Transport for NSW

Sydney Terminal Building Revitalisation

Air quality assessment

February 2023

NSW GOVERNMENT

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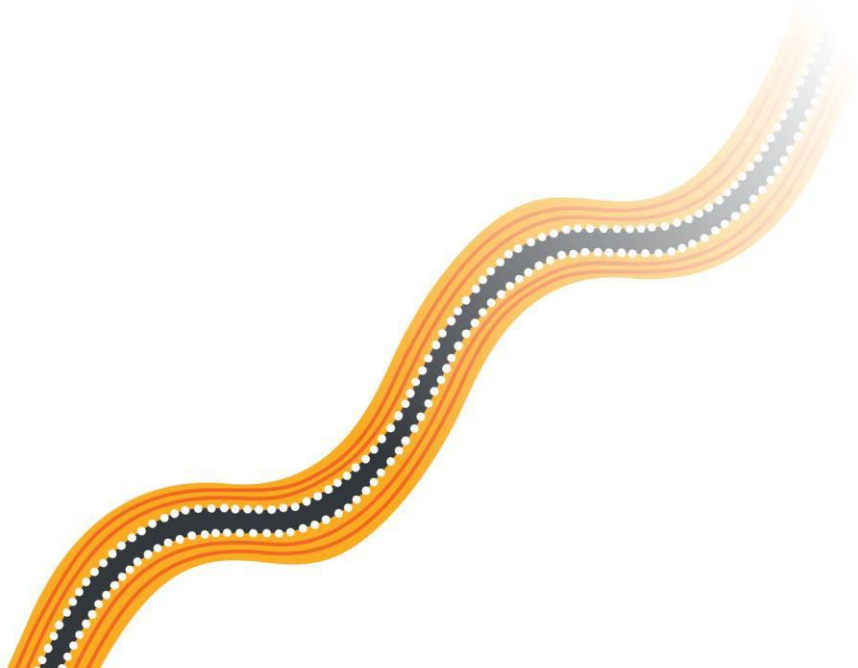
Acknowledgement of Country

We respectfully acknowledge the Traditional Custodians of the land of Central Precinct and the Sydney Terminal Building, the Gadigal. From time immemorial, this Country has been a place where people come to connect and reconnect. We pay our respects to all Aboriginal people who have journeyed and will journey through this place and acknowledge their ongoing connection to Country and culture. We pay our respects to members of the Stolen Generations and their descendants for whom the Sydney Terminal Building will always hold significance. We acknowledge that Platform One played a key role in Aboriginal children being removed from their families and communities.



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APPENDICES

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Abbreviations

Abbreviation	Definition
AQMS	Air Quality Monitoring Station
AWS	Automatic Weather Station
BoM	Bureau of Meteorology
CO	Carbon Monoxide
CPRP	Central Precinct Renewal Program
EIS	Environmental Impact Statement
LGA	Local Government Area
NO_x	Oxides of Nitrogen
PM_{10} and $PM_{2.5}$	Particulate Matter
SEARs	Secretary's Environmental Assessment Requirements
SO_2	Sulfur Dioxide
TSP	Total Suspended Particulate
VOCs	Volatile Organic Compounds

1. Introduction

1.1 Purpose of this report

This report documents the air quality impact assessment conducted to support the Sydney Terminal Building Revitalisation ('the project'). The assessment was completed to support the environmental impact statement (EIS) and address the relevant Secretary's Environmental Assessment Requirements (SEARs) as they relate to air quality.

1.2 project overview

Transport for NSW (Transport | the Proponent) is proposing to restore and revitalise the Sydney Terminal Building at Central Station (the project). The project is located on Gadigal Country of the Eora Nation, in Haymarket, in the City of Sydney local government area (LGA).

The project is located in an area bound by Eddy Avenue to the north, Pitt Street to the west, the Suburban Rail corridor to the east, and the head of the rail platforms in the Grand Concourse to the south (see **Figure 1**). This is referred to as the operational footprint. It includes the inside of the Sydney Terminal Building and:

- Eddy Avenue Plaza
- Eddy Avenue Colonnade
- Central Electric Building
- Western Forecourt
- Western loading dock (located beneath the Western Forecourt).

The project's key features are:

- Revitalisation and upgrade of the Sydney Terminal Building, Eddy Avenue Colonnade, Eddy Avenue Plaza and Western Forecourt to improve customer amenity, access and wayfinding (see **Figure 1**)
- Reconfiguration and market style retail activation within the loading dock
- Refurbishment of the Central Electric Building to be repurposed for additional retail space
- Adaptive reuse and improved activation of spaces, including high quality retail, and commercial, cultural, entertainment and community uses, complimentary to the transport interchange's function
- Utility relocation and replacement.

Construction is planned to start in mid-to-late 2023. It would take about three years subject to planning approval, funding availability, and weather. Construction will be phased to allow for the continued use and functionality of the Sydney Terminal Building while work is being carried out. Therefore, the building will be open and operational during construction. The construction footprint is shown in **Figure 2**.

Operation of the project will not result in any change of the primary use of the station as a transport interchange. Any operational changes that arise from the project are intended to be beneficial changes related to retail activation, accessibility, wayfinding and safety.

Figure 1 project Overview

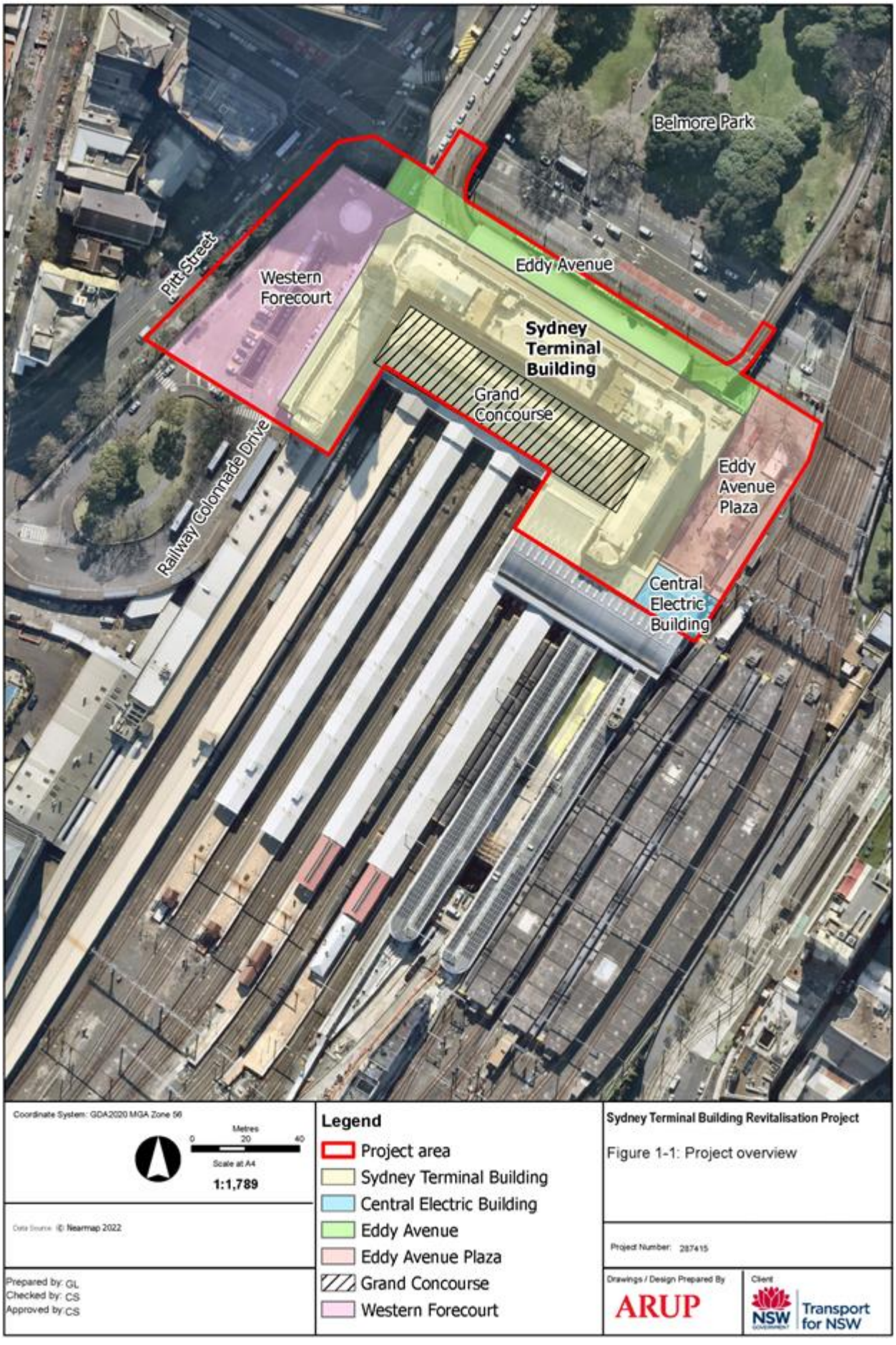


Figure 2 Construction Footprint

1.3 Secretary's Environmental Assessment Requirements

SEARs were issued by the NSW Department of Planning and Environment on 17 October 2022. **Table 1** outlines the SEARs relevant to air quality and where they have been addressed in this report.

