Appendix T
Air Quality Assessment

REPORT

POWERHOUSE ULTIMO RENEWAL

NSW, RFQ 8007294_17

AIR QUALITY ASSESSMENT
RWDI # 2203935
17 May 2022

SUBMITTED TO

Stephen Fabling
stephen.fabling@create.nsw.gov.au
T: +61 0468 640 620

Department of Enterprise, Investment and Trade (Create NSW)
Level 10, 52 Martin Place
Sydney NSW 2000

SUBMITTED BY

Rama Robbi, LEED AP
Senior Engineer/Scientist, Air Quality
rama.robbi@rwdi.com

John Wassermann, RPE NSW
Senior Technical Director
john.Wassermann@rwdi.com

Davis Lai
Project Manager
Davis.Lai@rwdi.com

RWDI Australia Pty Ltd (RWDI)
Suite 602, Level 6, 80 Williams Street
Woolloomooloo NSW 2011
T: +61 2 9437 4611
E-mail: solutions@rwdi.com
ABN: 86 641 303 871

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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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1 INTRODUCTION

This report has been prepared on behalf of the Department of Enterprise, Investment and Trade (Create NSW) to support a State Significant Development (SSD) Development Application (DA) for alterations and additions to Powerhouse Ultimo at 500 Harris Street, Ultimo.

The Powerhouse Ultimo Renewal project comprises a transformative $480-$500 million investment by the NSW Government to create a new Creative Industries Precinct that is integrated into the operations of the existing Powerhouse Museum. The retention and renewal of Powerhouse Ultimo will deliver an international standard museum with new and refurbished spaces for museum operations, exhibitions, programs and associated industry and creative uses that will activate and engage audiences. It will deliver a programming focus on design and fashion, presenting exhibitions that showcase the Powerhouse Collection, international exclusive exhibitions and programs that support the design and fashion industries.

1.1 Process

The Powerhouse Ultimo Renewal project is for the purposes of an 'information and education facility' with a capital investment value of more than $30 million, and such is classified as SSD pursuant to Section 13(1) of Schedule 1 of State Environmental Planning Policy (Planning Systems) 2021.

The delivery of the new Creative Industries Precinct for Powerhouse Ultimo will occur in stages, comprising the following:

- Stage 1 – Concept DA establishing the planning, design, and assessment framework for the Powerhouse Ultimo Renewal Project including the indicative land uses, maximum building envelopes, general parameters for the future layout of the site, and strategies to guide the subsequent detailed design phases of the project including Urban Design Guidelines and Design Excellence Strategy.
- Architectural Design Competition – A competitive design process to critically analyse and provide design alternatives for the Powerhouse Ultimo Renewal project in accordance with the planning and development framework established for the site under the Concept DA. A winning design will be selected by a jury of experts and will inform the subsequent detailed design and assessment phase (Stage 2) of the project.
- Stage 2 – A Detailed DA confirming the ultimate architectural design and operation of Powerhouse Ultimo and assessing any associated planning and environmental impacts. This Detailed DA will seek consent for the detailed design, construction and operation of the proposed development and follows the same planning assessment and determination process as the Concept DA (Stage 1).

1.2 Site Description

Powerhouse Ultimo is situated upon the lands of the Gadigal people of the Eora Nation. It is located within the City of Sydney Local Government Area and its primary address is 500 Harris Street, Ultimo.

The site contains two heritage-listed buildings, being the 'Ultimo Power House' (c.1899-1905) and the 'Former Ultimo Post Office including interior' (c.1901), both of which are listed on the State Heritage Register under the Heritage Act 1997.

Other buildings within the site include the former tram shed (Harwood Building) and the 1988 museum building fronting Harris Street (Wran Building). A café building has been constructed immediately to the south of the Power House at the northern end of the Ultimo Goods Line. Located at the corner of Harris Street and Macarthur Street is a forecourt that acts as the main public entrance to the site but provides limited activation and is disconnected from higher-quality urban spaces including the Ultimo Goods Line.

1.3 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 has been prepared having regard to the SEARs as described in the below 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
13. Air Quality	• Where applicable, provide an assessment of onsite and offsite air quality impacts on sensitive receives during the operation and construction, including odours, dust and particles, in accordance with the relevant EPA guidelines. • Where applicable, outline the proposed management and mitigation measures that would be implemented to reduce any air quality impacts.	This air quality report has identified the significant air emission sources and assessed their potential impacts	Sections 4-7

2 PROJECT DESCRIPTION

This Concept DA sets the vision for the renewal of Powerhouse Ultimo and the creation of the Powerhouse Creative Industries Precinct, with the detailed design, construction, and operation of the project to be sought at a separate and future stage (Stage 2).

