SFS Response to Submissions

(SSD9249)

Attachment 11- Air Quality Impact Assessment

September 2018

INFRASTRUCTURE NSW

A C O U S T I C S   A N D   A I R

SYDNEY FOOTBALL STADIUM REDEVELOPMENT - STAGE 1

AIR QUALITY IMPACT ASSESSMENT

REPORT NO. 18274
VERSION C

SEPTEMBER 2018

PREPARED FOR

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DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	7 August 2018	Nic Hall	John Wassermann
A	Final	20 August 2018	Nic Hall	John Wassermann
B	Final	20 August 2018	Nic Hall	John Wassermann
C	Final	13 September 2018	Nic Hall	John Wassermann

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GLOSSARY OF AIR QUALITY TERMS

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

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

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

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

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

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

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

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

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

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

Fugitive Emissions – Emissions not caught by a capture system.

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

Hydrogen Sulphide (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

A State Significant Development (SSD) application for the redevelopment of the Sydney Football Stadium has been submitted to the Minister for Planning, pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The redevelopment of the Sydney Football Stadium is proposed in a staged manner as follows:

- Stage 1 – Concept Proposal for the stadium envelope and supporting retail and functional uses as well as development consent for the carrying out of early works, including demolition of the existing facility and associated structures.
- Stage 2 – Detailed design, construction and operation of the stadium and supporting businesses, retail and functional uses.

Wilkinson Murray Pty Limited has been engaged by Infrastructure New South Wales to prepare an Air Quality Impact Assessment (AQIA) for the early works proposed under Stage 1 of the Sydney Football Stadium redevelopment.

1.1 Purpose of this Report

The Secretary's Environmental Assessment Requirements (SEARs) for the project (ref. SSD 9429) did not include a requirement for a detailed AQIA. However, subsequent to the exhibition of the Environmental Impact Statement (EIS) for the project, the Department of Planning and Environment (DP&E) have requested an assessment of potential dust emissions associated with the proposed demolition activities, including potential on-site crushing of concrete. Accordingly, this report presents a qualitative assessment of potential dust impacts in accordance with the *Guidance on the assessment of dust from demolition and construction* (IAQM, 2014), prepared by the UK Institute of Air Quality Management (IAQM), and identifies appropriate mitigation and management measures to minimise these impacts.

2 PROJECT DESCRIPTION

2.1 Site Location

The site is located at 40-44 Driver Avenue, Moore Park. The site is located on the eastern edge of the city, approximately 3 kilometres from the Sydney CBD, and forms part of a large entertainment and recreation precinct shared with Centennial and Moore parks, Fox Studios and the Entertainment Quarter. It is located in the north corner of the precinct and is bounded by Moore Park Road to the north, Paddington Lane to the east, the existing Sydney Cricket Ground stadium to the south and Driver Avenue to the west. The site is located immediately to the south of the suburb of Paddington, with the suburbs of Centennial Park to the east and Surry Hills to the West.

The location of the site is show in Figure 2-1.