Table 1 SEARs relevant to air quality

SEARs relevant to this technical report	Where addressed
1. An assessment of the following issues must be undertaken in accordance with the commitments in Section 7 of *Sydney Terminal Building Revitalisation project – Scoping Report* (Transport for NSW, June 2022): (f) air quality	See **Table 2**

Table 2 Proposed investigations and assessment as identified in the Sydney Terminal Building Revitalisation project – Scoping Report

Scoping report commitments	Where addressed
The EIS will include an air quality assessment which will assess the impacts of the project on air quality. The assessment will (as a minimum):	
• Identify and describe the background air quality environment based on a desktop review	**Section 4.3.1**
• Identify potential sensitive receivers likely to be impacted by sources of air emissions	**Section 4.1**
• Identify potential sources of air emissions during construction and operation of the project and qualitatively assess them	**Section 2.1** , **Section 2.2**, **Section 5**, and **Section 6**
• Identify appropriate mitigation and management measures.	**Section 5.4**

Quantitatively assessing impacts of fugitive emissions of dust and other pollutants from demolition and remediation projects using predictive modelling is seldom considered appropriate, primarily due to the uncertainty in the details of the activities. In addition, these details are likely to change as works progress. The uncertainty associated with the predictions of a quantitative study means it would be of limited value and would be unlikely to successfully assist with the identification of air quality control measures to actively manage potential risks.

SLR has therefore performed a qualitative, risk-based, assessment of both construction and operation impacts. The assessment methodologies for construction and operational assessments are described in **Section 5** and **Section 6** respectively.

2. Identification of Potential Air Emission Sources and Types

As outlined in **Section 1.3**, the scope of this AQIA covers potential air quality impacts on surrounding receptors due to the proposed construction and operation of the Project. The potential sources of air emissions during the construction and operation phases are identified below.

2.1 Construction

During the construction works, fugitive dust emissions are likely to be generated which could give rise to nuisance and/or health impacts for the surrounding sensitive areas. The following key sources of dust associated with the construction of the project have been identified as:

- Concrete cutting and breaking up of the existing buildings and/or surfaces
- Grading
- Loading and unloading of materials
- Wheel-generated dust from vehicles travelling on onsite unpaved disturbed surfaces;
- Wind erosion of exposed surfaces
- Combustion emissions from on-site mobile and fixed equipment/vehicles.

In addition to the construction activities being carried out at any point in time, a number of other environmental factors may also affect the generation and dispersion of dust emissions, including:

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

Where diesel-powered mobile machinery and vehicles are being used, localised elevations in ambient concentrations of combustion-related pollutants may occur, however considering the scale and duration of work, potential for exceeding the relevant criteria of these pollutants at surrounding sensitive areas can be considered as minimal. Fugitive dust emissions are therefore considered to have the greatest potential to give rise to downwind air quality impacts at construction sites.

The project has the potential to generate dust from demolition and excavation, and emissions from plant and machinery during construction. The project may result in potential localised air quality degradation, however impacts arising from this would be short term over the length of the construction and would be minor. These impacts would be managed through appropriate mitigation measures that would be developed as part of the EIS. Potential air quality impacts associated with the construction phase of the project have been addressed in **Section 5**.

2.2 Operations

Based on the Transport Strategy and Transport Impact Assessment prepared by Arcadis Australia Pacific Pty Limited for the project (Arcadis, 2022), the proposed development of Central Precinct is expected to generate 1,642 and 1,340 additional bus/car trips in the AM peak hour and PM peak hour respectively.

Therefore, the main source of air emissions during the operation of the project would be emissions of products of fuel combustion and particulate matter (associated with brake and tyre wear as well as re-entrainment of road dust) associated with these additional trip generations.

2.3 Pollutants of Concern

As identified in **Section 2.1** and **Section 2.2**, the key air pollutants of interest are the particulate matter (PM) from construction works, and products of fuel combustion from the additional vehicle trip generations due to the project.

The following section outline the potential health and amenity issues associated with the particulate matter and fuel combustion, while **Section 4.1** identifies the relevant air quality assessment criteria.

Particulate Matter

The term "particulate matter" refers to a category of airborne particles, typically less than 30 microns (µm) in diameter and ranging down to 0.1 µm and is termed total suspended particulate (TSP). Particulate matter with an aerodynamic diameter of 10 microns or less is referred to as PM10. The PM10 size fraction is sufficiently small to penetrate the large airways of the lungs, while PM2.5 (2.5 microns or less) particulates are generally small enough to be drawn in and deposited into the deepest portions of the lungs. Potential adverse health impacts associated with exposure to PM10 and PM2.5 include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

Nuisance Dust

Nuisance impacts are caused by dust deposited on surfaces and possessions, affecting visibility, and contaminating tank water supplies.

Products of Combustion

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

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

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

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

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

3. Air Quality Criteria

State air quality guidelines specified by the NSW Environmental Protection Agency (EPA) for the pollutants identified in **Section 0** are published in the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (NSW EPA, 2022) [hereafter 'Approved Methods']. The ground level air quality impact assessment criteria listed in Section 7 of the Approved Methods have been established by NSW EPA to achieve appropriate environmental outcomes and to minimise risks to human health. They have been derived from a range of sources and are the defining ambient air quality criteria for NSW and are considered to be appropriate for use in this assessment.

The impact assessment criteria listed in the Approved Methods for particulate matter and nuisance dust are shown in **Table 3**. A summary of the relevant impact assessment criteria for products of combustion is provided in **Table 4**.

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

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

Approved Methods, 2022

Table 4NSW EPA Impact Assessment Criteria for Combustion Gases

Pollutant	Averaging Period	Assessment Criteria
CO	15 minutes	87 ppm
	1 hour	25 ppm
	8 hours	9 ppm
NO_2	1 hour	8 pphm
	Annual	1.5 pphm
SO_2	1 hour	10 pphm
	24 hours	2 pphm

Approved Methods, 2022

4. Existing environment

4.1 Surrounding Land Uses and Sensitive Receptors

As shown in **Figure 3**, the project area and the adjacent areas to its south are zoned as Infrastructure (SP2), the areas north of the project area are zoned as Metropolitan Centre (B8), and the areas to the west of the project area are zoned as Mixed Use (B4).

There are several residential receptors located approximately 200 meters (m) to the east of the project area and the nearest commercial receptors are located adjacent to the northern boundary of the project area including amenities (such as office buildings or workshops; see **Figure 4** and **Table 5**). Individuals in these areas could potentially experience air quality impacts due to the construction and operation at the project area. Furthermore, people working within the central station and train customers can also be counted as sensitive receptors.

Figure 3 Surrounding Land Uses

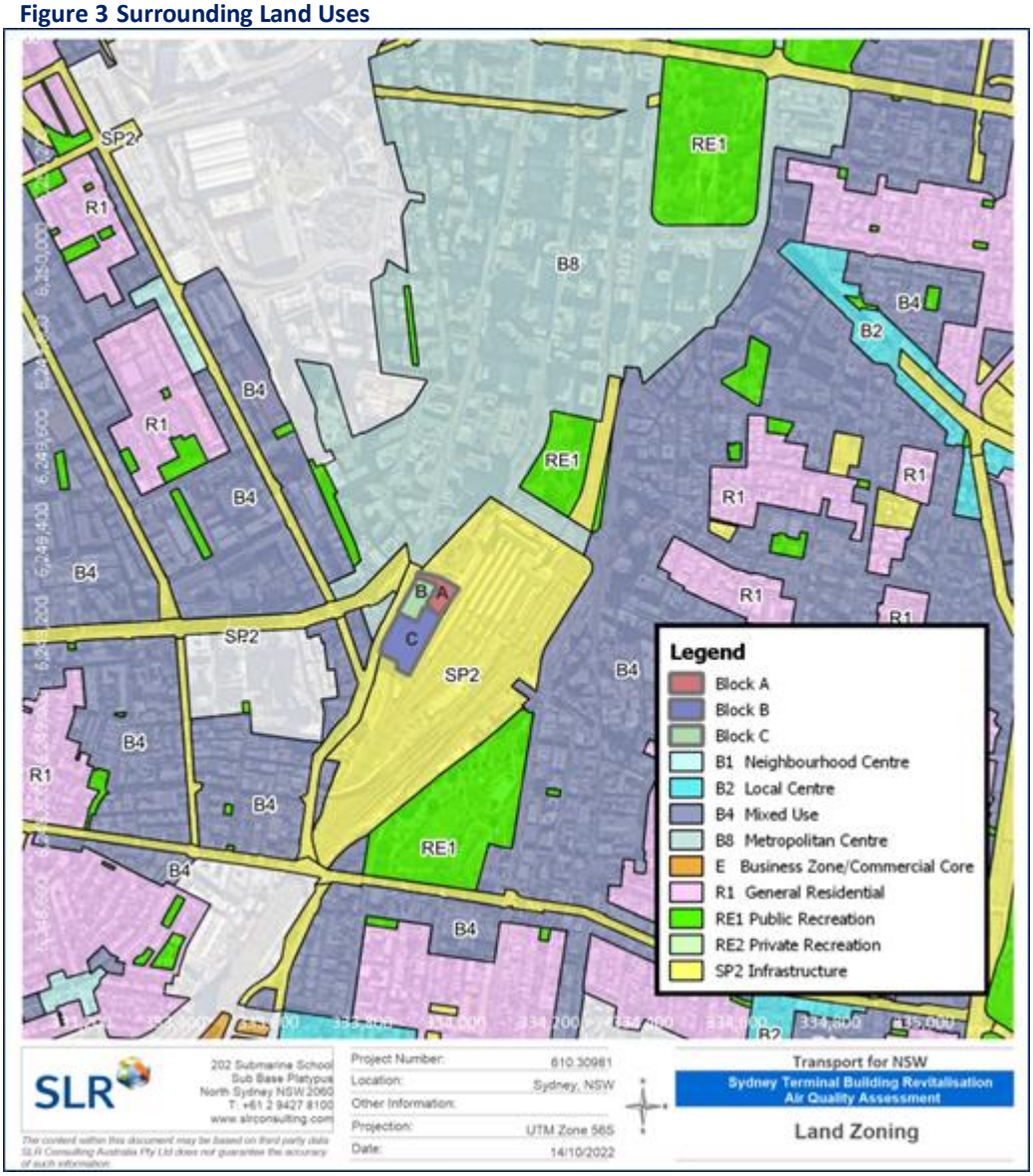
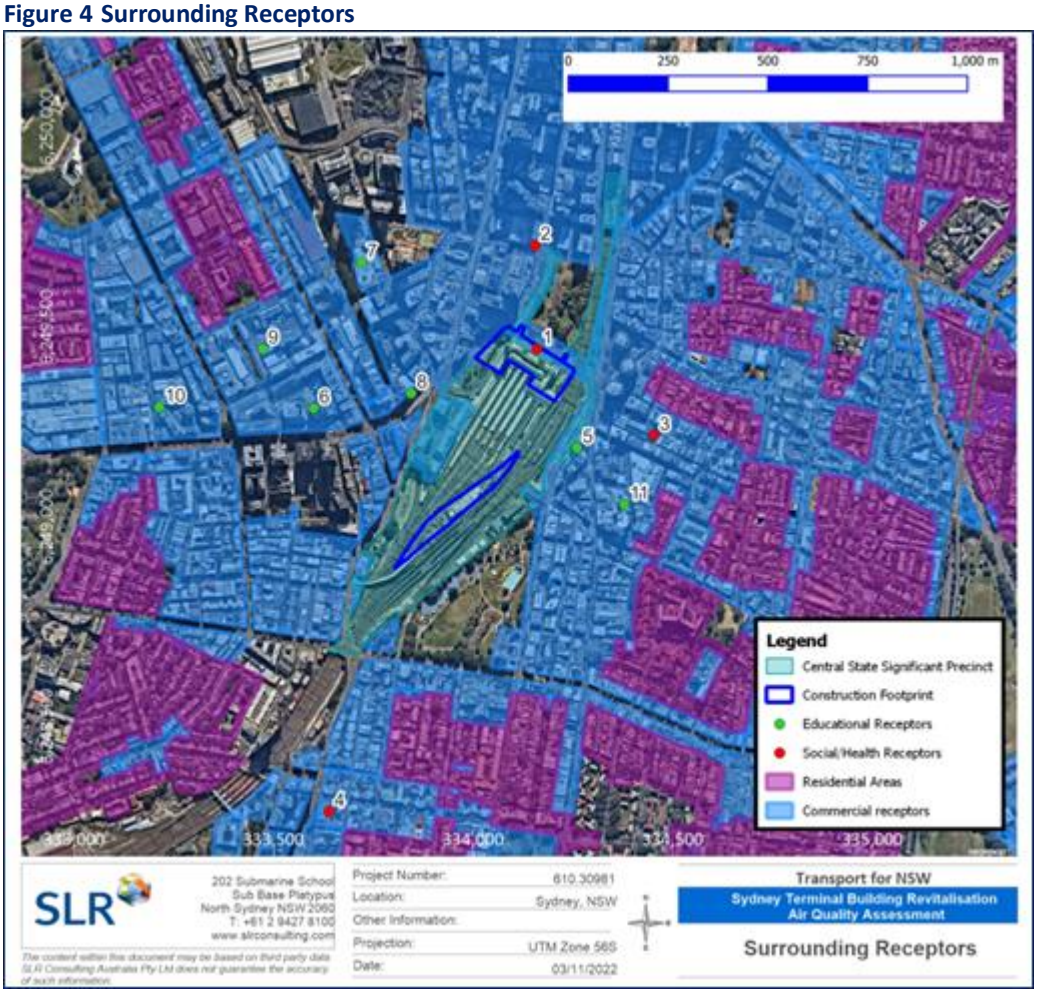


