



Appendix B6


Air Quality Management Sub-plan

Albion Park Rail bypass (Stage 2 – Princes Motorway between Yallah and Oak Flats)


February 2020

Document control

Approval and authorisation

Title	Air Quality Management Sub-plan Albion Park Rail bypass (Stage 2 – Princes Motorway between Yallah and Oak Flats)
Accepted on behalf of Transport for NSW by	Peter Hawkins
Signed	
Dated	26/02/2020

Endorsement

Endorsed by the Environmental Representative	Toby Hobbs
Signed	
Dated	26/02/2020

Document status

Revision	Date	Description	Approval
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1	24/07/18	Revised in response to comments from Roads and Maritime Services and the ER	
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		Resubmitted to DP&E for approval of the construction air quality monitoring program only.	
8	20/02/20	2019/20 annual review during construction including minor editorial changes including change of name from Roads and Maritime Services to Transport NSW, discussion on monitoring requirements including location of monitoring equipment. Inclusion of additional consideration regarding additional hard rock extraction methods in Section 5-1 and inclusion of additional mitigation measure AQMM23 detailed in Table 6-1. The review also updates air quality trends in the Illawarra regarding PM2.5 regional levels and monitoring requirements set out in the Project EPL.	

Distribution of controlled copies

This AQMP as part of the CEMP is available to all personnel and sub-contractors via the Project document control management system. An electronic copy can be found on the Project website.

The document is uncontrolled when printed. One controlled hard copy of the AQMP as part of the CEMP and supporting documentation will be maintained by the Quality Manager at the Project office and on the project website.

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Glossary/ Abbreviations

Abbreviation	Expanded text
AWS	Automatic Weather Station
AQMP	Air Quality Management Sub-plan
BoM	Australian Government Bureau of Meteorology
CEMP	Construction Environmental Management Plan
CoA	Conditions of approval (state or federal). State CoA are the NSW Minister for Planning's conditions of approval. Federal CoA are the federal Conditions of Approval under the EPBC Act.
DMG	Dust Monitoring Gauges
DPIE	Department of Planning, Infrastructure and Environment
EIS	Environmental Impact Statement
EPL	Environment Protection Licence
ER	Environmental Representative
ESCP	Erosion and Sediment Control Plan
EEC	Endangered Ecological Community
EPA	NSW Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EWMS	Environmental Work Method Statements
GREP	Government Resource Efficiency Policy
NSW Minister, the	NSW Minister for Planning
Non-compliance	Failure to comply with the requirements of the Project approval or any applicable licence, permit or legal requirements
Non-conformance	Failure to conform to the requirements
OEH	Office of Environment and Heritage
POEO Act	Protection of the Environment Operations Act 1997
PM _{2.5}	Particulate matter less than 2.5 µm in aerodynamic equivalent diameter
PM ₁₀	Particulate matter less than 10 µm in aerodynamic equivalent diameter
Project, the	Albion Park Rail bypass
REMM	Revised Environmental Management Measures
Roads and Maritime	Roads and Maritime Services – All references to Roads and Maritime should be interpreted as Transport for NSW (formerly Roads and Maritime Services)
SPIR	Submissions and Preferred Infrastructure Report - A report developed to respond to submissions raised during the exhibition of the EIS and assess changes from the EIS
TARP	Trigger Action Response Plan
TfNSW	Transport for NSW
TSP	Total suspended particulates

1 Introduction

1.1 Context

This Air Quality Management Sub-plan (AQMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for Albion Park Rail bypass (Stage 2 – Princes Motorway between Yallah and Oak Flats) (the Project).

This AQMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA), the Albion Park Rail Bypass Environmental Impact Statement (EIS), as amended by the Submissions and Preferred Infrastructure Report (SPIR), including the revised environmental management measures (REMM) listed in the SPIR and all applicable legislation.

1.2 Background and project description

Transport for NSW (TfNSW, formerly known as Roads and Maritime Services or Roads and Maritime) propose to extend the M1 Princes Motorway between Yallah and Oak Flats to bypass Albion Park Rail. The motorway would complete the 'missing link' for a high standard road between Sydney and Bomaderry. The project is known as the Albion Park Rail bypass.

The EIS assessed the impacts of construction and operation of the Project on air quality, within the EIS, chapter 19.

The EIS identified the potential for minor impacts on air quality during construction typically associated with dust. However, concluded any potential impacts could be managed by standard mitigation and management measures.

1.3 Environmental management systems overview

The overall Environmental Management System for the Project is described in Chapter 3 of the CEMP.

The AQMP is part of Fulton Hogan's environmental management framework for the Project, as described in Chapter 4 of the CEMP. Management measures identified in this Plan will be incorporated into site or activity specific Environmental Work Method Statements (EWMS).

EWMS will be developed and signed off by environment and management representatives prior to associated works and construction personnel will be required to undertake works in accordance with the identified mitigation and management measures.

Used together, the CEMP, strategies, procedures and EWMS form management guides that clearly identify required environmental management actions for reference by Fulton Hogan personnel and contractors.

The review and document control processes for this Plan are described in Section 1.6 of the CEMP.

1.4 Consultation for preparation of this AQMP

This AQMP (including the construction air quality monitoring program) has been developed in consultation with the Environment Protection Authority (EPA).

Key observations raised by the EPA generally related to the use of real time particulate monitors and the development of Trigger Action Response Plans (TARPs). The AQMP was revised to include two real time particulate monitors and a TARP and the plan was reissued to the EPA for review. The EPA acknowledged that Fulton Hogan had consulted with the EPA and revised the plan in response to EPA's observations. A presentation regarding air quality management and monitoring was made to the EPA on 23 October 2019, enabling greater understanding of local and regional air quality issues along with monitoring and reporting of PM₁₀ and PM_{2.5}. EPA confirmed monitoring requirements only as no limits exist in the EPL and there were no outstanding issues.

A summary of consultation undertaken during preparation of this Plan, including copies of all correspondence, is provided in Appendix A5 of the CEMP.