Concept approval is sought for the following:

- A maximum 'loose-fit' building envelope enabling a new building fronting Harris Street and the renewal of the Wran building to the north and the Power House main building.
- Use of the new spaces and built form as an 'information and education facility' including exhibition, education, and back of house spaces, and a range of related and ancillary uses such as office and co-working spaces, creative industry studios, retail facilities and public domain.
- Endorsement of Urban Design Guidelines and a Design Excellence Strategy to guide the detailed design of the future building, internal spaces, and public domain areas that will be the subject of a competitive design process and a separate and future DA (Stage 2).
- General functional parameters for the future design, construction, and operation of buildings and uses on the site including the principles and strategies for the management of transport and access, flooding, sustainability, heritage, and the like.

2.1 Site Location

The Powerhouse Ultimo site (Proposal site) is approximately 24,378m² in size and comprises a family of buildings varied in age, history, and heritage significance. The site is defined by the following lots that are owned by the Museum of Applied Arts and Sciences Trust:

- Lot 1 DP 770031 (Heritage Post Office)
- Lot 1 DP 781732 (Temporary exhibition hall)
- Lots 1 and 3 DP 631345 (Heritage components of the Powerhouse Museum)
- Lot 3 DP 216854 (Harwood Building)
- Lot 37 DP 822345 (Part Harris St Entry Plaza)

The site is located within the Ultimo NSW as shown in **Figure 2-1**. It is located west of the Tumbalong Park and the area is occupied mainly by residential and commercial developments. Darling Square is also located in the region, east to the Proposal site.

The site is bound to the north-west by William Henry St, and to the south-west by Harris St. The site is surrounded by Residential and Commercial developments to the north, south, east, and west.

Figure 2-1: Site Location

2.2 Proposal

The primary focus of the Powerhouse Ultimo Renewal project is the museum to the north of Macarthur Street and bounded by Harris Street, Pier Street, and the light rail corridor. However, some enabling and minor decoupling works will occur within the broader Powerhouse Ultimo precinct. No substantive works or changes in use are proposed to the Harwood Building located between Macarthur Street and Mary Ann Street.

The proposal includes interior demolition of the existing buildings (Power House, Switch House and Wran Building), construction and operation of a new building (existing forecourt) for Powerhouse Ultimo facility. The work comprises of the following:

- Interior demolition of the buildings;
- Minor earthworks involving cut and fill works for new building;
- Site preparation works and servicing;
- Rebuild of existing building, Construction of new 8 storey building which includes a Basement Level;