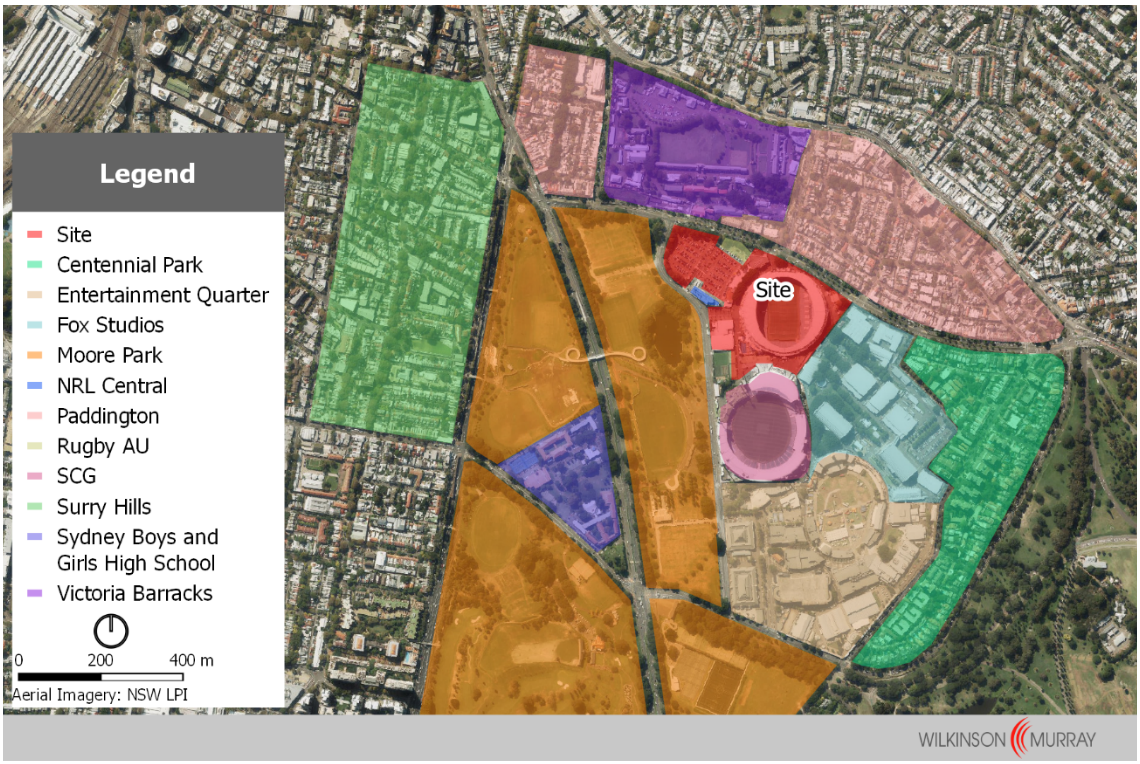
2.1.1 Sensitive Receptors

A number of sensitive receptors are located in proximity to the site, including:

- Residences in nearby Paddington, Centennial Park and Surry Hills;
- Places of work within:
  - Rugby AU/ UTS;
  - NRL Central;
  - The SCG;
  - Fox Studios; and,
  - The Entertainment Quarter;
- Moore Park
- Victoria Barracks;
- Kira Child Care Centre; and,
- Sydney Boys and Girls High School.

These sensitive receptors are shown in Figure 2-1.

Figure 2-1 Site Location and Sensitive Receptors



2.2 Overview of the Proposal

Stage 1 of the Sydney Football Stadium redevelopment includes both a Concept Proposal and an Early Works package.

The Concept Proposal Comprises:

- A new stadium with up to 45,000 seats on the site of the existing stadium including:
    - New facilities for general admission;
    - New paying pitch;
    - Hospitality facilities; and,
    - Ancillary food and beverage and entertainment facilities.
- New basement with service vehicular access for servicing and bump-in/bump-out;
- New public domain works surrounding the stadium, building on the venue's unique parkland setting;
- Urban Design and Public Domain Guidelines; and,
- Signage strategy.

Indicative concept building envelope plans are included within the Environmental Impact Statement for the project. These plans outline the extent of the proposed stadium building envelope and surrounding public domain to be included in the Stage 1 planning application.

From a capacity, operational and mix-of-use perspective, the new stadium will be consistent with the existing Allianz Stadium.

The Stage 1 Early Works comprise:

- Site establishment, including erection of site protection fencing and temporary relocation of facilities;
- Decommissioning and demolition of the existing stadium and associated structures including the existing Sheridan, Roosters and Waratahs buildings and the administration building of Cricket NSW to ground level and 'make safe' of the site;
- Use of the existing Moore Park 1 car park for construction staging; and,
- Make good of the site suitable for construction of the new stadium (subject to separate Stage 2 application).

