WESTERN NORTH SOUTH LINK ROAD

Construction Air Quality Management Plan
SSD 7348

Prepared for:

Goodman Property Services (Aust) Pty Ltd
Level 17
60 Castlereagh Street
Sydney NSW 2000

SLR Ref: 610.17948-R03
Version No: -v1.6
February 2020

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Grd Floor, 2 Lincoln Street
Lane Cove NSW 2066 Australia
(PO Box 176 Lane Cove NSW 1595 Australia)
T: +61 2 9427 8100
E: sydney@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Goodman Property Services (Aust) Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.17948-R03-v1.6	17 February 2020	Varun Marwaha	Kirsten Lawrence	Varun Marwaha
610.17948-R03-v1.5	7 January 2020	Varun Marwaha	Kirsten Lawrence	Varun Marwaha
610.17948-R03-v1.4	13 November 2019	Varun Marwaha	Kirsten Lawrence	Varun Marwaha
610.17948-R03-v1.3	11 November 2019	Varun Marwaha	Kirsten Lawrence	Varun Marwaha
610.17948-R03-v1.2	23 September 2019	Varun Marwaha	Jason Shepherd	Varun Marwaha
610.17948-R03-v1.1	19 July 2019	Varun Marwaha	Jason Shepherd	Varun Marwaha

CONTENTS

CONTENTS

TABLES

FIGURES

APPENDICES

1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Goodman Property Services (Aust) Pty Ltd (Goodman) to prepare a Construction Air Quality Management Plan (CAQMP) for the construction of the Western North South Link Road (WNSLR) located in western Sydney area of Erskine Park, New South Wales (NSW).

The CAQMP is required under Condition D100 of Development Consent for State Significant Development 7348 (SSD 7348), granted in 2019 by the Department of Planning, Industry and Environment (DPIE) for the Oakdale West Estate (OWE) 'Concept Proposal' and 'Stage 1 Development'. The 'Stage 1 Development' includes construction of the WNSLR and associated subdivision. The WNSLR connects OWE to Lenore Drive to provide primary access to the OWE.

Whilst development consent has been granted for OWE 'Concept Proposal' and 'Stage 1 Development', this CAQMP is specifically for construction of the WNSLR only. The construction of OWE is covered in a separate CAQMP.

1.1 Development Overview

The WNSLR is an Interim Regional Road located on the eastern boundary of the OWE. OWE is a regional warehouse and distribution hub, located at Kemps Creek within the Penrith local government area (LGA) and forms part of the broader Oakdale Industrial Precinct located within the Western Sydney Employment Area (WSEA) (see **Figure 1**).

Goodman obtained Development Consent SSD 7348 on 13 September 2019 from the Department of Planning and Environment (DPE) for the Oakdale West 'Concept Proposal' and 'Stage 1 Development'. The Concept Proposal essentially comprises a 'Master Plan' to guide the staged development of Oakdale West and core development controls that will form the basis for design and assessment of future development applications for the site. It includes:

- Establishing primary site access, road layouts (including internal road network and connections to the external road network), developable and non-developable lands, biodiversity offsets, indicative development stages and development controls for the future development of the site;
- Stage 1 Development of the Estate including:
  - Estate Works, including site preparation, bulk earthworks and retaining walls, catchment level stormwater infrastructure, trunk services connections and utility infrastructure, roads and access infrastructure associated with Stage 1 and subdivision in Stage 1 development works;
  - Precinct Development, including construction, fit out and use of warehouse buildings within Precinct 1, detailed earthworks, on lot stormwater, services and utility infrastructure and construction of industrial/warehouse buildings;
  - Construction of a new regional road known as the Western North South Link Road (WNSLR) connecting to Lenore Drive to provide the primary access to the site; and
  - Western boundary landscaping.

The WNSLR is intended to provide a connection between Lenore Drive and the future Southern Link Road currently under investigation by the DPE.

In the short term the WNSLR will be a public road managed by Penrith City Council (Council), providing local access for OWE and other industrial areas north of the Water New South Wales (WaterNSW) pipeline located on the northern boundary of Oakdale West (see **Figure 2**). Construction of the WNSLR is to be undertaken by Robson Civil Projects (Robson). AT&L Associates (AT&L) will act as the Project Manager and Contract Superintendent overseeing both the construction of the WNSLR and OWE.

Note: Where Goodman is nominated as having responsibility as the Applicant, this may be delegated to their specialist consultants.

For the purposes of this document, the development is described in *Environmental Impact Statement, Oakdale West Estate - State Significant Development Application* (EIS) prepared by Urbis (2017), including all specialist assessments and other appendices.

Figure 1 Regional Location of the Western North South Link Road

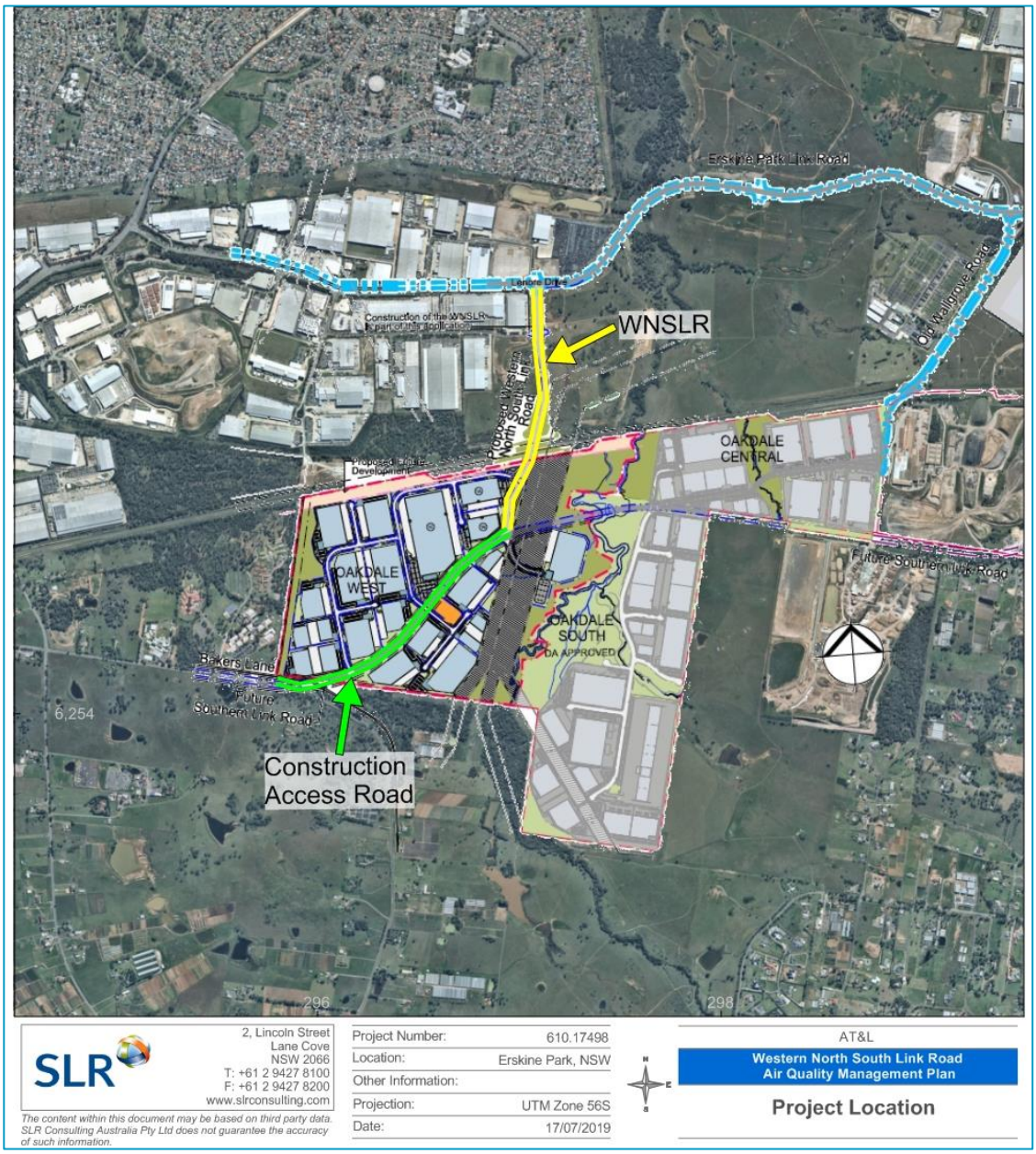
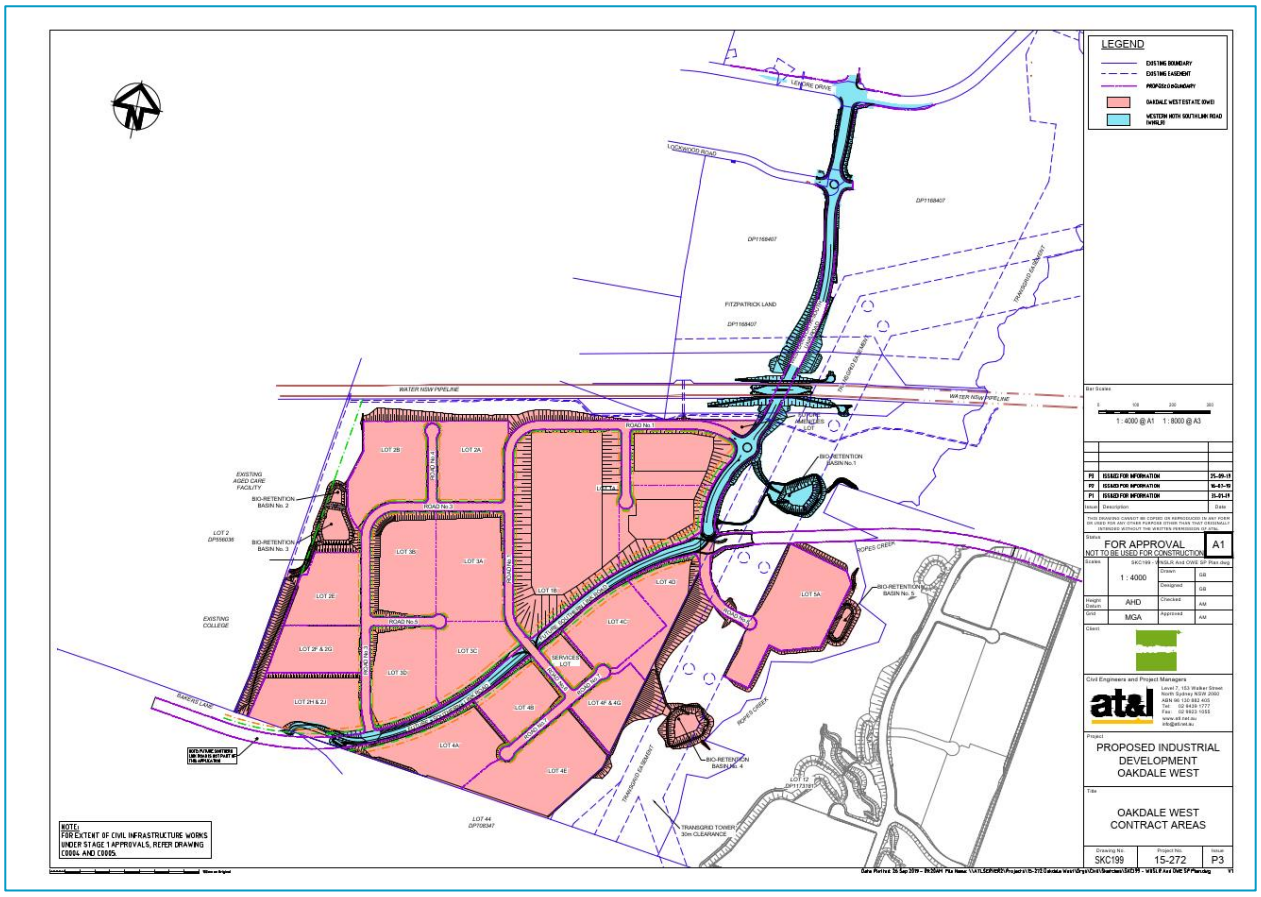


Figure 2 WNSLR Layout



1.2 Objectives of the CAQMP

The objectives of the CAQMP are as follows:

- Maintain acceptable levels of amenity for surrounding residents;
- Ensure compliance with relevant ambient air quality criteria for particulate matter at surrounding receptor locations;
- Maintain an effective response mechanism to deal with issues and complaints relating to dust emissions from the construction works;
- Outline roles and responsibilities in relation to the management of dust emissions during construction; and
- Promote environmental awareness among employees and subcontractors.

2 Statutory Requirements

2.1 Development Consent

The Development Consent (SSD 7348) requirements stipulated for the construction of the WNSLR and where they have been addressed in this CAQMP are shown in **Table 1**.

