17. Air quality

17.1 Existing environment and background

17.1.1 Overview

This chapter draws on information from Appendix P (Air quality assessment report). The soils within the construction footprint are highly erosive and dispersive and are more prone to dust generation. Refer to Chapter 16 (Groundwater, soils and contamination).

17.1.2 Policy and planning setting

State air quality guidelines specified by the NSW Environment Protection Authority (EPA) are published in the Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales (NSW EPA, 2022, referred to as Approved Methods). These criteria have been established to achieve appropriate environmental outcomes and minimise risks to human health, wellbeing, and amenity impacts. They are appropriate for use in this assessment.

The criteria within the Approved Methods are based on the standards set out in the National Environment Protection (Ambient Air Quality) Measure 2016 (NEPM, National Environment Protection Council, 2016). The NEPM sets the air quality standards nationally.

The key air pollutants of interest for this project are:

- Particulate matter (PM), including PM_{10} and $PM_{2.5}$ (that is, PM with a diameter of 10 micrometres and 2.5 micrometres respectively) and total suspended particulates (TSPs)
- Dust
- Combustion gases, which are emissions associated with road traffic and the combustion of fossil fuels. This includes carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2), and PM.

Table 17-1 outlines the relevant criteria used to measure impacts to PM, dust and combustion gases (CO, NO_2, SO_2).

Further, the Institute of Air Quality Management's (IAQM) Guidance on the assessment of dust from demolition and construction (2014) has guided the assessment of construction air quality impacts, as described further in Section 17.2.1.

Table 17-1: NSW EPA impact assessment criteria for PM, dust and combustion gases

Pollutant	Averaging period	Assessment criteria
TSP	Annual	90 micrograms per cubic metre ($\mu g/m^3$)
PM_{10}	Annual	$50\mu g/m^3$
	24 hours	$25\mu g/m^3$
$PM_{2.5}$	Annual	$25\mu g/m^3$
	24 hours	$8\mu g/m^3$
Dust	Annual	$2\mu g/m^3$ (maximum increase in deposited dust level)
		$4\mu g/m^3$ (maximum total deposited dust level)
CO	15 minutes	87 parts per million (ppm)
	1 hour	25ppm
	8 hours	9ppm
NO_2	1 hour	8 parts per hundred million (pphm)
	Annual	1.5pphm
SO_2	1 hour	10pphm
	24 hours	2pphm

17.1.3 Surrounding land uses and sensitive receivers

The IAQM Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014) identifies that further assessment is required for human receivers within 350 metres of the boundary of a project. Sensitive receivers within 350 metres of the construction footprint are shown in Figure 17-1 and Table 17-2 provides a list of educational and social/health receivers close to the construction footprint, a number of which fall within the 350 meter buffer. It is estimated that there are more than 100 sensitive receivers within 20 metres of the construction footprint. Further to the sensitive receivers identified in Figure 17-1 and Table 17-2, people working within Central Station and train customers are also considered sensitive receivers.

Table 17-2: Educational and social/health receivers close to the construction footprint

ID	Educational or social/health receiver name	Within 350m of the construction footprint
1	Central Railway Station Clinic	Yes
2	Sydney Central Medical Centre	Yes
3	The Practice Wellbeing Centre @ Torrens University	Yes
4	Redfern Station Medical Centre	No
5	University of Sydney Surry Hills Campus	Yes
6	University of Technology Sydney	No
7	University of Technology City Campus – Haymarket	No
8	Marcus Clark Building	Yes
9	TAFE NSW – Ultimo	No
10	Torrens University Australia	No
11	Academy of Film, Theatre & Television	Yes

17.1.1 Local meteorological conditions

The closest weather monitoring station (measuring wind speed and direction) is located at Cook and Phillip Park, about one kilometre north of the construction footprint. At this distance, it is taken as representative of the wind conditions experienced at the construction footprint. The monitoring indicates that the most frequent from the south, south-east and west directions, and the least frequent from the north.

Wind erosion of dust from exposed surfaces usually occurs when wind speeds exceed five metres per second. The frequency of wind speeds recorded at the Cook and Phillip Park weather monitoring station between 2019–2021 was about 11 per cent. Give the low wind speeds expected within the construction footprint, there is a low chance of dust pollution during construction.

17.1.1 Background air quality

The closest air quality monitoring station is also located at Cook and Phillip Park, about one kilometre from the construction footprint. The monitoring data is available between 2019–2021 (refer to Table 17-3) for NO_2, SO_2 and CO which shows that criteria for these pollutants (refer to Table 17-1) are largely achieved, and therefore it can be assumed that emissions of these pollutants would also not exceed criteria at the construction footprint. A review of the exceedances of $PM_{2.5}$ and PM_{10} indicates that they were likely to be associated with natural events such as bushfires, hazard reduction burns or dust storms.

There were widespread bushfire events in 2019 and the onset of Covid-19 in 2020. Due to this, these years may not be representative of typical background pollutant concentrations. To further strengthen the background air quality data considered in this assessment, data from another nearby air quality monitoring station at Rozelle, about four kilometres northeast of the construction footprint was also considered. Data from the Rozelle monitoring station between 2017–2021 shows that air quality in Rozelle has largely achieved the health-based criteria described above in Table 17-1. The exception are occasions where natural events such as bushfires, hazard reduction burns or dust storms have resulted in short-term exceedances of PM criteria.