The Sydney Football Stadium redevelopment will create a new stadium with up to 45,000 seats through a range of seating styles and corporate facilities. The stadium will include state of the art technology with digital screens throughout to improve the fan experience. Sightlines will be improved and facilities including catering, amenities and accessibility will be designed to service future needs, creating a world-class customer experience.

2.3 Demolition

2.3.1 Methodology

The anticipated demolition methodology is outlined in Table 2-1

Table 2-1 Indicative Demolition Staging

Stage	Description	Duration (approx.)
1 – Procurement & establishment	Establishment of project office compound. Installation of sedimentation fencing and erosion controls. Installation of perimeter hoardings, fences and signage.	30 days
2 – Ancillary building demolition works	Removal of classified hazardous materials. Removal of internal fitout. Demolition of roof structure. Demolition of concrete structural components. Breaking up of concrete.	190 days
3 – Stadium demolition works	Removal of classified hazardous materials. Removal of internal fitout. Demolition of roof structure. Demolition of concrete structural components. Breaking up of concrete.	240 days

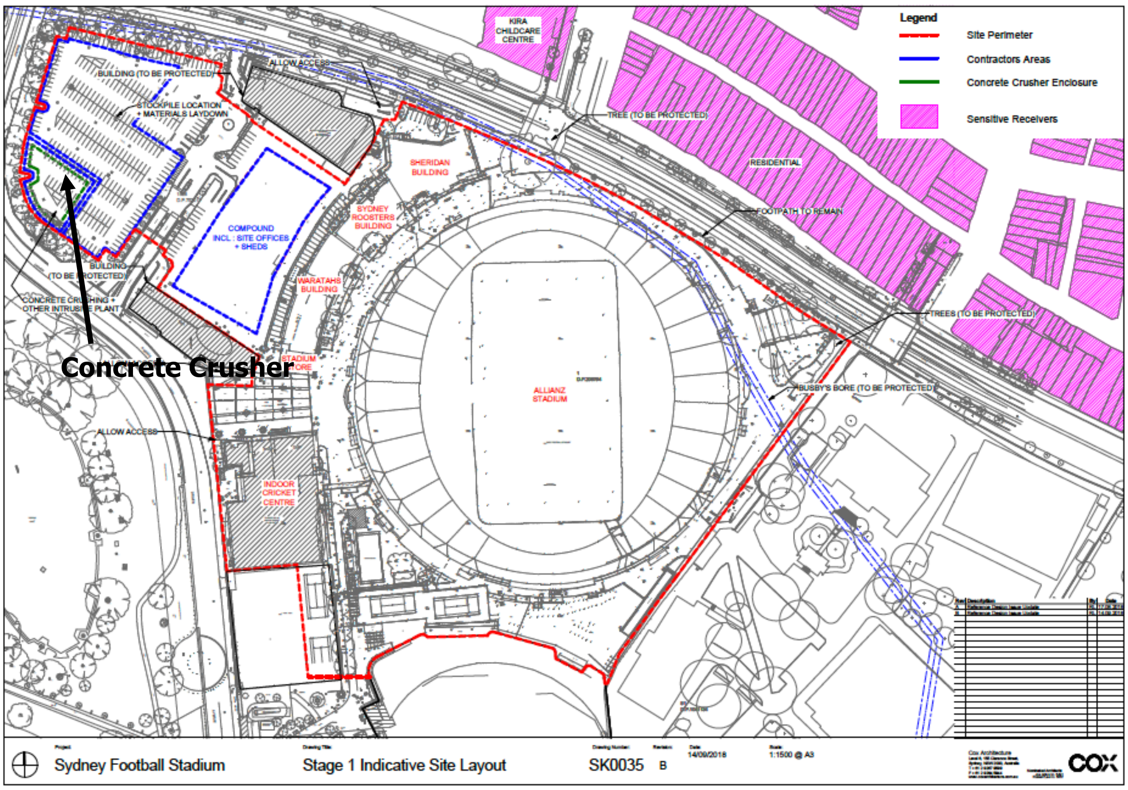
2.3.2 Plant and Equipment

Plant and equipment required for the works would be determined by the demolition contractor. However, the works are anticipated to require the following:

- 250 – 400 tonne cranes and boom lifts
- 50 tonne mobile cranes
- Excavators (including rockbreaker attachments and hydraulic shears)
- Concrete crusher
- Jackhammers
- Dump trucks
- Water carts; and
- Hand tools and other small equipment.

the concrete crusher would be in an enclosure and its location is shown in Figure 2-2.

