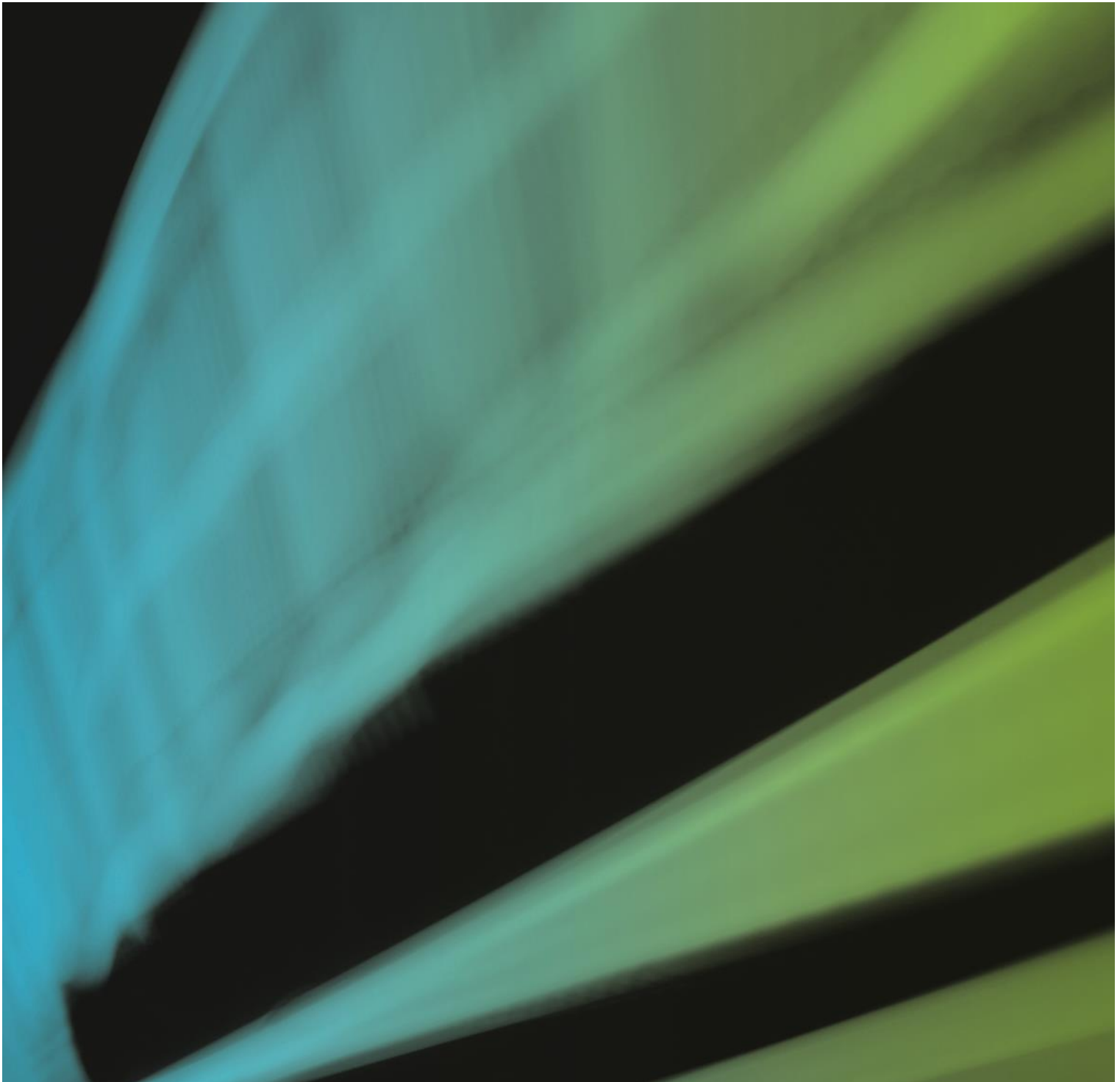


Air Quality Impact Assessment

One Carrington Street, Sydney



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One Carrington Street, Sydney

Client: Sovereign Wynyard Centre Pty Limited

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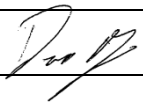
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Table of Contents

