ACOUSTICS AND AIR

WEE HUR REGENT
90-102 REGENT STREET, REDFERN

AIR QUALITY IMPACT ASSESSMENT

REPORT NO. 19173
VERSION A

OCTOBER 2020

PREPARED FOR

WEE HUR HOLDINGS LTD
C/- ALLEN JACK+COTTIER
2/79 MYRTLE STREET
CHIPPENDALE NSW 2008

WILKINSON MURRAY

DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Final	6 October 2020	John Wassermann	John Wassermann
A1	Final	7 October 2020	John Wassermann	John Wassermann

Note
The information contained in this document produced by Wilkinson Murray is solely for the use of the client identified on the front page of this report. Our client becomes the owner of this document upon full payment of our **Tax Invoice** for its provision. This document must not be used for any purposes other than those of the document's owner. Wilkinson Murray undertakes no duty to or accepts any responsibility to any third party who may rely upon this document.

Quality Assurance
Wilkinson Murray operates a Quality Management System which complies with the requirements of AS/NZS ISO 9001:2015. This management system has been externally certified by SAI Global and Licence No. QEC 13457 has been issued.

Certified System
Quality
ISO 9001
SAI GLOBAL

CASANZ
This firm is a member firm of the Clean Air Society of Australia and New Zealand and the work here reported has been carried out in accordance with the terms of that membership.

Celebrating 50 Years in 2012
Wilkinson Murray is an independent firm established in 1962, originally as Carr & Wilkinson. In 1976 Barry Murray joined founding partner Roger Wilkinson and the firm adopted the name which remains today. From a successful operation in Australia, Wilkinson Murray expanded its reach into Asia by opening a Hong Kong office early in 2006. Today, with offices in Sydney, Newcastle, Wollongong, Queensland and Hong Kong, Wilkinson Murray services the entire Asia-Pacific region.

YEARS
1962–2012

TABLE OF CONTENTS

GLOSSARY OF AIR QUALITY TERMS

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

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

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

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

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

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

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

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

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

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

Fugitive Emissions – Emissions not caught by a capture system.

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

Hydrogen Sulphide (H_2S) – Gas emitted during organic decomposition. Also, a by-product of oil refining and burning. Smells like rotten eggs and, in heavy concentration, can kill or cause illness.

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

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

Nitrogen Dioxide (NO_2) – The result of nitric oxide combining with oxygen in the atmosphere; major component of photochemical smog.

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

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

Particulates; Particulate Matter (PM-10) – A criteria air pollutant. Particulate matter includes dust, soot and other tiny bits of solid materials that are released into and move around in the air. Particulates are produced by many sources, including burning of diesel fuels by trucks and buses, incineration of garbage, mixing and application of fertilizers and pesticides, road construction, industrial processes such as steel making, mining operations, agricultural burning (field and slash burning), and operation of fireplaces and woodstoves. Particulate pollution can cause eye, nose and throat irritation and other health problems.

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

PM10/PM2.5 – PM10 is measure of particles in the atmosphere with a diameter of less than 10 or equal to a nominal 10 micrometers. PM2.5 is a measure of smaller particles in the air.

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

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

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

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

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

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

1 INTRODUCTION

This report supports a State Significant Development (SSD) Development Application (DA) for the Wee Hur Regent residential development at 90-102 Regent Street, Redfern.

1.1 Site Description

The site currently holds a row of two-storey attached terraces with ground floor retail and an attached four-storey mixed-use building with ground floor retail at 98-102 Regent Street.

The site boundary is identified in Figure 1-1 and Figure 1-2.

Figure 1-1 Site location

The surrounding area contains a mixed range of land uses and developments. To the north, several high-rise residential towers are currently under construction or recently completed. They contain a mix of ground floor retail tenancies, including a supermarket. They are predominantly residential, including student housing on the upper levels with some commercial office space within. To the immediate south, there is a BP Service Station which shares a boundary with the site. To the west, there are two sites with a light industrial character and a five-storey apartment building. To the east, opposite the site, are four- and five-storey shop top apartment buildings and a mechanics workshop.