Figure 2-2 Construction Site Plan



2.3.3 Hours

The demolition works would largely be confined to the following standard construction hours:

- 7:00am to 6:00pm Monday to Friday;
- 8:00am to 1:00pm Saturday; and,
- No work on Sunday or public holidays.

2.3.4 Site Access

Site access for demolition activities is outlined at section 6.6 of the Transport Impact Assessment, Appendix J to the EIS. The access points include:

- Paddington Lane, off Moore Park Road;
- Gate 4, off Moore Park Road opposite Oatley Road; and
- Through the existing MP1 car park entrance off Driver Avenue and Moore Park Road.

3 AIR QUALITY CRITERIA

3.1 Introduction

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

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.

3.2 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} and $PM_{2.5}$); and,
- Deposited Dust.

3.3 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 3-1 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 3-1 Impact Assessment Criteria – Dust and Particulate Matter

Pollutant	Averaging period	Impact	Criteria
Total suspended particulates (TSP)	Annual	Total	90 µg/m³
Particulate matter ≤10 µm (PM_{10})	Annual	Total	25 µg/m³
	24-hour	Total	50 µg/m³
Particulate matter ≤2.5 µm ($PM_{2.5}$)	Annual	Total	8 µg/m³
	24-hour	Total	25 µg/m³
Deposited dust (DD)	Annual	Total	4 g/m²/month
	Annual	Incremental	2 g/m²/month

4 EXISTING ENVIRONMENT

4.1 Local Climate

Meteorological conditions strongly influence air quality. Most significantly, wind speed, wind direction, temperature, relative humidity, and rainfall affect the dispersion of air pollutants. The following sub-sections discuss the local meteorology near the Proposal site.

4.1.1 Wind

Observations of wind speed and direction from the Office of Environment and Heritage (OEH) air quality monitoring station (AQMS) at Randwick have been selected to represent typical wind patterns in the area surrounding the site. The Randwick AQMS is located approximately 5 kilometres south east of the site.

Figure 4-1presents annual and seasonal "wind rose" plots for the Randwick AQMS for the period 2013 to 2017, inclusive. The plots show that north-easterly winds are prevalent in summer and spring and westerly winds are prevalent in winter and autumn.