Table 5 Surrounding educational and Social/Health Receptors

ID	Name
1	Central Railway Station Clinic
2	Sydney Central Medical Centre
3	The Practice Wellbeing Centre @ Torrens University
4	Redfern Station Medical Centre
5	University of Sydney Surry Hills Campus
6	University of Technology Sydney
7	University of Technology City Campus – Haymarket
8	Marcus Clark Building
9	TAFE NSW – Ultimo
10	Torrens University Australia
11	Academy of Film, Theatre & Television

Figure 4 Surrounding Receptors



4.2 Local Meteorological Conditions

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

NSW Department of Planning and Environment (NSWDPE) maintains and publishes data from several Air Quality Monitoring Stations (AQMSs) at several monitoring stations across NSW. The nearest such station is located at Cook and Phillip Park, which is approximately one kilometre north of Central Station. The Cook and Phillip AQMS was commissioned in September 2019 and is located at an elevation of 26 m. Considering the distance between the project area and the Cook and Phillip AQMS, it is considered reasonable to assume that the wind conditions recorded at the Cook and Phillip AQMS are representative of the wind conditions experienced

at the project area.

Annual wind roses for the years 2019 to 2021 compiled from data recorded by the Cook and Phillip AQMS are presented in **Figure 5**. Wind roses show the frequency of occurrence of winds by direction and strength. The bars correspond to the 16 compass points (degrees from North). The bar at the top of each wind rose diagram represents winds blowing from the north (i.e., northerly winds), and so on. The length of the bar represents the frequency of occurrence of winds from that direction, and the widths of the bar sections correspond to wind speed categories, the narrowest representing the lightest winds. Thus, it is possible to visualise how often winds of a certain direction and strength occur over a long period, either for all hours of the day, or for periods during the day.

The 'Beaufort Wind Scale' (consistent with terminology used by the BoM) presented in **Table 6** was used to describe the wind speeds experienced at the project area.

Table 6 Beaufort Wind Scale

Beaufort Scale #	Description	m/s	Description on land
0	Calm	0-0.5	Smoke rises vertically
1	Light air	0.5-1.5	Smoke drift indicates wind direction
2-3	Light/gentle breeze	1.5-5.3	Wind felt on face, leaves rustle, light flags extended, ordinary vanes moved by wind
4	Moderate winds	5.3-8.0	Raises dust and loose paper, small branches are moved
5	Fresh winds	8.0-10.8	Small trees in leaf begin to sway, crested wavelets form on inland waters
6	Strong winds	>10.8	Large branches in motion, whistling heard in telephone wires; umbrellas used with difficulty

Source: http://www.bom.gov.au/lam/glossary/beaufort.shtml

The annual wind rose (**Figure 5**) indicates that the majority of winds originated from south-southeast and west directions with least frequent winds from north. Calm wind conditions (wind speed less than 0.5 m/s) were recorded approximately 29.0% of the time throughout the period reviewed.
The average seasonal wind roses for the years 2019-2021 (**Figure 5**) indicate that:

- In summer, wind speeds ranged from calm to light breeze (between 0.5 m/s and 3.5 m/s). Most winds originated from south-southeast direction and northeastern quadrant. Calm wind conditions were recorded approximately 24.3% of the time during summer.
- In autumn, wind speeds ranged from calm to light breeze (between 0.5 m/s and 3.1 m/s). Most winds originated from south-southeast direction and northwestern quadrant. Calm wind conditions were observed to occur approximately 37.5% of the time during autumn.
- In winter, wind speeds ranged from calm to light breeze (between 0.5 m/s and 3.0 m/s). Most winds originated from west. Calm wind conditions were observed to occur approximately 21.3% of the time during winter.
- In spring, wind speeds ranged from calm to strong winds (between 0.5 m/s and 3.4 m/s). Most winds originated from south-southeast direction and northeastern quadrant. Calm wind conditions were observed to occur approximately 33.0% of the time during spring.

Wind erosion of dust from exposed surfaces is usually initiated when wind speeds exceed the threshold friction velocity for a given surface or material, however, a general rule of thumb is that wind erosion can be expected to occur above 5 m/s (USEPA, 2006).
The frequency of wind speeds for the period of 2019-2021 is presented in **Figure 6.** The plot showed that the frequency of wind speeds exceeding 5 m/s for the period 2019-2021 at Cook and Phillip AQMS was approximately 11.2%. Given the low wind speeds at the project area, it can be concluded that there is a low chance of off-site air impacts due to the downwind transport of the pollutants.

Figure 5 Annual and Seasonal Wind Roses for Cook and Phillip AQMS (2019 to 2021)

