ACOUSTICS AND AIR

ST MARYS DEVELOPMENT SITE - BASINS B & I

AIR QUALITY IMPACT ASSESSMENT

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PREPARED FOR

CARDNO
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ST LEONARDS NSW 1590

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Note

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50 YEARS 1962–2012

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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 pollutant. 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.

PM_{10}/$PM_{2.5}$ – PM_{10} is measure of particles in the atmosphere with a diameter of less than 10 or equal to a nominal 10 micrometers. $PM_{2.5}$ 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

Wilkinson Murray Pty Limited has been engaged by Cardno to prepare an Air Quality Impact Assessment (AQIA) for the proposed construction activities associated with dredging and remediation of two existing detention basins (basins B & I) within the St Marys development site at Llandilo, Sydney.

This AQIA 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.

This approach has been widely used for performing qualitative assessments of dust emissions from construction sites and has been used in NSW by Wilkinson Murray and other consultants.

Furthermore, it has been accepted as a suitable approach in the absence of any guidance by Australian regulatory authorities.

1.1 Purpose of this Report

This AQIA has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) for the proposal (ref. SEAR 1173 & 1174) which require:

- A description of all potential sources of air and odour emissions; and
- A description and appraisal of air quality impact mitigation and monitoring measures.

2 PROJECT DESCRIPTION

2.1 Site Location

The St Marys development site is located within the Penrith local government area (LGA), approximately 45 kilometres north west of the Sydney CBD. The locations of Basin B and Basin I are shown in **Figure 2-1**.

2.1.1 Sensitive Receptors

The most potentially affected sensitive receptors near the proposal are residents in the following suburbs:

- Werrington Downs;
- Cambridge Gardens;
- Cranebrook;
- Jordan Springs;
- Llandilo;
- Ropes Crossing; and,
- Jordan Springs East.

These sensitive receptors are shown in **Figure 2-1**.

Figure 2-1 Site Location and Sensitive Receptors

2.2 Project Description

The proposed works are associated with dredging and remediation of two existing detention basins and will primarily include:

- Minor clearing works;
- Dredging/excavation works;
- Haulage; and
- Compaction works.

2.3 Construction Methodology

2.3.1 Construction Hours

Consistent with EPA guidelines, it is proposed that the works will be constructed during the following (standard) hours:

- Monday to Friday 7:00am to 6:00pm
- Saturday 8:00am to 1:00pm
- Sunday and Public Holidays Works not permitted

2.3.2 Construction Programme

The current programme assumes that each basin will require a construction period of approximately 8 months and that there will be a short period of time where the construction of both basins will occur concurrently.

2.3.3 Haulage Routes

The haulage route(s) for the works have not been finalised, and for each basin, potential routes have been identified which would provide site access to the east and the west. The potential haulage routes for Basin B and Basin I are shown in **Figure 2-2** and **Figure 2-3**, respectively.

Figure 2-2 Potential Haulage Routes – Basin B

Figure 2-3 Potential Haulage Routes – Basin I

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 several 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.

No odours have been identified from the existing detention basins, and odour impacts associated with the proposed works are considered unlikely.

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, 2016). It is noted that there are no criteria specified for deposited dust within the NEPC.

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, with respect to dust and particulate matter from construction activities, wind speed and wind direction affect the dispersion of air pollutants.

Observations of wind speed and direction from the Office of Environment and Heritage (OEH) air quality monitoring station (AQMS) at St Marys have been selected to represent typical wind patterns in the area surrounding the site. The St Marys AQMS is located approximately 7 kilometres south of the site.

presents annual and seasonal "wind rose" plots for the St Marys AQMS for the period 2013 to 2018, inclusive. As can be seen from the plots, southerly and south-south-westerly winds are most common in all four seasons.

4.2 Local Ambient Air Quality

Data from the St Marys 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 St Marys AQMS over the period 2013 – 2018 is presented in .