4.1.2 Temperature Humidity and Rainfall

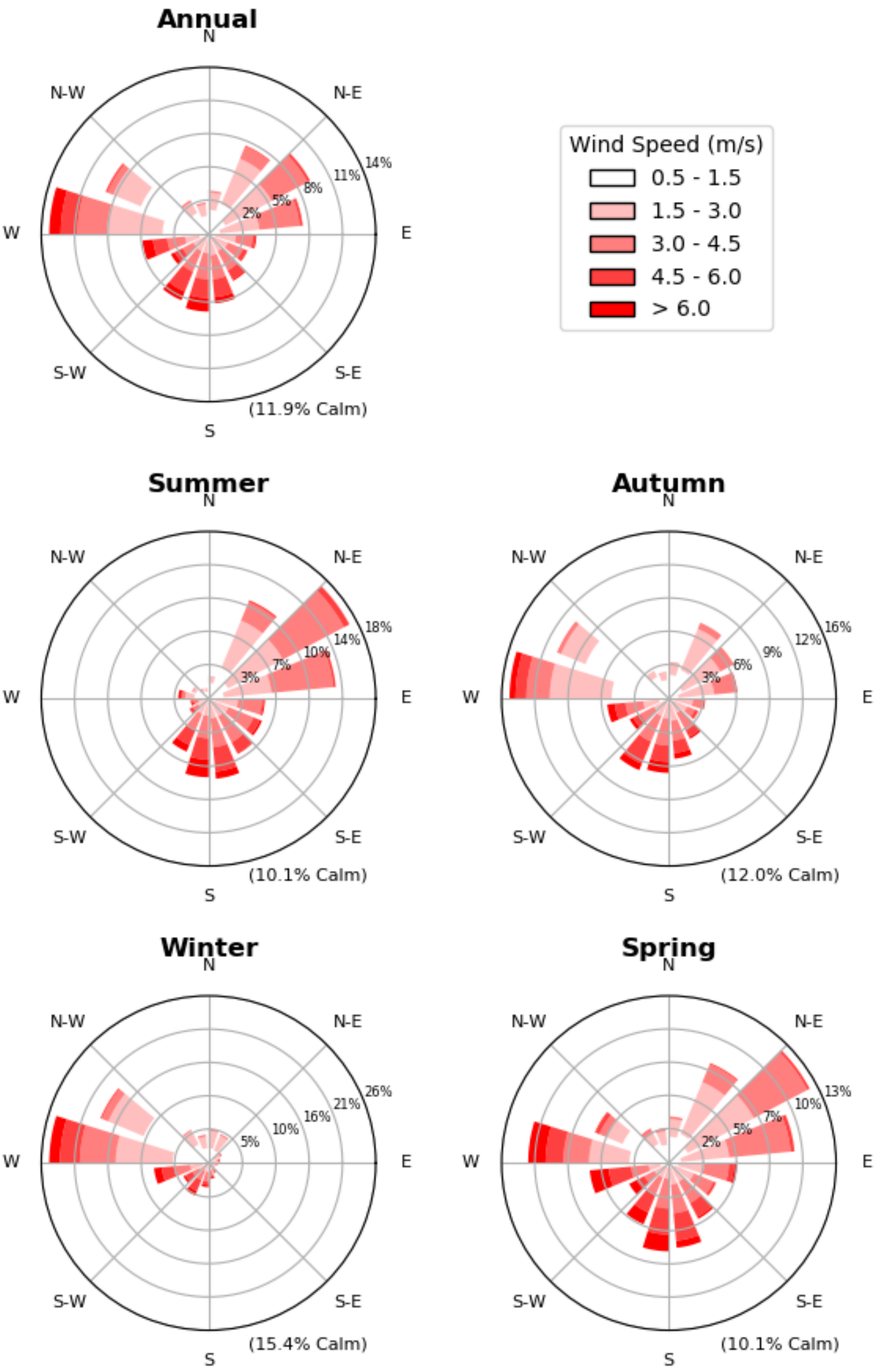
Long term meteorological data for the area surrounding the Site is available from the Bureau of Meteorology (BoM) operated weather station at Observatory Hill. The Observatory Hill BoM station is located approximately 3.7 km north west of the Proposal site and records observations of a number of meteorological parameters including temperature, humidity, and rainfall.

Long-term climate statistics are presented in Table 4-1. Temperature data recorded at the Observatory Hill BoM station indicates that January is the hottest month of the year, with a mean daily maximum temperature of 26.0°C. July is the coolest month with a mean daily minimum temperature of 8.1°C. June is the wettest month with an average rainfall of 133 mm falling over 9 days. There are, on average, 100 rain days per year, delivering 1,216 mm of rain.