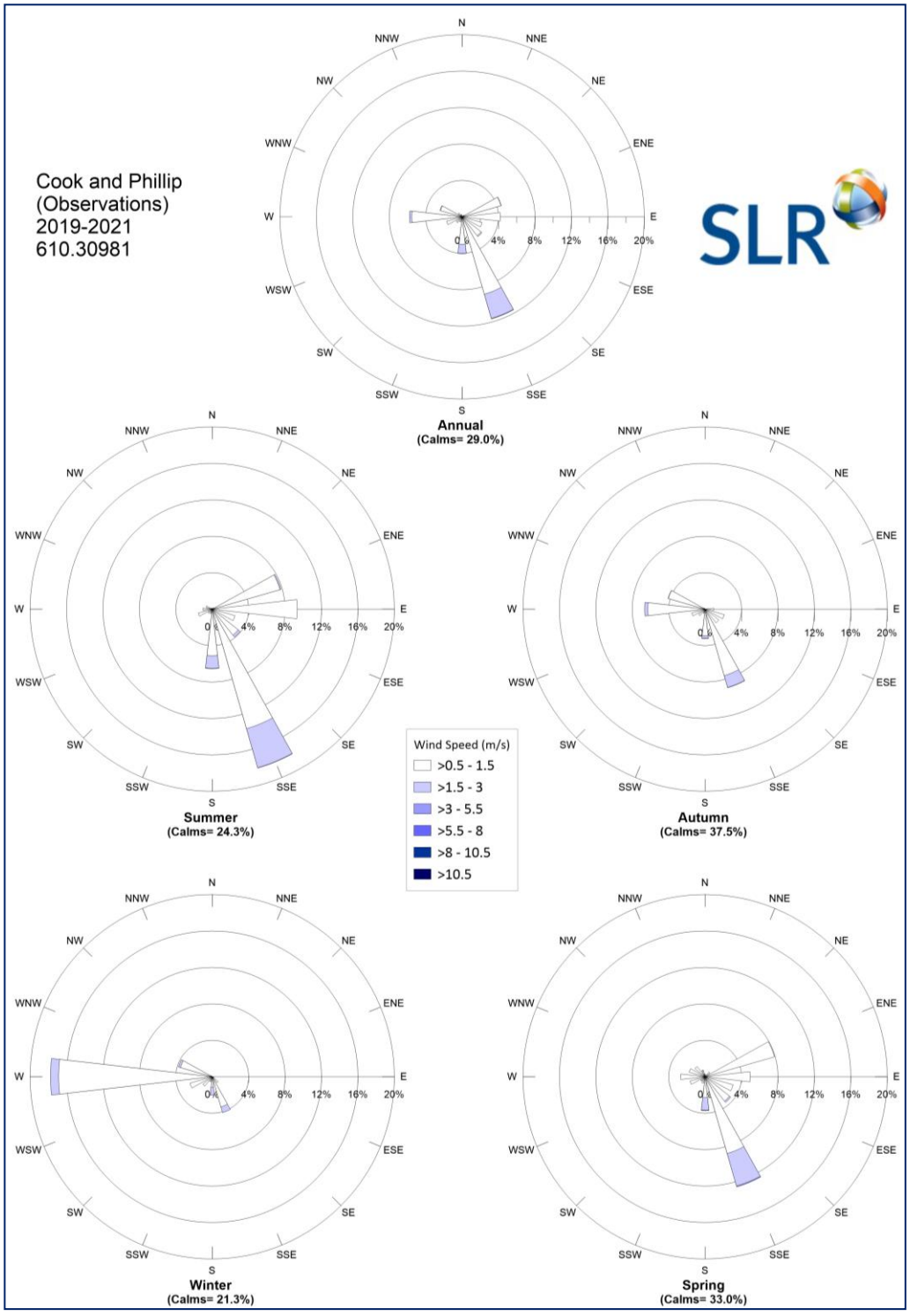
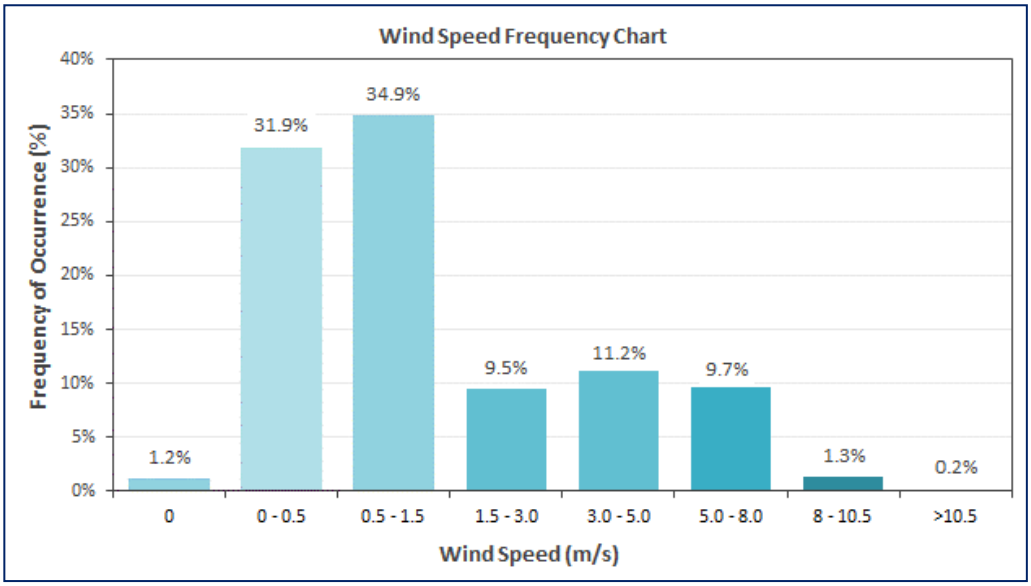


Figure 6 Wind Speed Frequency Chart for Cook and Phillip – 2019-2021



4.3 Background Air Quality

4.3.1 Regional Air Quality

Air quality monitoring is performed by the NSW DPE at several monitoring stations across NSW. The nearest such station is the Cook and Phillip AQMS which monitors the concentration levels of following air pollutants:

- NO, NO_2 and NO_x
- CO
- SO_2
- $PM_{2.5}$ and PM_{10}.

A summary of the PM_{10} and $PM_{2.5}$ concentrations reported for the last three years (2019-2021) is presented in **Table 7** and the data are presented graphically in **Appendix A**.

Table 7Summary of Air Quality Monitoring Data at Cook and Phillip AQMS (2019-2021)

Pollutant	PM10		PM2.5		NO_2		CO	SO_2	
Averaging Period	Max. 24-h	Annual	Max. 24-h	Annual	Max. 1-h	Annual	Max. 1-h	Max. 1-h	Annual
Units	µg/m3				pphm		ppm	pphm	
2019	116.8	29.6	96.5	15.6	11.0	1.2	4.4	1.8	0.1
2020	130.8	15.7	112.5	7.8	4.6	1.3	3.5	1.9	0.0
2021	36.9	13.4	29.5	6.4	4.7	1.2	2.4	1.6	0.0
Criterion	**50**	**25**	**25**	**8**	**8**	**1.5**	**25**	**10**	**2**

Red font indicates an exceedance of the criterion

The monitoring data for NO_2, SO_2, and CO indicate that the respective short-term and long-term air quality criteria for these pollutants are achieved at the Cook and Phillip AQMS except for maximum NO_2 average in 2019. Since the NO_2, SO_2, and CO concentrations are low at the Cook and Phillip AQMS and given the distance between the AQMS and the project area, it is highly unlikely that the emissions of these pollutants exceed the relevant criteria.

There were widespread bushfire events in 2019 and onset of Covid-19 in 2020. Due to this, both 2019 and 2020 may not be representative of typical background pollutant concentrations. Therefore, in addition to the data presented in **Table 8**, monitored data from Rozelle is also presented in **Table 8** to illustrate the pre- and post- Covid pollutant levels.

Table 8 Summary of Air Quality Monitoring Data at Rozelle AQMS (2017-2021)

Pollutant	PM_{10}		$PM_{2.5}$		NO_2		CO	SO_2	
Averaging Period	Max. 24-h	Annual	Max. 24-h	Annual	Max. 1-h	Annual	Max. 1-h	Max. 1-h	Annual
Units	$\mu g/m^3$				pphm		ppm	pphm	
2017	54.1	18.1	36.3	7.2	6.1	1.1	1.2	2.4	0.1
2018	88.3	18.4	19.2	7.3	5.7	1.0	1.0	3.0	0.1
2019	142.7	22.7	101.8	10.3	9.0	0.9	5.2	3.2	0.1
2020	113.5	18.1	87.3	7.5	4.3	0.8	3.3	1.6	0.0
2021	52.6	15.5	61.7	6.3	3.5	0.7	1.5	2.0	0.0
Criterion	**50**	**25**	**25**	**8**	**8**	**1.5**	**25**	**10**	**2**

Exceedances of the 24-hour average PM_{10} and $PM_{2.5}$ criterion were recorded by the Rozelle AQMS in all years except the 24-hour average PM_{10} in 2021. Furthermore, the annual $PM_{2.5}$ and PM_{10} average exceeded the relevant criterion in 2019. A review of the conditions around theseexceedances indicate that they were associated with natural events such as bushfires or dust storms, or hazard reduction burns.

4.3.2 Local Air Pollutant Sources

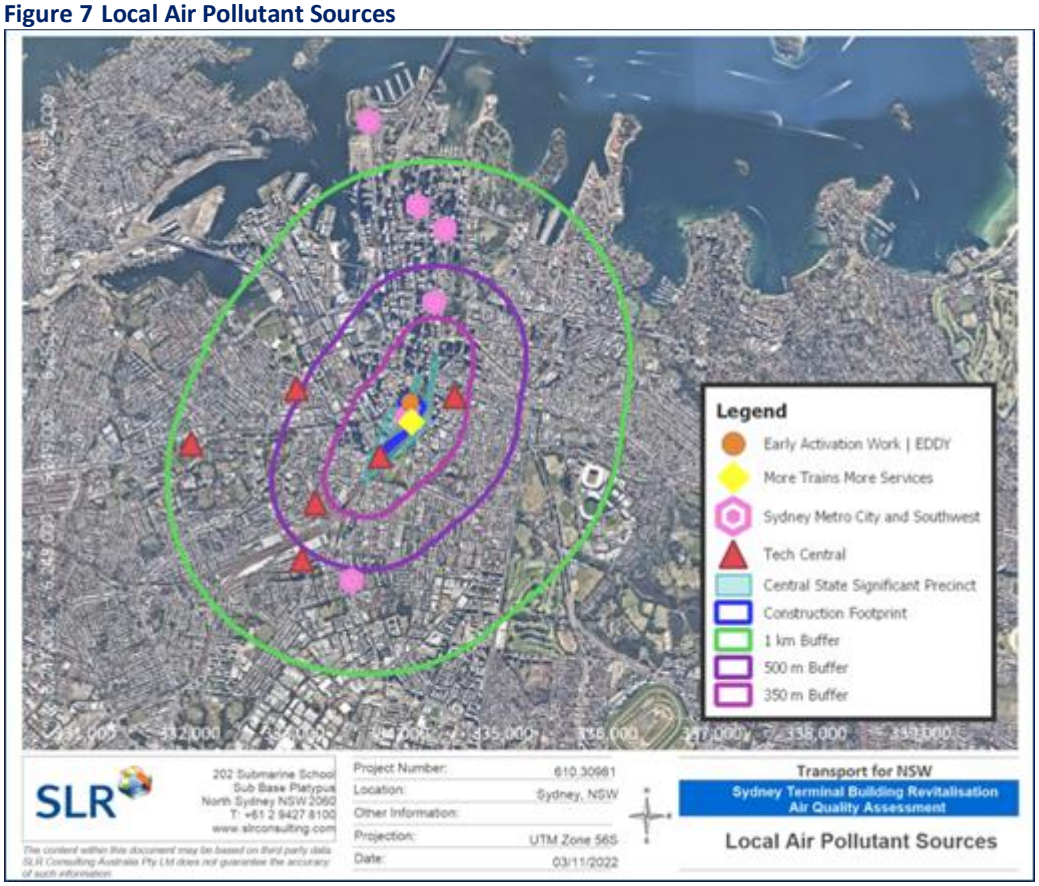
Other sources of emissions to air in the area are present with the potential to result in cumulative impacts with emissions from the demolition works and land remediation. These include the future projects that are not currently built but they're approved and are presented in **Table 9 and Figure 7**.