1.0	Introduction	1
1.1	Scope of Works	1
2.0	Project Description	2
2.1	Site Location and Context	2
2.2	Existing Development	3
2.3	Surrounding Land Use	4
2.4	Concept Approval	4
2.5	Other Relevant Planning Approvals	5
3.0	Baseline Conditions	6
3.1	Air Quality Criteria	6
3.2	Existing Environment	6
3.2.1	Particulate Matter as PM ₁₀	6
3.3	Meteorology	6
4.0	Assessment of Impacts	8
4.1	Vehicle Exhaust Emissions	8
4.2	Fugitive Dust Emissions	9
4.2.1	Particulate matter (TSP and PM ₁₀)	9
5.0	Mitigation	11
6.0	Residual Impacts	13
7.0	Conclusion	14

1.0 Introduction

Sovereign Wynyard Centre Pty Limited or its nominee, referred to herein as Brookfield, is proposing a major new PCA Premium Grade commercial and retail development over and including the eastern access ways to the Wynyard Station concourse from George Street through to Carrington Street inclusive of the heritage listed Shell House building on the corner of Margaret Street, Carrington Street, Wynyard Lane and the heritage listed Beneficial House located at 285 George Street. The proposed development is known as One Carrington Street.

The development will deliver a landmark commercial office tower and high quality retail experience. The development is uniquely positioned to contribute to and integrate with the re-development of one of the Sydney CBD's major transport hubs and deliver substantial public benefit through the upgrade of Wynyard Station's eastern concourses and pedestrian access ways.

The development will revitalise the greater Wynyard precinct by contributing, in conjunction with government agencies, to a world class subway station and transport interchange.

Director General's Requirements (DGRs) for the project (SSD 13_5824) were issued on 03 May 2013. In relation to air quality, the DGRs specified that the Environmental Impact Statement (EIS) for the project should assess the potential effects of the development on sensitive receptors (including residences and schools), and provide details of mitigation measures to minimise the potential effects on air quality in the surrounding area. Furthermore, the effects of the construction and demolition works on air quality were also to be assessed.

1.1 Scope of Works

AECOM was commissioned by Brookfield to address the following environmental assessment requirement from the Director General of the Department of Planning and Infrastructure (DPI):

Address Air Quality impacts to surrounding sensitive receivers (residences, schools, etc.) and include details of mitigation measures to minimise the impacts to the surrounding area.

The air quality assessment, therefore, examines the existing air quality, outlines the relevant air quality standards and guidelines and considers the likely effects on air quality arising from the construction and demolition of the One Carrington Street Development. Where appropriate, mitigation measures have also been recommended to prevent, reduce, or offset any potential adverse impacts and subsequent residual impacts.

2.0 Project Description

2.1 Site Location and Context

The site comprises 301 George Street, the Menzies Hotel, Shell House, strata above and below Wynyard Lane, and 285 - 287 George Street and has a site area of 4,452 m². The site location is shown in **Figure 1**. The application seeks approval for the following works:

- demolition of the Menzies Hotel, 301 George Street and the eastern access ways to Wynyard Station, development above Wynyard Lane, and partial demolition of Shell House and 285 George Street;
- upgrade of the eastern access ways to Wynyard Station including provision of a new Transit Hall, through site link, retail areas and concourse layout;
- construction and use of a 30 storey commercial building on the land between Carrington Street and George Street;
- construction of a retail / commercial loading dock and two levels of basement comprising 88 tenant car spaces and end of trip facilities; and
- refurbishment of 285 George Street and Shell House for commercial and retail uses.