Table 4-1 Climate Averages for Observatory Hill BoM Station

Obs.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
9am Mean Observations													
Temp (°C)	22.5	22.3	21.1	18.2	14.6	11.9	10.9	12.5	15.7	18.5	19.9	21.6	17.5
Hum (%)	71	74	74	72	74	74	71	66	62	61	66	67	69
3pm Mean Observations													
Temp (°C)	24.8	24.9	24.0	22.0	19.4	16.9	16.4	17.5	19.2	20.7	22.1	23.8	21.0
Hum (%)	62	64	62	59	57	57	51	49	51	56	58	59	57
Daily Minimum and Maximum Temperatures													
Min (°C)	18.8	18.8	17.6	14.7	11.6	9.3	8.1	9.0	11.1	13.6	15.7	17.6	13.8
Max (°C)	26.0	25.8	24.8	22.5	19.5	17.0	16.4	17.9	20.1	22.2	23.7	25.2	21.8
Rainfall													
Rain (mm)	101.7	117.5	130.8	127.9	118.0	133.2	96.6	80.7	67.9	76.4	83.6	77.5	1216
Rain (days)	8.6	9.0	9.8	9.0	8.6	8.7	7.5	7.2	7.2	7.9	8.4	8.0	99.9

Figure 4-1 Windrose Plot – Randwick OEH AQMS, 2013-2017



4.2 Local Ambient Air Quality

Data from the Randwick AQMS has been used to establish typical ground level concentrations of particulate matter in the area surrounding the Proposal. A summary of the PM_{10} and $PM_{2.5}$ monitoring results collected at the Randwick AQMS over the period 2013 – 2017 is presented in Table 4-2.

From time to time, the 24-hour average concentrations of PM_{10} and $PM_{2.5}$ exceed the goals of 50 µg/m^3 and 25 µg/m^3, respectively. These events are most often associated with extreme conditions such as bushfires, hazard reduction burning and dust storms. Where the maximum 24-hour average particulate matter concentrations in a particular year exceeded the goal, Table 4-2 presents the next highest value. In all cases, the next highest values comply with the goals.

It is noted that observations of $PM_{2.5}$ at the Randwick AQMS began in 2017.

Table 4-2 Particulate Matter Monitoring Results – Randwick

Year	PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m^3)	
	24-hour average (100th percentile)	Annual average	24-hour average (100th percentile)	Annual average
2013	55.3 (45.3)	18.8	No data	
2014	46.1	18.1		
2015	77.4 (41.9)	18.6		
2016	44.1	17.9		
2017	56.0 (46.2)	19.2	45.3 (22.0)	6.9

5 ASSESSMENT OF IMPACTS

5.1 Assessment Methodology

This section presents a qualitative assessment of potential air quality impacts associated with the proposed demolition works 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.

5.2 Risk Assessment of Dust Impacts from Demolition Works

The following qualitative risk assessment of potential dust impacts has been conducted for the proposed demolition works. These works include those activities outlined in Section 2.3.

5.2.1 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:

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

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

5.2.2 Step 2A – Potential dust emission magnitude

In accordance with 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 > 50,000 m^3, potentially dust 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 < 10 m above ground level, demolition during wetter months.

The total building volume, which includes concrete structures, to be demolished under the Proposal exceeds 50,000 m^3 and it is proposed that on-site concrete crushing could occur. Therefore, the dust emission magnitude for the proposed demolition works is classified as large.

5.2.3 Step 2B – Sensitivity of surrounding area

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

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

The most sensitive receptors near the proposed works are residents in nearby Paddington. In accordance with the IAQM guidance document, these receptors are considered to have a "high" sensitivity to dust soiling and health impacts.

Furthermore, in accordance with the IAQM guidance document, workers in nearby offices would have a "medium" sensitivity to dust soiling and health impacts and nearby parks and recreational areas would have a "medium" sensitivity to dust soiling impacts and a "low" sensitivity to health impacts.

It is considered unlikely that significant demolition works would be conducted within 20 m of sensitive receptors. However, there is the potential for more than 100 high sensitivity receptors to be located within 50 m 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 5-1, the area surrounding the works is determined to have a **high** sensitivity to dust soiling impacts.

Figure 5-1 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 5-2, the area surrounding the works is determined to have a **low** sensitivity to human health impacts from construction dust.