2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to describe how Fulton Hogan proposes to manage and protect air quality during construction of the Project.

2.2 Objectives

The key objective of the AQMP is to ensure that project impacts on air quality are minimised and within the scope permitted by the planning approval. To achieve this objective, Fulton Hogan will undertake the following:

- Ensure appropriate controls and procedures are implemented during construction activities to avoid or minimise air quality impacts and potential adverse impacts to sensitive receivers along the Project corridor
- Ensure appropriate measures are implemented to address the relevant CoA and REMM outlined in Table 3-2 and Table 3-3 respectively
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in Chapter 3 of this Plan.

2.3 Targets

The following targets have been established for the management of air quality impacts during construction of the project:

- Ensure full compliance with the relevant legislative requirements, CoA and REMM
- Meet environment protection licence (EPL) air quality parameters
- Ensure training on best practice air quality management is provided to all construction personnel through site inductions.

2.4 Environmental performance outcomes

Table 2-1 identifies the construction-related environmental performance outcomes identified in the EIS as amended by the SPIR and how these will be achieved.

Table 2-1 Environmental performance outcomes

EIS reference	Environmental performance outcome	How achieved
Section 18.3.1, p540	Significant effects on sensitive receivers would be prevented through the use of effective mitigation measures.	Chapter 6 mitigation measures.
Section 18.3.1, p539	Exhaust emissions from diesel-powered construction equipment would be minimised.	Chapter 6 mitigation measure ID AQMM9 - AQMM11.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

Legislation relevant to air quality management includes:

- *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act)
- *Protection of the Environment Operations Act 1997* (NSW) (POEO Act)
- *Protection of the Environment Operations (Clean Air) Regulation 2010* (NSW)
- *National Greenhouse and Energy Reporting Act 2007* (Cth)
- *Protection of the Environment (Air Toxics) Regulation 1998* (NSW) (as amended)
- *Protection of the Environment (General) Regulation 2009* (NSW)
- *Protection of the Environment (Ambient Air Quality) Regulation 1998* (NSW) (as amended)
- *National Environmental Protection Measure Act 1994* (Cth).

Relevant provisions of the above legislation are explained in the register of legal and other requirements included in Appendix A1 of the CEMP.

3.1.2 Guidelines and standards

The main guidelines, specifications and policy documents relevant to this Plan include:

- Roads and Maritime QA Specification G36 – Environmental Protection (Management System)
- Air Quality Monitoring Criteria for Deposited Dust (DEC Guideline)
- National Environment Protection Council's (NEPC) – NEPM for Ambient Air Quality Guidelines
- AS 3580.1.1:2007 Methods for sampling and analysis of ambient air: Part 1.1: Guide to siting air monitoring equipment
- AS 3580.10.1:2003 Methods for sampling and analysis of ambient air: Method 10.1: Determination of particulate matter – Deposited matter – Gravimetric method
- AS/NZS 3580.12.1:2001 Methods for sampling and analysis of ambient air - Determination of light scattering - Integrating Nephelometer method
- Action for Air 1998 (NSW DEC)
- Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW (EPA 2016).

3.2 Construction air quality criteria

The EPA sets goals for ambient dust concentrations and dust deposition, which is a measure of the impacts of nuisance (EPA 2001).

The acceptable increment in annual average dust deposition depends on the existing deposition level. These are based on research by Dean (1990) and other investigations, which detail community response to dust fallout. It should be remembered that the air quality goals relate to the total dust burden in the air and not just the dust from the Project. In other words, there needs to be some consideration of background levels when using these goals to assess impacts. This was discussed in detail with TfNSW, EPA and the Project ER during an air quality management and monitoring presentation on 23 October 2019. Based on data analysed from January 2019 to September 2019, PM_{2.5} levels appear primarily influenced by regional and State-wide emissions sources unrelated to construction emissions. All exceedances in the 9 month period reflect exceedances in the ambient air quality Table 3-1 details the air quality monitoring criteria for particulate matter and deposited dust.

Table 3-1 Air quality monitoring criteria for PM_{2.5}, PM₁₀, total suspended particulates and deposited dust^a

Pollutant	Averaging period	Concentration	
		pphm	µg/m ^{3d}
PM _{2.5}	24 hours	-	Monitor and report real time data in accordance with EPL requirements
	Annual	-	Monitor and report real time data iaw EPL
PM ₁₀	24 hours	-	50
	Annual	-	25
Total suspended particulates (TSP)	Annual	-	90
		g/m²/month^c	g/m²/month^d
Deposited dust ^b	Annual	2	4

Note:

- Adapted from Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016).
- Dust is assessed as insoluble solids as defined by AS 3580.10.1-2003 (AM-19).
- Maximum increase in deposited dust level due to the project
- Total cumulative concentrations and deposition rates due to the project plus background levels due to all other sources.

3.3 Minister's Conditions of Approval

The CoA relevant to this Plan are listed in Table 3-2 below. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