Table 1 Assessment against Development Consent Conditions

Conditions	Response/Section Reference
Condition D98 of SSD 7348	
The Applicant must take all reasonable steps to minimise dust generated during all works authorised by this consent	**Section 8**
Condition D99 of SSD 7348	
During construction of Stage 1, the Applicant must ensure that: (a) exposed surfaces and stockpiles are suppressed by regular watering; (b) all trucks entering or leaving the Site with loads have their loads covered; (c) trucks associated with Stage 1 do not track dirt onto the public road network; (d) public roads used by these trucks are kept clean; and (e) land stabilisation works are carried out progressively on site to minimise exposed surfaces.	**Section 8**
Condition D100 of SSD 7348	
(a) be prepared by a suitably qualified and experienced person(s)	2-page CV of the author is attached in **Appendix B**
(b) detail and rank all emissions from all construction activities, including particulate emissions	**Section 4**
(c) describe a program that is capable of evaluating the performance of the construction and determining compliance with key performance indicators	**Section 10**
(d) identify the control measures that will be implemented for each emission source	**Section 8**
(e) nominate the following for each of the proposed controls: - key performance indicator - monitoring method - location, frequency and duration of monitoring - record keeping - complaints register - response procedures - compliance monitoring	**Section 8 (Table 9)**
Condition D118 of SSD 7348	

Conditions	Response/Section Reference
(a) details of: (i) the relevant statutory requirements (including any relevant approval, licence or lease conditions); (ii) any relevant limits or performance measures and criteria; and (iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, Stage 1 or any management measures;	**Section 5.2**
(b) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	**Section 8**
(c) a program to monitor and report on the: (i) impacts and environmental performance of Stage 1; and (ii) effectiveness of the management measures set out pursuant to paragraph (b) above;	**Section 10**
(d) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	**Section 11**
(e) a program to investigate and implement ways to improve the environmental performance of Stage 1 over time;	**Section 10**
(f) a protocol for managing and reporting any: (i) incident and any non-compliance (specifically including any exceedance of the impact assessment criteria and performance criteria); (ii) complaint; (iii) failure to comply with statutory requirements; and	**Section 9 &** **Section 10** See overarching CEMP
(g) a protocol for periodic review of the plan.	**Section 13**

2.2 Roads and Maritime Environmental Protection Specification

Additional requirements for the Project are detailed in Roads and Maritime Services (Roads and Maritime) Environmental Protection Specification (G36), dated November 2018. The requirements relevant to this CAQMP are reproduced in **Table 2**.

Table 2 QA Specification G36 Conditions

Conditions	Response/Section Reference
Condition 4.4.1 of G36 (General)	
(a) potential sources of air pollution (such as dust, vehicles transporting waste, plant and equipment) during construction	**Section 4**
(b) identification of potential risks/impacts due to the work/activities as dust generation activities;	**Section 4**

Conditions	Response/Section Reference
(c) a procedure for monitoring of air quality to: - Verify the effectiveness of controls and enable early intervention, such as, but not limited to, visual monitoring - To assess compliance with the identified objectives, and developed in accordance with any relevant published EPA and/or OEH guidelines.	**Section 10**
(d) mitigation and management measures to be implemented to minimise risk, including measures during weather conditions where high dust episodes are likely (such as strong winds in dry weather).	**Section 8**
(e) A process for monitoring dust on site and weather conditions	**Section 10**
(f) contingency plans to be implemented in the event of non-compliances and/or complaints about dust	**Section 11**
(g) procedures for regularly reviewing the effectiveness of the Air Quality Management Sub-Plan and revising where required	**Section 13**
(h) Restrict dust generation to below 4 gm/m^2/month during construction and not more than 2 gm/m^2/month increase in dust deposition against base levels. Detail in your CEMP how monitoring of conformance with these criteria will be undertaken and validated	**Section 10**
Condition 4.4.2 of G36 (Air Emissions Performance Requirements of Mobile Non-road Diesel Plant and Equipment)	
Report on the conformity, or otherwise, of mobile non-road diesel plant and equipment used for the Work Under the Contract with the relevant United States Environmental Protection Agency, European Union (EU) standards or approved equivalent emission standards. Once a year, submit to the Principal such reports at the following dates: (a) before 31 July, for the reporting period ending 30 June for the previous 12 months; (b) at Actual Completion Date, for the final reporting period. Prepare the report in accordance with the GREP "Clean Air data management tool". The types of diesel plant and equipment that are to be included, or excluded, from the report are given in this document, which is available at: http://www.rms.nsw.gov.au/documents/about/environment/grep-clean-air-data-management-tool.xlsm.	**Section 8**

3 Project Overview

3.1 Description

The WNSLR project footprint is approximately 1.3 km in length and 30 m wide, and provides a link between OWE, Lenore Drive to the north and the future Southern Link Road to the south. The corridor will be bound by Fitzpatrick land on both sides of the corridor for the northern portion, WaterNSW land on both sides of the corridor for the middle portion, Goodman land to the west and the existing Transgrid easement to the east for the southern portion. A WaterNSW pipeline intersects the proposed WNSLR alignment; therefore a bridge is to be constructed over the pipeline. A Construction Access Road will also be constructed by Robson which will connect Bakers Lane to the WNSLR.

3.2 Location

Located in the Penrith local government area (LGA) at the far south western extent of the WSEA, the WNSLR is made up of the following five land parcels legally described as:

- Lot 3031, DP 1168407 (owned by Fitzpatrick Investments);
- Lot 6, DP 229784 (owned by WaterNSW);
- Lot 2, DP 84578 (owned by WaterNSW);
- Lot 3, DP 85393 (owned by WaterNSW); and
- Lot 11, DP1178389 (owned by Goodman).

3.3 Surrounding Land Uses

Within the area surrounding the WNSLR, the predominant land uses include industrial warehouses and factories, several of which have been identified as having the potential to be considered sources of air emissions. The nearest residential receptors to the WNSLR is located approximately 500 m north on Weaver Street, Erskine Park.

3.4 Construction Staging and Activities

Stage 1 Development includes the site preparation and infrastructure works required to facilitate development of the estate in line with the Concept Proposal. This includes the construction of the WNSLR and connection to the estate road network along with the development of Precinct 1 for warehousing and distribution. The construction of the WNSLR is estimated to take approximately 50 weeks, subject to any weather delays.

Work associated with the WNSLR includes the construction of the following intersections:

- A 4-leg signalised intersection with Lenore Drive, providing access to the regional road network and a local connection;
- A 4-leg roundabout intersection with Lockwood Road (previously a cul-de-sac), providing a local connection between the WNSLR and Templar Road as well as providing a connection for a local road supporting development to the east, comprising the balance of Fitzpatrick lands;
- A 3-leg roundabout to a T-junction to Estate Road 1, providing primary access to Oakdale West and will be the sole access provided to Precincts 1 - 4 until the completion of the Southern Link Road; and

- A full road construction with temporary line marking between Estate Road 1 and the future Southern Link Road to provide connection in advance of the Southern Link Road.

The WNSLR also includes the construction of the Construction Access Road along the future Southern Link Road alignment through Oakdale West. The WNSLR also includes the construction of Bio-retention Basin 1.

Construction is scheduled to commence in late October 2019 (earlier if possible, subject to all post-approval requirements). Robson estimate the construction program to take approximately 50 weeks, subject to any delays during construction (i.e. wet weather or authority delays) which may increase the duration of the works.

Construction of the Construction Access Road (see **Figure 3**) will be undertaken first and will take approximately 12-16 weeks. All other work zones will be constructed concurrently until completion of the project.

As part of the bridge construction, earthworks are required on either side of the WaterNSW easement. This work includes lowering the existing access track between the pipes to provide the necessary clearance under the bridge, as well reshaping the existing outside batters to provide access to the bridge abutments for maintenance.

3.5 Construction Hours

Construction hours for the WNSLR will be in accordance with Condition D70 and D71 of Development Consent SSD 7348, which are reproduced below:

> ***D70**. The Applicant must comply with the hours detailed in Table 5, unless otherwise agreed in writing by the Planning Secretary.*
>
> ***Table 5**: Hours of Work*

Activity	Day	Time
Construction	Monday – Friday Saturday	7 am to 6 pm 8 am to 1 pm
Operation	Monday – Sunday (including public holidays)	24 hours

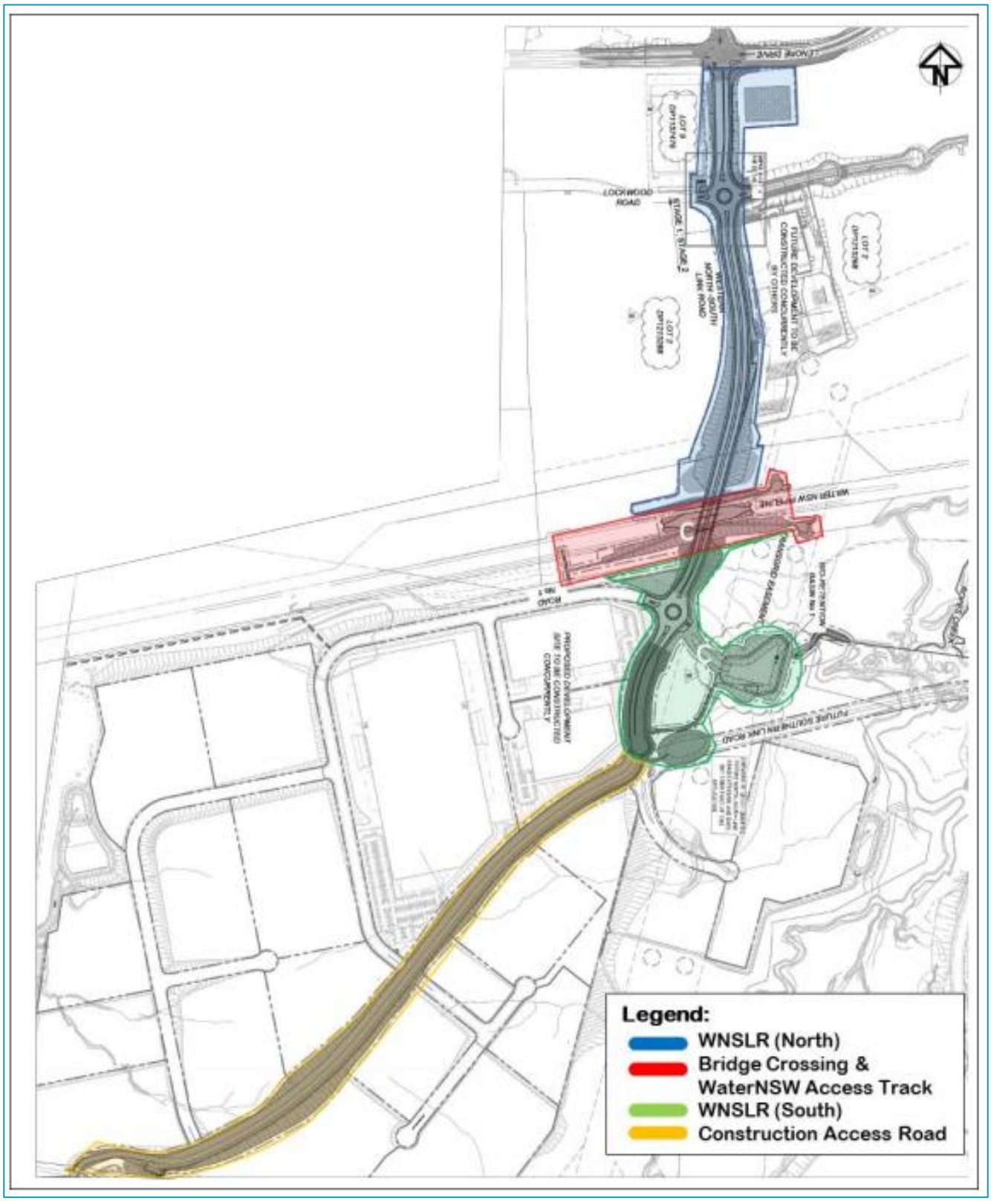
> ***D71**. Works outside of the hours identified in Condition D62 may be undertaken in the following circumstances:*
>
> *a) works that are inaudible at the nearest sensitive receivers;*
>
> *b) works agreed to in writing by the Planning Secretary;*
>
> *c) for the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons; or*
>
> *d) where it is required in an emergency to avoid the loss of lives, property or to prevent environmental harm.*

Additionally, Section 3.6 of the G36 specification lists the same construction hours set out in SSD 7348. G36 states that work outside of normal working hours is permitted without prior approval in the following circumstances:

- Delivery of materials outside of normal working hours, where delivery at such times is required by the Police or other authorities for reasons of safety or otherwise; or

- Work during an emergency, where such work is necessary to avoid the loss of lives, property and/or prevent environmental harm.

Figure 3 Construction Work Zones



3.6 Construction Site Access

The construction of the WNSLR will occur in accordance with **Section 3.4**. In accordance with the Construction Traffic Management Plan (CTMP) (Ason 2019), details the site access arrangements for the applicable work zones shown in **Figure 3**.

Table 3 Site Access

Work Zones	Access Arrangement
Construction Access Road	Via Bakers Lane.
WNSLR (North)	Primary access via Lockwood Road to facilitate all movement access to Lenore Drive. Left-in, left-out access to Lenore Drive.
Bridge Crossing	• Northern section – to/from Lenore Drive via Lockwood Road. • Central section – entry from Old Walgrove Road, under an approved Traffic Control Plan (to be submitted by Robson). • Southern section – to/from Mamre Road via Bakers Lane.
WNSLR (South)	In the short term, access will be to/from Mamre Road via Bakers Lane. Upon completion of the Bridge Crossing works, additional access shall be to Lenore Drive via the WNSLR.

4 Potential Sources of Air Emissions

During the construction works, fugitive dust emissions are considered to be the primary emission type, which could give rise to nuisance and/or health impacts for the surrounding sensitive areas. The key potential sources of dust associated with construction of the WNSLR have been identified as:

- Dust emissions from earthworks activities (eg excavation and loading of soils to trucks);
- Wind-generated dust from disturbed surfaces and stockpiles;
- Wheel-generated dust and particulate matter emissions in diesel exhaust emissions from on-site plant and equipment and construction traffic movements; and
- Particulate matter associated with exhaust emissions from increased/congested traffic emissions due to road closures or diversions.