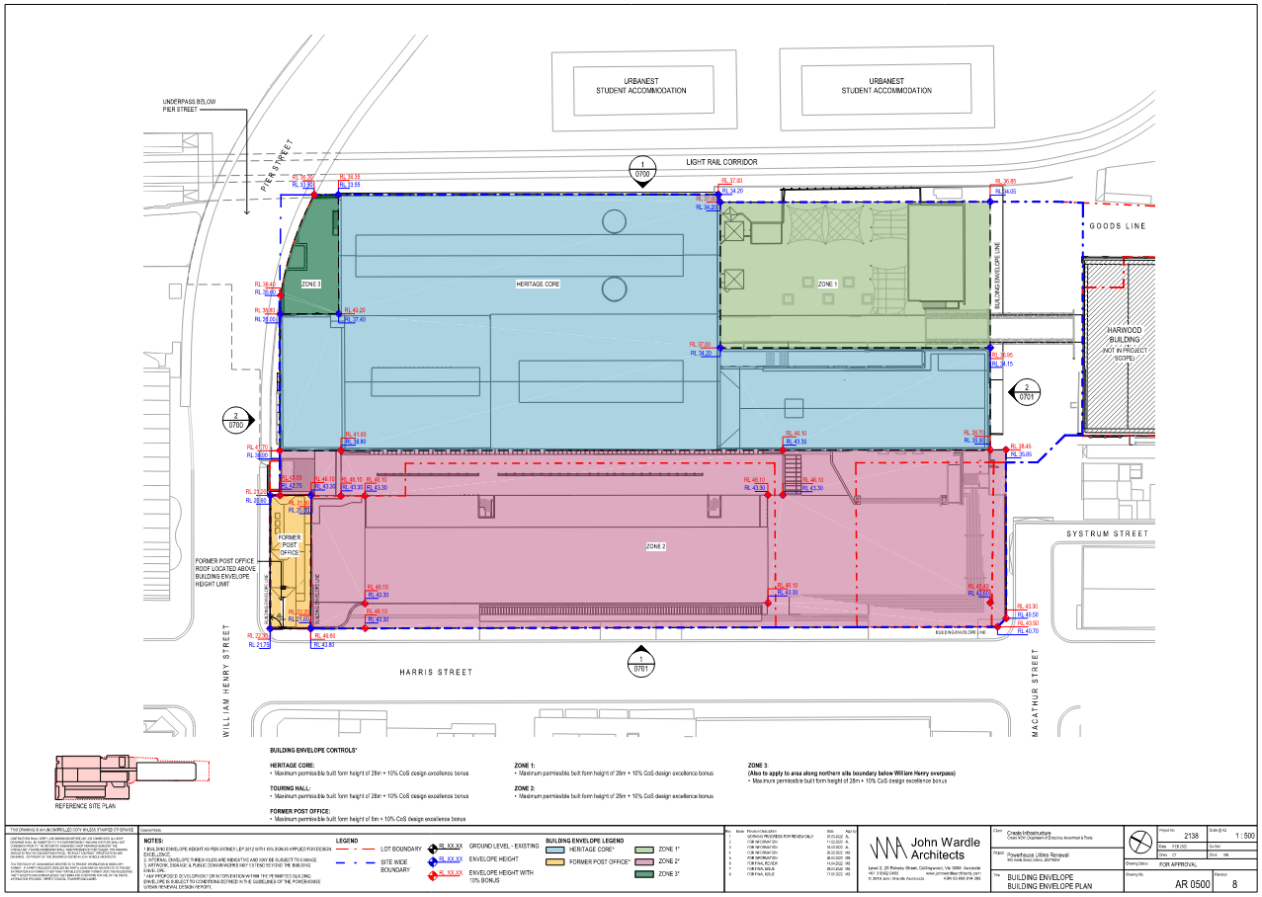

Figure 2-2: Proposed Site Layout

2.3 Potential Sources of Air Emissions Associated with the Development

Air emissions are likely during both the construction and the operation of the proposed Powerhouse Ultimo facility development. The most likely air quality sources for construction and operation are summarised in the following sections.

2.3.1 Construction phase

At the time of preparing this assessment a detailed construction programme was not developed, however the following stages and typical activities can be expected from this project:

Demolition:

- Internal Demolition work is likely to be shortest and of least impact.
- Small number of structures to be removed using hand tools.

Earthworks:

- Likely to be shortest stage of works and of most impact.
- Earthwork required will involve operation of trucks, excavators, dozers, graders and associate equipment.

Construction/Rebuilding of existing building:

- Staging is likely to be of longer duration with less impact than earthworks.
- Building works likely to involve a high number of truck movements, cranes and power tools.

During the temporary phase of construction earthwork activities including moving of material and truck movements along haul roads (wheel generated dust) is likely to lead to short-term elevate levels of particulate Matter (PM_{10} and $PM_{2.5}$).

During the earthwork activities, which includes moving of material and truck movements along haul roads (wheel generated dust), there is likely to be short-term periods of elevated dust levels.

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
- 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.

2.3.2 Operational phase

During the operational phase, the typical activities expected from this project are temporary accommodation for student and from onsite operation. Operation of plant (boiler and turbine) will emit Particles (PM_{10} and $PM_{2.5}$), NO_x, SO_2 and VOCs.

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

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 Office of Environment and Heritage (OEH) 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 3.64 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.