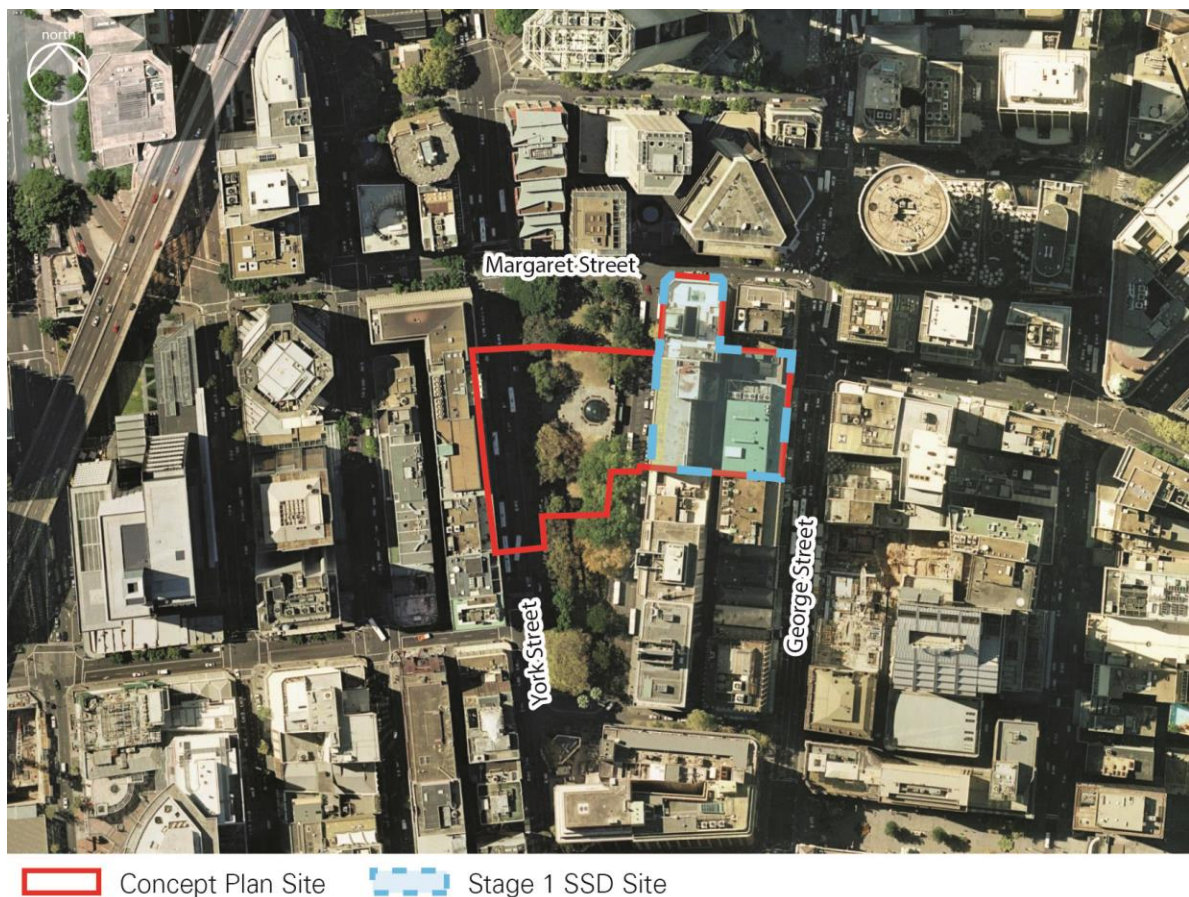


Figure 1 Aerial Photograph of the Site

Source: JBA Planning Consultants.

2.2 Existing Development

The site comprises a number of existing elements. These elements are shown in **Figure 2** and are summarised as follows:

- Former Shell House: An 11 storey commercial office building built in 1938. In 1979 the building was converted to hotel rooms as an extension of the Menzies Hotel. Shell House is a listed as a local heritage item.
- The Menzies Hotel: A 14 storey hotel, completed in 1963. It provides no direct public access to Wynyard Station or to the retail levels that pass beneath it.
- 301 George Street (formerly known as Thakral House): A 13 storey commercial office building completed in 1962, with retail space on the ground and first basement levels.
- 285 George Street (Beneficial House): A seven storey retail building built in 1923, which was home to Peapes Department Store and later converted to retail and commercial office uses. The building is listed as a local heritage item.
- Wynyard Lane (stratum lots above and below road level): Stratum lots that run above and below Wynyard Lane between 301 George Street and the Menzies Hotel.