In addition to the construction activities being carried out at any point in time, a number of other environmental factors may also affect the generation and dispersion of dust emissions, including:

- Wind direction - determines whether dust and suspended particles are transported in the direction of the sensitive receptors;
- Wind speed - governs the potential suspension and drift resistance of particles;
- Surface type - more erodible surface material types have an increased soil or dust erosion potential;
- Surface material moisture - increased surface material moisture reduces soil or dust erosion potential; and
- Other external influencers, such as other works being undertaken on the perimeter of the WNSLR works and pre existing drought related factors
- Rainfall or dew - rainfall or heavy dew that wets the surface of the soil reduces the risk of dust generation.

The Environmental Impact Statement (EIS) for the construction and operation of OWE was prepared by URBIS in November 2017 (URBIS 2017). Appendix U (Air Quality Impact Assessment) of the EIS states that the main emissions to air during the construction phase will be emissions of particulate matter (as TSP, PM_{10} and $PM_{2.5}$) and nuisance dust from the movement of vehicles and construction equipment, excavation and rehabilitation, demolition, clearing and grading, truck loading and unloading and wind erosion.

The construction activities are broadly divided into four categories, ie demolition, earthworks, construction (building) and trackout. Potential air quality impacts associated with the construction of the WNSLR and the relative risk ratings are addressed in **Section 7**.

5 Relevant Pollutants and Air Quality Criteria

5.1 Pollutants of Concern

As identified in **Section 4**, potential air pollutants of interest for the construction of the WNSLR are considered to be dust, both:

- Suspended particulate matter; and
- Deposited dust.

The following sections outline the potential health and amenity issues associated with the above pollutants, while **Section 5.2** outlines relevant air quality assessment criteria.

5.1.1 Suspended Particulate Matter

Airborne contaminants that can be inhaled directly into the lungs can be classified on the basis of their physical properties as gases, vapours or particulate matter. In common usage, the terms "dust" and "particulates" are often used interchangeably. The health effects of particulate matter are strongly influenced by the size of the airborne particles. Smaller particles can penetrate further into the respiratory tract, with the smallest particles having a greater impact on human health as they penetrate to the gas exchange areas of the lungs. Larger particles primarily cause nuisance associated with coarse particles settling on surfaces.

The term "total suspended particulate matter" (TSP) refers to a category of airborne particles, typically less than 30 microns (µm) in diameter. Particulate matter with an aerodynamic diameter of 10 microns or less is referred to as PM_{10}. The PM_{10} size fraction is sufficiently small to penetrate the large airways of the lungs, while $PM_{2.5}$ (2.5 microns or less) particulates are generally small enough to be drawn in and deposited into the deepest portions of the lungs. Potential adverse health impacts associated with exposure to PM_{10} and $PM_{2.5}$ include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children. In an urban setting, the emission of $PM_{2.5}$ is primarily associated with vehicles exhausts resulting from the incomplete combustion of diesel.

5.1.2 Deposited Dust

Section 5.1.1 is concerned in large part with the health impacts of particulate matter. Nuisance impacts need also to be considered, mainly in relation to deposited dust. Dust can cause nuisance by settling on surfaces and possessions, affecting visibility and contaminating tank water supplies. High rates of dust deposition can also adversely affect vegetation by blanketing leaf surfaces.

5.2 Ambient Air Quality Criteria

There are no air quality criteria outlined within the Development Consent SSD 7348, therefore the NSW EPA criteria have been adopted in **Table 4** and **Table 5**.

5.2.1 Suspended Particulate Matter

State air quality guidelines specified by the NSW Environmental Protection Agency (EPA) for the pollutants identified in **Section 5.1** are published in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2017a) (hereafter 'Approved Methods'). The ground level air quality impact assessment criteria listed in Section 7 of the Approved Methods have been established by NSW EPA to achieve appropriate environmental outcomes and to minimise associated risks to human health as published in the Approved Methods. They have been derived from a range of sources and are the defining ambient air quality criteria for NSW, and are considered to be appropriate for use in this assessment.

A summary of the relevant impact assessment criteria for suspended particulate matter is provided in **Table 4**.

Table 4 NSW EPA Criterion for Particulate Matter

Pollutant	Averaging Period	Concentration
PM_{10}	24 Hours	50 µg/m^3
	Annual	25 µg/m^3
TSP	Annual	90 µg/m^3

Source: EPA 2017a

5.2.2 Deposited Dust

The relevant criterion for nuisance dust deposition is provided in **Table 5**. The rate of dust deposition is measured by means of a collection gauge, which catches the dust settling over a fixed surface area and over a period of about 30 days.

Table 5 NSW EPA Criterion of Nuisance Dust Deposition

Pollutant	Averaging Period	Assessment Criteria (g/m^2/month)
Deposited dust	Annual	2 (maximum increase in deposited dust level) 4 (maximum total deposited dust level)

5.3 Local Government Air Quality Toolkit

The NSW EPA has developed the Local Government Air Quality Toolkit (EPA 2018), in response to requests from local Council officers for information and guidance on the common air quality issues they manage. Guidance is available under Part 3 of the Local Government Air Quality Toolkit for Construction Sites.

This document lists the common sources of emissions and mitigation and management measures to control airborne dust levels from construction sites and has been consulted in the development of this CAQMP.

6 Existing Environment

6.1 Local Meteorology

The Bureau of Meteorology (BoM) maintains and publishes data from weather stations across Australia. The closest such station recording wind speed and wind direction data is the Horsley Park Automatic Weather Station (AWS) (Station ID 67119), located approximately 5.5 kilometres (km) southeast of the WNSLR. The long term and short term seasonal wind roses and long term rainfall patterns observed at the Horsley Park AWS indicate that:

- Winds that would blow fugitive dust emissions from the demolition/construction works towards the nearest sensitive receptors located to the north and northwest of the proposed construction activities occur rarely during autumn and winter, and are more likely to occur during summer and spring.
- The long term wind and rainfall patterns suggest that the construction at the Development Site have the greatest potential to impact on surrounding sensitive receptors during the months of May (autumn), and July (winter) to October (spring).

Full analysis of the wind roses and rainfall can be found in **Appendix A**.

6.2 Background Air Quality

The NSW OEH maintains a network of Air Quality Monitoring Stations (AQMSs) across NSW. The nearest such station is located at St Marys, approximately 4.5 km northwest of the WNSLR. The St Marys AQMS was commissioned in 1992 and is located on a residential property off Mamre Road, St Marys. It is situated in the centre of the Hawkesbury Basin and is at an elevation of 29 m.

There were no exceedances of the 24 hour average PM_{10} criterion in 2014 and 2017, one exceedance in 2015 and three exceedances in 2016 and two exceedances in 2018. A summary of the PM_{10} concentrations for the last five years (2014-2018) is tabulated in **Table 6** and presented graphically in **Figure 4**. No TSP monitoring data are available.

Table 6 Summary of PM_{10} Monitoring Data at St Marys AQMS (2014 – 2018)

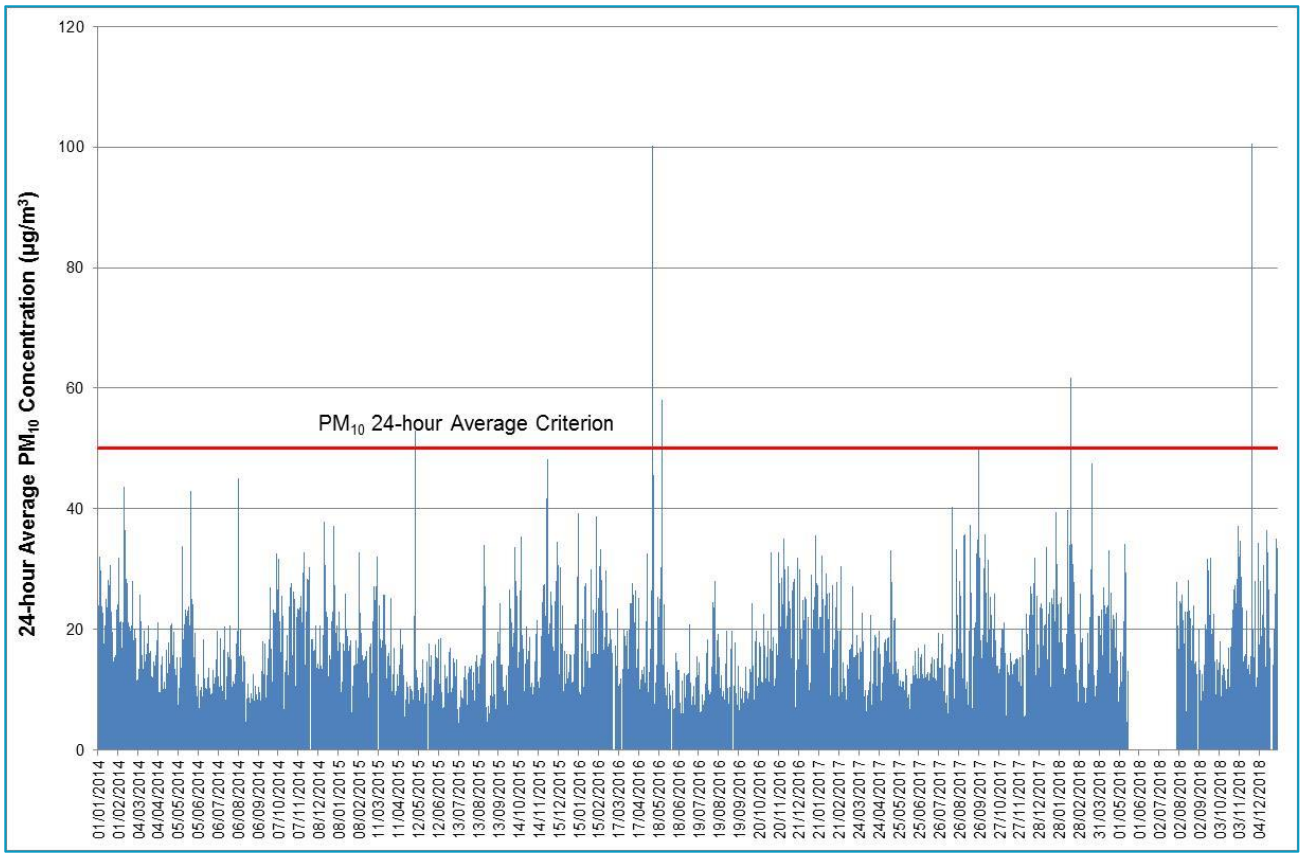
Averaging Period	Maximum 24-hour Average	Annual
	µg/m³	µg/m³
2014	45.0	16.7
2015	53.0[a]	15.0
2016	100.2[b]	16.1
2017	49.8	16.2
2018	100.5c	19.4
Criterion	50	25

[a] Recorded on 6 May 2015

[b] Recorded on 8 May 2016

[c] Recorded on 22 November 2018

Figure 4 Measured 24-Hour Average PM_{10} Concentrations at St Marys AQMS (2014 – 2018)



A review of the exceedances recorded during 2015 (OEH 2017a), 2016 (OEH 2018a), 2017 (OEH 2018b) and 2018 (OEH 2019) indicates that they were associated with natural events such as bushfires or dust storms, or hazard reduction burns.

It has been noted the NSW EPA in their publication – NSW Annual Air Quality Statement 2018 (OEH 2019) state that air quality is generally good in New South Wales based on information from the 43 station NSW Air Quality Monitoring Network. For 2018, the air quality was generally 'good', and air quality standards were met for 98% of the days in Sydney. During this time, exceedances of the national air quality standards for particle pollution have usually been associated with regional dust storms and vegetation fires.

PM_{10} concentrations vary across years with higher levels and more exceedances occurring in bushfire and dust storm affected years. Dry El Niño years (2002–2007) have been associated with a greater frequency of bushfires and dust storms and therefore higher particle pollution levels. Lower particle pollution levels have occurred during wetter La Niña years (2010–2012).

7 Assessment of Dust Emissions During Construction

The key potential health and amenity issues associated with construction of the WNSLR are, respectively:

- Elevated suspended particulate concentrations (PM_{10}); and
- Nuisance due to dust deposition (soiling of surfaces) and visible dust plumes.

7.1 Construction Impact Assessment Methodology

Quantitatively assessing impacts of fugitive dust emissions from construction projects using predictive modelling is seldom considered appropriate, primarily due to the uncertainty in the details of the construction activities, including equipment type, number, location and scheduling, which are unlikely to be available at the time of the assessment. Furthermore, they are also likely to change as construction progresses. In comparison, the equipment and operations of a mine or quarry are determined during the planning stages and more likely to remain consistent for long periods (several months or years).

Instead, it is considered appropriate to conduct a qualitative assessment. Potential impacts of dust emissions associated with proposed demolition and construction activities at the Development Site has been performed based on the methodology outlined in the Institute of Air Quality Management (UK) (IAQM) document, "*Assessment of dust from demolition and construction*" (Holman et al 2014). This guidance document provides a structured approach for classifying construction sites according to the risk of air quality impacts, to identify relevant mitigation measures appropriate to the risk (see **Appendix C** for full methodology).