Table 9 Facilities Emitting Particulate Matter in the Surrounding Area

ID	Facility Name	Details
1	Central Precinct Renewal Program	The project forms part of the wider CPRP. It includes the following key projects: • **Former Prince Alfred Substation Adaptive Reuse project** involves creating a new space for tech and creative industries or start-ups. • **Early Activation Work | EDDY** is a project that will allow 12-to-18-month leases to be taken on Eddy Avenue, Eddy Avenue Plaza, and the Grand Concourse for retail and dining spaces.
2	Sydney Metro City and Southwest	The **Sydney Metro City and Southwest** platforms are below the intercity rail Platforms 13, 14, and 15. This project is currently under construction and is expected to be open in 2024.
3	More Trains More Services program	The **More Trains More Services** program will support new suburban and intercity services. It involves reconfiguring Platforms 9 to 14 and other adjustments to allow more trains per hour. The first phase on Platforms 5 to 8 has just finished.
4	Tech Central	**Tech Central** is the biggest innovation district of its kind in Australia. It covers seven suburbs: Haymarket, Ultimo, Surry Hills, Camperdown, Darlington, North Eveleigh, and South Eveleigh. The district will provide technology company space and affordable space for start-ups and scaleups over the coming years.

These projects are likely to elevate the short-term pollutant concentrations.

Figure 7 Local Air Pollutant Sources



5. Assessment of Potential Construction Impacts

The following section assesses the construction-related dust impacts.

5.1 Step 1 – Screening Based on Separation Distance

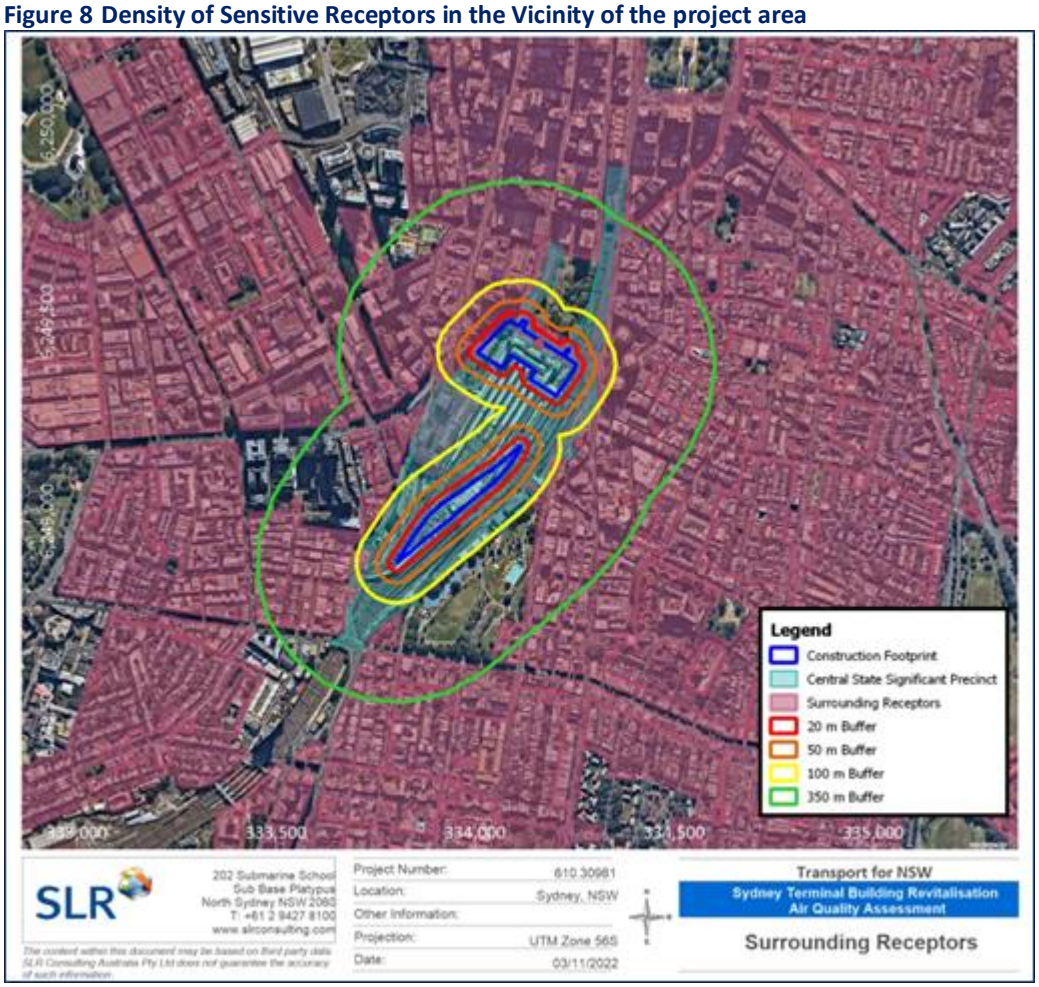
As noted in **Section 4.1**, several sensitive receptors are located adjacent to the northern boundary of the project area.

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

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

As a 'human receptor' is located within 350 m of the boundary of the site, and within 500 m of the site entrance, further assessment is required. Given that there are also receptors available on site, for this assessment, the number of sensitive receptors is estimated to be more than 100 within 20 m of the project area (see **Figure 8**).

Figure 8 Density of Sensitive Receptors in the Vicinity of the project area



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

Based upon the above assumptions, and the IAQM definitions presented in **Appendix B**, the scale of the dust emission for each phase of the construction works have been categorised as presented in **Table 10**.

Table 10 Categorisation of Dust Emission Magnitude

Activity	Dust Emission Magnitude	Basis
Demolition	Small	**IAQM Definition:** Total building volume <20,000 m^3, material with low potential for dust release (e.g., metal cladding or timber), demolition activities <10m above ground, demolition during wetter months. **Relevance to this project:** *Based on chapter 5 of the EIS, the main demolition activities include demolition of existing awning and escalators on the eastern side of the Sydney Terminal Building, demolition of wall in the centre of Eddy Avenue Plaza, demolition of ramp adjacent to rail line behind existing retail shops, and demolition of mezzanine within the Central Electric Building.*
Earthworks	Large	**IAQM Definition:** Total site area greater than 10,000 m^2, potentially dusty soil type (e.g., clay, which will be prone to suspension when dry due to small particle size), more than 10 heavy earth moving vehicles active at any one time, formation of bunds greater than 8 m in height, total material moved more than 100,000 t. **Relevance to this project:** *Total area of the Site is estimated to be approximately 2 hectares based on chapter 5 of the EIS.*
Construction	Large	**IAQM Definition:** Total building volume greater than 100,000 m^3, piling, on site concrete batching; sandblasting. **Relevance to this project:** *The total construction footprint is approximately 3 hectares based on chapter 5 of the EIS. Considering an average elevation of 7.2 m for the buildings (assuming an average of 3 storeys), the total building volume will be 216,000 m^3 .*
Trackout*	Large	**IAQM Definition:** More than 50 heavy vehicle movements per day, surface materials with a high potential for dust generation, greater than 100 m of unpaved road length. **Relevance to this project:** *It is estimated that more than 50 heavy vehicles movements per day will occur during the peak construction period.*

* Dirt, mud, or other debris tracked onto a paved public roadway by a vehicle leaving a construction site.

5.3 Step 2b – Risk Assessment

Receptor Sensitivity

Based on the criteria listed in **Table B1** in **Appendix B**, the receptor-sensitivity is as assessed as **high** for health impacts and **high** for dust soiling, as they are located where people may be reasonably expected to be present continuously as part of the normal pattern of land use.

Sensitivity of an Area

Based on the classifications shown in **Table B2** and **Table B3** in **Appendix B**, the sensitivity of the area to both dust soiling and health effects may be classified as **high**. This has accounted for the individual receptor sensitivities derived above, the three-year mean background PM_{10} concentration of 19.6 µg/m^3 recorded at Cook and Phillip AQMS (**Section 4.3.1**) and the existing number of sensitive receptors present in the vicinity of the project area (i.e., more than 100 within 20 metres).

Risk Assessment

Given the sensitivity of the general area is classified as **high** for both dust soiling and health effects, and the dust emission magnitudes for the various construction phase activities as shown in **Table 10**, the resulting risk of air quality impacts is as presented in **Table 11**.

Table 11 Preliminary Risk of Air Quality Impacts from Construction Activities (Uncontrolled)

Impact	Sensitivity of Area	Dust Emission Magnitude				Preliminary Risk			
		Demolition	Earthworks	Construction	Trackout	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	Small	Large	Large	Large	Medium Risk	High Risk	High Risk	High Risk
Human Health	High					Medium Risk	High Risk	High Risk	High Risk

The results indicate that there is a **medium** risk of adverse dust soiling and health effects during demolition phase and a **high** risk of dust soiling and health effects during earthworks, construction, and trackout phases.

Based on the IAQM methodology, the overall air quality risk from the project construction activities is rated as **high**.

5.4 Step 3 - Mitigation Measures

Mitigation measures targeting potential impacts from construction activities are provided in **Table 12**. Implementing these measures should reduce the risk of the adverse impacts during demolition from **medium** to **low** and the adverse effects during earthworks, construction, and trackout phases from **high** to **medium**.

