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Yiribana Logistics Estate, Kemps Creek

Construction Air Quality Management Plan

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Quality Control

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THE DEVELOPMENT	Final	Northstar	MD, GCG	MD
BASELINE DATA	Final	Northstar	MD, GCG	MD
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Report Status

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Final Authority

This report must be regarded as draft until the above study components have been each marked as final, and the document has been signed and dated below.



Martin Doyle

19 December 2023

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CONTENTS

1.	INTRODUCTION	5
1.1.	Objectives and Targets.....	5
2.	LEGAL AND OTHER REQUIREMENTS	7
2.1.	Legislation.....	7
2.2.	Guidelines and Relevant Documents	7
2.3.	Project Approval Conditions.....	7
3.	THE DEVELOPMENT	10
3.1.	Environmental Setting.....	10
3.2.	Description of Development.....	10
3.3.	Identification of Potential Emissions to Atmosphere	13
3.4.	Quantification of Potential Emissions to Atmosphere.....	15
4.	BASELINE DATA.....	18
4.1.	Meteorology	18
4.2.	Air Quality.....	19
5.	AIR QUALITY STANDARDS	21
6.	AIR QUALITY MANAGEMENT	23
6.1.	Key Performance Indicators	23
6.2.	Air Quality Monitoring	24
6.3.	Emission Control Measures.....	26
6.4.	Contingency Plan	32
6.5.	Training	33
7.	REVIEW AND IMPROVEMENT	34
7.1.	Non-Compliance, Corrective and Preventive Action	35
7.2.	Complaints Handling Procedure	35
7.3.	Record Keeping	36
7.4.	Reporting to the Environmental Representative.....	36
8.	REFERENCES	37
	APPENDIX A.....	38

FIGURES

Figure 1	Development site location.....	12
Figure 2	Site layout plan	13
Figure 3	Particulate emissions – uncontrolled and controlled	17
Figure 4	Annual wind roses 2017 to 2021, Horsley Park Equestrian Centre AWS.....	18
Figure 5	PM ₁₀ measurements, St Marys 2017-2021.....	19
Figure 6	PM _{2.5} measurements, St Marys 2017-2021.....	20
Figure 7	Dust deposition gauge with stand	25

TABLES

Table 1	Proposed targets and Key Performance Indicators (KPI) associated with the management of air quality	6
Table 2	Project Approval Conditions – air quality	7
Table 3	Anticipated volume of earthworks activities.....	14
Table 4	Proposed emissions controls with associated control efficiencies.....	15
Table 5	Assumptions adopted to estimate emissions	16
Table 6	NSW EPA impact assessment criteria.....	21
Table 7	KPI's associated with the management of air quality	23
Table 8	Air quality management measures adopted during development construction.....	27
Table 9	Contingency management plan	32

1. INTRODUCTION

The GPT Group has engaged Northstar Air Quality Pty Ltd (Northstar) to provide a Construction Air Quality Management Plan (CAQMP) which forms part of the Construction Environmental Management Plan (CEMP) developed for the construction of a logistics estate and associated warehouses, to be located at Lot 180 DP 1290397, Mamre Road, Kemps Creek (the Development).

This CAQMP identifies the potential sources of air emissions associated with the proposed construction activities and provides measures to control each of those potential sources.

As part of the State Significant Development (SSD) Application, an air quality impact assessment (AQIA) was performed (Northstar Air Quality, 2021) which included a risk-based assessment of the potential impacts associated with construction dust. The AQIA determined that with the implementation of appropriate controls, the risk of impacts associated with fugitive dust emissions from the construction of the development would be low.

The CAQMP has been performed by Northstar, a specialist air quality consultancy with extensive experience in the provision of air quality management plans. A CV for the principal author (Dr Martin Doyle) is provided in Appendix A.

1.1. Objectives and Targets

The key objectives of the CAQMP are to minimise emissions of air pollutants from the development site and to ensure that impacts to air quality are minimised and within the scope permitted by the Approval. To achieve these objectives, the summarised targets in Table 1 have been proposed for the management of air quality impacts during construction.

Table 1 Proposed targets and Key Performance Indicators (KPI) associated with the management of air quality

Measure	Target	Timeframe	Responsibility	Documentation
Visible dust emissions leaving the site boundary	- Any emissions of visible dust leaving the site boundary investigated immediately - Review controls applied and increase controls or modify activities	At all times	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
Spillage or track out onto public roads	Any spillage or track out on public roads to be cleaned immediately	At all times	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
Maintenance of all plant and equipment used on site in a proper and efficient condition Operation of all plant and equipment used on site in a proper and efficient manner	- All plant and equipment to be maintained in accordance with manufacture specifications - All plant and equipment to be operated efficiently	At all times	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
Complaints regarding air quality	- Zero validated complaints - Any complaints would be investigated (see Section 7.2)	At all times	Site supervisor	Complaints register
Meeting Project Approval Conditions regarding air quality	Compliance with conditions	At all times	Site supervisor	Environmental inspection checklist Construction Compliance Report

2. LEGAL AND OTHER REQUIREMENTS

Provided below are the key relevant legislation, guidelines and other relevant documentation and Project Approval Conditions, as they relate to air quality impacts during construction of the development.