The area to the east is characterised by attached buildings between 2-4 storeys in height. Development along Redfern Street and Regent Street are typified by retail on the ground levels and apartments on the upper storeys. Secondary streets typically contain attached residential terraces. The site is located approximately 150m southeast of Redfern Station.

Figure 1-2 Aerial photograph of the site and its context

1.2 Overview of the Proposed Development

It is proposed to build an 18-storey mixed-use development. The proposal includes the following elements:

- Site area 1,287m^2.
- Demolition of the existing structures on site.
- Two levels of basement waste management and utilities.
- The ground floor contains 134 bicycle parking, retail tenancy, common areas associated with the student housing development accessible from Regent Street, plant room, laundry, games room and fire control centre.
- 17-storey purpose-built student accommodation development comprising 381 rooms with a total of 408 beds and indoor and outdoor common areas.

1.3 The Proposed Construction

A detailed construction methodology and plant selection has not been completed at this stage. The construction methodology would typically be:

- Demolition – The demolition would include internal strip out and removal of existing structures. Typical plant would include excavator, cranes, concrete saws and hand tools.
- Excavation – Excavation would include excavation of the basement levels and piling. Typical plant would include rock hammers, excavators and trucks.
- Building construction - The building construction would include formwork erection, concrete pours, cranes, trucks and hand tools.

1.4 Assessment Requirements

The Department of Planning, Industry and Environment have issues Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development. This report has been prepared having regard to the SEARs as summarised in Table 1-1.

Table 1-1 SEARs

SEAR	Where addressed
13. Air Quality, Odour and Waste The EIS shall: · address the potential air quality, odour and waste impacts during the construction and operation of the development and appropriate mitigation measures. · detail any air quality control measures to be implemented into the Construction Management plan to reduce air quality impacts during demolition, excavation and construction.	Section 4 Section 5 Section 6

Wilkinson Murray Pty Limited has been engaged to prepare an Air Quality Impact Assessment (AQIA) (dust and odour) for the operation and construction works proposed for the development.

2 AIR QUALITY CRITERIA

2.1 Introduction

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

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The sections below identify the pollutants of interest in this study and the applicable air quality criteria for each pollutant.

2.2 Pollutants of Interest

Potential air pollutants associated with the Project comprise dust and particulate matter. Specifically, the following pollutants are identified:

- Total Suspended Particulates (TSP);
- Particulate Matter (PM_{10});
- Carbon Monoxide (CO); and
- Nitrogen Dioxide (NO_2).

The $PM_{2.5-10}$ fraction typically contributes approximately 90% of total PM_{10} emissions from construction activities, with $PM_{2.5}$ contributing approximately 10% of total PM_{10} emissions. Therefore, in accordance with the IAQM guidance, PM_{10} is adopted as the air pollutant most relevant to potential health impacts.

2.3 Impact Assessment Criteria

The Approved Methods specifies air quality assessment criteria for assessing impacts from dust generating activities. These criteria are consistent with the National Environment Protection Measures for Ambient Air Quality (NEPC, 1998).

Table 2-1 summarises the air quality goals for dust and particulate matter that are relevant to this study. The air quality goals relate to the total concentrations of dust and particulate matter in the air and not just that from the project. Therefore, some consideration of background levels needs to be made when using these goals to assess impacts.

Table 2-1 Impact assessment criteria – dust and particulate matter

Pollutant	Averaging period	Criteria
Total suspended particulates (TSP)	Annual	90 µg/m³
Particulate matter ≤10 µm (PM_{10})	Annual	25 µg/m³
	24-hour	50 µg/m³
Particulate matter ≤2.5 µm ($PM_{2.5}$)	Annual	8 µg/m³
	24-hour	25 µg/m³
CO	1-hour	50 mg/m³
	8-hour	10 mg/m³

Pollutant	Averaging period	Criteria
NO_2	1-hour	246 µg/m³
	Annual	62 µg/m³

For this project where we are considering potential construction air quality impacts the particulate criteria is required to be considered.

3 EXISTING ENVIRONMENT

3.1 Local Climatic Conditions

Long-term climatic data from the closest Bureau of Meteorology (BoM) weather station at Sydney Airport Aeronautical Meteorological Office (AMO) (Site No. 066037) were analysed to characterise the local climate in the proximity of the Study Area. The Sydney Airport AMO weather station is located approximately 5km west-northwest of the Study Area.