Table 3-2 Conditions of Approval relevant to the AQMP

CoA No.	Condition Requirements	Document Reference						
C9	<p>The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each Construction Monitoring Program to compare actual performance of construction of the SSI against performance predicted performance: Table 4: Construction Monitoring Program Consultation Requirements</p> <table border="1"> <thead> <tr> <th></th><th>Required Construction Monitoring Programs</th><th>Relevant government agencies to be consulted for each Construction Monitoring Program</th></tr> </thead> <tbody> <tr> <td>a)</td><td>Air Quality</td><td>EPA</td></tr> </tbody> </table>		Required Construction Monitoring Programs	Relevant government agencies to be consulted for each Construction Monitoring Program	a)	Air Quality	EPA	<p>Section 1.4 In accordance with CoA C16, the construction air quality monitoring program requirements have been incorporated into this AQMP. See below.</p>
	Required Construction Monitoring Programs	Relevant government agencies to be consulted for each Construction Monitoring Program						
a)	Air Quality	EPA						
C10	Each Construction Monitoring Program must provide: (a) details of baseline data available	Appendix A Construction air quality monitoring program (a) Section 4.1						
	(b) details of baseline data to be obtained and when	Appendix A Construction air quality monitoring program (b)						
	(c) details of all monitoring of the project to be undertaken;	Appendix A Construction air quality monitoring program (c)						
	(d) the parameters of the project to be monitored;	Appendix A Construction air quality monitoring program (d)						
	(e) the frequency of monitoring to be undertaken;	Appendix A Construction air quality monitoring program (e)						
	(f) the location of monitoring;	Appendix A Construction air quality monitoring program (f)						
	(g) the reporting of monitoring results;	Appendix A Construction air quality monitoring program (g)						
	(h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and	Appendix A Construction air quality monitoring program (h)						
	(i) any consultation to be undertaken in relation to the monitoring programs.	Appendix A Construction air quality monitoring program Section 1.4						
C11	The Construction Monitoring Programs must be developed in consultation with relevant government agencies as identified in Condition C9 of this approval and must include, to the written satisfaction of the Secretary, information requested by an agency to be included in a Construction Monitoring Programs during such consultation. Details of all information requested by an agency including copies of all correspondence from those agencies, must be provided with the relevant Construction Monitoring Program.	Section 1.4						

CoA No.	Condition Requirements	Document Reference
C12	The Construction Monitoring Programs must be endorsed by the ER and then submitted to the Secretary for approval at least one (1) month prior to the commencement of construction or within another timeframe agreed with the Secretary.	As permitted by CoA C16, the Air Quality Construction Monitoring Program has been incorporated into this AQMP. The Construction Monitoring Program is therefore, endorsed by the ER by virtue of the endorsement of this AQMP on page 1.
PART E – AIR QUALITY		
E1	In addition to the performance outcomes, commitments and mitigation measures specified in the EIS as amended by the SPIR, all feasibly and reasonably practicable measures must be implemented to minimise the emission of dust and other air pollutants during works and operation of the SSI.	Chapter 6

3.4 Revised Environmental Management Measures

Relevant REMM from the SPIR are listed in Table 3-3 below. This includes a cross reference as to where the measure is addressed in this Plan or other Project management documents.

Table 3-3 Revised environmental management measures relevant to this AQMP

ID No.	Revised environmental management measure	Document Reference
AQ01	The Construction Environmental Management Plan will include a strategy to manage air quality during construction. It will include, but not be limited to:	This AQMP
	Air quality and dust management objectives	Section 2.2
	Potential sources and impacts of dust, identifying all dust-sensitive receptors	Sections 5.1, 5.3, 4.3
	Mitigation measures to minimise dust impact, such as the use of water carts to suppress dust, stabilisation of exposed soils, covering trucks transporting loose material, and stopping dust generating activities during windy conditions	Chapter 6
	A monitoring program to assess compliance with the identified objectives	Section 7.3 Appendix A Construction air quality monitoring program
	Contingency plans to be implemented in the event of non-compliances and / or complaints about dust	Section 7.6 Appendix A Construction air quality monitoring program (h)
	Reporting on the use and performance of off-road diesel plant and equipment.	Section 7.8
BD05	Construction programming will show how progressive rehabilitation of disturbed areas will be undertaken to minimise soils exposure and the potential for dust generation, erosion and sedimentation, and visual impacts.	Chapter 6 mitigation measure ID AQMM1

4 Existing Environment

The following sections summarise what is known about factors influencing air quality within and adjacent to the Project corridor. The key reference document is chapter 18.2 of the EIS.

4.1 Air quality records

No air quality monitoring was specifically undertaken for the project as the NSW Office of Environment and Heritage (OEH) monitors air quality at a site in Albion Park, south of the airport, and the concentrations are considered to be representative of background air quality in the study area.

The monitored concentrations of NO₂ and PM₁₀ from the Albion Park air quality monitoring site is summarised in Table 4-1. Current data is available on the OEH website at <https://www.environment.nsw.gov.au/topics/air/monitoring-air-quality/illawarra>.

Table 4-1 Summary of monitoring data from the OEH Albion Park South site (EIS Table 18-2, p538)

Year	NO ₂ (µg/m ³)		PM ₁₀ (µg/m ³)	
	Maximum 1-hour	Annual mean	Maximum 24-hour	Annual mean
2010	84	5.6	42	14.0
2011	82	4.3	51	13.6
2012	76	7.6	44	13.6
2013	80	8.6	69	14.7
2014	78	8.0	48	16.2
2015*	96	7.1	41	14.0
2016*	88	7.7	43	14.9
2017*	78	7.4	45	15.3

µg/m³ = micrograms per cubic metre

*Source: <https://www.environment.nsw.gov.au/AQMS/search.htm>

As shown in Table 4-1:

- The highest annual mean NO₂ concentration was 8.6 micrograms per cubic metre measured in 2013, which is well below the NSW Approved Methods air quality criterion of 62 micrograms per cubic metre (NSW Department of Environment and Conservation, 2005)
- The highest one-hour mean NO₂ concentration was 96 micrograms per cubic metre, measured in 2015, which is well below the mean air quality criterion of 246 micrograms per cubic metre
- The highest annual mean PM₁₀ concentration was 16.2 micrograms per cubic metre, measured in 2014, which was taken to be the background annual mean PM₁₀ concentration for the project area. This value is well below the annual mean air quality criterion of 30 micrograms per cubic metre
- The 24-hour mean PM₁₀ criterion of 50 micrograms per cubic metre was exceeded at the Albion Park site for short periods during 2011 and 2014. These exceedances were generally due to regional events such as bushfires or dust storms and the effects of local topography rather than specific local sources. The 24-hour mean PM₁₀ measurements from 2010 to 2017 show that the majority of concentrations are well below 50 micrograms per cubic metre, with a number of spikes during the severe bushfires in Sydney in October 2013 as shown in Figure 4-18 of Technical Paper 12 – Air quality of the EIS.

Emissions were calculated for the following pollutants as shown in Table 4-2:

- Nitrogen oxides (NO_x)
- Particulate matter up to 10 micrometres (µm) (PM₁₀)
- Particulate matter up to 2.5 micrometres (PM_{2.5}).