Table 12 Mitigation Measures Specific to Demolition

Ref	Impact / Uncertainty	Environmental management measure	Timing
AQ01	Impact | air quality impacts (dust emissions and human health) from demolition	Measures to manage air quality impacts during demolition include: • Soft strip inside buildings retaining the walls and windows where possible, to provide a screen against dust before demolition • Ensure effective dust suppression is used during demolition • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in areas with suitable emission control systems to prevent escape of material and overfilling during delivery • For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.	Construction
AQ02	Impact | dust track out	Measures to manage air quality impacts associated with vehicle and pedestrian movements within the construction footprint include: • Use water-assisted dust sweeper(s) on the access and local roads, to remove any material tracked out of the site. • Avoid dry sweeping of large areas. • Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. • Inspect haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. • Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned. • Record all inspections of haul routes and any subsequent action in a site logbook. • Implement a wheel washing system, with rumble grids, to dislodge accumulated dust and mud prior to leaving the site, where reasonably practicable. • Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits. • Access gates will be at least 10 metres from receivers where possible.	Construction

5.5 Step 4 - Residual Impacts

Table 13 lists the residual impact ratings once the proposed mitigation is in place and effective.

Table 13 Residual Risk of Air Quality Impacts from Construction

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

The mitigated dust deposition and human health impacts for demolition phase are anticipated to be **low** and the mitigated dust deposition and human health impacts for earthworks, construction, and trackout phases are anticipated to be **medium**.

Based on the IAQM methodology, the overall residual air quality risk from the project construction activities is rated as **medium**.

6. Assessment of Potential Operational Impacts

As discussed in **Section 2.2**, air quality issues associated with the project's operations mainly relate to emissions of products of combustion and particulate matter and from any vehicles accessing and idling at the project area.

To assess the risk of air emissions from the project area impacting on surrounding sensitive receptors during the operational phase, the following risk based approach was adopted. It accounted for a range of impact descriptors, including the following:

- **Nature of Impact**: does the impact result in an adverse, neutral, or beneficial environmental impact?

  The nature of impact is rated **adverse**.

- **Receptor Sensitivity**: how sensitive is the receiving environment to the anticipated impacts?

  The nearest sensitive receptors to the project area are located within the boundary of the project (**Section 4.1**). In terms of the method in **Appendix D**, the sensitivity of the surrounding areas to emissions from the project area is rated as **very high** due to the presence of clinics and medical centers**.**

- **Magnitude**: what is the anticipated scale of the impact?

  As mentioned in **Section 2.2**, the proposed development of Central Precinct is expected to generate 1,642 and 1,340 additional bus/car trips in the AM peak hour and PM peak hour respectively. The emission from the excess trips is of a similar nature to existing emissions from traffic arterial road network around Central Precinct. In 2019, over 88,000 vehicles travelled within the area during the AM peak and PM peak periods, with 42,000 of those vehicles travelling through the Central Precinct (Arcadis, 2022). Given the relatively small amount of traffic movements due to the project compared to the existing traffic on the surrounding roads, the magnitude of the emissions from the project is considered to be negligible

Given the above considerations, and the scale of operations, the potential impact of the project on the local sensitive receptors is concluded to be **neutral** for all receptors (**Table 14**).

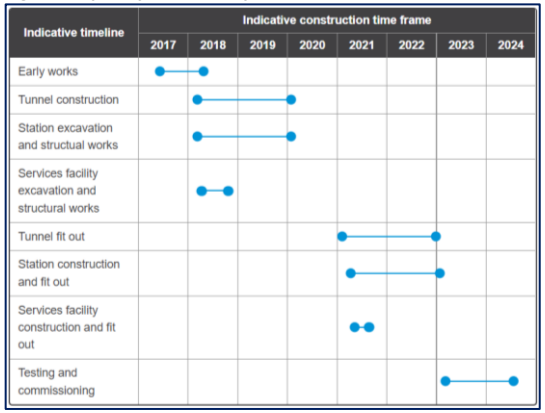
Table 14 Operational Impact Significance

Magnitude / Sensitivity	Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
Very High Sensitivity	Major	Major/ Intermediate	Intermediate	Neutral
High Sensitivity	Major/ Intermediate	Intermediate	Intermediate/Minor	Neutral
Medium Sensitivity	Intermediate	Intermediate/Minor	Minor	Neutral
Low Sensitivity	Intermediate/Minor	Minor	Minor/Neutral	Neutral

7. Cumulative Impact Assessment

This section presents a cumulative impact assessment to assess the cumulative impacts of the Project with other local projects identified in **Section 4.3.2**. The cumulative assessment methodology adopted is in line with the NSW Department of Planning, Industry and Environment guidelines - 'Cumulative Impact Assessment Guidelines for State Significant Projects (November 2021).

Table 15 Cumulative Impact Significance

Future Projects	Approx. distance to project	Project Status/Indicative timing/overlap	Potential overlap between impact of project on assessment matter and impact of other project on the same assessment matter	Potential Cumulative Risk
			Air	Air
Central Precinct Renewal Program	Within the Site	No publicly available information regarding the construction timeline for this Project is available. However, from the limited information available, it is understood that the 'Former Prince Alfred Substation Adaptive Reuse project' will start after the 'Western Gateway' project followed by the 'Early Activation Work | EDDY' Project.	• Within the site	The project may result in significant cumulative air quality impacts
Sydney Metro City and Southwest	0.3 km to 1.5 km	The construction timeline for Sydney Metro City and Southwest is presented in **Figure 9**. **Figure 9Sydney Metro City and Southwest Timeline**  Source: https://www.sydneymetro.info/citysouthwest/project-overview#generic-popup-window Construction will end in end of 2022/early 2023, so no overlap between the construction of the two projects. Testing and commissioning to occur	• Within the site; and • Generally, in suburbs Surry Hills, Haymarket and Ultimo.	The project is unlikely to result in significant cumulative air quality impacts

Future Projects	Approx. distance to project	Project Status/Indicative timing/overlap	Potential overlap between impact of project on assessment matter and impact of other project on the same assessment matter	Potential Cumulative Risk
			Air	Air
		during 2023 and 2024.		
More Trains More Services program	Within the Site	No publicly available information regarding the construction timeline for this Project is available.	• Within the site	The project may result in significant cumulative air quality impacts
Tech Central	0.3 km to 1.0 km	The project now awaits NSW Government final stage approvals - construction to commence in 2023, with the first stage completed in 2027. Operations overlap; peak operations are after 2027.	Within the site Generally, in suburbs It covers seven suburbs: Haymarket, Ultimo, Surry Hills, Camperdown, Darlington, North Eveleigh, and South Eveleigh..	The project may result in significant cumulative air quality impacts

8. Conclusion

Based on the above assessment, providing the proposed standard mitigation measures are introduced and effective:

- Based on the anticipated construction activities at the project area, the overall residual air quality risk from the Project construction activities is rated as **medium**.
- Based on the anticipated operational activities at the project area, the potential for offsite air impacts from the operations is concluded to be **neutral.**

With the implementation of the recommended mitigation measures air quality at the surrounding receptors can be effectively reduced to an acceptable level.

9. References

Arcadis. (2022). *Central Precinct Renewal Transport Strategy and Transport Impact Assessment*

IAQM. (2014). *Guidance on the assessment of dust from demolition and construction.* London: Institute of Air Quality Management.

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

Transport for NSW. (June 2022). *Sydney Terminal Building Scoping Report.*

USEPA. (2006). *United States Environmental Protection Authority, Compilation of Air Pollutant Emission Factors AP-42 - Chapter 13.2. Aggregate Handling and Storage Piles.*

APPENDIX A

Regional Air Quality Plots

Figure A-1 Measured Daily Maximum 1-Hour Average NO2 Concentrations at Cook and Phillip AQMS (2019 – 2021)

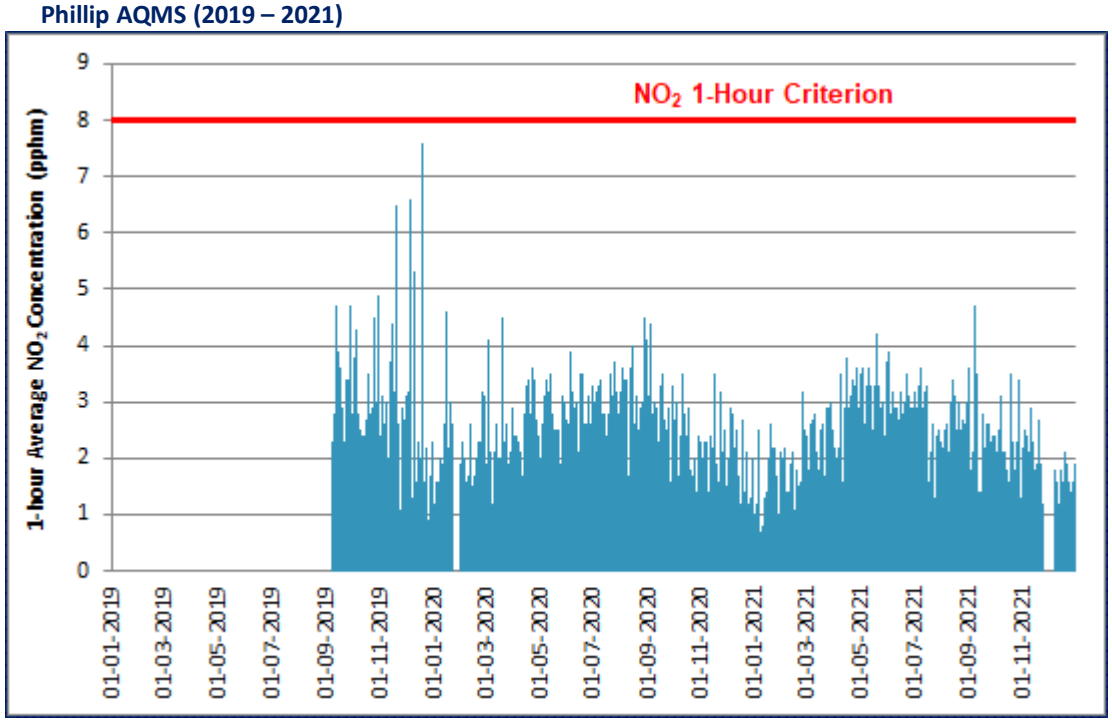


Figure A-2 Measured Daily Maximum 1-Hour Average SO2 Concentrations at Cook and Phillip AQMS (2019 – 2021)