The IAQM approach has been used widely in Australia for the assessment of air quality impacts from construction projects and the identification of appropriate mitigation measures, and has been accepted by regulators across all states and territories for a variety of construction projects.

The IAQM method uses a four-step process for assessing dust impacts from construction activities:

- **Step 1**: Screening based on distance to the nearest sensitive receptor; whereby the sensitivity to dust deposition and human health impacts of the identified sensitive receptors is determined.
- **Step 2**: Assess risk of dust effects from activities based on:
  - the scale and nature of the works, which determines the potential dust emission magnitude; and
  - the sensitivity of the area surrounding dust-generating activities.
- **Step 3**: Determine site-specific mitigation for remaining activities with greater than negligible effects.
- **Step 4**: Assess significance of remaining activities after management measures have been considered.

7.2 Risk Assessment

Table 7 presents the preliminary risk of air quality impacts from uncontrolled construction activities determined using the risk matrix provided in (**Table C4** in **Appendix C**), based on the identified receptor sensitivity and sensitivity of the area.

Table 7 Preliminary Risk of Air Quality Impacts from Construction Activities (Uncontrolled)

Impact	Sensitivity of Area	Dust Emission Magnitude				Preliminary Risk			
		Demolition	Earthworks	Construction	Trackout	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	Small	Large	Medium	Medium	Negligible	Low Risk	Low Risk	Low Risk
Human Health	Low					Negligible	Low Risk	Low Risk	Low Risk

The results indicate that there is a low risk of adverse dust soiling and a low risk of human health impacts occurring at the off-site sensitive receptor locations if no mitigation measures were to be applied to control emissions during the works.

Based on the dust emission magnitudes and the preliminary risk from these activities, the activities are ranked as (highest risk to lowest risk):

1. Earthworks
2. Construction
3. Trackout
4. Demolition

For almost all construction activity, the IAQM Methods notes that the aim should be to prevent significant effects on receptors through the use of effective mitigation and experience shows that this is generally possible.

8 Mitigation Measures

The potential for dust emissions during construction works at the WNSLR and the potential impact on surrounding sensitive receptors are anticipated to be largely controllable through a range of mitigation measures, including good site management, good housekeeping measures, appropriate vehicle maintenance and applying appropriate dust mitigation measures where required.

The general dust mitigation measures to be implemented during construction of the WNSLR are detailed in **Table 8**. The dust mitigation measures specific to the key emission activities (ie earthworks, construction, trackout and demolition) are also provided in **Table 8**.

Table 8 Dust Mitigation Measures

#	Mitigation Measure
1	**Communications**
1.1	Develop and implement a stakeholder communications plan that includes community engagement (via Goodman) before work commences on site.
1.2	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the Site Superintendent.
1.3	Display the head or regional office contact information.
2	**Site Management**
2.1	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 (as per Section 3.6 of the overarching CEMP).
2.2	Summary of complaints in Environmental Representative Monthly Report to the DPE.
2.3	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite (eg any dust clouds can be seen leaving site and smoky exhausts on vehicles and equipment) and the action taken to resolve the situation in the Incident Register.
2.4	Where excessive dust events occur (ie prolonged visual dust in a particular area or due to a specific scope or scopes of work) watering of dusty activities is to be undertaken or investigated and additional mitigation measures applied to control the specific dust generating scope(s) of work Review Horsley Park Bureau of Meteorology station daily weather forecast (ie wind, rain) to inform site dust management procedures for the day.
3	**Preparing and Maintaining the Site**
3.1	Implement additional dust mitigation resources where potential dust generating activities that are close to receptors is required.
3.2	Stockpiles that will be in place for more than 20 days as well as any stockpiles that are susceptible to wind or water erosion will be protected from erosion within 10 days of forming each stockpile. Temporary stabilisation of disturbed surfaces will be undertaken within two weeks.
3.3	Exposed surfaces and stockpile are suppressed by regular watering (Condition D91a).
3.4	Keep site fencing and barriers clean using wet methods.
3.5	Land stabilisation works are programmed to minimise exposed surfaces for extended periods (Condition D91e).
4	**Operating Vehicle/Machinery and Sustainable Travel**
4.1	Ensure all on-road vehicles comply with relevant vehicle emission standards, where applicable, and must be maintained in good condition and in accordance with manufacturer's specifications and that exhaust emissions comply with the Protection of the Environment Operations Act 1997 (Condition 4.4.2 of G36).

#	Mitigation Measure
4.2	Delivery trucks will switch off engines if idling time on-site is likely to exceed 5 minutes.
4.3	Vehicle speed limit restrictions are implemented on site, including: • General - 20km/h • High risk area - 10km/h • Haul routes – 30 km/h
4.4	Truck queuing on local project access roads and unnecessary trips will be negated through logistical planning.
4.5	Trucks associated with Stage 1 do not track dirt onto the local project related access roads (Condition D91c).
4.6	Local project related access roads used by these trucks are kept clean on an as required basis (Condition D91d).
5	**Operations**
5.1	Only use cutting, grinding or sawing equipment fitted with suitable dust suppression systems, such as water sprays.
5.2	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using a combination of potable and non-potable water.
5.3	Use of watercart(s) to reduce potential dust emissions on all denuded areas and haul roads.
5.4	Ensure equipment, inclusive of environmental spill kits are readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event.
5.5	Works (including spraying of paint and other materials) will not be carried out during strong winds or in weather conditions where high levels of air borne particulates are likely. Continual monitoring of wind speed and direction will be undertaken to guide this decision.
6	**Waste Management**
6.1	No on-site burning of waste materials, timbers or any other combustible materials.
6.2	All trucks entering or leaving the Site with loads have their loads covered (Condition D91b).
7	**Earthworks**
7.1	Works are to be programmed where possible, to ensure minimum areas are disturbed at any given time.
7.2	Rehabilitation of disturbed areas will be undertaken progressively and as soon as practicable, and rehabilitation of disturbed surfaces within 20 days of final construction levels.
7.3	If unanticipated strong odours are encountered or significant dust emissions are noted on site, related works will be investigated by the Contractors Project Manager (or his authorised representative), and mitigation work will be undertaken to control the odours/dust.
7.4	Implement additional dust mitigation resources as required during excavation works and vehicle loading/unloading should weather conditions be unfavourable (ie receptors are upwind from the works).
8	**Construction**
8.1	Ensure sand and other aggregates are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
9	**Trackout**
9.1	Use water-assisted dust sweeper(s) on the project related site access roads to remove, as necessary, any material that may be tracked out of the site.
9.2	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
9.3	Record all inspections of site haul roads and site access roads and document any subsequent action in a site log book.

#	Mitigation Measure
9.4	Implement a wheel washing system and/or cattle grid system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site). (provide and refer to a rumble grid design drawing here)
10	**Demolition**
10.1	Bag and remove any biological debris or damp down such material before demolition.

As required by condition D100 (e), **Table 9**, summarises the parameters identified to assess the effectiveness of the control measures shown in **Table 8**.

Table 9 Summary of the Parameters to Assess the Effectiveness of Control Measures

Parameter	Visible Dust	Dust Deposition	Complaints	PM_{10}
Key performance indicator	No visible dust leaving the site boundary	<4 g/m^2/month	No complaints related to nuisance dust	<50 $\mu g/m^3$ as a 24-hour average
Monitoring method	Visual inspection	Dust deposition gauges	-	See note
Location, frequency and duration of monitoring	Daily onsite inspection	Section 10	-	See note
Record keeping	Section 9	Section 11	Section 9	See note
Response procedures	Section 11	Section 11	Section 9	See note
Compliance monitoring	-	Section 10	-	See note

Note: Real-time suspended particulate monitors are installed at the site to assist with dust management (see **Section 10**). The monitoring system used however, does not meet the requirements of a compliance instrument. Should compliance-level monitoring be required as per **Table 10**, then this table will be updated to reflect the expanded monitoring programme.

9 Complaints Handling and Response Procedure

All complaints will be handled in accordance with the sections below and the WNSLR *Community Communication Strategy* (CCS) (SLR 2019b).

9.1.1 Performance Objective

To ensure that all environmental complaints in relation to the air emissions from construction of the WNSLR are promptly and effectively received, handled and addressed.

9.1.2 Responsibility

The Communications and Community Liaison Representative is responsible for ensuring that the appropriate management response and handling procedures are instigated and carried through in the event of an environmental complaint. The induction and toolbox talks outlined in the CEMP will be used to ensure all site employees are aware of and understand their obligations for complaints response.

All employees who take receipt of a complaint, either verbal or written, are to immediately notify the Contractor's Project Manager, who will then contact the Communications and Community Liaison Representative.

9.1.3 Complaints Handling Procedure

Upon becoming aware of a complaint, the protocol outlined below will be followed.

1. Record and Acknowledge

Any employee who take receipt of a complaint, either verbal or written, is to immediately notify the Contractor's Project Manager who will then contact the Communications and Community Liaison Representative. The Contractor's Project Manager will be available 24 hours a day, seven days a week and have the authority to stop or direct works.

In the normal course of events, the first contact for complaints will usually be made in person or by telephone.

The complainant's name, address and contact details, along with the nature of the complaint, must be requested. If the complainant refuses to supply the requested information, a note will be made on the form and complainant advised of this.

2. Assess and Prioritise

The Communications and Community Liaison Representative will prioritise all complaints by considering the seriousness of the complaint including risk to health and safety and will attempt to provide an immediate response via phone or email. This will be undertaken in accordance with the CCS (SLR 2019).

3. Investigate

A field investigation will be initiated in an attempt to confirm details relevant to the complaint and the cause of the problem. Any air quality monitoring information and/or site records at and around the time of the complaint will be reviewed for any abnormality or incident that may have resulted in the complaint.

If the complaint is due to an incident, the notification requirements and handling procedures outlined in the CEMP respectively will be followed.

4. Action or Rectify

Once the cause of the complaint has been established, every possible effort will be made to undertake appropriate action to rectify the cause of the complaint and mitigate any further impact. The Communications and Community Liaison Representative will assess whether the complaint is founded or unfounded and delegate the remediation of the issue to the Contractor's Project Manager for action, as required.

As outlined in **Section 11**, if a complaint regarding air quality impacts is concluded to be substantiated, the need for any changes to the air quality mitigation measures identified for the Project in **Section 8** and/or the air quality monitoring programme outlined in **Section 10** is to be assessed and, the AQMP updated as appropriate.

5. Respond to Complainant

The Communications and Community Liaison Representative will oversee the rectification of the issue and respond to the complainant once the issue has been resolved. The complainant will be provided with a follow up verbal response on what action is proposed within two hours during night-time works (between the hours of 6:00 pm and 10:00 pm) and 24 hours at other times. Where a complaint cannot be resolved by the initial or follow-up verbal response, a written response will be provided to the complainant within ten days.

6. Record

It is imperative that an assessment of the situation is carried out and documented in order to minimise the potential for similar complaints in the future. On this basis, every complaint received is to be recorded in the Complaint Enquiry Form. A copy of the completed form will be maintained for at least five years. The complaint will also be recorded in the Complaints Register.

7. Preventative Action

Once the complaint has been addressed, improvement measures may be identified and implemented to negate the possibility of re-occurrence. The Compliant Enquiry Form is not closed out until the preventative actions are completed and recorded on the form.

9.1.4 Complaints Register

A Complaints Register will be maintained during construction and will contain the following:

- A copy of the environmental complaint handling procedure;
- A separate reference sheet containing the contact details;
- Blank hard copies of the Complaint Enquiry Form; and
- Copies of all completed Complaint Enquiry Forms, which are to be maintained for at least five years after the event to which they relate.

10 Air Quality Monitoring Program

As discussed in **Section 7**, the risk of construction dust emissions causing nuisance impacts at off-site sensitive receptor locations is concluded to be low. It is also noted that any impacts will be temporary and managed through the implementation of appropriate mitigation measures (see **Section 8**).

While there is no stipulated requirement for air quality monitoring within SSD 7348, the RMS Environmental Protection Specification G36 (Condition 4.4.1) requires dust monitoring to be conducted during construction. Considering the low risk of the construction dust emissions causing nuisance at off-site sensitive receptor locations, dust monitoring at the nearest sensitive receptors is not considered to be warranted[1]. However, due to the possibility of concurrent construction of the WNSLR and the OWE, dust deposition monitoring at the nearest sensitive receptors, in conjunction with routine daily onsite visual inspections is deemed to be appropriate for this Project.

In addition, Goodman have installed three continuous particulate (TSP & PM_{10}) monitors along the western and southern OWE boundaries. It is noted that while the samplers are installed in accordance with Australian Standard AS/NZS 3580.9.9, they are laser photometer instruments (aerosol samplers) and do not comply with the requirements of the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (DEC, 2006).They are therefore to be used as a management tool to warn of increasing ambient dust levels and the need to implement additional dust mitigation measures, but cannot be used as a compliance instrument to demonstrate compliance with the ambient air quality criteria.

The following monitoring will therefore be implemented for the Project:

- Dust deposition rates will be monitored using static dust gauges be conducted for the duration of this Project and started at six (6) locations around the WNSLR and OWE boundaries, plus one dust gauge as a background dust monitor.
- Dust deposition monitoring is to commence at least one month before commencement of construction work on site, to provide 'before construction' dust deposition levels.
- Real-time TSP and PM_{10} sampling at three (3) locations along the OWE/WNSLR site boundaries.