The annual mean background concentration of PM_{2.5} for the project area was determined by multiplying the annual mean PM₁₀ concentration at Albion Park for the five years between 2010 to 2014 (14.4 micrograms per cubic metre) by the annual mean PM_{2.5}:PM₁₀ ratio from OEH's Wollongong monitoring station for all five years (0.33), giving a value of 4.7 micrograms per cubic metre (EIS, p539).

Table 4-2 Summary of background concentrations (EIS Table 18-3, p539)

Pollutant	Background Concentration (µg/m ³)		
	Annual mean	24-hour mean	Annual mean
NO _x (for NO _x to NO ₂ conversion)	8.3	Not applicable	133
PM ₁₀	14.4	37.9	Not applicable
PM _{2.5}	4.7	12.5	Not applicable

4.2 Soil dryness, rainfall and wind

The Bureau of Meteorology (BoM) collects climatic information in the vicinity of the Project. A range of climatic information collected from the Albion Park (Wollongong Airport) Automatic Weather Station (AWS) (Site Number 062841), which is located at the airport and outside the project boundary, is presented in Table 4-3. Temperature and humidity data consist of monthly averages of 9am and 3pm readings. Monthly daily averages of maximum and minimum temperatures are also provided. Rainfall data consist of mean monthly rainfall and the average number of rain days per month (EIS Technical Paper 12 Air Quality, p26).

The annual average maximum and minimum temperatures recorded at the Albion Park AWS are 22.5 °C and 11.4 °C respectively. On average, January is the hottest month, with an average maximum and minimum temperature of 26.8 °C and 16.7 °C respectively. July is the coldest month, with average maximum and minimum temperatures of 17.5 °C and 6.2 °C, respectively. The annual average relative humidity reading collected at 9am from the Albion Park AWS is 67% and at 3pm the annual average is 59% (EIS Technical Paper 12 Air Quality, p26).

February is recorded to have the highest rainfall with an average rainfall of 145.7 millimetres over an average of 11.6 rain days. The average annual rainfall is 883.4 millimetres with an average of 124 rain days per year (EIS Technical Paper 12 Air Quality, p26).

On an annual basis, the most common winds are from the west and are above 7.5 metres per second. Westerly winds dominate in autumn, winter and spring, while north-easterly winds are more common in summer. The mean wind speed in 2014 was 3.8 metres per second and the annual mean percentage of calms (wind speeds of less than 0.5 metres per second) was 6.3 per cent (EIS, p538).

Table 4-3 Climate Averages for the Albion Park AWS (EIS Technical Paper 12 Air Quality, p27)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
9am Mean Dry-bulb Temperatures (°C) and Relative Humidity (%)													
Dry-bulb	22.5	22.0	20.2	19.2	15.8	13.0	12.5	14.0	17.1	19.0	19.7	21.4	18.0
Humidity	68.0	74.0	76.0	68.0	69.0	73.0	68.0	61.0	57.0	58.0	67.0	66.0	67.0
3pm Mean Dry-bulb and Wet-bulb Temperatures (°C) and Relative Humidity (%)													
Dry-bulb	24.8	24.5	23.5	21.3	18.8	16.7	16.2	17.3	19.3	20.4	21.6	23.5	20.7
Humidity	63.0	67.0	64.0	61.0	58.0	57.0	54.0	49.0	53.0	58.0	63.0	61.0	59.0
Daily Maximum Temperature (°C)													
Mean	26.8	26.3	25.2	23.1	20.3	18.2	17.5	18.9	21.4	22.7	23.7	25.5	22.5
Rainfall (mm)													
Mean	63.5	146.7	101.0	67.7	67.8	72.4	63.6	30.5	42.9	79.8	87.2	66.4	883.4
Rain days (Number)													
Mean	11.0	11.6	12.3	10.5	9.3	9.3	8.1	7.8	8.2	11.1	13.5	11.3	124.0

4.3 Sensitive receivers

The proximity of sensitive receivers to construction activities will influence the potential impacts. Additionally, weather conditions such as those discussed in Section 4.2 will substantially influence the day to day potential for dust generation and suspension.

Sensitive receivers located immediately adjacent to the Project corridor are shown in Figure A-1 and include, but are not limited to:

- Residential homes
- Commercial and industry users
- Schools
- Community buildings.

There is the risk that the nearby commercial buildings and Albion Park Public School might experience some occasional dust soiling impacts. This does not imply that impacts are likely or, if they did occur, that they would be frequent or persistent. Overall construction dust is unlikely to represent a serious ongoing problem. Any effects would be temporary and relatively short-lived, and would only arise during dry weather with the wind blowing towards a receptor, at a time when dust is being generated and mitigation measures are not being fully effective (EIS Technical Paper 12 Air Quality, p36).

Review of the annual and seasonal wind roses provided in the EIS (Technical Paper 12 Air Quality, p29) indicates that winds could be capable of transporting emissions towards sensitive receptors. In view of the transitional nature of the prevailing winds with respect to the receptors this could occur at any time of year (EIS Technical Paper 12 Air Quality, p36).

5 Environmental aspects and impacts

The key construction activities and the associated potential sources of air quality impact are identified through a risk management approach. The consequence and likelihood of each activity's impact on the environment has been assessed to prioritise its significance. The results of this risk assessment are included in Appendix A2 of the CEMP.

Ongoing environmental risk analysis during construction will be undertaken through regular monitoring, inspections and auditing as described in Chapter 7.

5.1 Construction activities

Emissions to the atmosphere during construction that could result in adverse impacts to air quality are typically divided into two categories. These are:

- Dust and particulates
- Gaseous.

Key aspects of the Project that could result in dust emissions include:

- General earthworks particularly during site establishment
- Vegetation clearing
- Bulk Earthworks
- Drilling and Blasting or other methods of rock removal including surface profiling
- Operating, crushing and screening
- Operation of concrete / asphalt batching plants
- Topsoil / material handling including stockpiling, material loading and material haulage
- Vehicular movements over unpaved surface (including unsealed access roads)
- Wind erosion of exposed areas and temporary stockpiles
- Tracking of dirt onto roads.