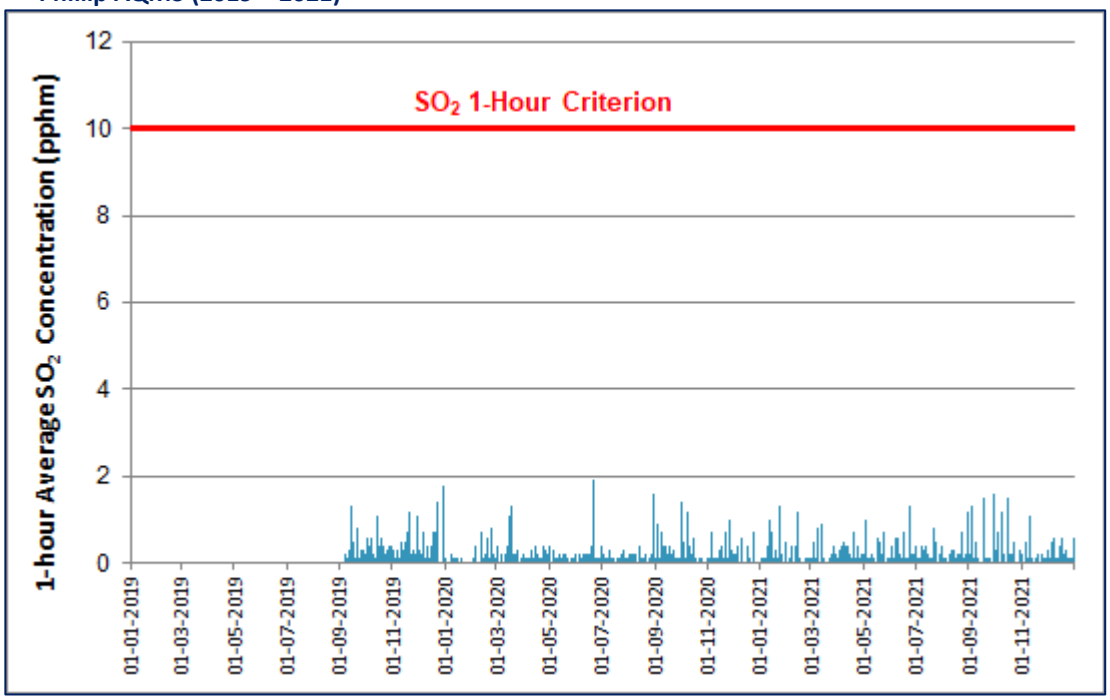


Figure A-3 Measured Daily Maximum 1-Hour Average CO Concentrations at Cook and Phillip AQMS (2019 – 2021)

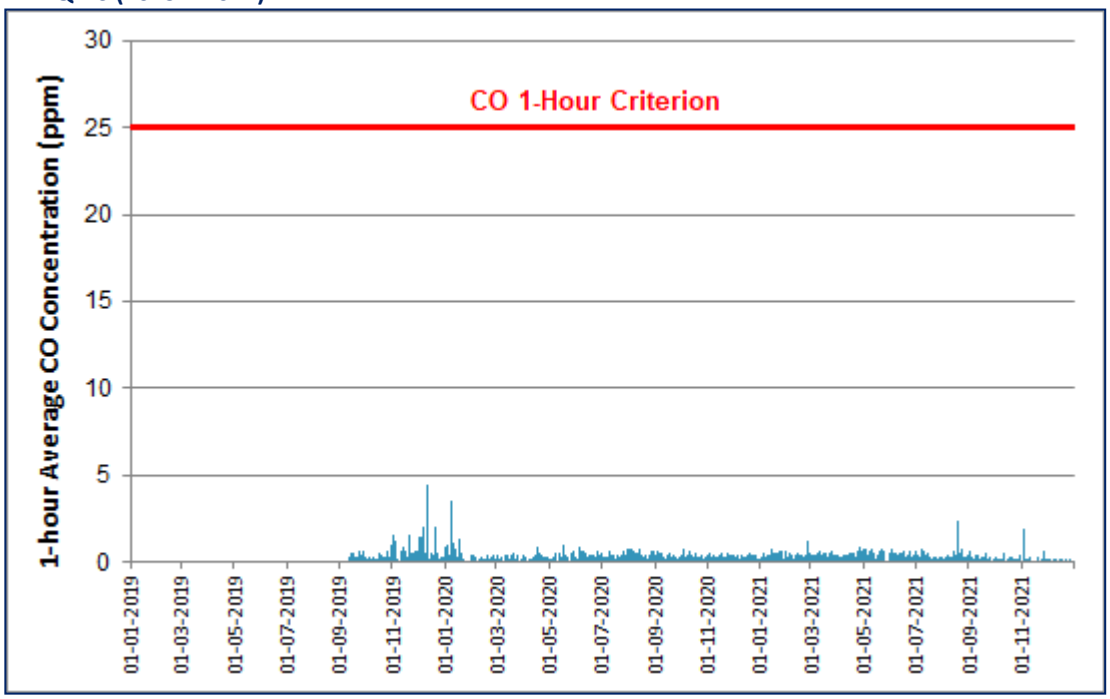


Figure A-4 Measured 24-Hour Average PM10 Concentrations at Cook and Phillip AQMS (2019- 2021)

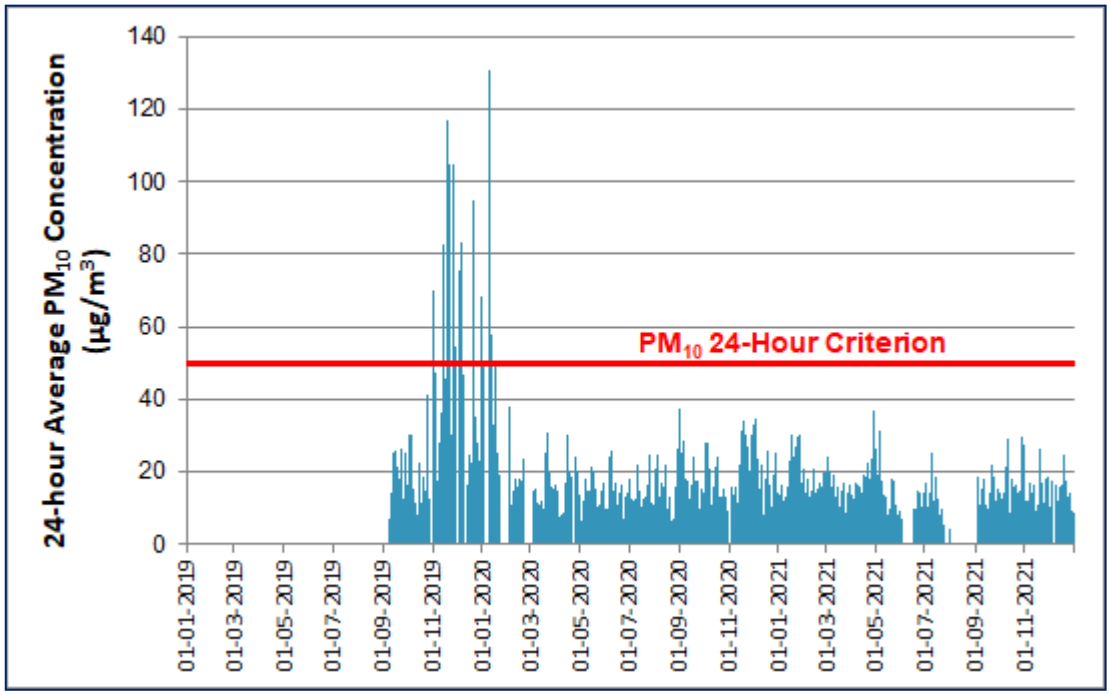
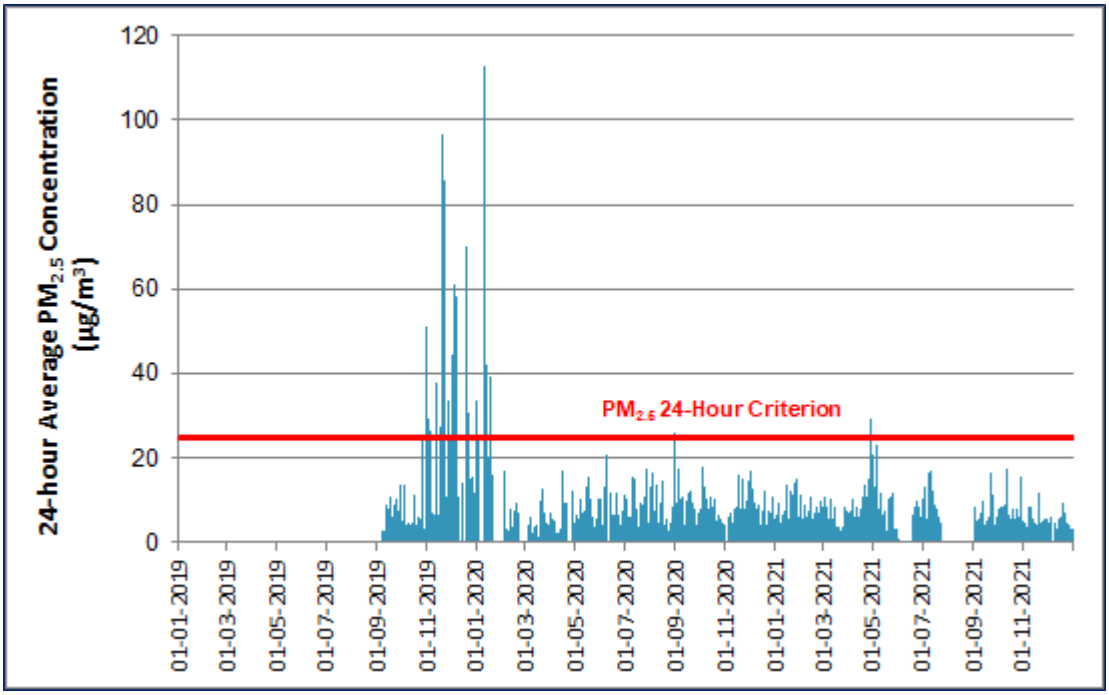