The background dust monitor will be located upwind and further away from the construction works, closer to the nearby sensitive receptors towards the northwest. As there is a possibility of concurrent construction of the OWE, dust gauges within the OWE area are not proposed due to the inherent risk of equipment safety (e.g. heavy machinery knocking down the dust gauge).

Indicative locations of the dust deposition gauges are shown in **Figure 5**. The exact locations of the gauges will depend on a number of factors, such as site accessibility, safety risk to equipment, distance from the construction works etc, and will need to be finalised by the dust monitoring contractor.

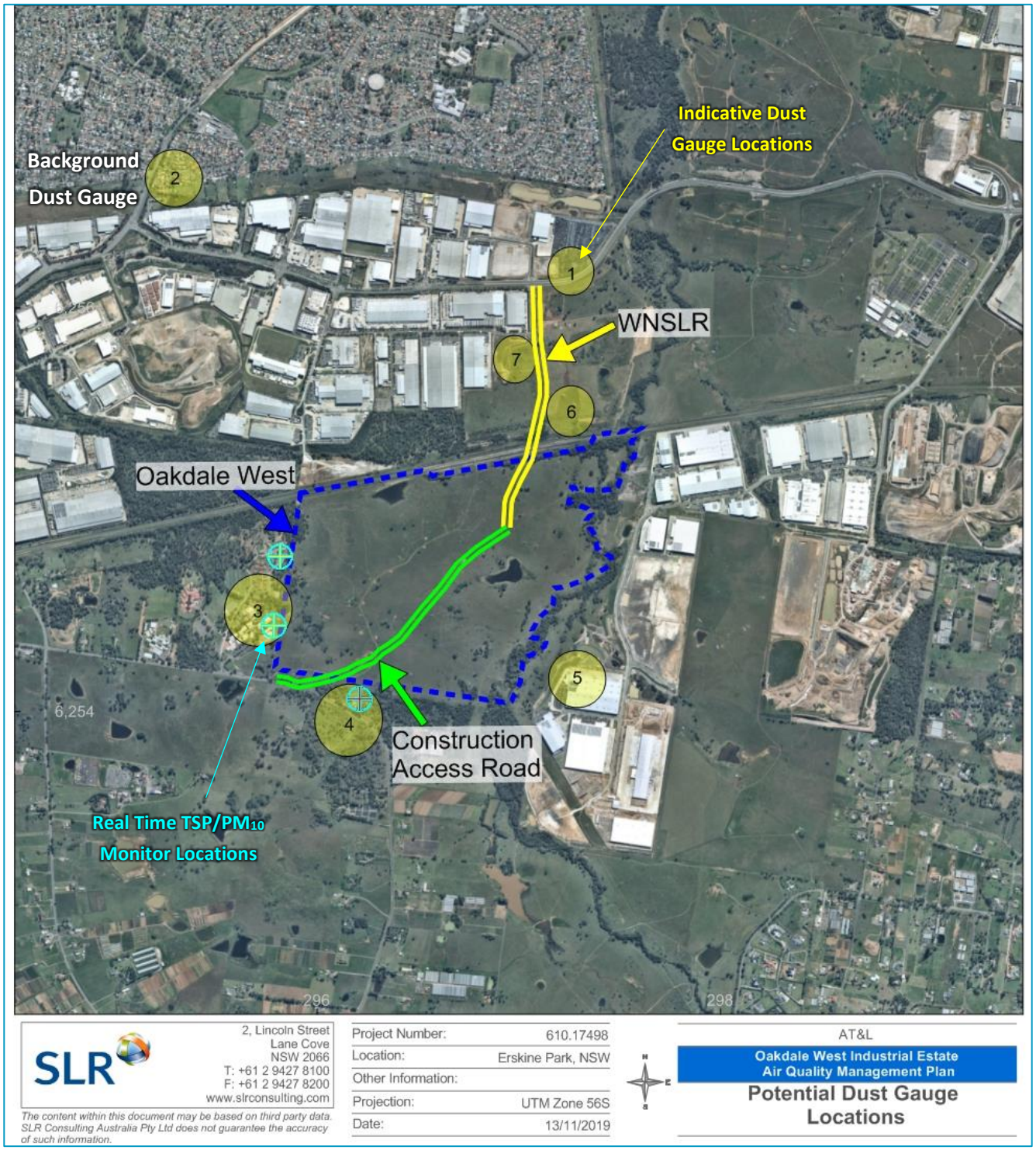
A summary of the proposed air quality monitoring program is shown in **Table 10**.

[1] Note that dust monitoring at a sensitive receptor may be an appropriate action in response to a complaint.

Table 10 Air Quality Monitoring Program

Description	Parameter	Methodology	Duration	Location	Frequency
Nuisance dust monitoring	Deposited dust in g/m^2/month	AS/NZS 3580.1.1:2016 - *Methods for sampling and analysis of ambient air – Guide to siting air monitoring equipment*	During site preparation, earthworks, construction	Indicative locations shown in **Figure 5**	Monthly
Suspended Particulate Monitoring	TSP and PM_{10} concentrations in µg/m^3	Real-time monitoring using a light-scattering laser photometer (aerosol monitor). The monitors are to be calibrated every 6 months by co-locating a Low Volume Air Sampler (LVAS) at each monitoring location to derive a site-specific correction factor. LVAS calibration monitoring will be performed in accordance with: AS/NZS 3580.9.9 *Methods for Sampling and Analysis of Ambient Air – Determination of suspended particulate matter – PM_{10} low volume sampler – Gravimetric Method*	During site preparation, earthworks, construction	Current locations shown in **Figure 5**	Continuous with 6-monthly calibration

Figure 5 Dust Monitoring Locations for the WNSLR Construction Project



In addition to the dust deposition monitoring, the contractor will:

- Perform daily on-site site observations and inspections to visually assess dust levels. The inspection results are to be recorded in a daily log book, with the log to be available to the DPE when requested. The daily environmental inspections will include, but not be limited to:
  - Visual inspection of any airborne dust being generated on-site or being observed to be potentially blowing off-site;
  - Ensure project access roads leaving the site are free of soil, and that there is no observable soil tracking onto the road network;
  - Inspection and ongoing maintenance of the erosion and sediment control systems for silt build-up; and
  - Inspection of stockpiles and waste storage areas to ensure no significant wind erosion is observable.
- Review Horsley Park Bureau of Meteorology station daily weather forecast (i.e. wind, rain) to inform site dust management procedures.
- Carry out weekly site inspections to monitor compliance with this CAQMP, record inspection results, and make an inspection log available to the DPE when requested; and
- 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 prolonged dry or windy conditions.

A summary of the requirements of the site dust inspection programme is provided in **Table 11**.

Table 11 Air Quality Management – Visual Inspections

Description	Parameter	Methodology	Duration	Location	Frequency
Daily visual inspections	On-site dust generation, vehicle exhaust emissions and compliance with mitigation measures	Visual inspection of dust-generating activities to: - identify if any dust clouds can be seen leaving site etc; - check for smoky exhausts on vehicles and equipment operating on site; and - confirm compliance with air quality mitigation measures specified in this CAQMP. Where excessive dust events are likely to occur (ie prolonged visual dust in a particular area), additional watering of dusty activities will be undertaken. Record inspection results and make an inspection log available to the DPE when asked.	During site preparation, earthworks, construction	On-site within boundaries of the WNSLR construction area	Daily

11 Contingency Management Plan

The air quality contingency management plan for the WNSLR Project is shown in **Table 12**.

Table 12 Air Quality Contingency Management Plan for the WNSLR

Key Element	Trigger / Response	Condition Green	Condition Amber	Condition Red
Visible dust leaving the site	Trigger	Daily inspections show that there is no visible dust leaving the site.	Daily inspections show that there is visible dust leaving the site.	Daily inspections show that there is visible dust leaving the site multiple times during a day OR from multiple locations within the site.
	Response	Continue monitoring program as normal.	Review and investigate construction activities and respective control measures, where appropriate. Implement additional remedial measures, such as: • Deployment of additional water sprays, water trucks etc	Undertake an investigation of the dust generating activities, and if necessary, temporarily halt the dust generating activities.

Key Element	Trigger / Response	Condition Green	Condition Amber	Condition Red
Dust deposition reading of >4g/m²/month	Trigger	Dust deposition rates are less than 4 g/m²/month at all the dust gauges.	Dust deposition rate greater than 4 g/m²/month is recorded by any of the dust gauges	Dust deposition rates greater than 4 g/m²/month are recorded by two or more dust gauges for two months in a row.
	Response	Continue monitoring program as normal.	• Analyse data to try to identify the source(s) of dust. • Review operations to reduce dust emissions from the identified key source(s). Implement any additional mitigation measures as required, such as additional watering.	• Review and investigate construction activities and respective control measures for the monitoring period, in an air pollution incident report and record (see **Appendix D**). • If it is concluded that construction activities were directly responsible for the exceedance (ie the exceedance event was not caused due to high regional dust levels or local non-project dust source), submit an incident report to government agencies. **Note**: Real time suspended particulate monitoring is also to be undertaken, to assist in managing dust from onsite activities (se **Section 10**).
Complaints received regarding nuisance dust	Trigger	There are no complaints received during the construction	An air-quality related complaint is received from a nearby resident	Further complaints are received from the same complainant after the additional mitigation measures have been implemented
	Response	Continue monitoring program as normal.	• Report the complaint to the regulator, in line with complaints handling procedure (See **Section 9**). • Review and investigate construction activities and increase dust suppression measures (additional watering, covering stockpiles etc), where appropriate.	• Implement additional real-time monitoring of dust levels using a continuous monitor (eg Dustrack or eBAM), at (or near) the complainant location (depending on land access), to assist with real time management of construction dust. Update this CAQMP accordingly to include these additional monitoring requirements. • The location of the real-time dust monitor will be determined by the complainant location.

Key Element	Trigger / Response	Condition Green	Condition Amber	Condition Red
Real-time suspended particulate matter monitoring (TSP and PM_{10})	Trigger	Running 24-hour average PM_{10} concentrations < 40 µg/m³	Running 24-hour average PM_{10} concentrations >40 µg/m³ but <50 µg/m³	Running 24-hour average PM_{10} concentrations >50 µg/m³
	Response	Continue monitoring program as normal.	Review and investigate construction activities and respective control measures. Where appropriate, implement additional remedial measures, such as: • Deployment of additional water sprays, water trucks etc • Relocation or modification of dust-generating sources • Record findings of investigations and actions taken to reduce dust levels • Continue to closely monitor dust levels to ensure they are decreasing If elevated dust levels are due to regional dust event (fire, dust storm etc) – still take action to minimise dust from the site to minimise cumulative impacts, but also record details of the cause of the elevated background levels.	• Review and investigate construction activities and respective control measures for the monitoring period, in an air pollution incident report (see **Appendix D**). • If it is concluded that construction activities were directly responsible for the exceedance (ie the exceedance event was not caused due to high regional dust levels or local non-project dust source), submit an incident report to government agencies.

12 Roles and Responsibilities

Overall roles and responsibilities relating to the project are outlined in Section 3.2 of the overarching CEMP.

The key responsibilities specifically for dust management are as follows:

12.1 Project Manager

- Ensuring appropriate resources are available for the implementation of this CAQMP;
- Providing assistance and advice to the Site Superintendent to fulfil the requirements of this Plan, assessing data from inspections and providing project-wide advice to ensure consistent approach and outcomes are achieved;
- Providing necessary training for project personnel to cover air quality management;
- Reviewing and update of this CAQMP; and
- Commissioning a suitably qualified consultant to install any other PM_{10} dust monitoring systems identified as being required.

12.2 Site Superintendent

- Assessing and (as required) mitigating risks of elevated dust levels before commencing works each day and ensuring that the appropriate controls are implemented and effective;
- Reviewing weather forecasts and current observations of meteorological conditions (as recorded at Horsley Park AWS);
- Throughout the day, visually assessing the dust levels and the effectiveness of any dust controls implemented, making adjustments accordingly;
- Investigating works in the event of excessive dust generation due to extreme weather conditions or inadequately controlled construction activities (eg high winds, surface dirt accumulation, etc.); and
- In the event that an air quality complaint is received, the Site Superintendent will conduct an investigation in accordance with the complaint handling procedure (see **Section 9**).

12.3 All Workers on Site

- Observing any dust emission control instructions and procedures that apply to their work;
- Taking action to prevent or minimise dust emission incidents; and
- Identifying and reporting dust emission incidents.

13 Review and Improvement of the CAQMP

The review of the CAQMP will be undertaken at least quarterly and will include participation by Goodman. The review will comprise, as a minimum, the following:

- Identification of areas of opportunity for improved environmental performance;
- Analysis of the causes of any recorded non-compliances, including those identified in environment inspections and audits;
- Verification of the effectiveness of corrective and preventative actions; and
- Highlighting any changes in procedures resulting from process improvement.

This CAQMP will also be reviewed and, if necessary, revised in the following circumstances:

- Where there is any change to the scope of the construction activities and/or disturbance footprint;
- Where it is identified that the environmental performance is not meeting the objectives of the CAQMP;
- In the event of a substantiated complaint being received regarding air quality impacts; and/or
- At the request of a relevant regulatory authority.