Air emissions, other than dust, which may be generated by construction activities include:

- Vehicle and plant exhaust emissions, which may be excessive if vehicles and plant are poorly maintained
- Odours/ gases released during:
 - Excavations of organic or contaminated materials
 - During sealing works
 - Operation of concrete / asphalt batching plants.

5.2 Factors likely to affect dust generation and impacts

In addition to the inherent risks of specific construction activities creating the potential to generate dust, a number of other environment factors also affect the likelihood of dust emissions. These include:

- Wind direction – determines whether dust and suspended particles are transported in the direction of the sensitive receivers
- Wind speed – governs the potential suspension and drift resistance of particles
- Soil type - more erodible soil types have an increased soil or dust erosion potential
- Soil moisture – increased soil moisture reduces soil or dust erosion potential
- Rainfall or dew – rainfall or heavy dew that wets the surface of the soil and reduces the risk of dust generation.

5.3 Impacts

The potential for impacts on air quality will depend on a number of factors. Primarily impacts will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment.

The potential impacts on air quality during the construction include:

- Annoyance due to dust deposition (soiling of surfaces) and visible dust plumes
- Elevated PM₁₀ concentrations due to dust-generating activities
- Exhaust emissions from diesel-powered construction equipment.

The results for the construction dust soiling risk assessment undertaken as part of the EIS are provided in Table 5-1.

Table 5-1 Summary of risk assessment for the four construction scenarios (EIS Technical Paper 12 Air Quality, p34).

Type of Activity	Step 2A: Potential for dust emissions	Step 2B: Sensitivity of area		Step 2C: Risk of dust impacts	
		Dust Soiling	Human Health	Dust soiling	Human health
Demolition	Medium	High	Medium	Medium risk	Medium risk
Earthworks	Large	High	Medium	High risk	Medium risk
Construction	Large	High	Medium	High risk	Medium risk
Track-out	Large	High	Medium	High risk	Medium risk

Overall construction dust is unlikely to represent a serious ongoing problem. Any effects would be temporary and relatively short-lived, and would only arise during dry weather with the wind blowing towards a receptor, at a time when dust is being generated and mitigation measures are not being fully effective (EIS Technical Paper 12 Air Quality, p36).

Chapter 6 provides a suite of mitigation measures that will be implemented to avoid or minimise those impacts.

6 Environmental mitigation measures

Specific mitigation measures to address impacts on air quality are outlined in Table 6-1.

Table 6-1: Air Quality mitigation measures

ID	Mitigation Measure	Responsibility
AQMM1	Progressively stabilise all exposed ground surfaces and stockpiles to minimise wind-blown dust using soil binders, cover crop species, compaction or other appropriate practices endorsed by RMS.	Foreman Project / Site Engineer Superintendent Environmental Officer Construction Manager
AQMM2	Regularly water unsealed active work areas, including stockpiles, haul roads and access points, during working hours to minimise wind-blown or traffic generated dust emissions and when dust is observed leaving the site.	Foreman
AQMM3	Cover unsealed roads with densely graded road base or dust control water cart additives where practicable if dust is excessive.	Foreman
AQMM4	Restrict speeds of construction traffic to 20km/h or 40km/h for haul roads. Signpost the speed limit.	Foreman
AQMM5	Restrict construction traffic to designated roadways.	Foreman
AQMM6	Control mud tracking on public roads by installing stabilised access (eg hardstand, rock, rumble grids, or wheel washes) at all access/egress points on site.	Foreman
AQMM7	Remove mud spilt by construction traffic from public roads as soon as practicable but no later than by the end of each working day.	Foreman
AQMM8	Modify or stop construction activities during periods of strong wind (in excess of 40km/h) and in response to strong wind weather forecasts. Promote this in the internal communications (eg site weather update via email) and record any specific actions implemented in the Strong Wind Work Modification Record included in Appendix B.	Foreman Environmental Officer
AQMM9	Maintain all vehicles and construction equipment in good working order to prevent excessive exhaust emissions in accordance with the manufacturer's specification to comply with all relevant legislation.	Procurement Manager Foreman
AQMM10	Turn machinery and vehicles off when not in use	Subcontractors Foreman
AQMM11	Where practicable, ensure vehicles are fitted with pollution reduction devices.	Subcontractors Foreman
AQMM12	Cover all loads that enter or leave the site.	Subcontractors Foreman
AQMM13	Check that tyres and trailer draw bars are cleaned of sediment or debris that may be tracked onto public roads prior to leaving the site.	Subcontractors Foreman
AQMM14	Use dust suppressants (eg soil stabilisers, polymers) and temporary ground covers (eg hydromulch) as much as possible to progressively stabilise disturbed surface, such as batters and stockpiles.	Foreman Environmental Manager
AQMM15	No burning off (eg of cleared and grubbed vegetation or waste).	Foreman
AQMM16	Establish and operate temporary batching plants (in the unlikely event they are required on site) in accordance with a site specific Concrete batch plant establishment and operation EWMS (refer to G36 Clause 3.2.4(ii)).	Environmental Manager Project Engineers Foreman
AQMM17	Ensure temporary concrete batching plants (in the unlikely event they are required on site) are designed to include a partially enclosed load hopper (on three sides) when truck loading/delivery is in progress.	Project Engineers
AQMM18	Ensure temporary concrete batching plants (in the unlikely event they are required on site) are designed to include continual wetting operations to reduce emissions during all materials handling and along all exposed surfaces and stockpiles during unfavourable meteorological conditions (ie windy and dry conditions).	Project Engineers
AQMM19	Ensure temporary concrete batching plants (in the unlikely event they are required on site) are designed to store bulk cement in silos with fabric filters on the vents (filters to be designed to accommodate the maximum discharge from each on site concrete batch plant) (refer to G36 Clause 4.4.2 (w)).	Project Engineers
AQMM20	Ensure temporary concrete batching plants (in the unlikely event they are required on site) are designed to include a dry batch dust collector to extract dust during the transfer of the concrete product to the trucks and any emissions from the loading of the weigh hoppers (this system has a dust extraction efficiency of 99.9% for all particulates greater than 5 microns).	Project Engineers