Figure 5-2 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	$>32\ \mu g/m^3$ ($>18\ \mu g/m^3$ in Scotland)	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	$28\text{-}32\ \mu g/m^3$ ($16\text{-}18\ \mu g/m^3$ in Scotland)	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	$24\text{-}28\ \mu g/m^3$ ($14\text{-}16\ \mu g/m^3$ in Scotland)	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	$<24\ \mu g/m^3$ ($<14\ \mu g/m^3$ in Scotland)	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	$>32\ \mu g/m^3$ ($>18\ \mu g/m^3$ in Scotland)	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	$28\text{-}32\ \mu g/m^3$ ($16\text{-}18\ \mu g/m^3$ in Scotland)	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	$24\text{-}28\ \mu g/m^3$ ($14\text{-}16\ \mu g/m^3$ in Scotland)	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	$<24\ \mu g/m^3$ ($<14\ \mu g/m^3$ 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 5-1.

Table 5-1 Sensitivity of the Surrounding Area

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

5.2.4 Step 2C – Define the risk of impacts

To define the risk of impacts, the dust emission magnitude ("large" for this site) is combined with the sensitivity of the area, as per Table 5-2.

Table 5-2 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 5-2, the proposed demolition works are considered to have a "High Risk" of dust soiling effects and a "Medium Risk" of health impacts.

5.2.5 Step 3 – Site-specific mitigation

The IAQM guidance document identifies a range of appropriate dust mitigation measures that should be implemented as a function of the risk of impacts. These measures are presented in Section 6.

5.2.6 Step 4 – Significance of residual impacts

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

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

Based on the proposed demolition works, and the advice in the IAQM guidance document, it is considered unlikely that these works would result in unacceptable air quality impacts, subject to the implementation of the mitigation measures outlined in Section 6.

6 MITIGATION AND MANAGEMENT

6.1 Mitigation Measures

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

Accordingly, the following mitigation measures are deemed "highly recommended" in accordance with the IAQM guidance document. 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 demolition work commences on site, and:
    - Displays the name and contact details of the Responsible Person accountable for air quality and dust issues on the site boundary.
    - Displays the head or regional office contact information.
  - Develop and implement a Dust Management Plan (DMP) that considers, as a minimum, the measures identified herein.
- **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.
  - Hold regular liaison meetings with any other high-risk construction sites within 500 m of the site boundary to ensure plans are coordinated.
- **Monitoring**
  - Undertake daily on-site and off-site inspection, where receptors are nearby, to monitor dust. Record inspection results and make available to relevant authorities. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of the site boundary, with cleaning to be provided if necessary.
  - Carry out regular on site and off site inspections to monitor compliance with the DMP, record inspection results, and make inspection log available to relevant authorities.
  - Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during any periods of prolonged dry or windy conditions.
  - Agree any dust monitoring locations with the relevant authority. Where possible, commence baseline monitoring before work commences on site.
- **Preparing and maintaining the site**
  - Plan site layout so that machining and dust generating activities are located away from receptors, as far as possible.
  - Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on sit.

  - Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
  - 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.
  - Cover, seed or fence stockpiles to prevent wind erosion.

- **Construction vehicles and sustainable travel**
  - Ensure all vehicles switch off engines when stationary - no idling vehicles.
  - Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
  - Impose and signpost a maximum-speed-limit of 25 kph on surfaced and 15 kph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided).
  - Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
  - Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)
- **Measures for general construction activities**
  - Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
  - 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.
  - Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
  - Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
- **Measures specific to demolition**
  - Soft strip inside buildings before demolition (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.
  - Avoid explosive blasting, using appropriate manual or mechanical alternatives.
  - Bag and remove any biological debris or damp down such material before demolition.
- **Measures specific to haulage**
  - Use water-assisted dust sweeper(s) on the access and local roads, as necessary.
  - Avoid dry sweeping of large areas.

- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- 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 to be located at least 10 m from receptors where possible.