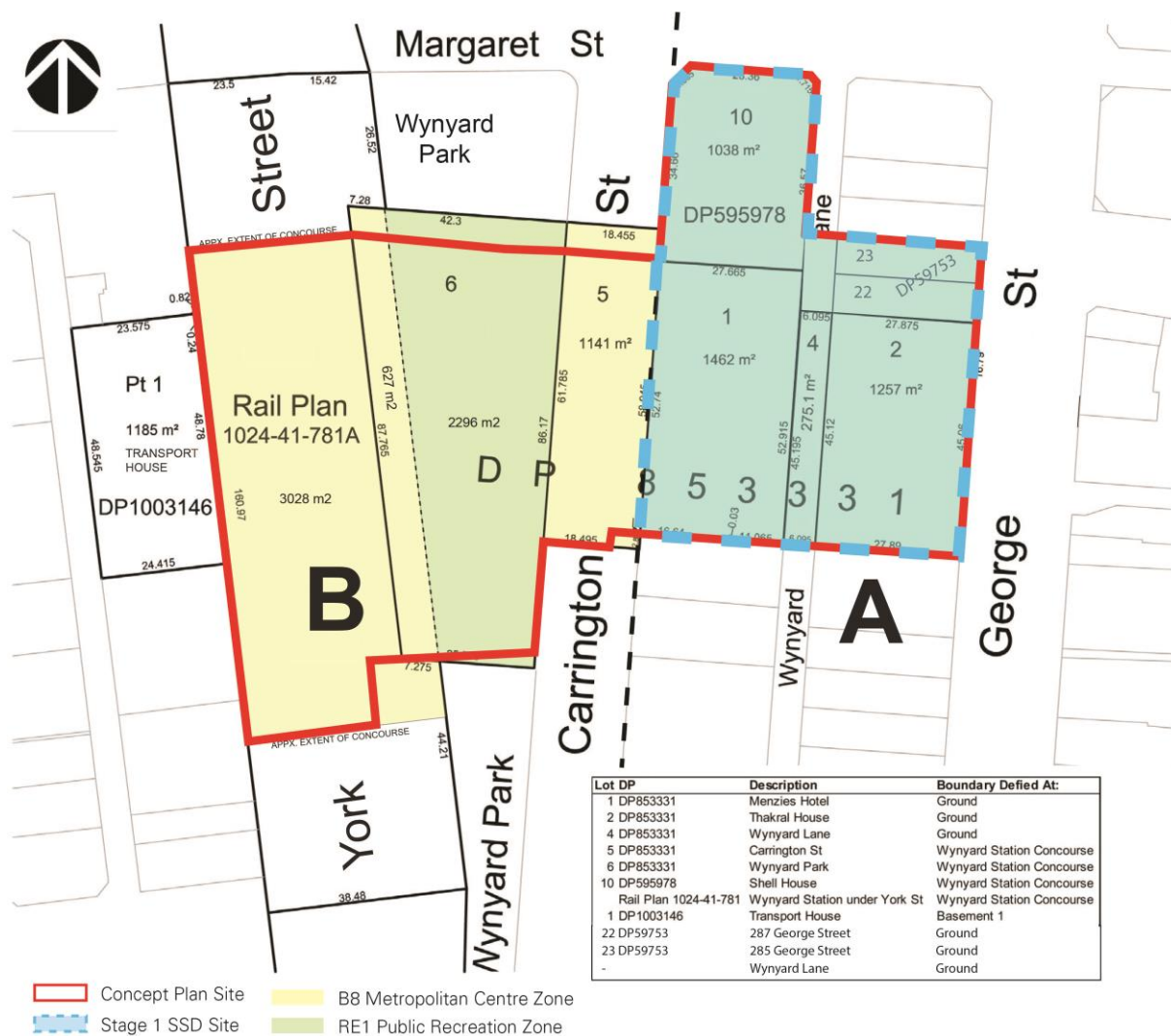


Figure 2 Proposed Development Site

Source: JBA Planning Consultants.

The public domain areas within and surrounding the site experience high levels of pedestrian activity due to their central city location and the presence of the major transport interchange of Wynyard Station. There are significant pedestrian movements through and surrounding the site from workers, shoppers, tourists and residents.

George Street is situated to the east of the site and is a major north-south arterial route through the Sydney CBD, providing two traffic lanes in both directions. George Street is set to be pedestrianised with the introduction of light rail services undertaken during the project duration.

Carrington Street is located to the west of the Stage 1 development site, and runs one way in a northbound direction. It is a local road, which connects Margaret Street and Wynyard Street and is a part of the Wynyard bus interchange.

Wynyard Lane bisects the site in a north-south direction. It predominantly functions as a service vehicle access to the buildings fronting George Street and Carrington Street and access to the Wynyard public car park.

Margaret Street is situated to the north and functions as a major east-west collector road providing one traffic lane and kerbside parking in both directions.

2.3 Surrounding Land Use

The surrounding land uses are predominantly office uses with ground floor retail. Development on the western side of Wynyard Park along York Street is also typically commercial office development of varying heights.

2.4 Concept Approval

The site has a current Concept Approval (MP 09_007) under Section 75O of Part 3A of the Act, which was granted by the Planning Assessment Commission (PAC) as delegate of the Minister for Planning and Infrastructure. The approval covers both Stage 1 (Eastern) and Stage 2 (Western) components of the development site.

For any future Development Application (DA):

- the Consent Authority must not grant consent unless it is satisfied that the development is generally consistent with the terms of the approval of the Concept Plan; and
- the provisions of any environmental planning instrument or any development control plan do not have effect to the extent to which they are inconsistent with the terms of the Concept Approval.