ID	Mitigation Measure	Responsibility
AQMM21	Ensure temporary concrete batching plants are designed to include a fully enclosed conveyor	Project Engineers
AQMM22	Ensure temporary concrete batching plants are fitted with dust filters to minimise air quality impacts from batching operations (refer to G36 Clause 4.4.2 (z)).	Project Engineers
AQMM23	Ensure construction plant is fitted with dust suppression devices where practical and available technology exists, ensuring that reasonable and feasible controls or measures are assessed and implemented to prevent excessive dust emissions.	Superintendent Environmental Manager Construction Manager

7 Compliance management

7.1 Roles and responsibilities

The Fulton Hogan Project Team's organisational structure and overall roles and responsibilities are outlined in Section 3.2 of the CEMP. Specific responsibilities for the implementation of environmental mitigation measures are detailed in Chapter 6 of this Plan

7.2 Training

All employees, sub-contractors and utility staff working on site will undergo site induction training relating to air quality management issues, including:

- Existence and requirements of this sub-plan
- Relevant legislation
- Roles and responsibilities for air quality management
- Air quality mitigation measures.

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in air quality management. Examples of training topics include:

- Planning and preparedness for strong wind events (in excess of 40km/h) / dust risk periods
- Lessons learnt from dusty periods, incidents and other events eg low rainfall/ strong wind (in excess of 40km/h).

Further details regarding staff induction and training are outlined in Section 3.4 of the CEMP.

7.3 Monitoring and inspections

Regular monitoring and inspections will be undertaken during construction. Monitoring and inspections will include, but not be limited to:

- Monthly dust monitoring in accordance with DEC's "Approved Method for the Sampling and Analysis of Air Pollutants in NSW" guidelines
- Meteorological monitoring, including rainfall measured and recorded in millimetres per 24-hour period at the same time each day from the time that the site office is established
- Weather forecasts.

Refer to the construction air quality monitoring program contained in Appendix A.

Additional requirements and responsibilities in relation to inspections and monitoring are documented in Section 3.7.1 and Section 3.7.2 of the CEMP.

7.4 Licences and permits

An EPL will be obtained for the scheduled activity "road construction". The EPL typically prescribes air quality parameters to be measured. Fulton Hogan will comply with all EPL requirements.

Any other relevant licenses or permits will be obtained in the lead up to and during construction as required.

7.5 Non-conformances

Non-conformances related to air quality will be dealt with and documented in accordance with Section 3.8 of the CEMP. Also refer to Appendix A item (h) for the procedure to identify and implement additional mitigation measures where results of monitoring have exceeded the air quality criteria in Section 3.2.

7.6 Complaints

Complaints will be recorded and addressed in accordance with Section 3.5.4 of the CEMP and the Community Communication Strategy (CCS). Also refer to Appendix A for the procedure to identify and implement additional mitigation measures where complaints are received about dust.

7.7 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub-plan, CoA and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 3.7.3 of the CEMP.

7.8 Reporting

A report verifying conformity of mobile non-road diesel plant and equipment used for the works will be submitted to Transport for NSW annually in accordance with G36 Clause 4.4.4, at the following dates:

- Before 31 July, for the reporting period ending 30 June for the previous 12 months
- At Actual Completion Date, for the final reporting period.

The report will be prepared in accordance with the GREP “Clean Air data management tool”.

Additional reporting requirements and responsibilities (including for the Construction Monitoring Report) are documented in Section 3.7.5 of the CEMP.

8 Review and improvement

8.1 Continuous improvement

Continuous improvement of this Plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies
- Verify the effectiveness of the corrective and preventative actions
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets.

8.2 AQMP update and amendment

The processes described in Section 3.7 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

Any revisions to this Plan will be in accordance with the process outlined in Section 1.6 of the CEMP and as required, be provided to Transport for NSW , ER and other relevant stakeholders for review and comment and forwarded to the Secretary of DP&E for approval.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 1.5 of the CEMP.

Appendix A Construction air quality monitoring program

Construction air quality monitoring program

This construction air quality monitoring program has been prepared to address the requirements of CoA C10(a) – (i) as detailed below.

a) Baseline data available

As detailed in Section 4.1 above, no air quality monitoring was specifically undertaken for the project as part of the EIS; however, the data obtained from an OEH monitor in Albion Park (south of the airport) was deemed to be representative of the background air quality for the project. Refer to Section 4.1 for additional details.

b) Baseline data to be obtained and when

Dust deposition gauge monitoring will begin at least three months prior to the commencement of construction to determine existing background dust levels. Dust deposition monitoring will continue during construction of the Project until all disturbed areas in the subject area have been stabilised (refer to G36 Clause 4.4.3).

As discussed with the EPA, background ambient air monitoring (for PM_{2.5}, PM₁₀ and total suspended particulates) is not required prior to the commencement of construction.

c) Details of all monitoring of the project to be undertaken

Regular monitoring and inspections of the project will be undertaken during construction in accordance with Table A-2. Additional requirements and responsibilities in relation to inspections and monitoring are documented in Section 3.7.1 and Section 3.7.2 of the CEMP.

d) Parameters of the project to be monitored

The purpose of air quality monitoring during the construction phase is to determine impacts resulting from construction of the project only (i.e. road construction) and not other unrelated sources, such as bushfires, dust storms or other natural occurrences, quarry, land development and domestic wood heating emissions or agricultural operations. The key emissions from road construction will most likely be dust and Particulate Matter (PM). Generally speaking, particulate matter from earthworks tends to be dominated by particles larger than 2.5 µm in aerodynamic equivalent diameter. Detailed analysis of data obtained from January 2019 – December 2019 confirm that PM_{2.5} levels are directly related to seasonal and regional ambient air quality and are not reflective of construction activity impacts.