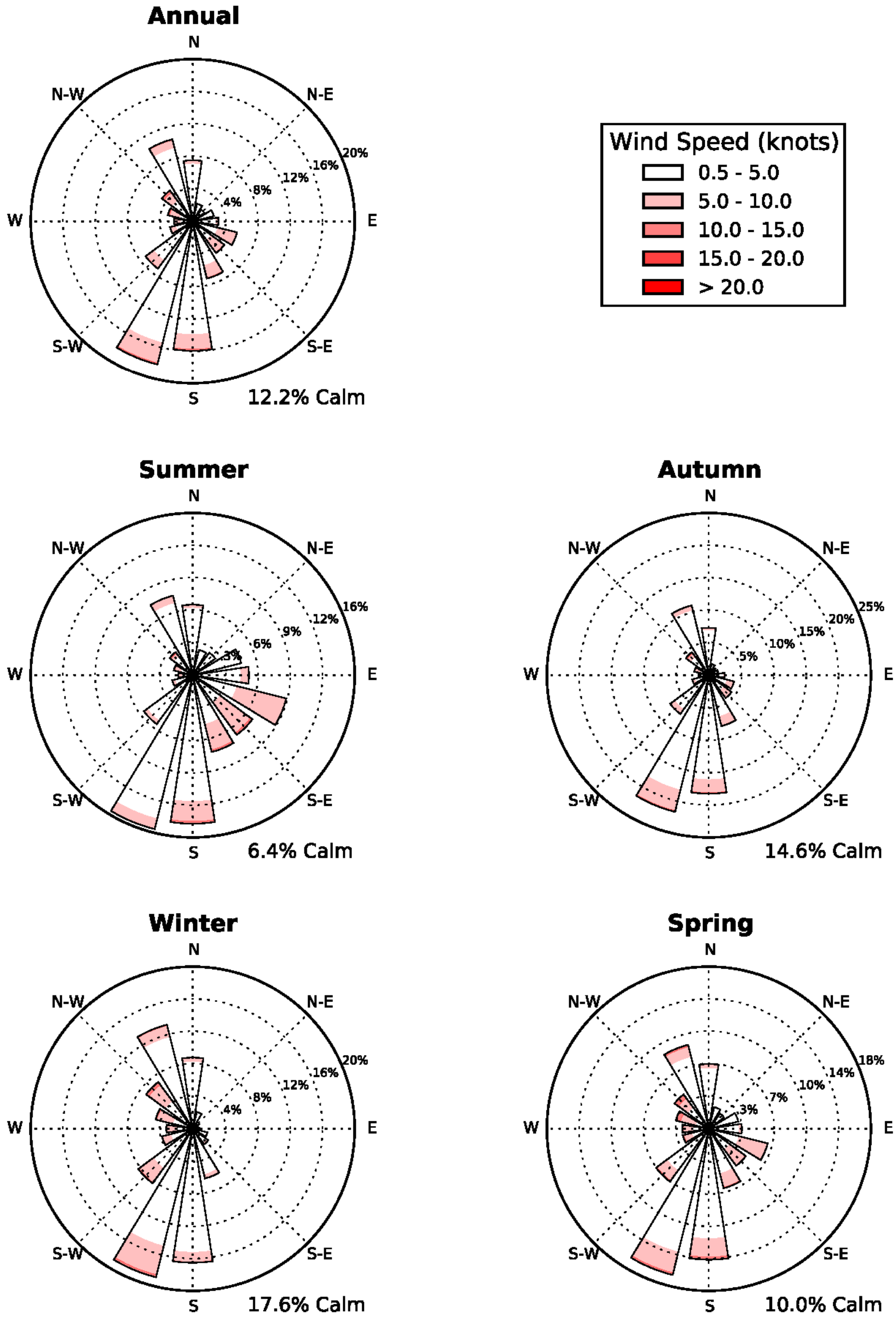
It is noted that observations of $PM_{2.5}$ at the St Marys AQMS began in 2016.