Coordinate System: GDA2020 MGA Zone 56

Metres
0 110 220

Scale at A4

1:9,000

Data Source: Esri Community Maps Contributors, Geoscape, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

Prepared by: MD
Checked by: AS
Approved by: AS

Legend

- Construction footprint
- 350m buffer
- Educational receptors
- Social/health receptors
- Commercial areas
- Residential Areas

Sydney Terminal Building Revitalisation Project

Figure 17-1: Sensitive receivers within 350 metres of the construction footprint

Project Number: 287415

Drawings / Design Prepared By: ARUP

Client: NSW Government Transport for NSW

Table 17-3 summarises the monitoring data from the Cook and Phillip Park between 2019 and 2021. Table 17-4 summarises the monitoring data from the Rozelle air quality monitoring station between 2017 and 2021. Red text marked with an asterisk shows the recorded exceedances beyond the relevant criteria.

Table 17-3: Summary of air quality monitoring data at the Cook and Phillip Park air quality monitoring station (2019–2021)

Pollutant	PM_{10}		$PM_{2.5}$		NO_2		CO	SO_2	
Averaging period	Max. 24-hr	Annual	Max. 24-hr	Annual	Max. 1-hr	Annual	Max. 1-hr	Max. 1-hr	Annual
Units	µg/m³				pphm		ppm	pphm	
2019	116.8*	26.9*	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

Note: asterisk (*) notes exceedance of relevant criteria

Table 17-4: Summary of air quality monitoring data at the Rozelle air quality monitoring station (2017–2021)

Pollutant	PM_{10}		$PM_{2.5}$		NO_2		CO	SO_2	
Averaging period	Max. 24-hr	Annual	Max. 24-hr	Annual	Max. 1-hr	Annual	Max. 1-hr	Max. 1-hr	Annual
Units	µg/m³				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

Note: asterisk (*) notes exceedance of relevant criteria

17.1.2 Local air pollutant sources

Other likely emissions that impact local air quality are related to transport, both vehicles using the local surrounding roads and emissions associated with the operation and maintenance of Central Station as a transport interchange.

17.2 Assessment of potential impacts

17.2.1 Construction

Potential impacts would result from dust emissions, exhaust (fuel combustion) emissions, and PM from brake and tyre wear. These impacts are predicted to be greatest during construction, associated with:

- Demolition of existing buildings
- Loading and unloading of materials
- Wheel-generated dust
- Wind erosion of exposed surfaces.

Key construction activities that contribute to dust emissions include demolition, earthworks, construction, and the movement of vehicles on public roads, a term called trackout. The definition of each of these activities based on the IAQM Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014). The Guidelines also define the likely magnitude of dust emissions for each activity, as summarised in Table 17-5 (ranging from small to large as defined in Appendix P (Air quality assessment report).

The construction dust risk assessment presented in Appendix P (Air quality assessment report) assessed the sensitivity of receivers and the sensitivity of the surrounding area based on the IAQM Guidance. This found that receiver sensitivity was **high** for health impacts and **high** for dust emissions, and that the sensitivity of the area was **high** for both health impacts and dust emissions. The sensitivity of the area took into consideration the individual receiver sensitivities, the air quality monitoring results from the Cook and Phillip Park air quality monitoring station, and the number of sensitive receivers surrounding the construction footprint (that is, more than 100 sensitive receivers within 20 metres of the construction footprint).

Based on these sensitivities and the likely dust emission magnitudes for each of the construction activities, a risk assessment for air quality impacts was carried out and is presented in Table 17-5.

Table 17-5: Preliminary risk of air quality impacts from construction activities

Impact	Sensitivity of area	Dust emission magnitude				Preliminary risk			
		Demolition	Earthworks	Construction	Trackout	Demolition	Earthworks	Construction	Trackout
Dust emissions	High	Small	Large	Large	Large	Medium	High	High	High
Human health	High					Medium	High	High	High

These results indicate that there is a **medium** risk of dust emissions and human health impacts during demolition. The risk of dust emissions and human health impacts at sensitive receiver locations is predicted to be **medium** during earthworks, construction, and trackout.

Management measures to further reduce these impacts are detailed in Table 17-6. With their implementation, dust emissions and human health impacts for demolition are predicted to be **low**, and dust emissions and human health impacts for earthworks, construction, and trackout are predicted to be **medium.**

17.2.2 Operation

There would be no change in emissions as the project does not alter the station's use as a transport interchange or any of the standing emission sources. Operation of the project is expected to generate an extra 1,642 and 1,340 bus/car trips in the morning and afternoon peak hours respectively. Data from 2019 noted that over 88,000 vehicles travelled in the area during the morning and afternoon peak periods. Therefore, the additional trips are considered relatively small in the context of the existing traffic movements and the operational emissions are considered to be negligible.

17.3 Environmental management measures

Both positive and negative air quality impacts will be addressed in the form of management measures. Measures to minimise impacts relating to traffic, soil, contamination and water quality are addressed in other impact chapters and have not been included here. Table 17-6 lists the measures to manage air quality impacts specifically.

Table 17-6: Environmental management measures – air quality

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	Construction

Ref	Impact/uncertainty	Environmental management measure	Timing
		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.	
AQ02	Impact | Dust trackout	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