The parameters to be monitored are those identified in the EPL and include:

- Deposited dust
- PM_{2.5}
- PM₁₀
- Total suspended particulates (TSP)

Trigger level

A trigger level has been included in the construction air quality monitoring program (refer to Table A-2) to protect the PM₁₀ 24 hour standard criterion identified in Table 3-1 (i.e. 50µg/m³). The real time response trigger level provides a system to warn construction personnel (e.g. via SMS) when short term average periods indicate that the 24 hour criterion may be exceeded. The real time monitoring system is used to trigger implementation of additional mitigation measures as identified in Table A-2; that is, a Trigger Action Response Plan (TARP). This will allow proactive dust management to control 24 hour and ultimately annual average impacts.

Refer to item (h) below for the procedures to be implemented when a monitoring result is outside of the air quality trigger level and/or criteria provided in Table 3-1.

e) Frequency of monitoring

Dust will be monitored monthly for the duration of construction using gravimetric Dust Monitoring Gauges (DMG) to assess compliance with the criteria detailed in Table 3-1.

Particulate matter (PM_{2.5}, PM₁₀ and TSP) will be monitored on a real-time continuous basis.

f) Location of monitoring

Dust and particulate matter will be measured at the monitoring locations identified in Figure A-1.

One DMG site is located at the northern end of the project near potential dust sensitive receivers and potentially high dust generating activities. One additional DMG site is a 'control', located away from the influence of Project related activities. This is used for the purposes of monitoring and evaluating meteorological and other non-project related variances in ambient dust levels.

Two real time monitoring sites are located at the southern end of the project. One is located north of the East West Link adjacent to potential dust sensitive receivers. The other is located west of the project alignment.

Refer to Table A-1 for the location (MGA) and rationale for all dust monitoring gauge and real time monitoring sites associated with the Project.

All DMG and real time monitors have been sited in the field in accordance with AS 3580.1.1:2016 Methods for sampling and analysis of ambient air: Part 1.1: Guide to siting air monitoring equipment.

Additional DMG(s) may be installed along the alignment on an as-needs basis when there is evidence that current dust mitigation measures are not effective, or in response to complaints.

Table A-1 Indicative dust monitoring gauge and real time monitoring sites

Identifier	Location (MGA)	Reason
Dust monitoring gauge sites		
DMG1	West of the existing Princes Highway and south of Yallah Road at ≈ Ch 18000 Easting: 296456.505 Northing: 6175586.078	To monitor potential dust impacts on domestic and commercial premises from construction activities eg major cutting works, fill operations and haulage of materials associated with the Princes Motorway and local road construction. This location accounts for the dominant NE wind and is not unduly influenced by haul road operation
DMG CONTROL	Outside the project boundary Easting: 298286.532 Northing: 6172581.501	Control - away from the influence of the project at the corner of Ash Ave and Tongarra Rd, Albion Park Rail
Real time monitoring sites		
RT1	Rear of 12 Churnwood Place Albion Park, north of the East West Link Road at ≈ Ch 24050 Easting: 298690.366 Northing: 6171892.720	To monitor potential dust impacts on residential homes north of the East West Link Road from road construction activities eg cut and fill operations, haulage of materials associated with the Princes Motorway and local road construction.
RT2	Southern side of Duplex 2 / 2 Stapleton Avenue, Albion Park at ≈ Ch 21450 Easting: 296362.173 Northing: 6172312.501	To monitor potential dust impacts on residential homes from construction activities eg filling operations and haulage of materials associated with the Princes Motorway and ramps.