Table 3-1 present a summary of data from the Sydney Airport AMO weather station collected over a 71 to 87-year period for the various meteorological parameters.

The data indicate that January is the hottest month with a mean maximum temperature of 26.5 degrees Celsius (ºC) and July is the coldest month with a mean minimum temperature of 7.2ºC.

Rainfall peaks during the first half of the year declines during the latter, with an annual average rainfall of 1083.7 millimetres (mm) over 96.0 days. The data indicate that June is the wettest month with an average rainfall of 122.5mm over 8.8 days and September is the driest month with an average rainfall of 60.3mm over 6.8 days.

Relative humidity exhibits little variability across the year. Mean 9.00am relative humidity ranges from 61% in October to 74% in June. Mean 3pm relative humidity levels range from 49% in August to 63% in February.

Wind speeds during the warmer months have a greater spread between the 9.00am and 3.00pm conditions compared to the cooler months. Mean 9am wind speeds range from 12.6 kilometres per hour (km/h) in May to 16.3km/h in October. Mean 3pm wind speeds range from 17.1km/h in May to 25.3km/h in November.

Table 3-1 Monthly climate statistics summary – Sydney Airport AMO

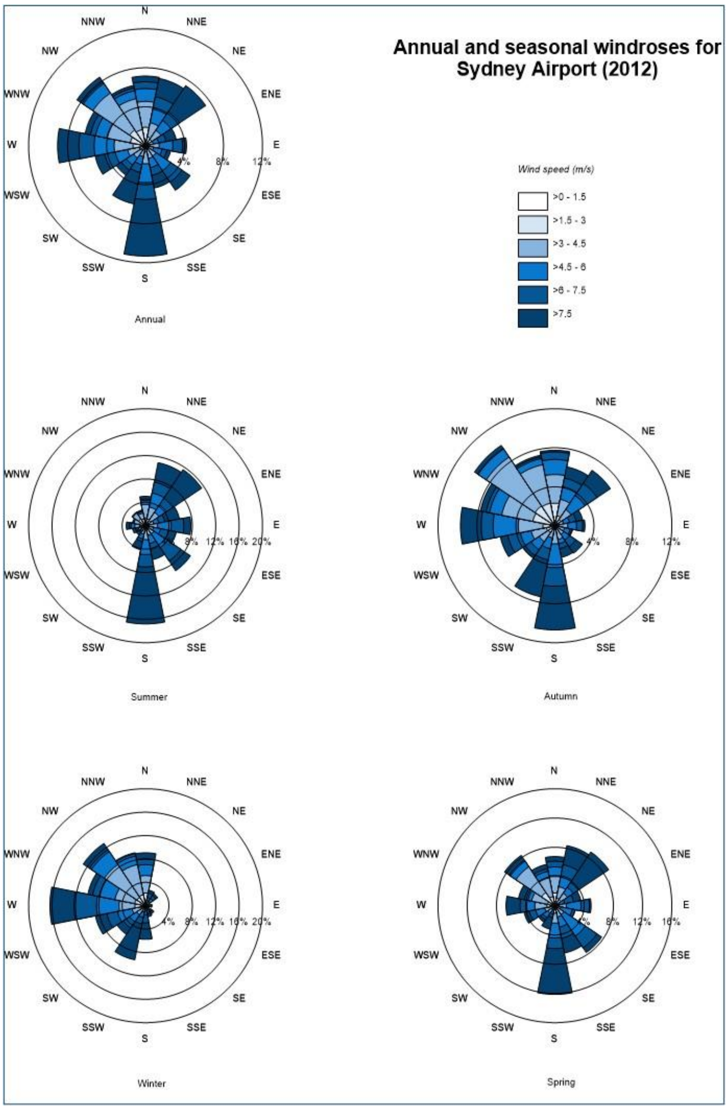
Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Temperature													
Mean max. temperature (ºC)	26.5	26.4	25.3	22.9	20.0	17.6	17.0	18.4	20.6	22.6	24.1	25.8	22.3
Mean min. temperature (ºC)	18.9	19.1	17.6	14.2	11.0	8.7	7.2	8.2	10.5	13.3	15.5	17.5	13.5
Rainfall													
Rainfall (mm)	95.9	111.1	115.7	109.3	98.6	122.5	69.6	76.8	60.3	70.3	81.5	74.0	1083.7
Mean No. of rain days (≥1mm)	8.1	8.5	9.2	8.6	8.5	8.8	6.7	6.8	6.8	7.8	8.4	7.8	96.0
9am conditions													
Mean temperature (ºC)	22.4	22.3	21.1	18.2	14.6	11.9	10.8	12.5	15.7	18.4	19.9	21.6	17.4
Mean relative humidity (%)	70	73	73	71	73	74	71	65	62	61	64	66	69
Mean wind speed (km/h)	14.4	13.8	12.9	12.9	12.6	13.4	13.3	14.4	15.5	16.3	16.0	14.8	14.2
3pm conditions													
Mean temperature (ºC)	24.8	24.8	23.9	21.7	19.0	16.6	16.1	17.2	19.0	20.7	22.1	23.9	20.8
Mean relative humidity (%)	60	63	61	59	58	57	52	49	51	54	56	58	57
Mean wind speed (km/h)	24.1	23.0	21.0	19.3	17.1	17.8	18.2	20.8	23.1	24.6	25.3	25.2	21.6