14 References

- DEC 2006, Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales, Department of Environment and Conservation NSW, December 2006.
- EPA 2017, Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, Environment Protection Authority NSW, January 2017.
- EPA 2018, Local Government Air Quality Toolkit, Module 3 – Guidelines for Managing Air Pollution, Part 3 – Guidance Notes for Construction Sites, available online at https://www.epa.nsw.gov.au/your-environment/air/air-nsw-overview/local-government-air-quality-toolkit, accessed on 17 July 2018.
- Holman et al 2014, IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London. http://www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf.
- OEH 2017a, NSW Annual Compliance Report 2015, National Environment Protection (Ambient Air Quality) Measure, published by Office of Environment and Heritage, OEH 2017/0211, May 2017.
- OEH 2017b, NSW Air Quality Statement 2016 – Towards Cleaner Air, published by Office of Environment and Heritage, OEH 2017/0013, January 2017.
- OEH 2018, NSW Air Quality Statement 2017 – Clearing the Air, published by Office of Environment and Heritage, OEH 2018/0044, January 2018.
- OEH 2019, NSW Annual Air Quality Statement 2018, published by Office of Environment and Heritage, OEH 2019/0031, January 2019.
- SLR Consulting (2019b) Community Communications Strategy
- URBIS 2017, Environmental Impact Statement Oakdale West Estate, State Significant Development Application, prepare for: Goodman Limited, SA6642, 1 November 2017.
- USEPA 2006, AP42 Fifth Edition, Volume I, Chapter 13: Miscellaneous Sources, 13.2.5 – Industrial Wind Erosion, November 2006.

APPENDIX A

WIND ROSES AND RAINFALL DATA ANALYSIS

Wind Conditions

Local wind speed and direction influence the dispersion of air pollutants. Wind speed determines both the distance of downwind transport and the rate of dilution as a result of 'plume' stretching. Wind direction, and the variability in wind direction, determines the general path pollutants will follow and the extent of crosswind spreading. Surface roughness (characterised by features such as the topography of the land and the presence of buildings, structures and trees) will also influence dispersion.

The Bureau of Meteorology (BoM) maintains and publishes data from weather stations across Australia. The closest such station recording wind speed and wind direction data is the Horsley Park Automatic Weather Station (AWS) (Station ID 67119), located approximately 5.5 kilometres (km) southeast of the WNSLR. Considering the relatively flat terrain between WNSLR and Horsley Park AWS, it is considered reasonable to assume that the wind conditions recorded at the Horsley Park AWS are representative of the wind conditions experienced at the WNSLR.

Annual wind roses for the years 2014 to 2018 compiled from data recorded by the Horsley Park AWS are presented in **Figure A1**, with seasonal wind roses for 2018 presented in **Figure A2**. Wind roses show the frequency of occurrence of winds by direction and strength. The bars correspond to the 16 compass points (degrees from North). The bar at the top of each wind rose diagram represents winds blowing from the north (i.e. northerly winds), and so on. The length of the bar represents the frequency of occurrence of winds from that direction, and the widths of the bar sections correspond to wind speed categories, the narrowest representing the lightest winds. Thus it is possible to visualise how often winds of a certain direction and strength occur over a long period, either for all hours of the day, or for particular periods during the day.

The 'Beaufort Wind Scale' (consistent with terminology used by the BoM) presented in **Table A1** was used to describe the wind speeds experienced at the WNSLR.

Table A1 Beaufort Wind Scale

Beaufort Scale #	Description	m/s	Description on land
0	Calm	0-0.5	Smoke rises vertically
1	Light air	0.5-1.5	Smoke drift indicates wind direction
2-3	Light/gentle breeze	1.5-5.3	Wind felt on face, leaves rustle, light flags extended, ordinary vanes moved by wind
4	Moderate winds	5.3-8.0	Raises dust and loose paper, small branches are moved
5	Fresh winds	8.0-10.8	Small trees in leaf begin to sway, crested wavelets form on inland waters
6	Strong winds	>10.8	Large branches in motion, whistling heard in telephone wires; umbrellas used with difficulty

Source: http://www.bom.gov.au/lam/glossary/beaufort.shtml

The annual wind roses for the years 2014 to 2018 (**Figure A1**) indicate that predominant wind directions in the area are consistently from the southwest quadrant. Very low frequencies of winds from the north-eastern quadrant were recorded across all years. The annual frequency of calm wind conditions was recorded to be approximately 12%-14.5% for all the years between 2014 and 2018.

A review of the annual wind roses (**Figure A1**) indicates that:

- Winds that would blow fugitive dust emissions from the demolition/construction works towards the nearest sensitive receptors located to the north and northwest of the proposed construction activities occur approximately 15-20% of the time.

The seasonal wind roses for the year 2018 (**Figure A2**) indicate that:

- In summer, wind speeds ranged from calm to fresh winds (between 0.5 m/s and 9.8 m/s). The majority of winds originated from eastern and south eastern quadrants, with very few winds from western directions. Calm wind conditions were recorded approximately 13% of the time during summer.
- In autumn, wind speeds ranged from calm to fresh winds (between 0.5 m/s and 8.9 m/s). The majority of winds originated from southwest quadrant, with very few winds from north eastern directions. Calm wind conditions were observed to occur approximately 16% of the time during autumn.
- In winter, wind speeds ranged from calm to fresh winds (between 0.5 m/s and 8.6 m/s). The majority of winds originated from southwest quadrant, with very few winds from northeast and east directions. Calm wind conditions were observed to occur approximately 16% of the time during winter.
- In spring, wind speeds ranged from calm to fresh winds (between 0.5 m/s and 9.8 m/s). The frequency of winds are mostly even in each directions, with relatively low frequency of winds originating from northwest quadrant. Calm wind conditions were observed to occur approximately 14% of the time during spring.

Wind erosion of dust from exposed surfaces (ie, during the construction phase of the development) is usually initiated when wind speeds exceed the threshold friction velocity for a given surface or material, however a general rule of thumb is that wind erosion can be expected to occur above 5 m/s (USEPA 2006). The frequency of wind speeds for the period of 2014-2018 is presented in **Figure A3**. The plot showed that the frequency of wind speeds exceeding 5 m/s for the period 2014-2018 at Horsley Park AWS was approximately 6%.

Figure A1 Annual Wind Roses for Horsley Park (2014 to 2018)

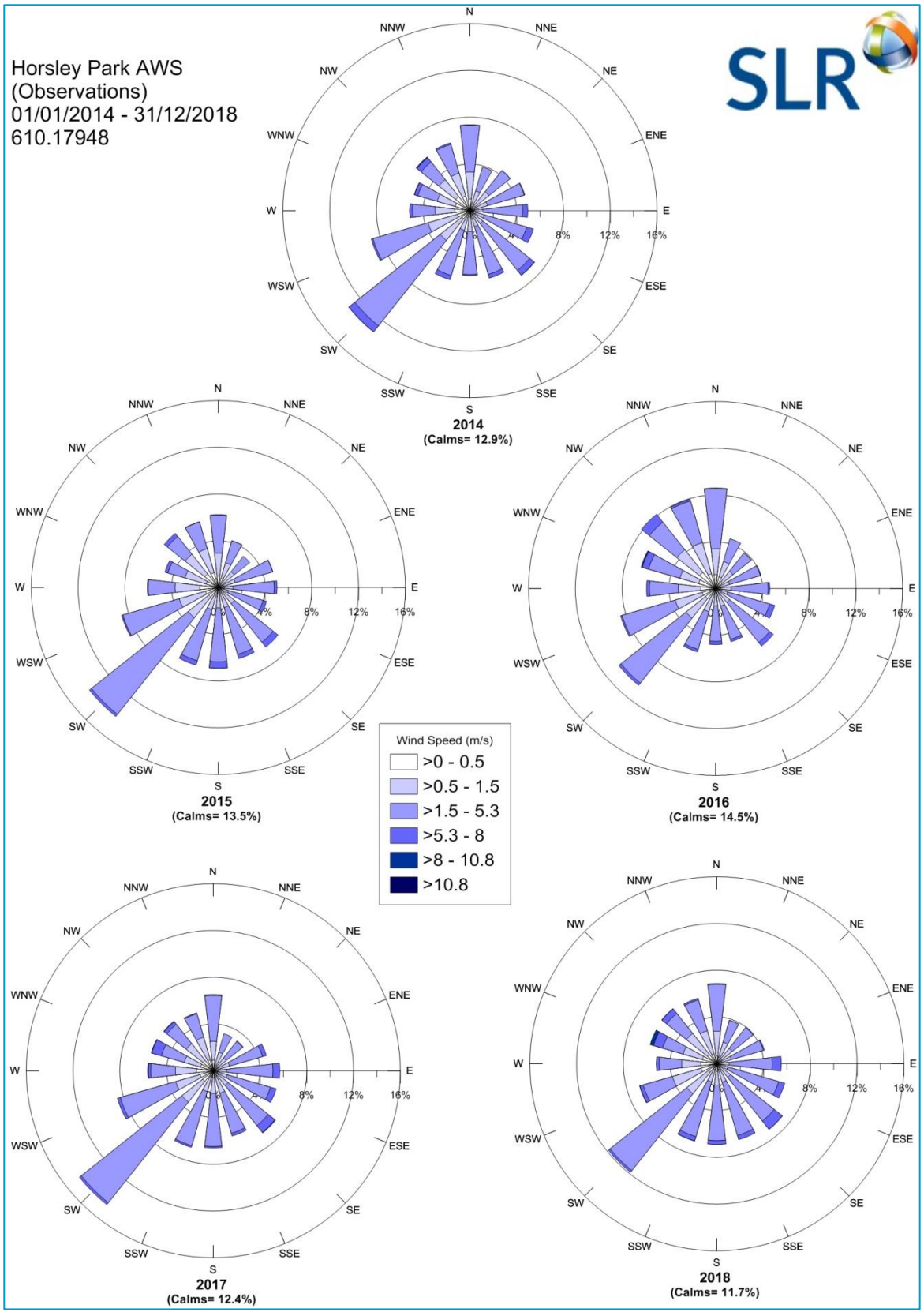


Figure A2 Annual and Seasonal Wind Roses for Horsley Park (2018)

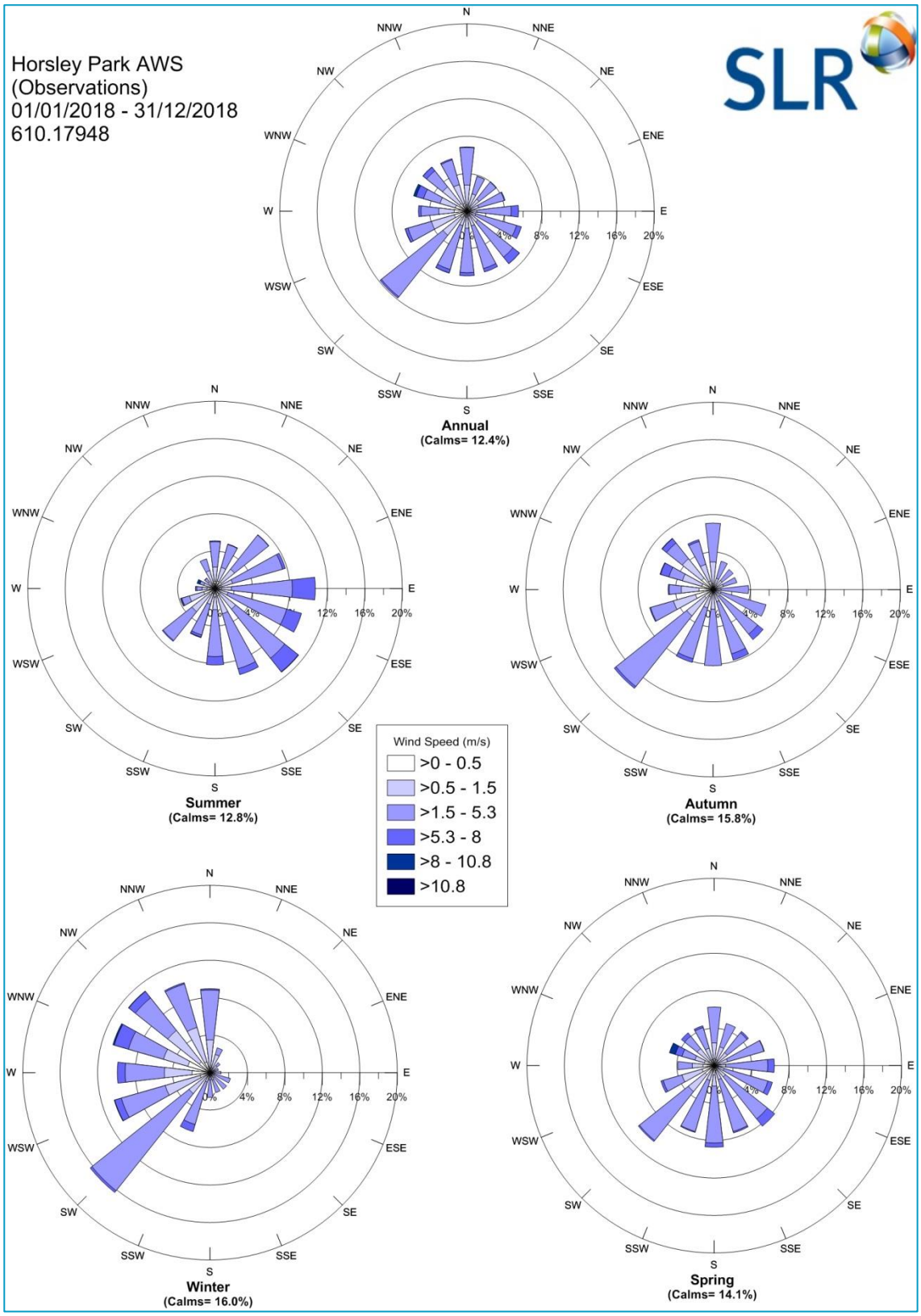
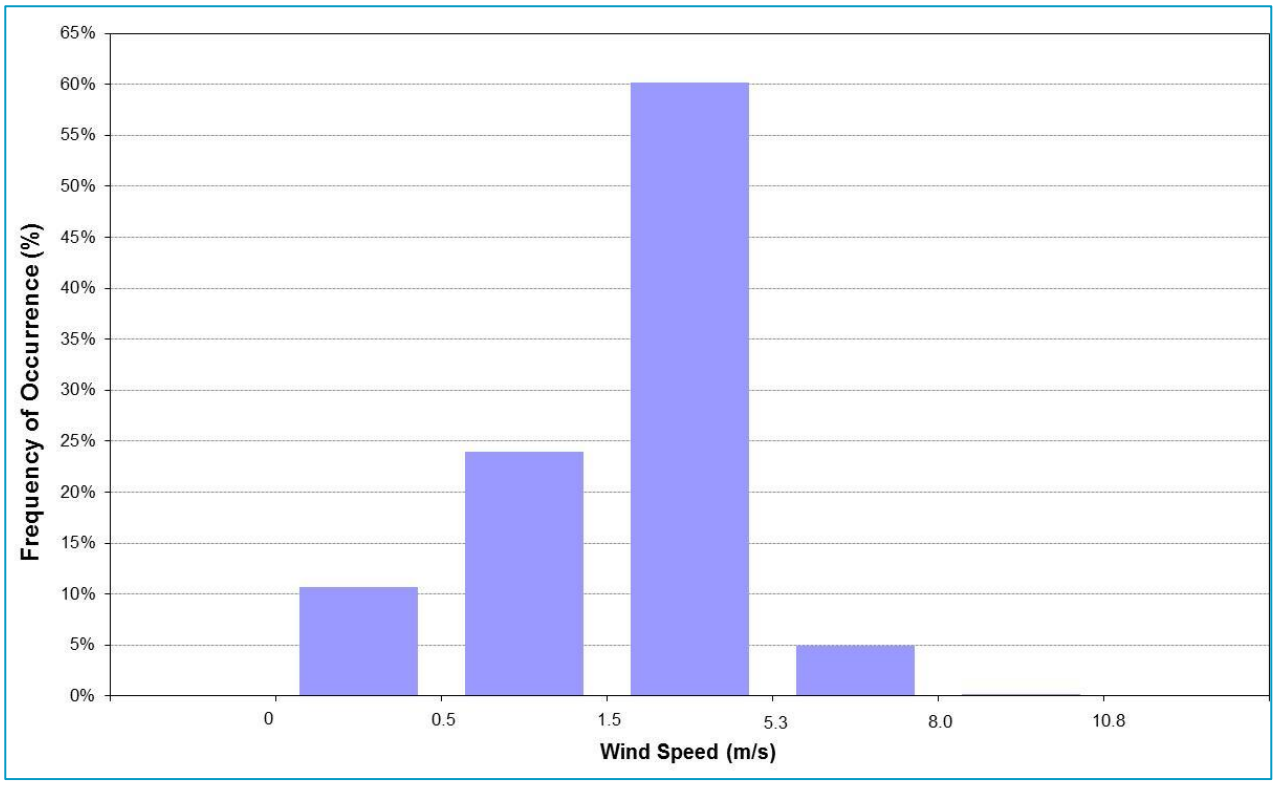