It is noted that a *Construction (Demolition) Management Plan* has been prepared for the project (Appendix E to the EIS) and includes several measures to manage and mitigate dust impacts. These measures include, but are not limited to, the following:

- Locating the crushing activities as far away from the ARDC and NRL buildings and the residents on Moore Park Road, SCG, Fox Studios and Entertainment Quarter as practicable.
- Implementation of water sprays to suppress dust emissions (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).
- Ceasing or limiting crushing activities during times of adverse winds.
- Ceasing or limiting crushing activities during Event Mode operating hours.
- Sheet and screen buildings with suitable material and where possible strip out internals before demolition begins.
- Limit demolition activities that will create dust during times of adverse wind.
- Dusty materials should be removed from site as soon as practicable

The dust mitigation measures already identified in the *Construction (Demolition) Management Plan* for the Project include some of the most beneficial actions to reduce dust impacts from the works and are consistent with many of the measures recommended by the IAQM guidance document.

It is also noted that the concrete crusher is proposed to be installed and operated within an enclosure. This would further reduce the likelihood of dust impacts associated with the works.

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

6.2 Dust Monitoring

Additionally, it is recommended that dust monitoring is conducted during the works at locations representative of the most potentially affected sensitive receptors. The monitoring locations should have regard for the location of dust generating equipment and activities and the prevailing weather conditions.

The monitoring equipment should be capable of measuring ambient PM_{10} concentrations and providing notifications when levels exceed certain threshold values. The notifications should be provided in a timely fashion, say within one hour, to facilitate the implementation of reactive management. It is recommended that optical type equipment, such as an Aeroqol Dust Sentry, is used for the monitoring. While it is noted that these units are not approved under the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (EPA, 2007), they are well suited to reactive management of construction dust as they can provide data in near real-time and have significantly lower capital costs compared to other equipment.

The trigger levels in Table 6-1 are proposed for reactive management. These values have been developed with a view to ensuring that ambient dust and particulate matter concentrations in the surrounding area comply with the criteria presented in Section 3.3, but are expressed in time scales short enough to support reactive management. Similar trigger levels have been used on other large dust generating activities in NSW.

Table 6-1 Reactive Management Trigger Levels – PM_{10}

Trigger Stage	Averaging Period	Trigger Value (µg/m^3)	Action Required
1 Investigate	1 hour	85	Site Manager to undertake review of possible dust sources operating during the average period. Identify possible measures for these activities; action if deemed necessary.
	3 hour	80	
2 Action	1 hour	470	Site Manager to attend site and ensure implementation of the control. Effectiveness of control actions to be reviewed and escalate where appropriate.
	3 hour	160	
3 Stop Work	1 hour	940	Targeted shut down of dust-generating activities until the measured pollutant levels are below the stated trigger value. Identify long-term solutions to dust issues.
	3 hour	320	

Prior to the commencement of construction / demolition works, a dust monitoring plan should be prepared and included in the *Construction (Demolition) Management Plan* for the project.

7 CONCLUSION

A State Significant Development (SSD) application for the redevelopment of the Sydney Football Stadium has been submitted to the Minister for Planning, pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The redevelopment of the Sydney Football Stadium is proposed in a staged manner as follows:

- Stage 1 – Concept Proposal for the stadium envelope and supporting retail and functional uses as well as development consent for the carrying out of early works, including demolition of the existing facility and associated structures.
- Stage 2 – Detailed design, construction and operation of the stadium and supporting businesses, retail and functional uses.

Wilkinson Murray Pty Limited has been engaged by Infrastructure New South Wales to prepare an Air Quality Impact Assessment (AQIA) for the early works proposed under Stage 1 of the Sydney Football Stadium redevelopment.

A qualitative assessment of potential air quality impacts associated with the proposed demolition 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 Table 5-2, the proposed demolition works are considered to have a "High Risk" of dust soiling effects and a "Medium 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 risk of generating unacceptable air quality impacts.

Real time dust monitoring and reactive management has been recommended to confirm that dust impacts associated with the works are acceptable.