In light of the above, the Concept Approval provides the key planning framework for the future development of the site. The Concept Approval provides:

- the building envelopes (above and below ground) including a maximum height, podium height and building setbacks;
- a maximum Floor Space Area (FSA) of:
 - 79,370 m² - for the Stage 1 section of the site located east of Carrington Street; and
 - 5,926 m² - for the Stage 2 section of the site located under and to the west of Carrington Street (excluding the paid ticket area and platform areas) that will be subject of a separate DA.
- use of the site for a mixed use development including commercial offices, business premises, shops, general retail food and drink premises, health/medical centre, public amenities, transport facilities, and tenant car parking;
- a maximum of 81 tenant car parking spaces and the requirement to provide bicycle parking and end of trip facilities for commercial office employees;
- performance specifications for the Wynyard station unpaid concourse east of the eastern alignment of Carrington Street;
- design criteria to guide the future detailed design stages of the development east of Carrington Street; and
- design principles for future upgrades to Wynyard Park, the commercial tower and transit hall.

2.5 Other Relevant Planning Approvals

A number of sites in proximity to the development site have current planning approvals, which may present cumulative air quality impacts:

- Wynyard Walk: A fully accessible pedestrian link between Wynyard Station (Clarence Street Portal) and the developing CBD western corridor and the Barangaroo development precinct. Construction has commenced and is expected to be completed in late 2015.
- 200 George Street: Approval for construction of a new 37 storey commercial building. Construction has commenced and is expected to be completed in 2016.
- 333 George Street: Approval for a new 19 storey commercial building; construction is yet to commence.

3.0 Baseline Conditions

In order to determine the potential effects on air quality at the proposed Development site from existing sources or to assess the general air quality in the air shed, ambient pollutant concentrations can be compared to relevant impact assessment criteria.

3.1 Air Quality Criteria

In New South Wales, the criteria are specified by the Environment Protection Authority (EPA) (DEC, 2005a) and represent maximum allowable pollution levels within an air shed (see **Table 1**).

Table 1: EPA Impact Assessment Criteria for Pollutants of Potential Concern

Pollutant	Averaging Period	Concentration ($\mu\text{g}/\text{m}^3$)
Particles as PM_{10}	24 hours	50
	Annual	30
Total suspended particulates (TSP)	Annual	90

3.2 Existing Environment

For this study, no specific measurements or predictions of ground level concentrations were undertaken by AECOM. To provide a simple assessment of the existing background concentration of pollutants of concern in the assessment area, existing ambient air data were reviewed as described in the following section.

3.2.1 Particulate Matter as PM_{10}

The New South Wales EPA operates ambient air quality monitoring at a number of sites near Sydney's CBD. The three nearest monitoring stations to One Carrington Street where PM_{10} concentrations are measured are located at Randwick (8 km to the south east), Rozelle (4.5 km to the west), and Earlwood (9 km to the south west). A summary of recent PM_{10} monitoring results at these stations is presented in **Table 2**. The maximum 24 hour average concentrations at each of the three stations can be seen to have exceeded the criterion of $50 \mu\text{g}/\text{m}^3$ in 2013.

Table 2 Summary of PM_{10} Concentrations at EPA Monitoring Sites in 2013

Averaging Period	Year	PM_{10} Concentrations ($\mu\text{g}/\text{m}^3$)		
		Randwick Lat 33°56'00" Long 151°14'31"	Rozelle Lat 33°51'57" Long 151°09'45"	Earlwood Lat 33°55'04" Long 151°08'05"
Maximum 24 Hour Average	2011	40.1	39.4	124.9
	2012	43.7	40.7	44.2
	2013	55.3	58.5	63.1
Annual Average	2011	15.9	16.6	18.1
	2012	18.0	16.9	19.6
	2013	18.8	18.3	19.9

3.3 Meteorology

Wind roses show the frequency of occurrence of winds by direction and strength. Each wind rose arm represents a wind blowing from the direction it is projected, i.e. an arm pointing up represents northerly winds. 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.

The Bureau of Meteorology meteorological station at Sydney Airport is located approximately 9 km south-south west of One Carrington Street. Long term wind roses from the Sydney Airport station are presented in **Figure 3**.