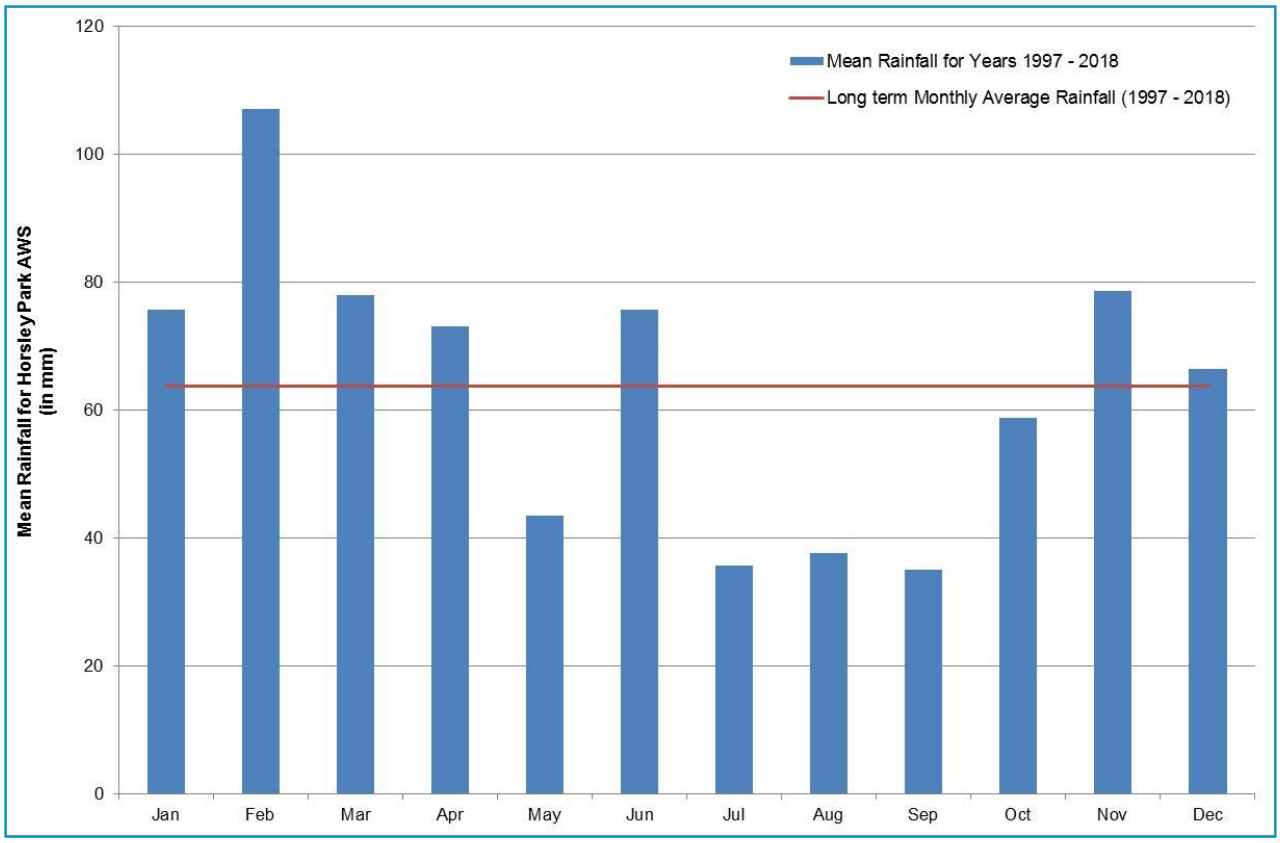
Figure A3 Wind Speed Frequency Chart for Horsley Park AWS – 2014-2018



Rainfall

Dry periods (no rainfall) have the greatest potential for fugitive dust emissions during construction. The long term monthly rainfall averages recorded at Horsley Park AWS rain gauge are shown in **Figure A4**. It is noted that generally rainfall is relatively low in mid-winter to mid spring periods. This rainfall pattern suggests that dust emissions from the demolition/construction activities at the WNSLR have the greatest potential to impact on receptors for the period of late autumn to early spring.

Figure A4 Long term Mean Rainfall for Horsley Park AWS – 1997 to 2018



APPENDIX B

CURRICULUM VITAE OF AUTHOR

CURRICULUM VITAE

VARUN MARWAHA

ASSOCIATE

Air Quality, Asia-Pacific

QUALIFICATIONS

BEng	2006	Bachelor of Engineering - Chemical, University of Sydney

EXPERTISE

- Air Quality Dispersion modelling using a variety of software applications
- Meteorological and Ambient air quality monitoring & assessment for legislative compliance
- Australian state and federal regulatory compliance – Air Quality
- Opportunities and constraints reporting
- Detailed knowledge of air quality/meteorological interactions

Varun is an Associate Air Quality Consultant working within the Air Quality team. He has over 10 years of environmental and process engineering experience.

Varun has acquired a broad environmental experience including air quality (including odour) impact assessments, emission inventories (including National Pollutant Inventory), air quality dispersion modelling (including Ausplume, CALPUFF and CAL3QHCR), air quality monitoring (including odour), meteorological monitoring, meteorological modelling (The Air Pollution Model [TAPM] & CALMET), greenhouse gas assessments and overall project management.

Varun has conducted numerous environmental audits and prepared NPI reports for a range of industries including power stations throughout Australia.

Varun is a Certified Air Quality Professional (CAQP) and a Certified Practicing Project Manager (CPPM), and is respected for his contribution to the air quality industry.

PROJECTS

Sentosa Gateway Project, Singapore	The project involved the assessment of air impacts due to road traffic tunnel from Sentosa Island to mainland Singapore. The project proposed to build a tunnel for the outbound traffic from Sentosa with tunnel exits located on Lower Delta Road and Keppel Road. The emissions were quantified and modelled using CAL3QHCR and CALPUFF modelling suites to predict the roadside impacts. The project also included assessment of other sources of pollutants in the region for the cumulative assessment
Sydney Harbour Bridge, Sydney, NSW, Australia	Compliance Monitoring (Lead, PM_{10} and TSP). The project involves repainting the iconic Sydney Harbour Bridge. The process includes stripping the old paint (containing lead), preparation of the surface and repainting. The monitoring was conducted for lead concentration in the air along with the concentration of particulate (PM_{10} and TSP) was required. For lead monitoring, membrane filters were used and for particulate monitoring High Volume air samplers (HVAS) were employed.

Capital Metro Project, Canberra, ACT, Australia (2018-2019)	The project involved preparation of Air Quality Impact Assessment (AQIA) for the proposed ACT Light Rail Stage 1 – Gungahlin to Civic Project, a 12 kilometre light rail service linking the fast- developing area of Gungahlin in the north, to the City. The emissions due to the operation of light rail network were quantified and compared to the existing regional air emissions levels. It was demonstrated that the regional emissions were likely to decrease significantly when compared with the current situation.
Proposed Residential Development, RMS	Road Traffic Impact Assessment. The project involved assessment of roadside impacts on the proposed residential development due to road traffic on a busy motorway. The aim of the project was to determine the maximum impacts and validating against the monitored roadside data. The emissions were quantified and modelled using CAL3QHCR modelling suite to predict the roadside impacts. The project also included assessment of other sources of pollutants in the region for the cumulative assessment. The modelling skills were put to test when integrating predicted results from several modelling suites (CAL3QHCR and CALPUFF)
Proposed Haul Roads (Fortescue Metals Group), WA, Australia	The project involved assessment of two possible options for building haul roads in separate directions. The aim of the project was to determine mine access route from the nearest transport facility. The emissions were quantified and modelled using CALPUFF modelling suite to predict the roadside impacts on the nearest receptors on each haul road route.
Confidential Highway Project, QLD, Australia	Emissions estimation and modelling for an air quality impact assessment for a proposed new highway in Queensland. Work included the estimation of vehicle emissions for the operational phase using the COPERT-Australia emissions modelling software and dispersion modelling of the road and tunnel emissions using CAL3QHCR and CALPUFF dispersion models.
MEMBERSHIPS	Clean Air Society of Australia and New Zealand (CASANZ)
	Member of Engineers Australia (EA)
	Institute of Chemical Engineers (IChemE)
ACCREDITATION	Certified Air Quality Professional (CAQP), CASANZ
	Certified Practicing Project Manager (CPPM), UNE
TRAINING	Advanced CALPUFF Course – Clean Air Society of Australia and New Zealand (CASANZ), 2008
	The Role of Meteorology in Dispersion Modelling – CASANZ, 2011
	Diploma of Project Management – University of New England, 2012

APPENDIX C

CONSTRUCTION PHASE RISK ASSESSMENT METHODOLOGY

Step 1 – Screening Based on Separation Distance

The Step 1 screening criteria provided by the IAQM guidance suggests screening out any assessment of impacts from construction activities where sensitive receptors are located more than 350 m from the boundary of the site, more than 50 m from the route used by construction vehicles on public roads and more than 500 m from the site entrance. This step is noted as having deliberately been chosen to be conservative, and will require assessments for most projects.

As noted in **Section 3.3**, the nearest sensitive receptor is located within 500 m from the nearest WNSLR boundary.

The screening criteria for detailed assessment are:

- a 'human receptor' within:
  - 350 m of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).
- an 'ecological receptor' within:
  - 50 m of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

Sensitive receptors (residences) are located beyond 350 m from the boundary of the WNSLR and beyond 50 m from the route used by construction vehicles on public roads, however the nearest sensitive receptor is located within 500 m of the site entrance, therefore further assessment is required.

Step 2a – Assessment of Scale and Nature of the Works

Step 2a of the assessment provides "dust emissions magnitudes" for each of four dust generating activities; demolition, earthworks, construction, and track-out (the movement of site material onto public roads by vehicles). The magnitudes are: *Large*; *Medium*; or *Small*, with suggested definitions for each category. The definitions given in the IAQM guidance for earthworks, construction activities and track-out, which are most relevant to this Development, are as follows:

Demolition *(Any activity involved with the removal of an existing structure [or structures]. This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time)*:

- ***Large***: Total building volume >50,000 m^3, potentially dusty 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 <10m above ground, demolition during wetter months.

