substances and fine particles and provides recommendations for controlling both. The Proposal would not emit significant amounts of fine particles; and therefore, this assessment is focused on odours from gaseous emissions.

Table 7-1presents the three possible odour risk categories, and the appropriate level of odour control.

Table 7-1 : Odour Risk Categories and Control Requirements

Impact Risk	Odour Control Requirement	Significant Score
Low to Medium	Low Level odour control	Less than 20
High	High Level odour control	20 to 35
Very High	Very High-Level odour control	More than 35

The significance scores in Table 7-1 are calculated by summing the individual risk factors scores, as outlined in Table 7-2.

Table 7-2 : Risk Factors and Scores

Factor	Risk		Details
	Description	Score	
Dispersion	Very Poor	20	Low Level Discharge, discharge into courtyard or restriction on stack.
	Poor	15	Not low level but below eaves, or discharge velocity below 10 m/s.
	Moderate	10	Discharge 1 m above eaves with velocity 10-15 m/s.
	Good	5	Discharge 1 m above ridge with velocity 15 m/s or greater.
Proximity of receptors	Close	10	Closest sensitive receptor less than 20 m from kitchen discharge.
	Medium	5	Closest sensitive receptor between 20 m and 100 m from kitchen discharge.
	Far	1	Closest sensitive receptor more than 100 m from kitchen discharge.
Size of Kitchen	Large	5	More than 100covers or large sized take away.
	Medium	3	Between 30 and 100 covers or medium sized take

Factor	Risk		Details
	Description	Score	
			away.
	Small	1	Less than 30 covers or small take away.
Cooking type (odour loading)	Very High	10	Pub (high level of fried food), fried chicken, burgers, or fish & chips.
	High	7	Kebab, Vietnamese, Thai or Indian.
	Medium	4	Cantonese, Japanese or Chinese.
	Low	1	Most pubs, Italian, French, Pizza, or steakhouse.

7.4.1 Risk Assessment

Closest residential receptors and distances to the proposed kitchen exhaust are presented below:

- Sensitive Receptors R01 and R02 to the south of the proposed development is within 50m from the kitchen exhaust.
- All Other receptors are more than 100m from the kitchen exhaust.

The kitchen exhaust is located on Level 6 of the building and the arrangement is likely to result in “moderate” dispersion due to height of the building and stack parameters. The nearest sensitive receptors are located in the adjacent building (residence) and are within 20 and 100m of the kitchen exhaust, which is considered “medium” proximity.
The risk factors and scores relating to kitchen size in Table 7-2**Error! Reference source not found.** are a function of the number of “covers” (i.e., meals) produced in a restaurant. Given there are 2 or 3 floors café, kitchen, and restaurant, it would be reasonable to assume that the facility could deliver up 30 and 100 meals therefore should be considered to be Medium. This is a conservative assumption.

The food cooking activities would be quite varied involving many different cooking types. Overall, the cooking load is unlikely to generate significant odours. Therefore, the “odour loading” risk factor is considered low to medium.

A tally of the individual odour risk scores, and a summary of the resultant odour risk is presented in **Table 7-3**.

Table 7-3 : Odour Risk Assessment

Factor	Risk	
	Description	Score
Dispersion	Moderate	10
Proximity of receptors	Medium	5
Size of Kitchen	Medium	3
Cooking type (odour loading)	Low	1
	Total	19

It should be noted that DEFRA odour risk categories do not make a distinction between low and medium risk.

Table 7-3**Error! Reference source not found.** indicates that the risk of nuisance odour impacts from the premises, in the absence of specific control measures are between low/medium and high.

The nearest receptors near to the site are approximately a 50 metres distance at which they are considered to be low risk under the DEFRA guidance. On this basis, the risk of odour impacts from the site, in the absence of specific control measures, is considered to be low.

Due to the Low risk of odour impacts from the proposed development, specific odour control measures are not recommended. However, oil and grease from kitchen sources must be removed either by filtration or scrubbing.

7.5 Traffic Emissions

The air quality impacts arising from the proposed development due to vehicular movement will be negligible. The emissions would be of a similar nature to those already emitted by road traffic along the nearby road network, although at a much lower level and is therefore considered a low risk to the nearby receivers. The closest residential receivers are located approximately 10m to the south of the site boundary as shown in Figure 5-1. Moreover, as shown in Section 4.1, Southern winds are prevalent throughout the year. Although southern winds would be able to carry emissions downwind of the site towards the sensitive receptors located to the south of the site, it is not anticipated that these will have a large significant impact.