2.1. Legislation

Legislation relevant to the management of air quality for the development includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Protection of the Environment Operations Act 1997* (POEO Act);
- Protection of the Environment Operations (Clean Air) Regulation 2022 (POEO (Clean Air) Regulation 2022); and
- State Environmental Planning Policy (Western Sydney Employment Area) 2009.

2.2. Guidelines and Relevant Documents

Guidelines and other documentation relevant to the management of air quality for the development includes:

- NSW EPA Local Government Air Quality Toolkit – Air Quality Guidance Note – Construction sites (NSW EPA, 2017);
- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA, 2022); and,
- Guidance on the assessment of dust from demolition and construction (IAQM, 2016).

2.3. Project Approval Conditions

Project Approval Conditions have been issued by the NSW Department of Planning and Environment (DPE) for the development. The Conditions which apply to air quality are reproduced in Table 2.

Table 2 Project Approval Conditions – air quality

Approval Reference	Conditions	Report reference
Operation of Plant and Equipment A24	All plant and equipment used on site, or to monitor the performance of the development, must be: (a) maintained in a proper and efficient condition; and (b) operated in a proper and efficient manner.	Section 6.1
Dust Minimisation B58	The Applicant must take all reasonable steps to minimise dust generated during all works authorised by this consent.	This document

Approval Reference	Conditions	Report reference
Dust Minimisation B59	During construction of the development, the Applicant must ensure that: (a) exposed surfaces and stockpiles are suppressed by regular watering or other alternative suppression method; (b) all trucks entering or leaving the site with loads have their loads covered; (c) trucks associated with the development 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 6.3
Construction Air Quality Management Plan B60	Prior to the commencement of construction, the Applicant must prepare a Construction Air Quality Management Plan (CAQMP) to the satisfaction of the Planning Secretary. The CAQMP must form part of the CEMP required by condition C2 and must:	This document
	(a) be prepared by a suitably qualified and experienced person(s);	Section 1
	(b) detail and rank all emissions from all construction activities, including particulate emissions;	Section 3.4 Section 3.4
	(c) describe a program that is capable of evaluating the performance of the construction and determining compliance with key criteria, including installation of dust deposition gauges on the site boundary;	Section 1.1 Section 6
	(d) identify the control measures that will be implemented for each emission source; and	Section 6.3
	(e) nominate the following for each of the proposed controls: (i) key criteria; (ii) monitoring method; (iii) locations, frequency and duration of monitoring;	Section 6.1
	(f) outline procedures that will be implemented in relation to: (i) record keeping; (ii) reporting to the Environmental Representative required under condition A33; (iii) complaints register; (iv) response procedures; (v) compliance monitoring; and	Section 6 Section 7
	(g) detail contingency measures to be implemented to reduce any exceedances of relevant performance indicators or criteria and include a timetable for implementation.	Section 6.4
Construction Air Quality Management Plan	The Applicant must: (a) not commence earthworks until the CAQMP required by condition B60 is approved by the Planning Secretary; and	Not covered in this report

Approval Reference	Conditions	Report reference
B61	(b) implement the most recent version of the CAQMP approved by the Planning Secretary for the duration of earthworks and construction.	
Air Quality Discharges B62	The Applicant must install and operate equipment in line with best practice to ensure that the development complies with all load limits, air quality criteria/air emission limits and air quality monitoring requirements as specified in the Protection of the Environment Operations (Clean Air) Regulation 2010.	Section 6.1
Management Plan Requirements	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:	-
C1	(a) detailed baseline data;	Section 4
	(b) details of:	Section 2
	(i) the relevant statutory requirements (including any relevant approval, licence or lease conditions);	Section 5
	(ii) any relevant limits or performance measures and criteria; and	Section 6.1
	(iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	
	(c) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	Section 6.3
	(d) a program to monitor and report on the:	Section 6
	(i) impacts and environmental performance of the development; and	Section 7
	(ii) effectiveness of the management measures set out pursuant to paragraph (c) above;	
	(e) 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 6.4
	(f) a program to investigate and implement ways to improve the environmental performance of the development over time;	Section 7
	(g) a protocol for managing and reporting any:	Section 7
	(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	
	(h) a protocol for periodic review of the plan.	Section 7

3. THE DEVELOPMENT

The following provides a description of the context, location, and scale of the development and provides a description of the processes on site. It also identifies the potential for emissions to air associated with the development.

3.1. Environmental Setting

The development site is located at 772-782, 754-786 Mamre Road, Kemps Creek, NSW. A map showing the location of the development site is provided in Figure 1 (overleaf).

The closest residential property is located approximately 52 meters (m) from the development site boundary to the west, on Mamre Road.

3.2. Description of Development

The development comprises the construction of two warehouses as part of the Stage 1 works, with estate works across the broader site comprising bulk earthworks to create building pads for future development, stormwater infrastructure and an internal road network.