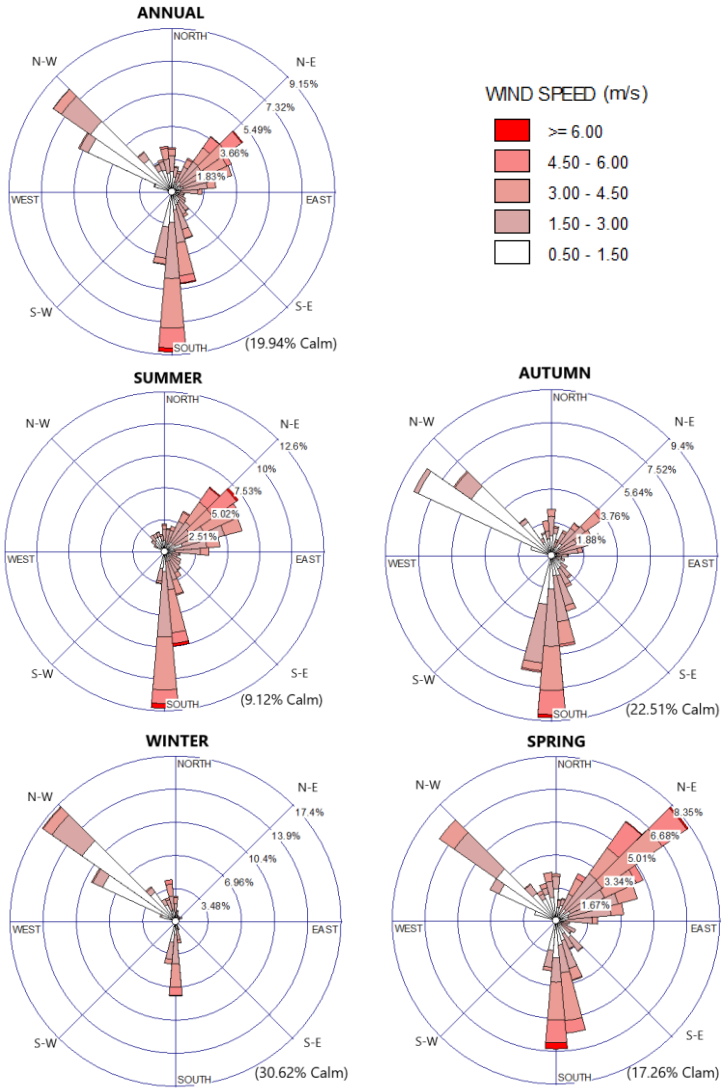

Figure 4-1: Rozelle AQMS Wind Roses, 2017

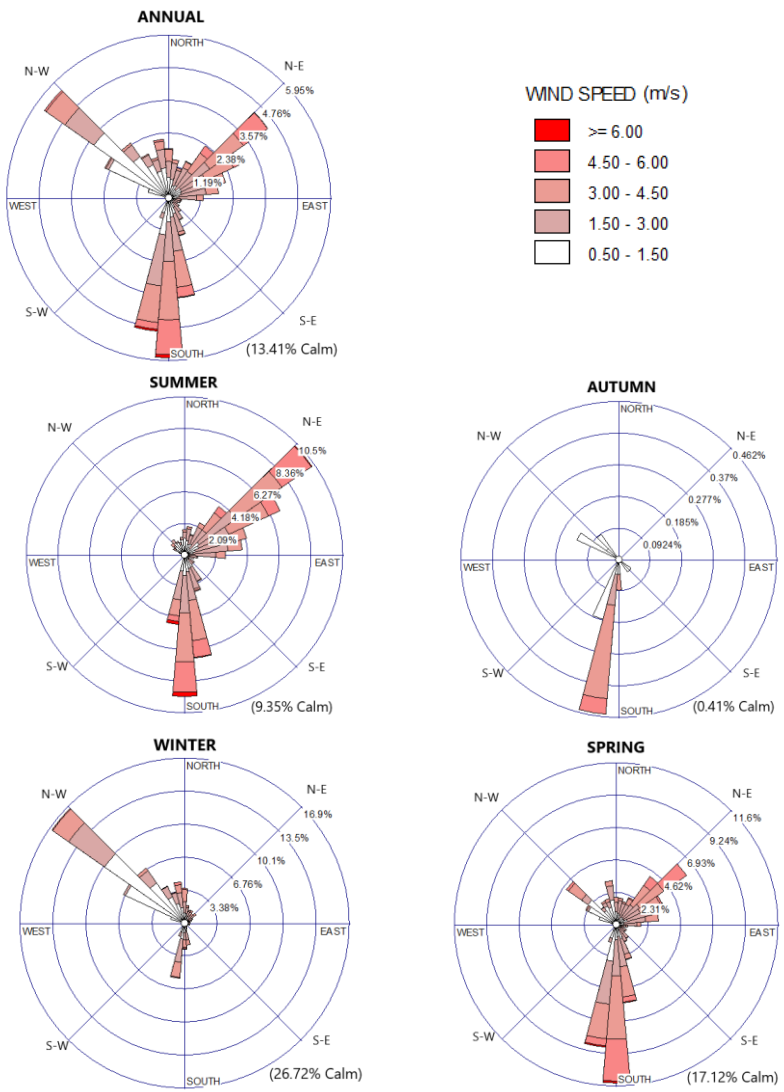

Figure 4-2: Rozelle AQMS Wind Roses, 2018

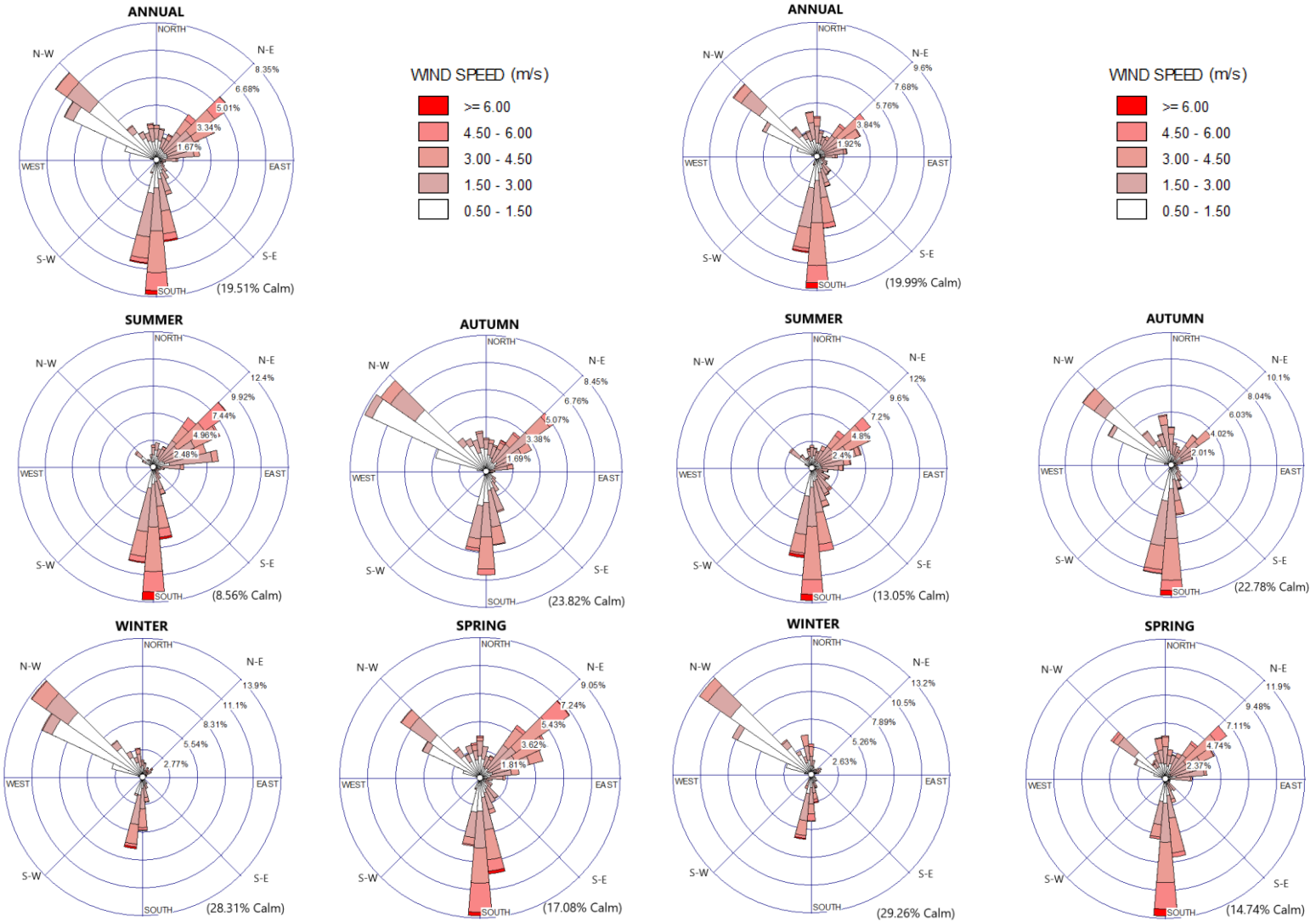

Figure 4-3: Rozelle AQMS Wind Roses, 2019

Figure 4-4: Rozelle AQMS Wind Roses, 2020

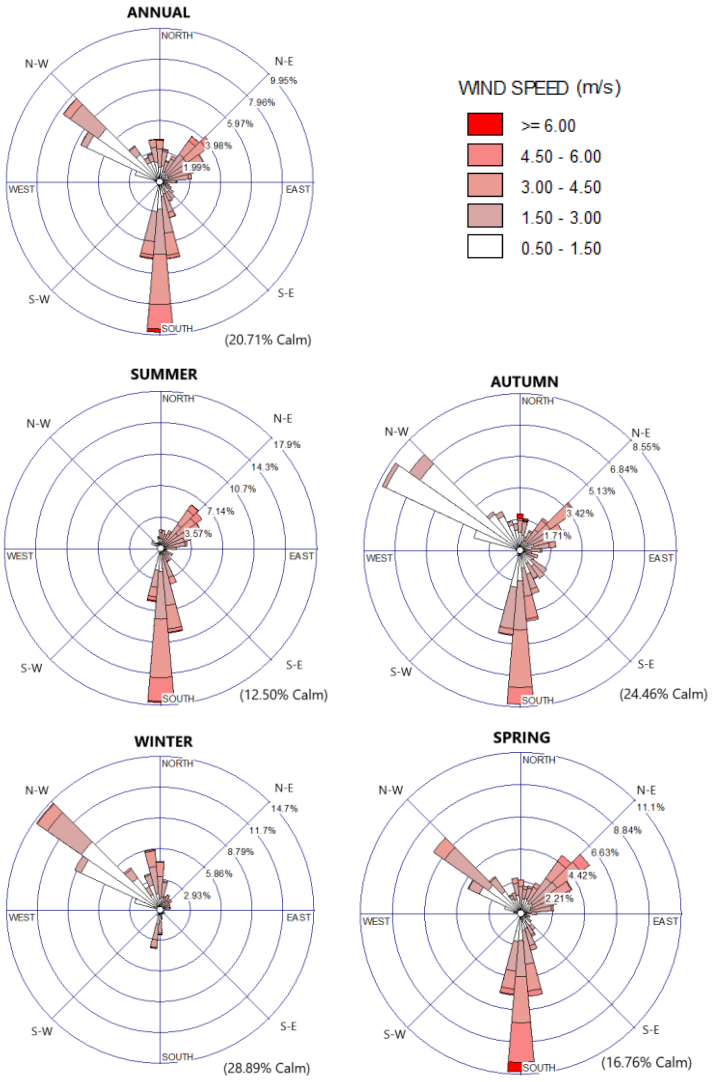

Figure 4-5: Rozelle AQMS Wind Roses, 2021

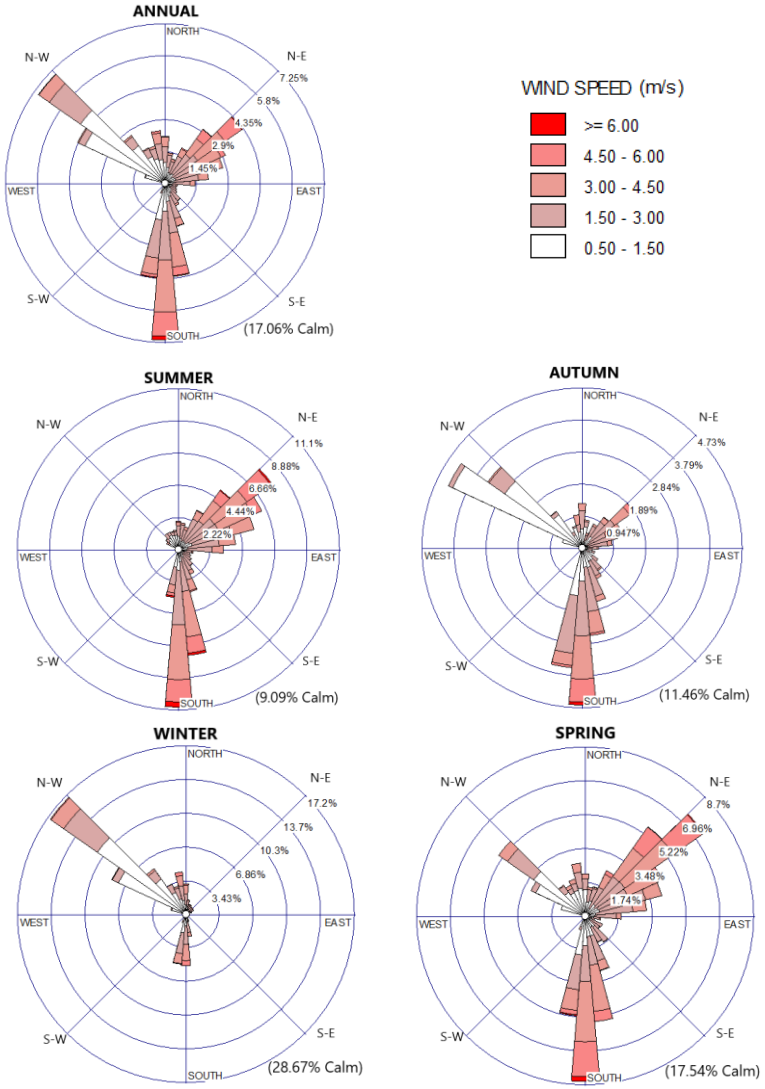

Figure 4-6: Rozelle AQMS Wind Roses, 2017-2021

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 Department of Planning and Environment (DPE) operates a network of air quality monitoring stations (AQMS) across NSW. The nearest DPIE AQMS measuring the selected pollutants is located approximately 3.65 kilometres northwest of the Proposal site, at Rozelle AQMS.

A summary of the ambient air quality monitoring data collected for year 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)
2020	18.1	7.5	15.04
2021	15.5	6.3	13.16
Average	16.8	6.9	14.10
Impact Criteria	25	8.0	28

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.
- 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 16.8 µg/m^3 which is at **67%** of the annual impact criteria.

$PM_{2.5}$

- Measured annual average has ranged between 7.5 and 6.3 µg/m^3.
- Considering this data period, the annual impact criteria of 8 µg/m^3 has not been exceeded and the arithmetic average of the period is calculated to be 6.9 µg/m^3 which is at **86%** of the annual impact criteria.