Source: **Bureau of Meteorology, 2020**
RH = Relative Humidity, WS = Wind speed

3.2 Local Meteorological Conditions

Annual and seasonal windroses for the Sydney Airport weather station during the 2012 calendar period are presented in Figure 3-1.

Figure 3-1 Annual and seasonal windroses for Sydney Airport (2012)



In summer, winds are typically from the north-east and southeast quadrants, with dominant winds from the northeast and south. The autumn distribution is similar to the annual distribution with a high portion of winds from the north-west. During winter, winds are typically from the southwest and northwest quadrants, with winds from the northeast most frequent. Spring has similar distribution to the annual distribution; however, indicates a slightly higher portion of northeast winds

3.3 Ambient Air Quality

The main sources of air pollutants in the area surrounding the Site include emissions from local commercial or industrial activities, motor vehicle exhaust and domestic wood heaters. The available data from the nearest air quality monitors operated by the NSW Department of Planning, Industry and Environment (DPIE) were used to quantify the existing air quality levels at the Study Area.

The NSW DPIE air quality monitors at Randwick, Earlwood, Rozelle and Cook and Phillip are approximately 2 to 7km from the site and are considered to be generally representative of the background levels in the vicinity of the Study Area. The data from Randwick monitoring station has been used to quantify the existing ambient levels of air pollutants around the site.

3.3.1 PM_{10} monitoring

A summary of the available PM10 data from the Randwick monitoring station is presented in Table 3-2.

Table 3-2 Summary of PM_{10} levels from NSW DPIE TEOM monitoring (µg/m³)

Station ID	Annual average					Maximum 24-hour average				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Randwick	18.6	18	19.2	21.2	24.1	77.4	44.1	56	95.5	127.7

3.3.2 $PM_{2.5}$ monitoring

A summary of the PM2.5 data from the Randwick monitoring station is presented is presented in Table 3-3.

Table 3-3 Summary of $PM_{2.5}$ levels from NSW DPIE monitoring (µg/m³)

Station ID	Annual average					Maximum 24-hour average				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Randwick	-	-	-	7.6	10.8	-	-	45.3	31.8	95.2

3.3.3 NO_2 monitoring

Table 3-4 presents a summary of the annual average and maximum 1-hour average NO_2 monitoring data recorded at the Randwick monitoring station.

Table 3-4 Summary of NO_2 levels from NSW DPIE monitoring sites (µg/m³)

Station ID	Annual average					Maximum 1-hour average				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Randwick	16.4	16.4	-	14.4	14.4	88.2	90.2	84.1	82.0	104.6

3.3.4 CO monitoring

Table 3-5 presents a summary of the CO monitoring data recorded at Rozelle monitoring station as Randwick does not monitor that pollutant.