Specifically, the development includes:

- Estate wide pre-commencement works including:
 - Site remediation works as defined within the Remediation Action Plan (RAP);
 - Heritage salvage works
- Subdivision construction works including;
 - Creation of roads and access infrastructure;
 - Clearing of existing vegetation on the subject site zone and associated dam dewatering and decommissioning;
 - Realignment of the former E2 zone to serve a purpose as a trunk drainage corridor, with landscaping and planting in accordance with the Mamre Road Precinct Stormwater Scheme Plan;
 - On-site bulk earthworks including any required ground dewatering;
 - Importation, placement and compaction of:
 - Virgin excavated natural material (VENM) within the meaning of the POEO Act, and/or
 - Excavated natural material (ENM) within the meaning of the NSW Environmental Protection Authority's (EPA) Resource Recovery Exemption under Part 9, Clause 91 and 92 of the POEO (Waste) Regulation 2012, and/or

- Materials covered by a specific EPA Resource Recovery Order and Exemption which are suitable for their proposed use.
 - Construction of boundary retaining wall as part of Stage 1 works;
 - Delivery of stormwater infrastructure, trunk service connections, utility infrastructure;
 - Boundary stormwater management, fencing and landscaping;
 - Construction and dedication of internal road network to Penrith City Council (PCC);
 - Construction of a temporary access road from Mamre Road to remain in GPT ownership.
- Warehouse and distribution building works including:
 - Warehouse 1 (Lot 2A)
 - Detailed on-lot earthworks to refine final levels and establish final building pads;
 - On-lot stormwater and utility infrastructure and services connection;
 - Construction of warehouse building;
 - Fitout of buildings, including standard racking and office fit out;
 - Landscaping of development sites in accordance with detailed Landscape Plans
 - Warehouse 3 (Lot 1)
 - Detailed on-lot earthworks to refine final levels and establish final building pads;
 - On-lot stormwater and utility infrastructure and services connection;
 - Construction of warehouse buildings;
 - Fitout of building, including standard racking and office fit out;
 - Landscaping of development sites in accordance with Stage 1 landscape plans; and
 - Reconstruction of environmental corridor in accordance with the Vegetation Management Plan (VMP).
 - Building works including:
 - Construction and fit out of two warehouse and distribution buildings in Stage 1 on Lots 1 and 2A which will operate 24 hours/day, seven days/week
 - Subdivision of Stage 1; and
 - Signage.

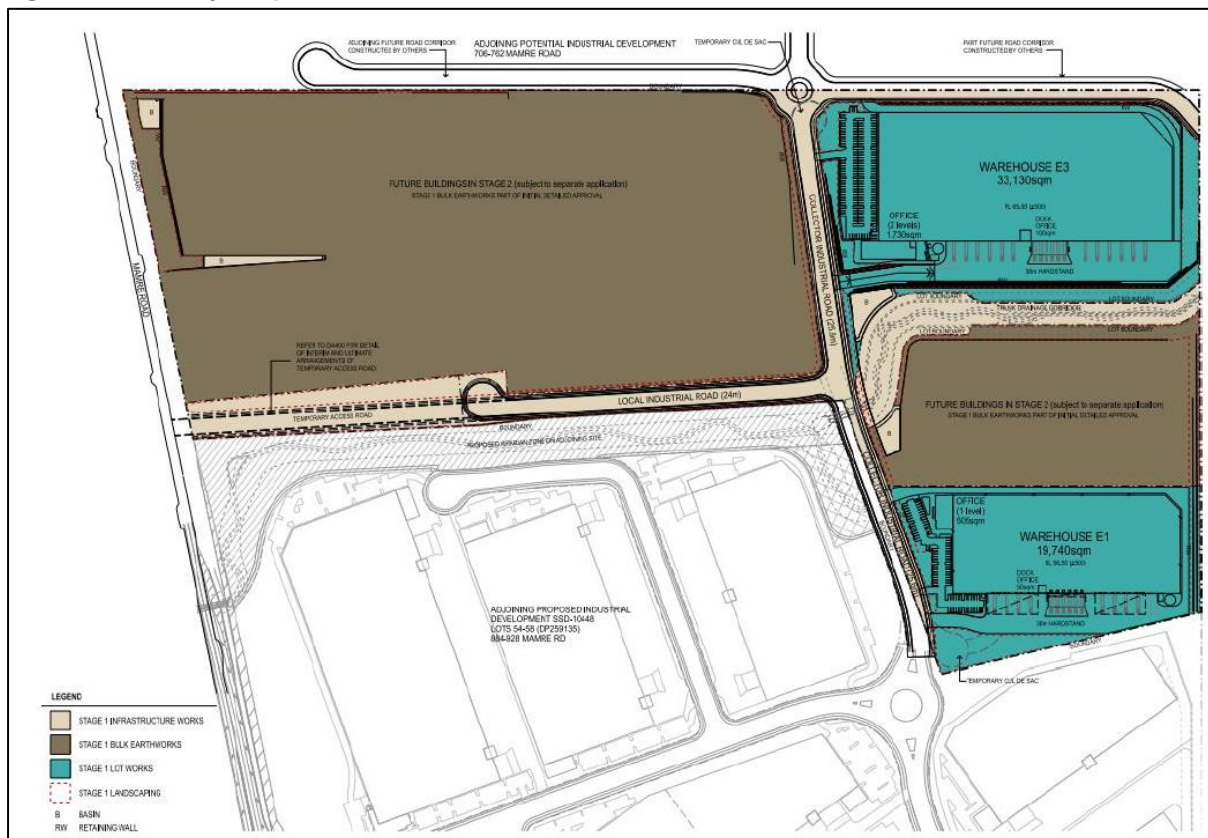
The site layout plant is illustrated in Figure 2.