Similar to the assessment of construction dust (refer Section 5), an approach developed by the Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) has been referenced following an estimate of the contribution of the three main pollutants from the operation of the Project. The guideline is entitled “Land-Use Planning & Development Control: Planning for Air Quality” (EPUK & IAQM, 2017).

In particular Table 6.3 from the guideline has been referenced and reproduced as Table 7-4.

Table 7-4 : Impacts descriptors for individual receptors

Table 6.3: Impact descriptors for individual receptors.

Long term average Concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Explanation

1. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.
2. The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5%, will be described as Negligible.
3. The Table is only designed to be used with annual mean concentrations.
4. Descriptors for individual receptors only; the overall significance is determined using professional judgement (see Chapter 7). For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.
5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.
6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.
7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

7.5.1 Operation Assumptions

The site is not expected to generate any impacts on road network; however, if any, the additional traffic associated with the Project will travel along George St/ Broadway/ Parramatta Rd. and eventually onto other arterial roads (such as Cross City Tunnel and Great Western Highway). On this basis, we have conservatively assumed that the road traffic portion of the emissions within the Sydney airshed is exclusively controlled by the traffic on George St/ Broadway/ Parramatta Rd. This is clearly not the case given the many other roads in this region however allows a conservative assessment.

The typical annual average daily traffic (AADT) for Parramatta Rd is around 58,059 for the year 2022.

An approximate increase to the overall traffic movements is assumed to be less than 5% in the area, based on worst case increase in traffic.

7.5.2 Estimate of Increase in Pollutants

Considering the main three pollutants, PM_{10}, $PM_{2.5}$ and NO_2, and assuming a worst case 5% increase in traffic, Table 7-5 presented the estimated increase in pollutant concentration due to the operation of the Project.

Table 7-5 : Increase in concentration (ug/m³) due to the Project.

Pollutant	Existing concentration (Average)	Estimated[1] concentration (existing traffic)	Estimated[2] increase in concentration (the Project operational traffic)
PM10	18.8	2.24	0.11
PM2.5	8.0	1.03	0.05
NO_2	15.67	8.68	0.43

Note 1: Applied correction to *Existing Concentration (average)* Table 4-3 as per for year 2013.

Note 2: Applied 5% correction to *Estimated Concentration (Existing Traffic)* considering worst case increase in traffic.

Considering the EPUK & IAQM, 2017 guideline, the impact and significance of the Project's operation for each pollutant is defined as:

- PM_{10} - Negligible impact and not significant.
- $PM_{2.5}$ - Negligible impact, however the existing concentration is slightly above criteria and not significant due to the conservatism of the assessment.
- NO_2 - Negligible impact and not significant.

With regard to the sensitive receptors, operations at the site are not expected to significantly impact the receivers to the south, west and north of the site. Hence, it is anticipated that the impacts from the Proposal site are likely negligible and not to be significant.

7.6 Assessment of Rail operations on the Project

There is potential that emissions from idling diesel locomotives impact on the Project if natural ventilation is used rather than air conditioning. The NSW Government has begun a project to replace the aging NSW regional rail fleet with new diesel-electric hybrid technology trains as part of the Regional Rail Fleet Project.

However, if there is a delay to the locomotive replacement program, or for other reasons, locomotives with diesel exhaust emissions use the platforms in front of the Project, this could result in adverse outcomes for building users, unless there is a way of ceasing natural ventilation. Therefore, it is recommended that the design of the ventilation system might need to be reviewed, and possibly modified, to enable natural ventilation to temporarily shut down at the lower levels, should this situation arise.

8 CONCLUSION

RWDI was engaged by the Toga to conduct an air quality assessment for the proposed development of approximately 200m high (RL 202.28) tower which will include both hotel and commercial spaces at 2 Lee Street, Haymarket.

A risk-based approach in accordance with the IAQM guidance was adopted to assess dust emissions from the construction of the Project. The assessment concluded that there would be a low risk of dust impacts if the recommended mitigation measures are implemented. 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 qualitative approach was adopted to assess air quality impacts on nearby receptors during the operation of the Project. No significant air quality impacts were identified to occur during the operation of the Project and associated risks are likely not to be significant.

STATEMENT OF LIMITATIONS

This report entitled Air Quality Assessment – Toga Central, 21 July 2022, was prepared by RWDI Australia Pty Ltd ("RWDI") for Toga ("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.