Table 3-5 Summary of CO levels from NSW EPA monitoring sites (mg/m³)

Station ID	Maximum 1-hour average				
	2015	2016	2017	2018	2019
Rozelle	2.0	2.1	1.5	1.3	6.5

4 CONSTRUCTION DUST ASSESSMENT

4.1 Assessment Methodology

This section presents a qualitative assessment of potential air quality impacts associated with the proposed demolition/excavation/construction works, as these would typically generate the highest level of dust, and has been conducted in general accordance with the methodology described in *Guidance on the assessment of dust from demolition and construction* (IAQM, 2014) prepared by the UK Institute of Air Quality Management (IAQM). This approach presents the risk of dust soiling and human health impacts associated with construction and demolition works and involves the following steps:

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

4.2 Risk Assessment of Dust Impacts from Construction Works

The following qualitative risk assessment of potential dust impacts has been conducted for the proposed construction works.

4.2.1 Step 1 – Screen the need for a detailed assessment

The IAQM guidance document recommends that a risk assessment of potential dust impacts from construction activities be undertaken when sensitive receptors are located within:

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

As shown in Table 1-2, a number of sensitive receptors are located within 350m of the site and within 50m of routes used by construction traffic. Therefore, an assessment of dust impacts is considered necessary under the guideline.

4.2.2 Step 2A – Potential dust emission magnitude

The following section evaluates the potential dust emission magnitude for demolition, earthworks, construction and trackout (i.e. haulage) activities. These emission magnitudes have been classified based on the examples provided in the IAQM guidance document (Section 7, Step 2: Assess the Risk of Dust Impacts).

Demolition dust emission magnitudes may be defined as:

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

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

The total volume of structures to be demolished is less than 20,000m^3. Therefore, the dust emission magnitude for the proposed demolition works is classified as **small**.

The dust emission magnitude associated with earthworks activities may be classified as:

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

The total site area is less than 2,500m^2. Therefore, the dust emission magnitude for earthworks activities is classified as **small**.

The dust emission magnitude associated with general construction activities may be classified as:

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

The total building volume of new structures to be built would be between 25,000 - 100,000 m^3. Therefore, the dust emission magnitude for the construction of the development is classified as **medium**.

The dust emission magnitude associated with trackout by heavy vehicles may be classified as:

- **Large:** >50 heavy vehicle (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- **Medium:** 10-50 heavy vehicle outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m; and,
- **Small:** < 10 heavy vehicle outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.

It is unknown how many heavy vehicle movements would occur. It is estimated to range from 10-20 during demolition to 10-20 during construction. Therefore, the dust emission magnitude for trackout is classified as **medium**.

4.2.3 Step 2B – Sensitivity of surrounding area

The sensitivity of the surrounding area to dust impacts considers a number of factors, including:

- Specific receptor sensitivities;
- The number of receptors and their proximity to the works;
- Existing background dust concentrations; and,
- Site-specific factors that may reduce impacts, such as trees that may reduce wind-blown dust.

Specific sensitivities for dust soiling and human health impacts at receptors relevant to this study are summarised in Table 4-1.

Table 4-1 Receptor sensitivities

Sensitivity	Example land uses	
	Dust soiling	**Human health**
High	Dwellings, museums and culturally important collections, medium-long term carparks and car showrooms	Residential properties, hospitals, schools and residential care homes
Medium	Parks and places of work	Offices and shops
Low	Playing fields, footpaths, short-term carparks and roads	Footpaths, playing fields and parks

Residents in nearby apartments are considered highly sensitive to both dust soiling and health impacts. These receptors are unlikely to be located withing 50 metres of the works. There is potential for more than 100 of these receptors to be located within 50 metres of the works.

Based on the above factors and following the decision matrix in Table 2 of the IAQM guidance document and presented in Figure 4-1, the area surrounding the works is determined to have a **medium** sensitivity to dust soiling impacts.

Figure 4-1 Area sensitivity decision matrix – dust soiling

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)[c]			
		<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

In accordance with the decision matrix in Table 3 of the IAQM guidance document and presented in Figure 4-2, the area surrounding the works is determined to have a **low** sensitivity to human health impacts from construction dust.