Figure 1 Development site location



Source: Northstar

Figure 2 Site layout plan



Source: SBA Architects

3.3. Identification of Potential Emissions to Atmosphere

The activities to be performed during the construction of the Stage 1 development which may have the potential to impact upon air quality include:

- demolition of existing structures within the development site;
- earthworks including stripping and stockpiling of topsoil, and cut and fill;
- importation of fill from offsite;
- movement of plant and equipment on the site and heavy vehicles on unpaved areas; and
- construction of hardstand areas, roads, and warehouses and offices.

The activities above would result in emissions of particulate matter (dust) and gaseous emissions through the combustion of fuel in vehicles, plant and machinery.

Of the activities outlined above, emissions associated with earthworks and the movement of heavy vehicles on unpaved areas have the greatest potential to impact on local air quality, and it is these activities which are examined in detail in this CAQMP. However, the controls outlined in this CAQMP consider all sources of emissions (refer Section 6.3).

The risk of dust impacts from a demolition/construction site causing loss of amenity and/or health or ecological impacts is related to the following (IAQM, 2016):

- The nature of the activities being undertaken;
- The duration of the activities;
- The size of the site;
- The meteorological conditions (wind speed, direction, rainfall). Adverse impacts are more likely to occur downwind of the site and during drier periods;
- Soil moisture content and soil type and erodibility;
- The proximity of receptors to the activities;
- The sensitivity of the receptors to dust; and
- The adequacy of the mitigation measures applied to reduce or eliminate dust.
- In addition, the risk of air quality impacts arising from exhaust emissions are related to the following:
- The number and type of plant and equipment being used;
- The duration of use of each item of plant and equipment;
- Appropriate operation and maintenance of plant and equipment; and
- Compliance of plant and equipment with relevant emission standards.

The anticipated volume of earthworks activities performed for the Stage 1 development are presented in Table 3.

Table 3 Anticipated volume of earthworks activities

Description	Estimated volume (m ³)
Strip topsoil and stockpile	432 100
Cut to fill	542 500
Import and compact fill	66 200
Detailed excavation	66 200
Balance	44 200 (fill over cut)

A number of ancillary activities such as construction of retaining walls, stormwater infrastructure, electrical installation, landscaping and construction of offices and internal roads will also take place, although the earthworks activities outlined in Table 3 would result in the greatest potential for emissions to air, and it is these activities which have been examined in detail.

The plant and equipment to be used during the construction of the development will include:

- Dump trucks;
- Scrapers;
- Excavators;
- Compactors;
- Water cart;

- Grader;
- Dozer;
- Smooth drum roller; and
- Crusher

It is anticipated that at least four dump trucks will be required for the earthworks component of the construction of the Stage 1 development, with each performing up to 120 round trips per day.

3.4. Quantification of Potential Emissions to Atmosphere

As required by the Project Approval Conditions, this CAQMP provides a quantification of emissions associated with construction activities and identifies the emission control measures which would be applied to each source.

Emissions have been estimated adopting activity data as outlined in Table 3, and emission factors for materials handling processes, movement of trucks on unpaved site roads, and wind erosion contained within the US EPA AP-42 emission factor compendium (US EPA, 1995 and updates). These factors are appropriate for adoption in Australia and are routinely adopted in the assessment of operations of a similar nature.

Emissions of total suspended particulate (TSP), particulate matter with an aerodynamic diameter of ≤ 10 microns (PM_{10}), and ≤ 2.5 microns ($PM_{2.5}$) have been calculated without the inclusion of controls. Emission controls have then been identified and applied to the sources of emissions to determine the likely reductions which could result through the implementation of those measures.

The proposed emission controls to be adopted during the construction of the development that are associated with justifiable emission control efficiencies as available in the literature (DSEWPC, 2012), have been presented in Table 4.

It is noted that a range of additional control measures are proposed for the development for which justifiable control efficiencies are not available (see Section 6.3).

Table 4 Proposed emissions controls with associated control efficiencies

Measure	Aim	Anticipated emission control efficiency (%)
Watercarts and handheld water sprays on site to control dust regularly	Minimise dust generation on haul roads, exposed areas and during materials handling activities	50
Dust suppressant/hydromulching to areas where final level achieved	Minimise the area of exposed surface available for wind erosion	70

A number of assumptions have been adopted to estimate the emissions resulting from the construction of the Stage 1 works in conjunction with the anticipated volume of earthworks presented in Table 3. It is noted that the adopted assumptions generally represent a conservative approach to estimating the emissions and correspondingly, the actual emissions generated from construction works are likely to be less than those presented in this CAQMP. The assumptions are provided below in Table 5.