Figure A-5 Measured 24-Hour Average PM2.5 Concentrations at Cook and Phillip AQMS (2019- 2021)



APPENDIX B

CONSTRUCTION PHASE RISK ASSESSMENT METHODOLOGY

Step 1 – Screening Based on Separation Distance

The Step 1 screening criteria provided by the IAQM guidance suggests screening out any assessment of impacts from construction activities where sensitive receptors are located more than 350 m from the boundary of the Site, more than 50 m from the route used by construction vehicles on public roads and more than 500 m from the Site entrance. This step is noted as having deliberately been chosen to be conservative and will require assessments for most projects.

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

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

Demolition *(Any activity involved with the removal of an existing structure [or structures]. This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time)*:

- ***Large***: Total building volume >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.

Earthworks *(Covers the processes of soil-stripping, ground-levelling, excavation and landscaping)*:

- ***Large***: Total site area greater than 10,000 m^2, potentially dusty soil type (eg clay, which will be prone to suspension when dry due to small particle size), more than 10 heavy earth moving vehicles active at any one time, formation of bunds greater than 8 m in height, total material moved more than 100,000 t.
- ***Medium***: Total site area 2,500 m^2 to 10,000 m^2, moderately dusty soil type (eg silt), 5 to 10 heavy earth moving vehicles active at any one time, formation of bunds 4 m to 8 m in height, total material moved 20,000 t to 100,000 t.
- ***Small***: Total site area less than 2,500 m^2, soil type with large grain size (eg sand), less than five heavy earth moving vehicles active at any one time, formation of bunds less than 4 m in height, total material moved less than 20,000 t, earthworks during wetter months.

Construction *(Any activity involved with the provision of a new structure (or structures), its modification or refurbishment. A structure will include a residential dwelling, office building, retail outlet, road, etc)*:

- ***Large***: Total building volume greater than 100,000 m^3, piling, on site concrete batching; sandblasting.
- ***Medium***: Total building volume 25,000 m^3 to 100,000 m^3, potentially dusty construction material (eg concrete), piling, on site concrete batching.
- ***Small***: Total building volume less than 25,000 m^3, construction material with low potential for dust release (eg metal cladding or timber).

Track-out *(The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network)*:

- ***Large***: More than 50 heavy vehicle movements per day, surface materials with a high potential for dust generation, greater than 100 m of unpaved road length.
- ***Medium***: Between 10 and 50 heavy vehicle movements per day, surface materials with a moderate potential for dust generation, between 50 m and 100 m of unpaved road length.
- ***Small***: Less than 10 heavy vehicle movements per day, surface materials with a low potential for dust generation, less than 50 m of unpaved road length.

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

Step 2b – Risk Assessment

Assessment of the Sensitivity of the Area

- Step 2b of the assessment process requires the sensitivity of the area to be defined. The sensitivity of the area takes into account:
- The specific sensitivities that identified sensitive receptors have to dust deposition and human health impacts;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and
- Other site-specific factors, such as whether there are natural shelters such as trees to reduce the risk of wind-blown dust.
- Individual receptors are classified as having *high*, *medium* or *low* sensitivity to dust deposition and human health impacts (ecological receptors are not addressed using this approach). The IAQM method provides guidance on the sensitivity of different receptor types to dust soiling and health effects as summarised in **Table B-1**. It is noted that user expectations of amenity levels (dust soiling) is dependent on existing deposition levels.

Table B-1 IAQM Guidance for Categorising Receptor Sensitivity

Value	High Sensitivity Receptor	Medium Sensitivity Receptor	Low Sensitivity Receptor
Dust soiling	Users can reasonably expect a high level of amenity; or The appearance, aesthetics or value of their property would be diminished by soiling, and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land.	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or The appearance, aesthetics or value of their property could be diminished by soiling; or The people or property would not reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.	The enjoyment of amenity would not reasonably be expected; or Property would not reasonably be expected to be diminished in appearance, aesthetics, or value by soiling; or There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.
	Examples: Dwellings, museums, medium and long term car parks and car showrooms.	*Examples: Parks and places of work.*	*Examples: Playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.*
	Locations where the public are exposed over	Locations where the people exposed are	Locations where human exposure is transient.

Health effects	a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	
	Examples: Residential properties, hospitals, schools and residential care homes.	*Examples: Office and shop workers, but will generally not include workers occupationally exposed to PM_{10}.*	*Examples: Public footpaths, playing fields, parks and shopping street.*

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

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

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

Table B-2 IAQM Guidance for Categorising the Sensitivity of an Area to Dust Soiling Effects

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
Low	>1	Low	Low	Low	Low

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

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

- This approach is consistent with the IAQM guidance, which notes that in using the tables to define the *sensitivity of an area*, professional judgement may be used to determine

alternative sensitivity categories, taking into account the following factors:

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

Table B-3 IAQM Guidance for Categorising the Sensitivity of an Area to Dust Health Effects

Receptor sensitivity	Annual mean PM_{10} conc.	Number of receptors [a,b]	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>25 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	21-25 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	17-21 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<17 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>25 µg/m³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	21-25 µg/m³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	17-21 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<17 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Notes: (a) Estimate the total within the stated distance (e.g. the total within 350 m and not the number between 200 and 350 m); noting that only the highest level of area sensitivity from the table needs to be considered.

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

Risk Assessment

The dust emission magnitude from Step 2a and the receptor sensitivity from Step 2b are then used in the matrices shown in **Table B-4** (demolition), **Table B-5** (earthworks and construction) and **Table B-6** (track-out) to determine the risk category with no mitigation applied.

Table B-4 Risk Category from Demolition Activities

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

Table B-5 Risk Category from Earthworks and Construction Activities

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

Table B-6 Risk Category from Track-out Activities

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

Step 3 - Site-Specific Mitigation

Once the risk categories are determined for each of the relevant activities, site-specific management measures can be identified based on whether the Site is a low, medium or high risk site.

Step 4 – Residual Impacts

Following Step 3, the residual impact is then determined after management measures have been considered.

APPENDIX C

OPERATIONAL PHASE RISK ASSESSMENT METHODOLOGY

Nature of Impact

Predicted impacts may be described in terms of the overall effect upon the environment:

- **Beneficial**: the predicted impact will cause a beneficial effect on the receiving environment.
- **Neutral**: the predicted impact will cause neither a beneficial nor adverse effect.
- **Adverse**: the predicted impact will cause an adverse effect on the receiving environment.

Receptor Sensitivity

Sensitivity may vary with the anticipated impact or effect. A receptor may be determined to have varying sensitivity to different environmental changes, for example, a high sensitivity to changes in air quality, but low sensitivity to noise impacts. Sensitivity may also be derived from statutory designation which is designed to protect the receptor from such impacts.

Sensitivity terminology may vary depending upon the environmental effect, but generally this may be described in accordance with the following broad categories - Very high, High, Medium and Low.

Table C1 outlines the methodology used in this study to define the sensitivity of receptors to air quality impacts.

Table C1 Methodology for Assessing Sensitivity of a Receptor

Sensitivity	Criteria
Very High	Receptors of very high sensitivity to air pollution (e.g. dust or odour) such as: hospitals and clinics, and retirement homes.
High	Receptors of high sensitivity to air pollution, such as: schools, residential areas, food retailers, glasshouses and nurseries.
Medium	Receptors of medium sensitivity to air pollution, such as: farms / horticultural land, offices/recreational areas, painting and furnishing, hi-tech industries and food processing, and outdoor storage (ie new cars).
Low	All other air quality sensitive receptors not identified above, such as light and heavy industry.

Magnitude

Magnitude describes the anticipated scale of the anticipated environmental change in terms of how that impact may cause a change to baseline conditions. Magnitude may be described quantitatively or qualitatively. Where an impact is defined by qualitative assessment, suitable justification is provided in the text.

Table C2 Magnitude of Impacts

Magnitude	Description
Substantial	Impact is predicted to cause significant consequences on the receiving environment (may be adverse or beneficial)
Moderate	Impact is predicted to possibly cause statutory objectives/standards to be exceeded (may be adverse)
Slight	Predicted impact may be tolerated.
Negligible	Impact is predicted to cause no significant consequences.

Significance

The risk-based matrix provided below illustrates how the definition of the sensitivity and magnitude interact to produce impact significance.

Table C3 Impact Significance Matrix

Sensitivity \ Magnitude		[Defined by Table B2]			
		Substantial Magnitude	**Moderate Magnitude**	**Slight Magnitude**	**Negligible Magnitude**
[Defined by TableB1]	**Very High Sensitivity**	Major Significance	Major/ Intermediate Significance	Intermediate Significance	Neutral Significance
	High Sensitivity	Major/ Intermediate Significance	Intermediate Significance	Intermediate/Minor Significance	Neutral Significance
	Medium Sensitivity	Intermediate Significance	Intermediate/Minor Significance	Minor Significance	Neutral Significance
	Low Sensitivity	Intermediate/Minor Significance	Minor Significance	Minor/Neutral Significance	Neutral Significance

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