Figure 4-2 Area sensitivity decision matrix – human health

Receptor Sensitivity	Annual Mean PM_{10} concentration[c]	Number of Receptors[d]	Distance from the Source (m)[e]				
			<20	<50	<100	<200	<350
High	>32 µg/m³ (>18 µg/m³ in Scotland)	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m³ (16-18 µg/m³ in Scotland)	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m³ (14-16 µg/m³ in Scotland)	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m³ (<14 µg/m³ in Scotland)	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m³ (>18 µg/m³ in Scotland)	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m³ (16-18 µg/m³ in Scotland)	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m³ (14-16 µg/m³ in Scotland)	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m³ (<14 µg/m³ in Scotland)	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

The determinations of area sensitivities to dust soiling and human health impacts from the proposed works are summarised in Table 4-2.

Table 4-2 Sensitivity of the surrounding area

Impact	Key factors	Sensitivity of the area
Dust Soiling	Receptor sensitivity = high >100 receptors within 50m of works	Medium (ref. IAQM Table 2)
Human Health	Receptor sensitivity = high >100 receptors within 50m of works Annual average PM_{10} concentration < 24 µg/m³	Low (ref. IAQM Table 3)

4.2.4 Step 2C – Define the risk of impacts

To define the risk of impacts, the dust emission magnitudes for demolition (small), earthworks (small), general construction (medium) and trackout (medium) are combined with the sensitivity of the area, as per Table 4-3, Table 4-4, Table 4-5 and Table 4-6, respectively.

Table 4-3 Risk of dust impacts from demolition

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

In accordance with Table 4-3, demolition activities associated with the Proposal are considered to have a **low** risk of dust soiling impacts and a **negligible** risk of health impacts.

Table 4-4 Risk of dust impacts from earthworks

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

In accordance with Table 4-4, earthworks activities associated with the Proposal are considered to have a **low** risk of dust soiling impacts and a **negligible** risk of health impacts.

Table 4-5 Risk of dust impacts from construction

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

In accordance with Table 4-5, general construction activities associated with the Proposal are considered to have a **medium** risk of dust soiling impacts and a **low** risk of health impacts.

Table 4-6 Risk of dust impacts from trackout

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

In accordance with Table 4-6, vehicle trackout associated with the construction of the Proposal is considered to have a **low** risk of dust soiling impacts and a **low** risk of health impacts.

The identified dust risks associated with the construction of the Proposal are summarised in Table 4-7.

Table 4-7 Summary of dust risks

Potential impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low Risk	Low Risk	Medium Risk	Low Risk
Human Health	Negligible	Negligible	Low Risk	Low Risk

4.2.5 Step 3 – Site-specific mitigation

The IAQM guidance document identifies a range of appropriate dust mitigation measures that should be implemented as a function of the risk of impacts. These measures are presented in Section 5.

4.2.6 Step 4 – Significance of residual impacts

In accordance with the IAQM guidance document, the final step in the assessment is to determine the significance of any residual impacts, following the implementation of mitigation measures. To this end, the guidance states:

> *For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be "not significant".*

Based on the proposed construction works, and the advice in the IAQM guidance document, it is considered unlikely that these works would result in unacceptable air quality impacts, subject to the implementation of the mitigation measures outlined in Section 5.

5 MITIGATION & MANAGEMENT

5.1 Mitigation Measures

The preceding assessment of potential dust impacts from the proposed construction works indicates that, in the absence of specific mitigation measures, the works have a medium risk of dust soiling impacts and a negligible risk of health impacts.

Accordingly, the following mitigation measures are recommended. A Dust Management Plan (DMP) should be developed prior to commencement of works and should consider the following measures where practicable:

- **Communications**
    - Develop and implement a stakeholder communications plan that includes community engagement before construction work commences on site.
    - Display the name and contact details of the Responsible Person accountable for air quality and dust issues on the site boundary.
    - Develop and implement a Dust Management Plan (DMP) that considers, as a minimum, the measures identified herein.
- **Site management**
    - Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
    - Make the complaints log available to relevant authorities (Council, EPA, DP&E).
    - Record any exceptional incidents that cause dust and/or air emissions, either on or off site, and the action taken to resolve the situation in the log book.
- **Monitoring**
    - Undertake daily on-site and off-site inspections, where receptors are nearby, to monitor dust, record inspection results, and make inspection log available to relevant authorities.
- **Preparing and maintaining the site**
    - Avoid site runoff of water or mud.
    - Keep site fencing, barriers and scaffolding clean using wet methods.
    - Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If being re-used, keep materials covered.
- **Construction vehicles and sustainable travel**
    - Ensure all vehicles switch off engines when stationary - no idling vehicles.
- **Operations**
    - Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays.
    - Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
    - Use enclosed chutes and conveyors and covered skips.

- **Measures specific to demolition**
  - Soft strip inside buildings before demolition, thereby retaining walls and windows in the rest of the building where possible to provide a screen against dust.
  - Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- **Measures specific to construction**
  - 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.
- **Measures specific to trackout (haulage)**
  - Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
  - Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

Prior to the commencement of construction / demolition works, the dust mitigation management measures recommended should be considered and, where practicable, included in the *Construction Environmental Management Plan* (CEMP) for the project.

6 OPERATIONAL AIR QUALITY

The operational air quality assessment primarily provides a qualitative assessment of potential air quality impacts from the BP Service Station to the proposed development; however, it also reviews the potential impacts of air quality and odour to its neighbouring buildings.

When filling underground fuel storage tanks or vehicle fuel tanks, the volume of fuel entering the tank will displace an equal volume of 'air'. Due to the relatively high volatility of petrol, the 'air' which is displaced contains a significant proportion of petrol vapours, containing benzene, xylene, toluene and other volatile organic compounds (VOCs). These compounds are odorous and contribute to local, regional and global air pollution.

To mitigate the potential for air quality impacts (including odour) from service stations the EPA in their *Environment Operations (Clean Air) Regulation* (the Regulation) require petrol stations in the metropolitan area to have stage 1 and 2 vapour recovery systems.

Vapour recovery control equipment aims to capture petrol vapours before they enter the atmosphere. VR1 captures displaced vapours from storage tanks when a tanker delivers petrol to a service station, while VR2 captures displaced vapours at the bowser while a motorist refuels. The VR1 capture efficiency is approximately 97% and VR2 capture efficiency is approximately 85% of petrol vapour.

A site inspection of the BP Service Station neighbouring the proposed development was conducted. The station is newly developed and appears to have both stage 1 and 2 vapour recovery systems. The station design specifically the locations of fuel bowsers and tank filling points appear to be located as far away from the development as practicable. During the site visit there were no VOC odours detectable.

Due to the fact that the service station includes Stage 1 and 2 vapour recovery systems Wilkinson Murray considers that there would be negligible impact of air quality and odour from the BP Service Station on the proposed development.

With respected to minimising air quality and odour to adjoining properties the following have been considered in the design:

- garbage storage room is located towards the centre of the development and enclosed; and
- the common area kitchens, retail kitchen and SOU kitchenette have all been design for localised façade discharges distributing the potential for odour impacts.

7 CONCLUSION

Wilkinson Murray Pty Limited has been engaged to prepare an Air Quality Impact Assessment (AQIA) for the construction works and operation for the proposed mixed-use development (retail and student housing) at 90-102 Regent Street, Redfern.

A qualitative assessment of potential air quality impacts associated with the proposed construction works has been conducted in general accordance with the methodology described in *Guidance on the assessment of dust from demolition and construction* (IAQM, 2014) prepared by the UK Institute of Air Quality Management (IAQM).

In accordance with the IAQM assessment methodology, the construction of the Proposal is considered to have a medium risk of dust soiling impacts and a negligible risk of health impacts. Accordingly, a range of management and mitigation measures have been identified to minimise these impacts.

Subject to the implementation of mitigation measures, the residual effects of dust from the project are expected to be not significant and to have a low to medium risk of generating unacceptable air quality impacts.

Due to the fact that the service station includes Stage 1 and 2 vapour recovery systems Wilkinson Murray considers that there would be negligible impact of air quality and odour from the BP Service Station on the proposed development.

When designing the project minimising air quality and odour to adjoining properties has been considered.