Table 5 Assumptions adopted to estimate emissions

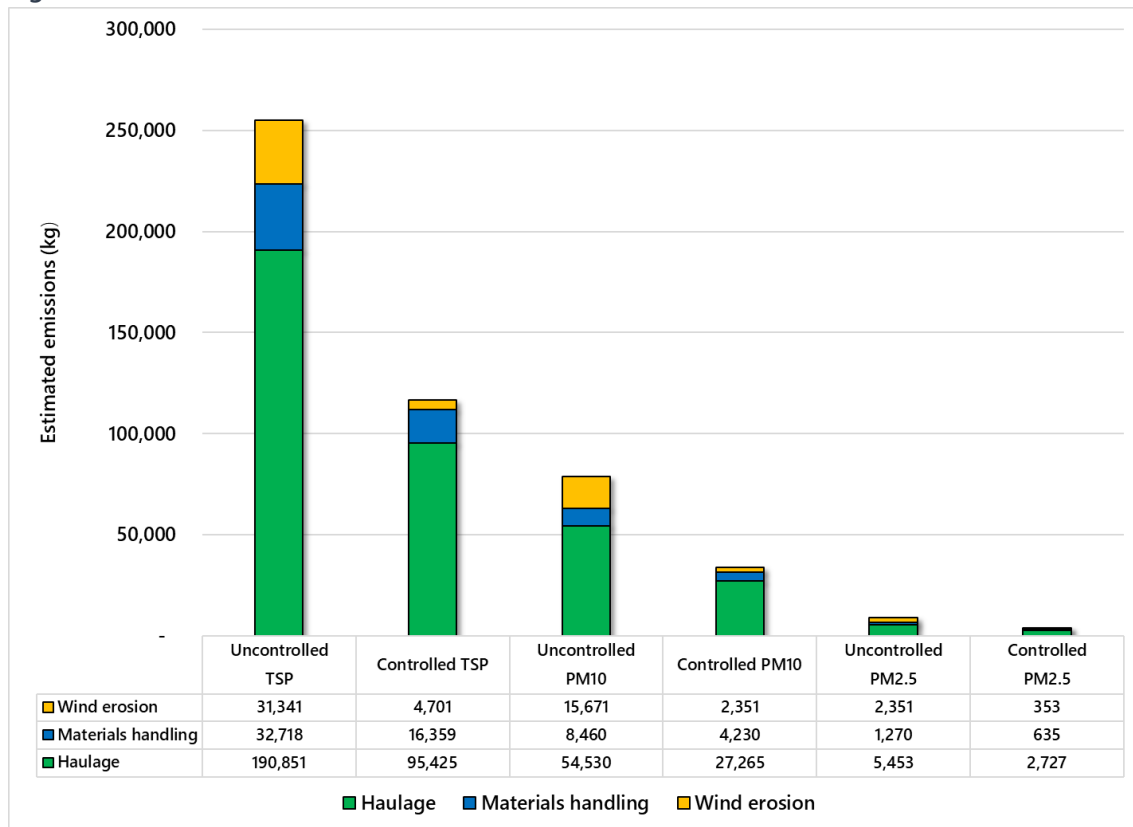
Parameter	Assumption	Comment
Total duration of earthworks	182 days	Estimated from information received from earthworks contractor
Number of dump truck movements per day	120 movements per truck	
Payload of trucks importing fill material	35 tonnes	Assumed payload
Dozer operating hours per day	10 hours	Assumed hours
Heavy vehicle on site path length	0.5 kilometres	Measured from site entrance to centre of development site

Figure 3 presents the anticipated emissions during the construction of the Stage 1 works, before (uncontrolled) and after the application of the proposed control measures outlined in Table 4 (controlled). Figure 3 indicates that emissions of particulate matter are dominated by haulage activities, should these not be appropriately controlled. For clarity, a range of control measures have been identified in this report to sufficiently control emissions associated with haulage activities.

The application of the emission control measures results in reductions in all three particulate size fractions (i.e. TPM_{10} , PM_{10} and $PM_{2.5}$), as presented in Figure 3. The potential reduction in emissions through application of the proposed emissions controls is as follows:

- TSP – 54 %
- PM_{10} – 57 %
- $PM_{2.5}$ – 59 %

Figure 3 Particulate emissions – uncontrolled and controlled

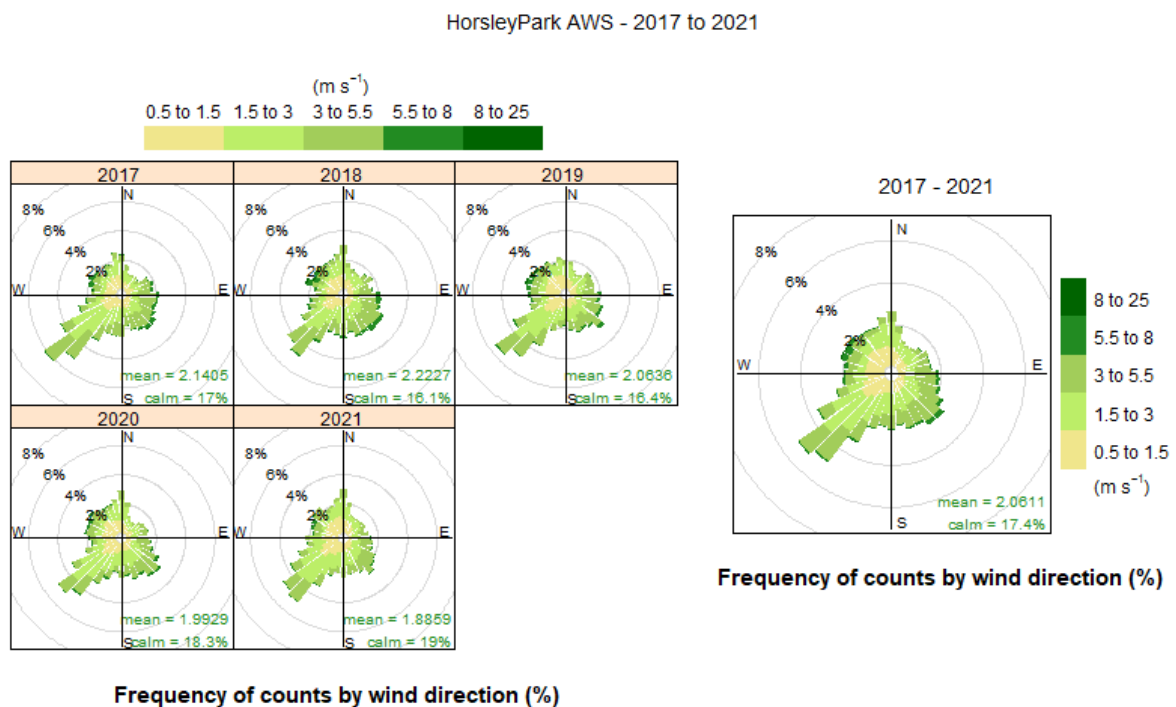


4. BASELINE DATA

4.1. Meteorology

The meteorology of the area surrounding the development site was characterised in the SSD Application through the use of observations collected by the Australian Government Bureau of Meteorology (BoM) at the Horsley Park Equestrian Centre automatic weather station (AWS located approximately 7.1 kilometres (km) from the development site. Wind roses showing the frequency of wind speed and direction from 2017 to 2021, as presented in the SSD Application are shown in Figure 4.

Figure 4 Annual wind roses 2017 to 2021, Horsley Park Equestrian Centre AWS



The wind roses indicate that from 2017 to 2021, winds at Horsley Park Equestrian Centre show similar patterns across the years, with a predominant south-westerly wind direction.

The majority of wind speeds experienced at the Horsley Park Equestrian Centre AWS between 2017 and 2021 are generally in the range 0.5 meters per second ($\text{m}\cdot\text{s}^{-1}$) to $5.5\text{ m}\cdot\text{s}^{-1}$ with the highest wind speeds (greater than $8\text{ m}\cdot\text{s}^{-1}$) occurring from north-westerly directions. Winds of this speed are rare and occur during 0.3 % of the observed hours during the years. Calm winds ($< 0.5\text{ m}\cdot\text{s}^{-1}$) are more common and occur during 17.4 % of hours across the years.

4.2. Air Quality

The air quality of the area surrounding the development site was characterised in the SSD Application through the use of observations collected at the NSW DPE AQMS located at St Marys. Particulate matter (as PM₁₀ and PM_{2.5}) data for the period 2017-2021 are presented in Figure 5 and Figure 6. These data indicate that that particulate matter concentrations were significantly higher than the NSW EPA criteria in late 2019 and early 2020. This was predominantly driven by exceptional weather events such as drought conditions and bushfires (NSW DPIE, 2021).

The aim of the CAQMP is to minimise the contribution of particulate matter resulting from the construction of the development.