Table 4-1 Particulate Matter Monitoring Results – St Marys

Year	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)
	Annual Average	Annual Average
2013	16.0	No data
2014	16.7	
2015	15.0	
2016	16.1	7.8
2017	16.2	7.0
2018	19.5	7.7

A review of the data from St Marys and comparison to the impact criteria indicates that the measured annual average PM_{10} has been typically between 15.0 and 19.5 µg/m^3 over the 5-year period which is below the impact criteria of 25 µg/m^3. Regarding the $PM_{2.5}$ monitored results, the range has been consistent and between 7.0 and 7.8 µg/m^3. These measured are only marginally below the impact criteria of 8 µg/m^3.

Figure 4-1 Windrose Plot – St Marys OEH AQMS, 2013-2018



5 ASSESSMENT OF IMPACTS

5.1 Assessment Methodology

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

The process outlined above will be applied to both the earthworks and haulage activities associated with the remediation of the basins. For both the earthworks and haulage activities, the worst-case impacts will be considered, thereby leading to a conservative assessment of the potential risks for human health and dust soiling impacts.

As outlined in **Section 3.2**, the works are considered unlikely to result in nuisance odours. Accordingly, no further assessment of odour has been conducted. However, if odours are detected during the works, appropriate steps would be taken to control these impacts.

5.2 Risk Assessment of Dust Impacts from Proposed Works

The following qualitative risk assessment of potential dust impacts has been conducted for the proposed earthworks and haulage at Basins B & I.

5.2.1 Step 1 – Screen the need for a detailed assessment

The IAQM guidance 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 (Section 7, Step 2: Assess the Risk of Dust Impacts), dust emission magnitudes from bulk earthworks may be defined as:

- **Large:** total site area >10,000 m^2, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes;
- **Medium:** total site area 2,500 m^2 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes; and,
- **Small:** total site area <2,500 m^2, soil type with large grain (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes.

The areas affected by the proposed earthworks are well in excess of 10,000 m^2 and the material to be removed would exceed 100,000 tonnes. Therefore, the dust emission magnitude associated with bulk earthworks would be classified as **large**.

With regard to dust "trackout" associated with haulage activities, dust emission magnitudes may be defined as:

- **Large:** >50 heavy vehicle outward movements per day, potentially dusty surface material, unpaved road length > 100 m;
- **Medium:** 10-50 heavy vehicle outward movements per day, moderately dusty surface material, unpaved road length 50m – 100 m; and,
- **Small:** <10 heavy vehicle outward movements per day, surface material with low potential for dust release, unpaved road length <50 m

The works are expected to result in more than 50 heavy vehicles per day leaving the site, and all haulage options would include unpaved sections of road more than 100 m long. Therefore, the trackout dust emission magnitude associated with haulage 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 the nearby suburbs identified in **Section 2.1.1**. In accordance with the IAQM guidance, these receptors are considered to have a "high" sensitivity to dust soiling and health impacts.

Based on the current development state of Jordan Springs East, it is considered unlikely that any sensitive receptors would be located within 350 m of the Basin B earthworks. It is noted that, depending upon the staging of the construction of Jordan Springs East and the proposed basin works, this separation distance may be reduced. In that event, this risk assessment should be updated accordingly.

The nearest residential receptors to Basin I would be located approximately 20 m away. The estimated number of human receptors at various distances from Basin I are presented in **Table 5-1**.

Table 5-1 Receptor Distances from Basin B

Basin	No. of Receptors v Distance from Basin [a]			
	20 m	50 m	100 m	350 m
I	8	24	78	883

a. 2.7 persons per household in Penrith LGA per 2016 Census.

Regarding trackout dust associated with haulage from either basin, depending upon the haulage routes chosen, there is potential for more than 100 sensitive receptors to be located within 20 m of the haulage route. For the purposes of this risk assessment, the haulage route is considered to include a distance of 500 m along the sealed public road network after leaving the site.

Considering the above receptor sensitivities and the estimated number of receptors (2.7 persons per household as per 2016 Census for Penrith LGA) from the earthworks and from trackout, **Figure 5-1** and **Figure 5-2** have been reproduced from the IAQM (only show the "high" receptor sensitivity applicable to this project) so that the sensitivity of the area can be determined.