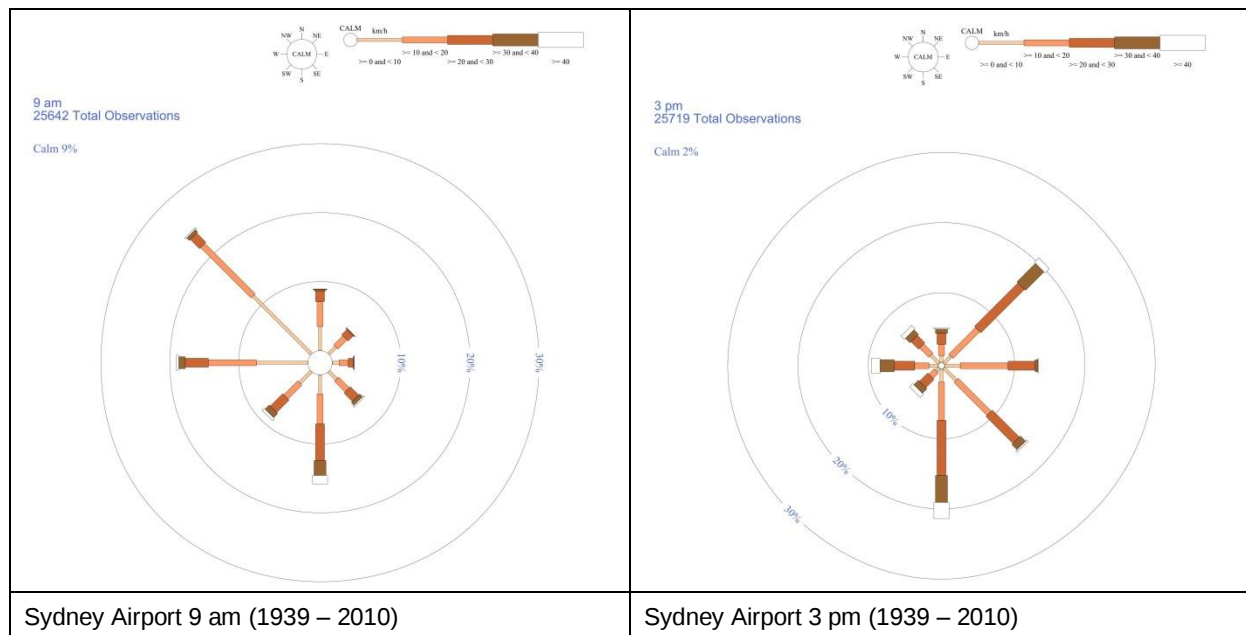


Figure 3 Long Term Wind Roses from Sydney Airport

Night-time and early morning winds are best represented by the 9 am wind rose. Winds at this time of day are typically light with dominant north-westerly, westerly, and southerly components. Daytime and afternoon winds are best represented by the 3 pm wind rose. Winds at this time of day are typically stronger with dominant components from the south and north-east.

4.0 Assessment of Impacts

Atmospheric emissions from demolition and construction activities will depend on a combination of the potential for emission (the type of activities) and the effectiveness of control measures. In general, there are two sources of emissions that would need to be controlled to minimise the potential for adverse environmental effects:

- Exhaust emissions from site plant, equipment and vehicles; and
- Fugitive dust emissions from site activities.

4.1 Vehicle Exhaust Emissions

The operation of vehicles and equipment powered by internal combustion engines results in the emission of waste exhaust gases containing the pollutants oxides of nitrogen (NO_x), particulate matter (PM₁₀), volatile organic compounds (VOCs) and carbon monoxide (CO). The quantities emitted depend on factors such as engine type, service history, and pattern of usage and composition of fuel. The operation of site equipment, vehicles and machinery would result in emission to the atmosphere of unquantified levels of waste exhaust gases, but such emissions are unlikely to result in discernible differences in local air quality - particularly in comparison to levels of similar emissions from road traffic.

Construction traffic could potentially affect receptors located along the traffic routes employed by haulage vehicles, construction vehicles and employees. The principal construction activities with transportation implications are:

- Removal of materials;
- Delivery of materials for new development; and
- Movement of heavy plant.

The works will be undertaken in a staged approach. Expected vehicle numbers associated with each stage are summarised in **Table 3**. As shown, the greatest heavy vehicle numbers are expected during the podium and basement and tower construction works, where up to 100 concrete trucks per day plus other heavy vehicle movements are anticipated. These traffic numbers are not considered likely to be distinguishable from usual CBD traffic volumes, even with the installation of light rail along George Street during the construction period.