Figure 5 PM₁₀ measurements, St Marys 2017-2021

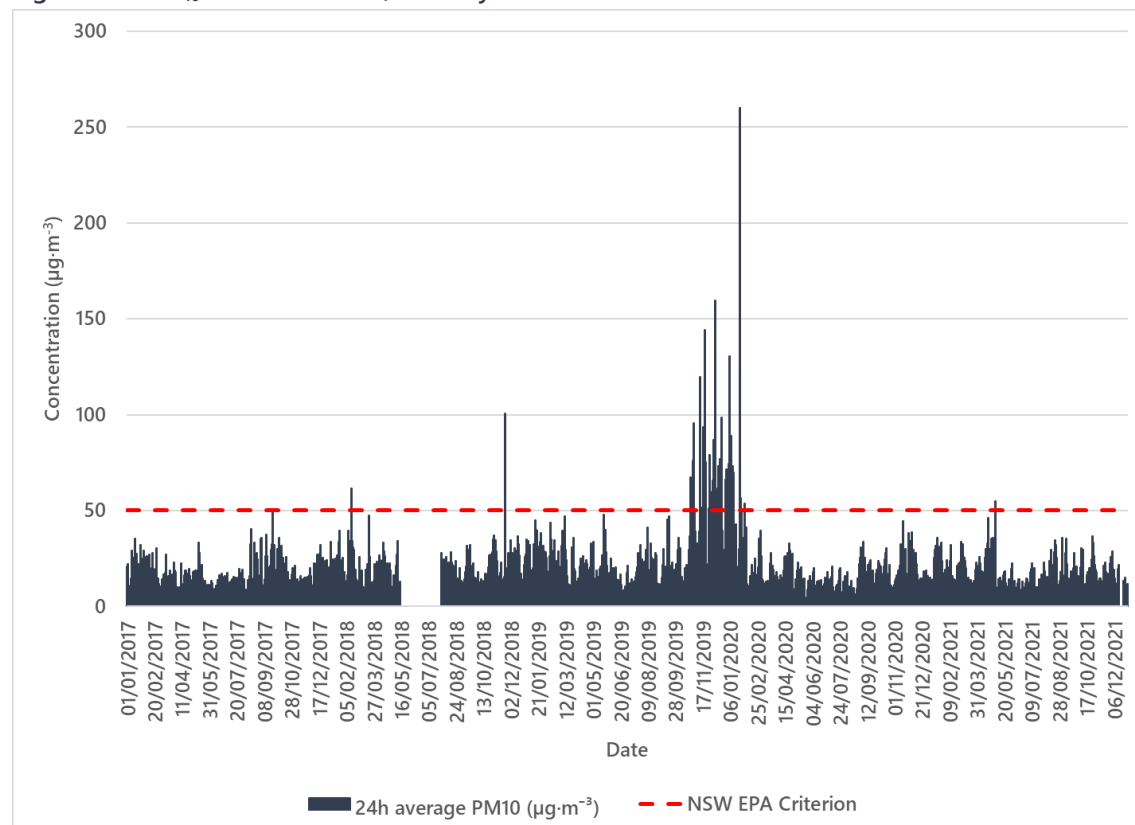
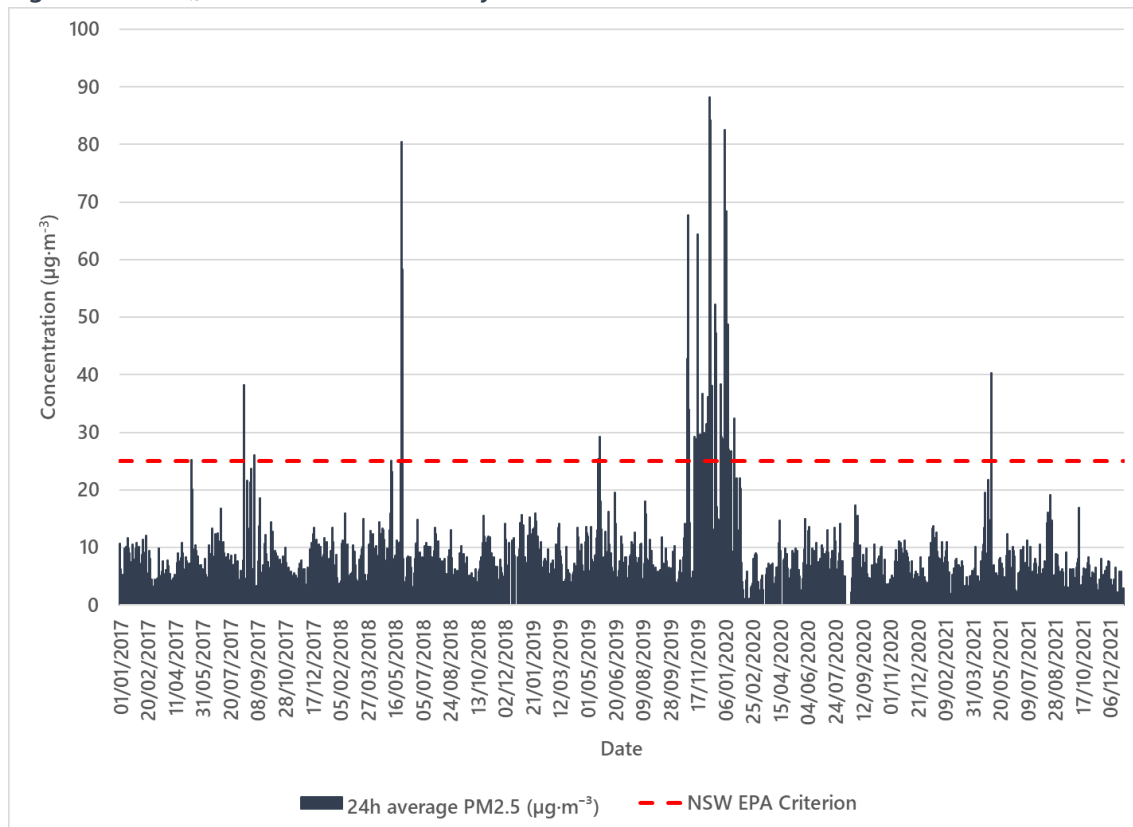


Figure 6 PM_{2.5} measurements, St Marys 2017-2021



5. AIR QUALITY STANDARDS

The NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA, 2022) lists the statutory methods that are to be used to model and assess emissions of criteria air pollutants from stationary sources in NSW.

The criteria listed in the Approved Methods are derived from a range of sources (including National Health and Medical Research Council (NHMRC), National Environment Protection Council (NEPC), Department of Environment (DoE), World Health Organisation (WHO), and Australian and New Zealand Environment and Conservation Council (ANZECC)).

It is noted that the primary pollutants of concern associated with the construction of the Development are as follows:

- PM₁₀;
- PM_{2.5};
- TSP; and,
- Deposited dust.

The impact assessment criteria for the abovementioned pollutants as set out in Section 7.1 of NSW EPA (2022) are presented in Table 6 below. The standards applicable to the monitoring to be undertaken through this AQMP are presented in **bold** text.

Table 6 NSW EPA impact assessment criteria

Pollutant	Average period	Units ^(E)	Criterion	Notes
Particulates (as PM ₁₀)	24 hours	µg·m ⁻³ ^(A)	50	Numerically equivalent to the Ambient Air Quality National Environment Protection (AAQ NEPM) ^(B) standards and goals.
	Annual	µg·m ⁻³	25	
Particulates (as PM _{2.5})	24 hours	µg·m ⁻³	25	
	Annual	µg·m ⁻³	8	
Particulates (as TSP)	Annual	µg·m ⁻³	90	
Particulates (as dust deposition)	Annual ^(C)	g·m⁻²·month⁻¹	2	Assessed as insoluble solids as defined by AS 3580.10.1
	Annual ^(D)	g·m⁻²·month⁻¹	4	

Notes: (A): micrograms per cubic metre of air
 (B): National Environment Protection (Ambient Air Quality) Measure
 (C): Maximum increase in deposited dust level
 (D): Maximum total deposited dust level

As summarised in Section 1, it is noted that the AQIA performed as part of the SSD application (Northstar Air Quality, 2021) indicates that the risk of adverse dust impacts from construction activities being experienced at offsite locations would be low. However, as required by the Project Approval Conditions, dust deposition

gauge monitoring will be performed against the criteria outlined in Table 6. It is noted that no additional monitoring is required for construction activities.