Earthworks *(Covers the processes of soil-stripping, ground-levelling, excavation and landscaping)*:

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

Construction *(Any activity involved with the provision of a new structure (or structures), its modification or refurbishment. A structure will include a residential dwelling, office building, retail outlet, road, etc)*:

- ***Large***: Total building volume greater than 100,000 m^3, piling, on site concrete batching; sandblasting.
- ***Medium***: Total building volume 25,000 m^3 to 100,000 m^3, potentially dusty construction material (eg concrete), piling, on site concrete batching.
- ***Small***: Total building volume less than 25,000 m^3, construction material with low potential for dust release (eg metal cladding or timber).

Track-out *(The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network)*:

- ***Large***: More than 50 heavy vehicle movements per day, surface materials with a high potential for dust generation, greater than 100 m of unpaved road length.
- ***Medium***: Between 10 and 50 heavy vehicle movements per day, surface materials with a moderate potential for dust generation, between 50 m and 100 m of unpaved road length.
- ***Small***: Less than 10 heavy vehicle movements per day, surface materials with a low potential for dust generation, less than 50 m of unpaved road length.

Note: No demolition of existing structures will be performed as part of this Development.

In order to provide a conservative assessment of potential impacts, it has been assumed that if at least one of the parameters specified in the 'large' definition is satisfied, the works are classified as large, and so on.

Based on the above, dust emission magnitudes have been categorised as presented in **Table C1**.

Table C1 Categorisation of Dust Emission Magnitude

Activity	Dust Emission Magnitude	Basis
Demolition	Small	**IAQM Definition:** Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months. **Relevance to this Project:** *There are no sheds to be demolished as part of constructing the WNSLR, however small old infrastructure (such as old electric poles) that may require relocation.*
Earthworks	Large	**IAQM Definition:** Total site area greater than 10,000 m^2, potentially dusty soil type (eg clay, which will be prone to suspension when dry due to small particle size), more than 10 heavy earth moving vehicles active at any one time, formation of bunds greater than 8 m in height, total material moved more than 100,000 t. **Relevance to this Project:** *Total area where the earthworks will be undertaken for the WNSLR is estimated to be greater than 30,000 m^2. This is based on proposed WNSLR dimensions of 1 km length and 30 m width.*
Construction	Medium	**IAQM Definition:** Total building volume 25,000 m^3 to 100,000 m^3, potentially dusty construction material (eg concrete), piling, on site concrete batching. **Relevance to this Project:** *Although there are no new buildings proposed as part of the WNSLR construction, the total volume of road is estimated to be approximately 30,000 m^3. This is based on road area of 30,000 m^2 and average depth of 1 m.*
Trackout	Medium	**IAQM Definition:** Between 10 and 50 heavy vehicle movements per day, surface materials with a moderate potential for dust generation, between 50 m and 100 m of unpaved road length. **Relevance to this Project:** *The traffic volume during construction is estimated to be 20 vehicle movements per hour.*

Step 2b – Risk Assessment

Assessment of the Sensitivity of the Area

Step 2b of the assessment process requires the sensitivity of the area to be defined. The sensitivity of the area takes into account:

- The specific sensitivities that identified sensitive receptors have to dust deposition and human health impacts;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and
- Other site-specific factors, such as whether there are natural shelters such as trees to reduce the risk of wind-blown dust.

Individual receptors are classified as having *high*, *medium* or *low* sensitivity to dust deposition and human health impacts (ecological receptors are not addressed using this approach). The IAQM method provides guidance on the sensitivity of different receptor types to dust soiling and health effects as summarised in **Table C1**. It is noted that user expectations of amenity levels (dust soiling) is dependent on existing deposition levels.

Table C2 IAQM Guidance for Categorising Receptor Sensitivity

Value	High Sensitivity Receptor	Medium Sensitivity Receptor	Low Sensitivity Receptor
Dust soiling	Users can reasonably expect a high level of amenity; or The appearance, aesthetics or value of their property would be diminished by soiling, and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land.	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or The appearance, aesthetics or value of their property could be diminished by soiling; or The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.	The enjoyment of amenity would not reasonably be expected; or Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.
	Examples: Dwellings, museums, medium and long term car parks and car showrooms.	*Examples: Parks and places of work.*	*Examples: Playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.*
Health effects	Locations where the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	Locations where human exposure is transient.
	Examples: Residential properties, hospitals, schools and residential care homes.	*Examples: Office and shop workers, but will generally not include workers occupationally exposed to PM10.*	*Examples: Public footpaths, playing fields, parks and shopping street.*

According to the IAQM methods, the sensitivity of the identified individual receptors (as described above) is then used to assess the *sensitivity of the area* surrounding the active construction area, taking into account the proximity and number of those receptors, and the local background PM_{10} concentration (in the case of potential health impacts) and other site-specific factors. Additional factors to consider when determining the sensitivity of the area include:

- any history of dust generating activities in the area;

- the likelihood of concurrent dust generating activity on nearby sites;
- any pre-existing screening between the source and the receptors;
- any conclusions drawn from analysing local meteorological data which accurately represent the area and if relevant, the season during which the works will take place;
- any conclusions drawn from local topography;
- the duration of the potential impact (as a receptor may be willing to accept elevated dust levels for a known short duration, or may become more sensitive or less sensitive (acclimatised) over time for long-term impacts); and
- any known specific receptor sensitivities which go beyond the classifications given in the IAQM document.

Based on the criteria listed in **Table C2**, the sensitivity of the identified receptors in this study is concluded to be *high* for health impacts and *high* for dust soiling, as they include residential areas where people may be reasonably expected to be present continuously as part of the normal pattern of land use.

The IAQM guidance for assessing the sensitivity of an area to dust soiling is shown in **Table C3**. The sensitivity of the area should be derived for each of activity relevant to the project (ie construction and earthworks).

Table C3 IAQM Guidance for Categorising the Sensitivity of an Area to Dust Soiling Effects

Receptor Sensitivity	Number 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
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Note: Estimate the total number of receptors within the stated distance. Only the *highest level* of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors < 20m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors < 50 m is 102. The sensitivity of the area in this case would be high.

A modified version of the IAQM guidance for assessing the *sensitivity of an area* to health impacts is shown in **Table C4**. For high sensitivity receptors, the IAQM methods takes the existing background concentrations of PM_{10} (as an annual average) experienced in the area of interest into account and is based on the air quality objectives for PM_{10} in the UK. As these objectives differ from the ambient air quality criteria adopted for use in this assessment (ie an annual average of 19.4 $\mu g/m^3$ for PM_{10}) the IAQM method has been modified slightly.

This approach is consistent with the IAQM guidance, which notes that in using the tables to define the *sensitivity of an area*, professional judgement may be used to determine alternative sensitivity categories, taking into account the following factors:

- any history of dust generating activities in the area;
- the likelihood of concurrent dust generating activity on nearby sites;
- any pre-existing screening between the source and the receptors;
- any conclusions drawn from analysing local meteorological data which accurately represent the area, and if relevant the season during which the works will take place;

- any conclusions drawn from local topography;
- duration of the potential impact; and
- any known specific receptor sensitivities which go beyond the classifications given in this document.

Table C4 IAQM Guidance for Categorising the Sensitivity of an Area to Dust Health Effects

Receptor sensitivity	Annual mean PM_{10} conc.	Number of receptors [a,b]	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>25 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	21-25 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	17-21 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<17 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>25 µg/m³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	21-25 µg/m³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	17-21 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<17 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Notes:

(a) Estimate the total within the stated distance (e.g. the total within 350 m and not the number between 200 and 350 m); noting that only the highest level of area sensitivity from the table needs to be considered.

(b) In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties.

As noted in **Section 3.3**, the nearest sensitive receptor is located within 500 m from the nearest WNSLR boundary. Based on the classifications shown in **Table C3** and **Table C4**, the sensitivity of the area to dust soiling and to health effects may both be classified as '*low*'. This categorisation has been made considering the individual receptor sensitivities derived above, the annual mean background PM_{10} concentration of 19.4 µg/m³ recorded at St Marys AQMS (see **Section 6.2**) and the anticipated number of sensitive receptors present in the vicinity of the WNSLR.

Risk Assessment

The dust emission magnitude from Step 2a and the receptor sensitivity from Step 2b are then used in the matrices shown in **Table C5** (earthworks and construction), **Table C6** (track-out) and **Table C7** (demolition) to determine the risk category with no mitigation applied.

Table C5 Risk Category from Earthworks and Construction Activities

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

Table C6 Risk Category from Track-out Activities

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

Table C7 Risk Category from Demolition Activities

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

APPENDIX D

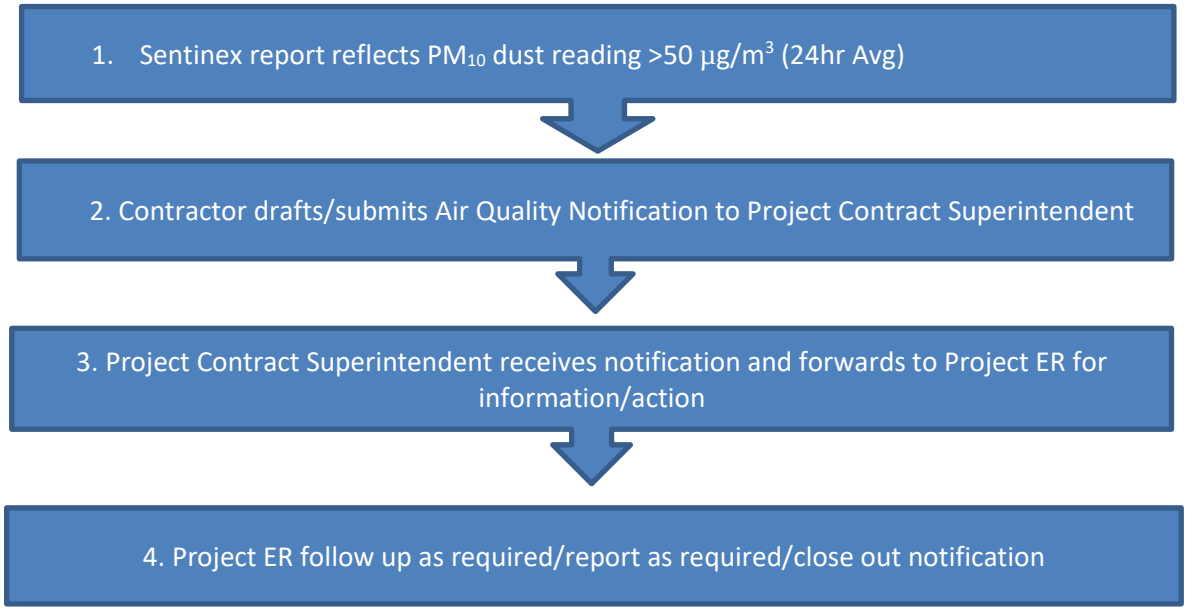
AIR QUALITY NOTIFICATION FORM

WESTERN NORTH SOUTH LINK ROAD	
Air Quality Notification Form ➢ This form to be completed within 24hrs of an exceedance of PM10 dust >50 µg/m^3 (24hr average) on site (CAQMP Sect 5.2.1 Table 4 – 24hr average) ➢ This form to be completed by the Contractor PM, PE or Environmental Representative ➢ Please attach site observation photographs as required	
Contract	
Prepared by (Print Name)	
Position (Project PM, Engineer etc)	
Time/Day/Date of notification	
What were the PM_{10} levels recorded at the start of the shift?	
Condition Red Notification Summary Provide PM_{10} level data for the three Sentinex units located on site Ref: CAQMP Sect 11 Table 12.	South µg/m^3(24hr) North µg/m^3(24hr) West µg/m^3(24hr)
Was there scope of work specific dust generation observed during the reporting period? (If yes, please provide site specific area)	

WESTERN NORTH SOUTH LINK ROAD	
Was the measured dust level influenced by dust from external sources? (yes/no/possible)	
Dust generating construction related activities at the time of the notification (1) Provide a brief description of works being undertaken at the time of the dust being observed	
Background levels for PM10 recorded for the reporting period (St Mary's dust gauges) (2)	St Mary's AQMS µg/m^3(24hr)
Wind direction and speed relating to the reporting period (show variable wind directions and speed throughout the notification period. Attach wind charts if applicable) (3)	
Were additional dust mitigation resources implemented during the reporting period? (if yes, provide a brief description)	
Sign/Date	
OWE Contract Superintendent to Complete	
Notified ER Time/Day/Date	
Follow up required (yes/no)	
Is this notification issued as a result of an external complaint? If so, provide reference to CCCS report	
Sign/Date	

WESTERN NORTH SOUTH LINK ROAD

AIR QUALITY NOTIFICATION CHAIN OF REPORTING MATRIX



ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
5 Foelsche Street
Darwin NT 0800
Australia
T: +61 8 8998 0100
F: +61 2 9427 8200

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Suite 2, 2 Domville Avenue
Hawthorn VIC 3122
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY
2 Lincoln Street
Lane Cove NSW 2066
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
Level 1, 514 Sturt Street
Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

TOWNSVILLE SOUTH
12 Cannan Street
Townsville South QLD 4810
Australia
T: +61 7 4772 6500

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 404 939 922

AUCKLAND
68 Beach Road
Auckland 1010
New Zealand
T: +64 27 441 7849

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628