Table 3 Construction Traffic

Stage	Activities	Indicative Vehicles
Initial establishment works (Months 0 – 3)	Site establishment; erection of hoardings; erection of two tower cranes; scaffolding	6 flatbed trucks/day 5 HRV/AV trucks/day 3 HRV/AV trucks/night Mobile crane 10 AVs/day (over 2 day periods)
Tower demolition works (Months 1 – 7)	Demolition of 301 George St Tower and Menzies Tower; scaffold removal	24 single & double bogeys/day 2 - 4 waste bin trucks/day 2 - 3 HRV/AV trucks/day
Podium and basement demolition and excavation works (Months 7 – 12)	Demolition, excavation and scaffold removal	12 single & double bogeys/day 1 - 2 waste bin trucks/day 1 - 2 HRV/AV trucks/day
Podium and basement construction works (Months 12 – 16)	Pouring of footings; construction of perimeter walls, columns and slabs; installation of façades	3 – 5 reinforcing trucks/day Up to 100 concrete trucks/day 2 – 3 concrete pumps/day 2 formwork trucks/day 1 – 2 AVs (curtain wall)/day
Tower construction works (Months 16 – 30)	Construction of tower structure (walls, columns and slabs) and tower curtain wall façade	2 – 3 reinforcing trucks/day Up to 100 concrete trucks/day 1 – 2 concrete pumps/day 2 formwork trucks/day 1 – 2 AVs (curtain wall)/day

Stage	Activities	Indicative Vehicles
Fit out and internal works (Months 16 – 39)	Tower services and fit out and plant room installation	25 HRV/MRV trucks/day 12 AVs/day
Phasing works (Months 25 – 35)	Demolition, new structure, services and finishes	3 – 5 single bogeys/day (demolition) 30 concrete trucks (pour days; 1 – 2 days/week) 6 – 10 MRV/HV trucks/day
Public domain works	Footpath paving and associated works	3 – 4 trucks/day
Shell House works (Months 1 – 28)	Scaffold erection and removal and demolition	6 - 7 HRV/AV trucks/day 4 single and double bogeys/day
285 George Street works (Months 1 – 28)	Scaffold erection and removal; internal structural work, services and fit out	3 – 5 HRV/AV trucks/day
Source: One Carrington Street – Construction Traffic Management Planning. Brookfield Multiplex.		

Emissions of combustion source pollutants during the construction and demolition activities, with the exception of PM₁₀, are generally considered to be insufficient to affect sensitive off-site receptors. Therefore, emissions of NO_x, VOC and CO were excluded from further consideration in this assessment.

4.2 Fugitive Dust Emissions

Dust (particulate matter) is the primary pollutant of concern associated with demolition and construction activities. Fugitive dust emissions from construction activities are likely to be variable and would depend upon type and extent of the activity, soil conditions (soil type and moisture), road surface condition and weather conditions. Soils are inevitably drier during the summer period, and periods of dry weather combined with higher than average winds have the potential to generate the most dust. Dust may be generated from site activities such as:

- Crushing and pulverising of concrete materials during demolition;
- Excavation;
- Internal vehicle movements;
- Wind erosion of stockpiled materials and areas of bare earth; and
- Loading and unloading of materials from trucks.

While the surrounding land uses are predominantly commercial, fugitive dust emissions can lead to nuisance impacts if not effectively controlled. Most of the dust emitting activities outlined above, however, respond well to appropriate dust control/mitigation measures and adverse effects can be greatly reduced or eliminated. A description of particulate matter in relation to this assessment is provided in **Section 4.2.1** with mitigation measures outlined in **Section 5.1**.

4.2.1 Particulate matter (TSP and PM₁₀)

Particulate matter is the term for solid or liquid particles found in the air. Some particles are large or dark enough to be seen as smoke, but fine particulate matter is tiny and is generally not visible to the naked eye. Particulate matter is typically produced by the mechanical break-up of larger solid particles. The larger or coarse fraction can include dust from roads, agricultural processes, uncovered soil or mining operations, as well as non-combustible materials released when burning fossil fuels. Pollen grains, mould spores, evaporation of sea spray and plant and insect parts can also contribute to the coarse fraction. The smaller or fine particulates are largely formed by the oxidation of primary gases.

There are two main effects of particulates: nuisance effects and health effects. Nuisance effects are primarily due to deposited dust and the coarser fraction of total suspended particulates. Health effects are primarily due to particles in the size range less than 10 µm in diameter (PM₁₀). PM₁₀ refers to the range of particulate matter that is inhalable and is able to penetrate the nose or mouth under normal breathing conditions.

Deposited dust refers to the larger fractions that fall from the air and deposit on exposed surfaces. In general, deposited dust has an aerodynamic diameter of greater than about 20 µm. Larger dust particles are generally responsible for nuisance (amenity) effects including vegetation damage and surface soiling. Depending on its physical or chemical characteristics, dust may also cause surface deterioration of materials due to its abrasive or corrosive properties. If the dust composition is dangerous, it is considered a hazardous air pollutant (and may contain toxic material).