NO_2

- Measured annual average has been quite steady between 15.04 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 14.10 µg/m^3 which is at **50%** 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.

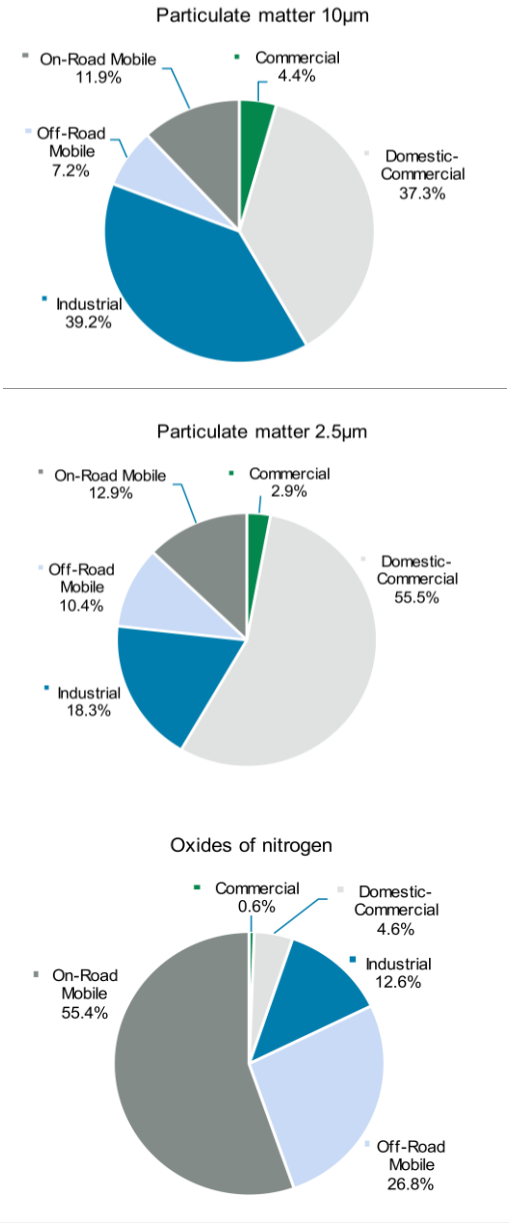

Figure 4-7 : Proportions of total estimated annual emissions for human-made source types (PM_{10}, $PM_{2.5}$ and NO_x) – Sydney Region – 2013

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).

As can be seen in **Figure 4-1**, the nearest residential receivers AAS1 are located within 30m south of the proposed site and another residential receivers AAS2 and AAS3 are located within 90m and 300 m respectively 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.