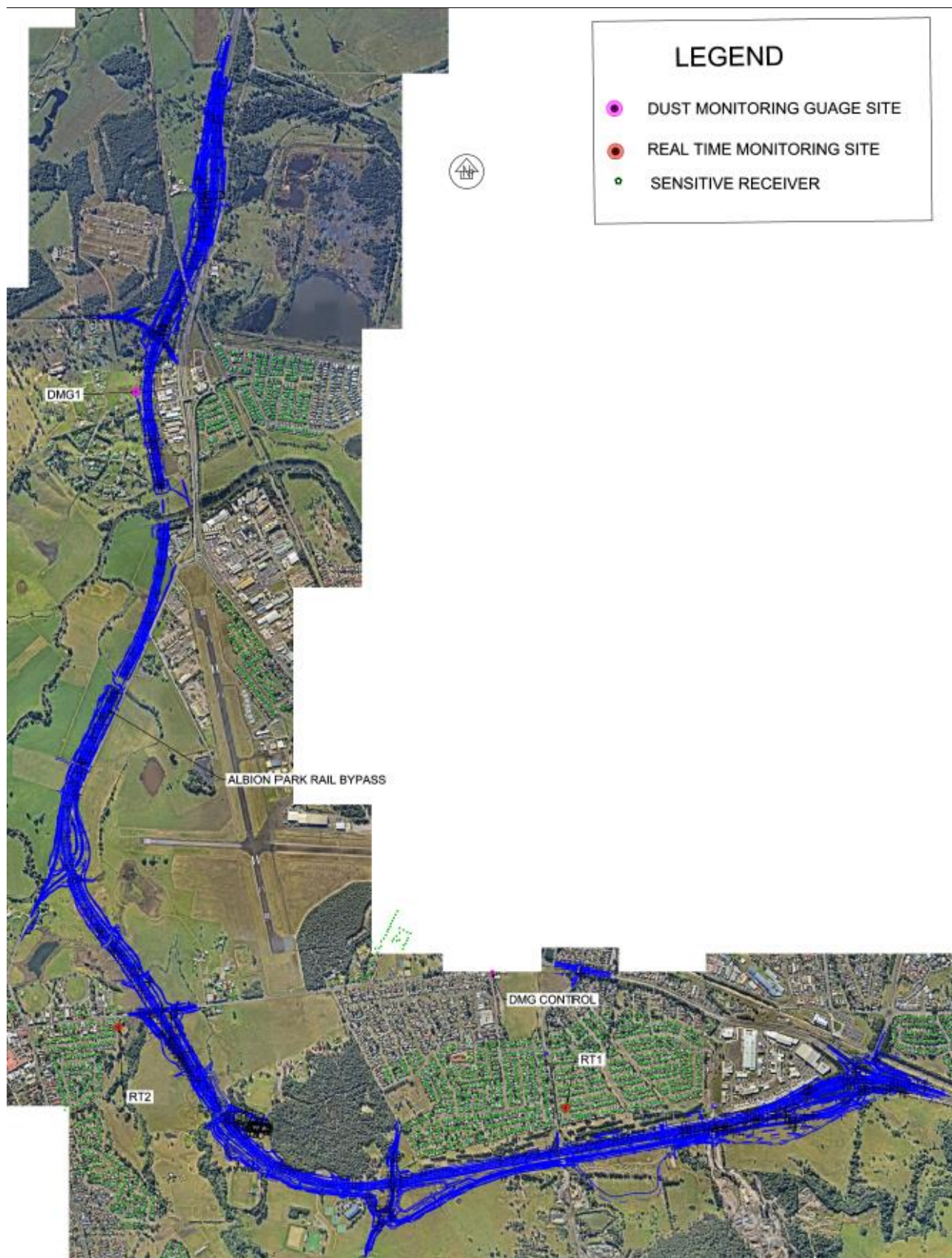


Figure A-1 Map showing locations of dust monitoring gauges and real time monitoring sites

g) Reporting of monitoring results

Monitoring results will be reported in monthly environmental meetings and reports, Pollution Monitoring Data report), EPL annual returns, construction monitoring reports, construction compliance reports and where there is an exceedance against criteria provided in Table 3-1.

Refer to Section 3.7.5 of the CEMP for the reporting requirements applicable to the Project, timing of the reporting, who is responsible for managing preparation of the reports and the intended recipient(s).

h) Procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory

Implementation of the standard mitigation measures listed in Table 6-1 will ensure air quality impacts are minimised during construction. In the event that complaints about dust and/or the air quality are received or an exceedance of air quality trigger level and/ or criteria provided in Table 3-1 has been identified through monitoring, site inspections or audits, Fulton Hogan will implement the following procedure:

- The Environmental Manager will investigate the issue to determine possible causes of the non-conformance (in accordance with Section 7.5) and develop appropriate mitigation measures. Depending on the outcome of this investigation, Environmental Manager, in consultation with the wider construction team, might recommend modifications to the construction methods used.
- All dust and other air quality complaints will be managed in accordance with complaints management process described in Sections 2.3 and 2.4 of the Community Communication Strategy.
- In accordance with Clause 4.4.3 of RMS Specification G36, where investigation confirmed clear and unambiguous dust impact resulting from the construction of the project, the Environmental Manager, in consultation with the project team, will identify additional mitigation measures which may include, but are not limited to:
 - Wash-down of the roof at the completion of dust generating works to ensure a clean roof for water supply and reconnection of the water tanks, or
 - Disconnect water tanks from roofing and maintain water supply to properties using tanks during dust-generating works.
 - Assessment of best available technology, ensuring that reasonable and feasible controls or measures are re-assessed and implemented to prevent excessive dust emissions.

It is the responsibility of the relevant Foreman to ensure that the identified additional mitigation measures are implemented.

i) Consultation

Refer to Section 1.4 of this AQMP.

Table A-2 Monitoring and inspections

Monitoring details	Area	Record	Responsibility	Frequency	Trigger level	Additional mitigation measures
Dust deposition monitoring	Dust Monitoring Gauge Sites (Refer to Table A-1 for locations)	Laboratory results	Environmental Officer	Monthly	Not applicable	Not applicable
Ambient air monitoring - Real time atmospheric monitoring of airborne particulate concentrations (including PM _{2.5} , PM ₁₀ and TSP)	Real time Monitoring Sites (Refer to Table A-1 for locations)	Online via web portal	Environmental Officer	Continuous	When winds blow towards sensitive receivers and the 1 hour average PM ₁₀ level is greater than 50µg/m ³ (over 3 consecutive 1 hour periods)	<ul style="list-style-type: none"> Review regional weather data (OEHA air quality) and trends Review weather predictions Review current operations and locations of dust generating activities Check that standard mitigation measures in Table 6-1 are in place. Implement additional mitigation measures where reasonable and feasible Continue to monitor PM₁₀ levels until decreasing trend observed. Make operational changes until decreasing PM₁₀ trend observed.
Review real time ambient air monitoring data	Real time Monitoring Sites (Refer to Table A-1 for locations)	Online via web portal	Environmental Manager (or delegate)	Daily	Not applicable	Refer to item (h) above for the procedures to be implemented when a monitoring result is outside of the air quality trigger level and/or criteria provided in Table 3-1.
Meteorological data including daily rainfall, temperature, relative humidity, wind (direction and speed) and barometric pressure from the BoM website.	All	Written correspondence (eg email) to project personnel relying on the latest weather observations from the BoM website.	Environmental Manager (or delegate)	Daily	Not applicable	Not applicable
Visual observations during daily site inspections, including activities observed outside of the Project that may impact on dust levels captured in DMG.	All	Noted in site diary as required	Foreman Environmental Officer	Daily	Not applicable	Not applicable
Asbestos fibre monitoring (if friable asbestos is identified)	All	As required in laboratory results	Safety Manager	As required	Not applicable	Not applicable

Monitoring details	Area	Record	Responsibility	Frequency	Trigger level	Additional mitigation measures
in accordance with the <i>Unexpected contaminated land and asbestos finds procedure</i> (CoA E60).						

Appendix B Strong wind work modification record

Strong wind work modification record

Item	Detail
Date	
Time	
Location	
Wind speed and direction	
Existing controls in place to minimise dust generation	
Modifications to work practices implemented	
Additional controls implemented (e.g. barriers, non-toxic biodegradable polymer binder, mist cannons)	
Outcome	
Any other comments	

Completed by:

Date: / /

Related Sub-plan: Air Quality Management Sub-plan

File in Air quality and dust records