Particulate matter emissions from demolition and construction at One Carrington Street are considered to have the potential to contribute to local particulate matter concentrations if not adequately managed and mitigated.

5.0 Mitigation

Dust emissions from the demolition and construction works to be undertaken at One Carrington Street are expected to be minimal. While the surrounding land uses are predominantly commercial, there is the possibility of dust being emitted during certain activities or during adverse meteorological conditions and causing nuisance. The following standard construction dust mitigation methods should, therefore, be implemented where necessary at the site to avoid dust nuisance:

For site preparation:

- Identify responsible person in charge;
- Erect appropriate barriers at the site boundary;
- Erect effective barriers around dusty activities;
- Ensure machinery, fuel and chemical storage and dust generating activities are not located close to boundaries and sensitive receptors (such as pedestrian walkways, air conditioning intakes and businesses) if at all possible;
- Communicate with neighbouring properties prior to undertaking works in proximity to their premises; and
- Establish a complaints management system to record details on the time and extent of any reasons for air quality based complaints.

For construction traffic:

- All vehicles should switch off engines when not in use (no idling should be permitted);
- Ensure all vehicles have adequate exhaust systems and emission control technologies;
- Clean or wash all vehicles effectively before they leave a site to prevent additional dirt from exiting the site and being deposited on roads where dust generation is likely; and
- All loads entering and leaving site should be covered.

For demolition works:

- Sheet and screen buildings with suitable material and, where possible, strip inside buildings before demolition begins;
- Demolition activities should be limited during times of adverse meteorological condition; and
- Materials should be removed from site as soon as possible.

For the use of stockpiles:

- Make sure that stockpiles exist for the shortest possible time;
- Do not build steep sided stockpiles or mounds or those that have sharp changes in shape;
- Whenever possible, keep stockpiles or mounds away from the site boundary, sensitive receptors, watercourses and surface drains; and
- Wherever possible, enclose stockpiles or keep them securely sheeted.

For cutting and grinding:

- All equipment should use water suppressant or suitable local exhaust ventilation systems;
- Use dust extraction techniques where available;
- All other equipment should be fitted with water suppressant systems;
- Use local exhaust ventilation; and
- Service all fans and filters regularly to ensure they are properly maintained.

For the use of chutes and skips:

- Securely cover skips;
- Minimise drop heights to control the fall of materials;
- Regularly damp down surfaces with water;
- Completely enclose skips whenever possible; and
- Reduce drop heights by using variable height conveyors or chutes.

For excavation and earthworks:

- All dusty activities should be damped down, especially during dry weather;
- Temporarily cover earthworks if possible;
- Under adverse meteorological conditions, for example wind blowing from source to sensitive receptors, minimise earth moving activities;
- Minimise drop heights to control the fall of materials; and
- Only remove secure covers in small areas during work and not all at once.

While the Sydney Airport wind roses illustrated in **Table 3** show a long-term diurnal wind pattern, given the central Sydney location of One Carrington Street and the site's proximity to existing high-rise buildings, it is expected that wind conditions at ground level are likely to be highly variable, channelled by the canyons. Care to minimise the potential for dust nuisance should, therefore, be undertaken at all times.

6.0 Residual Impacts

Whilst there may be an infrequent to intermittent impact on adjacent sensitive receptors during the construction and demolition activities associated with the proposed One Carrington Street Development, with effective implementation of the above described mitigation measures, it is considered that there will be no long term residual effects related to the construction and demolition of the proposed development.

7.0 Conclusion

AECOM was commissioned by Brookfield to address the following environmental assessment requirement for the One Carrington Street Development, from the Director General of the Department of Planning and Infrastructure:

Address Air Quality impacts to surrounding sensitive receivers (residences, schools, etc) and include details of mitigation measures to minimise the impacts to the surrounding area.

The air quality assessment examined existing air quality, outlined the relevant air quality standards and guidelines and considered the likely effects on air quality arising from the construction and demolition phases of the One Carrington Street Development. The effects of the construction and demolition phase of the Development on local air quality would be primarily short-term events where dust may arise. However, with the implementation of outlined best-practise mitigation measures contained with this report, the risk of dust nuisance would be minimised.

Overall, it is considered that any locations in the vicinity of the One Carrington Street Development site would not experience significant adverse air quality impacts associated with the construction or demolition stages following the application of outlined mitigation measures.