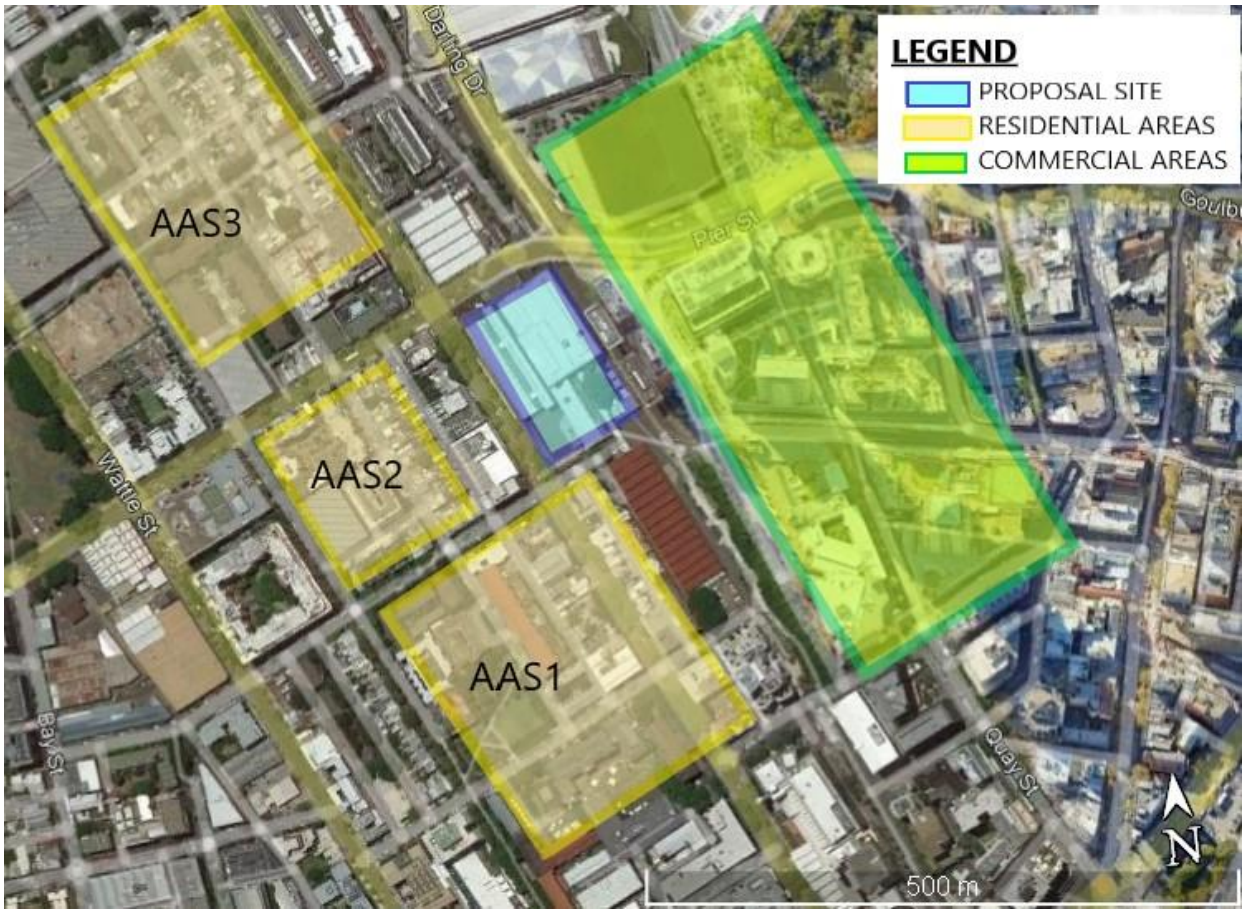

Figure 5-1 Locations of Identified Residential and Industrial/Commercial Areas

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 emission magnitudes from earthworks may be 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 smaller than 2,500 sqm.

Regarding dust "Trackout" associated with haulage activities, dust emission magnitudes may be 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 highest number of heavy vehicle movements, expected to be in the order of 50 - 60 heavy vehicles movements per day leaving the site. However, this number reduces to up to 25 heavy vehicle movements per day for the remaining of the construction activities, and all on-site haulage would include unpaved sections of road larger than 100m long.

For conservative purposes (worst-case scenario), this assessment assumed that 60 heavy vehicles movements per day will be expected during the entirety of construction and demolition operations.

The dust emission magnitude is therefore:

- **Small** for earthworks.
- **Large** 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 wouldn't 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:

5.2.3.1 Residential Receivers in AAS1 and AAS2

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

Considering the above receptor sensitivities, Table 5-1 and

Table 5-2 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 PM10 concentration of below 14.55 µg/m^3 has been used given the local ambient air quality measured from Table 4-1.

Table 5-1: 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

Residential receivers in AAS1

Residential receivers in AAS1, AAS2 and AAS3

Residential receivers in AAS1, AAS2 and AAS3

Table 5-2: 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

Residential receivers in AAS1, AAS2 and AAS3

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

- For earthworks:
  - Low 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 5-3 and Table 5-4 for earthworks and trackout, respectively.

Table 5-3: 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 5-4: 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 5-3, the proposed earthworks are considered to have a low risk of both dust soiling and human health impacts. In accordance with Table 5-4, the haulage activities are 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 5.

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 earthworks haulage (track out) 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 (earthworks 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

The Proposal site will operate as Museum and temporary student accommodation as proposed in the "New Build" building which is located in a residential and commercial area. During operation, the site is not expected to generate any impacts on the surrounding road network. Also additionally, the site can be easily accessed by public transportation and given no on-site car parking is provided as a part of the project, the air quality impacts arising from the Proposed development due to vehicular movement will be negligible.

The closest residential receivers are located approximately 10m to the south of the site boundary and the closest industrial/commercial receivers are also adjacent to 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 residential areas located to the south-west of the site, it is not anticipated that these will have a large significant impact.

As regard to the residential receivers, 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 not to be significant.

8 CONCLUSION

RWDI was engaged by the Create NSW to conduct an air quality assessment for the proposed development of Powerhouse Ultimo which is located at 500 Harris St, Ultimo NSW.

The air quality assessment concludes that the construction phases can be adequately managed so that the short-term and temporary dust related impacts will remain to be low risk.

A qualitative assessment of the operational phase was carried out and it was concluded that the impacts of the operation, at residential and commercial receivers, are likely not to be significant.

STATEMENT OF LIMITATIONS

This report entitled Powerhouse Ultimo Renewal – Air Quality Assessment, 6 April 2022, was prepared by RWDI Australia Pty Ltd ("RWDI") for Department of Enterprise, Investment and Trade (Create NSW) ("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.