For human health impacts, the mean background PM_{10} concentration of below 24 µg/m^{3}has been used given the local ambient air quality measured (refer **Section 4.2**).

Figure 5-1 Area Sensitivity Decision Matrix – Dust Soiling

Receptor Sensitivity	No. of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low

Figure 5-2 Area Sensitivity Decision Matrix – Human Health

Receptor Sensitivity	Annual Mean PM_{10} concentration	No. of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	> 32 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low Risk	Low	Low	Low
	< 24 µg/m³	>100	Medium	Low Risk	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low

The determinations of area sensitivities to dust soiling and human health impacts from the proposed earthworks and haulage activities are summarised in **Table 5-2**. It is important to note that the tabulated risks assume that ***dust mitigation measures are not implemented***.

Table 5-2 Sensitivity of the Surrounding Area

Aspect	Impact	Key Factors	Sensitivity of the Area
Earthworks	Dust Soiling	Receptor sensitivity = high 10-100 receptors within 100 m of works	Medium (ref. IAQM Table 2)
	Human Health	Receptor sensitivity = high 10-100 receptors within 100 m of works Annual average PM_{10} concentration < 24 µg/m³	Low (ref. IAQM Table 3)
Haulage	Dust Soiling	Receptor sensitivity = high >100 receptors within 20 m of haulage routes	High (ref. IAQM Table 2)
	Human Health	Receptor sensitivity = high >100 receptors within 20 m of haulage routes Annual average PM_{10} concentration < 24 µg/m³	Medium (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 5-3** and **Table 5-4** for earthworks and trackout, respectively.

Table 5-3 Risk of Dust Impacts – 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	Medium Risk	Low Risk	Negligible

Table 5-4 Risk of Dust Impacts – Trackout

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

In accordance with **Table 5-3**, the proposed earthworks are considered to have a **medium risk** of both dust soiling and human health impacts.

In accordance with **Table 5-4**, the haulage activities are considered to have a **high risk** of dust soiling impacts and a **medium risk** of human 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 & MANAGEMENT

6.1 Dust Mitigation Measures

The preceding assessment of potential dust impacts from the proposed works indicates that, in the absence of specific mitigation measures, the earthworks would have a medium risk of both dust soiling and human health impacts, and that the haulage would have a high risk of dust soiling impacts and a medium risk of human 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 at least 10 days 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.
  - 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**
  - 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 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 logbook.

- 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.

6.2 Odour Mitigation Measures

No odours have been identified from the existing detention basins, and odour impacts associated with the proposed works are considered unlikely. Notwithstanding, if odours are identified during the works at any sensitive receptor location, the following mitigation measures are recommended:

- Apply covers, odour sealant or odour suppressant to control odours generated at the point of excavation or at stockpiles.
- Have contingency odour suppressant available such as Zeolite and/ or odour suppressing foam.
- Cover or coat with sealant stockpiled material that is to remain inactive for a period greater than two weeks to prevent odour / dust generation.
- Ensure that the site manager is on site during work hours to manage potential odour impacts, managing odour suppressants and controls, reporting and implementing contingency measures if required.

The measures identified above should be consolidated with the dust mitigation measures identified in **Section 6.1** to form a Construction Dust & Odour Management Plan (CDOMP) for the Proposal.

6.3 Dust Monitoring

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 Aeroqual 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/m³)	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 hours	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 hours	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 hours	320	

Real time monitoring of meteorology to include basic levels such as wind speed, direction, air temperature and rainfall is also recommended.

7 CONCLUSION

Wilkinson Murray Pty Limited has been engaged by Cardno to prepare an Air Quality Impact Assessment (AQIA) for the proposed construction activities associated with dredging and remediation of two existing detention basins (basins B & I) within the St Marys development site at Llandilo, Sydney.

A qualitative assessment of potential air quality impacts associated with the proposed 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 proposed 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.