6. AIR QUALITY MANAGEMENT

The air quality management measures to be adopted during the construction of the development have been determined through the quantification of emissions and the identification of major emissions sources as outlined in Section 3.4. Measures have also been identified through review of (NSW EPA, 2022) and (IAQM, 2016).

Key performance indicators (KPI) for the development are provided in Section 6.1. For the CAQMP as a whole, the following is provided, as required by the Project Approval Conditions:

- Monitoring method;
- Location, frequency and duration of monitoring;
- Record keeping;
- Complaints register;
- Response procedures; and
- Compliance monitoring.

6.1. Key Performance Indicators

As previously outlined, the key objectives of the CAQMP are to prevent visible emissions of dust from leaving the site boundary and to ensure that impacts to air quality are minimised and within the scope permitted by the Approval. To achieve these objectives, the summarised targets in Table 1 (replicated in Table 7) have been proposed for the management of air quality impacts during construction as follows.

Table 7 KPI's associated with the management of air quality

Measure	Target	Timeframe	Responsibility	Documentation
Visible dust emissions leaving the site boundary	• Any emissions of visible dust leaving the site boundary investigated immediately • Review controls applied and increase controls or modify activities	At all times	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
Spillage or track out onto public roads	• Any spillage or track out on public roads to be cleaned immediately	At all times	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
Maintenance of all plant and equipment used on site in a proper and efficient condition	• All plant and equipment to be maintained in accordance with manufacture specifications	At all times	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist

Measure	Target	Timeframe	Responsibility	Documentation
Operation of all plant and equipment used on site in a proper and efficient manner	All plant and equipment to be operated efficiently			
Complaints regarding air quality	- Zero validated complaints - Any complaints would be investigated (see Section 7.2)	At all times	Site supervisor	Complaints register
Meeting Project Approval Conditions regarding air quality	Compliance with conditions	At all times	Site supervisor	Environmental inspection checklist Construction Compliance Report

Air quality impacts during construction are likely to be minor and manageable through the implementation of the control measures outlined in Section 6.3. The success of the CAQMP would, in part, be determined through compliance with the KPIs outlined above. To ensure that the development is operated in accordance with conditions of consent, dust deposition monitoring is proposed at four locations on the boundary of the development site, for the duration of works. A description of the proposed monitoring program is outlined in Section 6.2.

6.2. Air Quality Monitoring

The monitoring process is detailed below and will support the assessment of compliance for dust deposition against the criteria specified in Section 5. The process will consist of:

- Locating four (4 no) dust deposition monitoring devices at the development site in line with Australian Standard / New Zealand Standard (AS/NZS) 3580.10.1:2016 and other relevant standards;
- Operating and maintaining the dust deposition monitoring devices at the development site in line with AS/NZS 3580.10.1:2016 and other relevant standards;
- Collect deposited dust samples each 30±2 days in accordance with AS/NZS 3580.10.1:2016 and other relevant standards and provide the collected samples to a NATA accredited laboratory for analysis;
- Compile monitoring results over a 12-month sampling period and calculate the annual average dust deposition rate (as g·m⁻²·month⁻¹) for each monitoring location;
- Review the number, frequency and nature of any environmental complaints received over the same 12-month period, as relates to dust amenity issues;
- Produce a dust monitoring report specifying the results of the monitoring and whether compliance has been achieved; and,

- If the monitoring results reveal an exceedance of the dust deposition criteria (in any month of monitoring), identify and apply further dust mitigation measures.

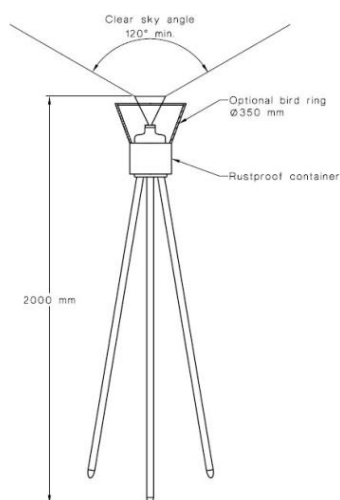
A review of the 12-month sampling period results will be undertaken by a suitably qualified and experienced professional.

Monitoring is proposed at four locations on the boundary of the development site. These locations will generally reflect the northern, southern, eastern and western boundaries, and specific locations will be selected prior to construction to ensure that they meet the requirements of the relevant AS/NZS.

Monitoring will be conducted using dust deposition gauges (DDG) constructed in accordance with AS/NZS 3580.1.10:2016. This apparatus involves the collection of passing dust with a funnel and bottle arrangement. The dust emissions settle into the funnel from the ambient air and are collected in the bottle with any rainwater. The sampled mass deposition rate is calculated from the mass of solids collected from the bottle. The dust is collected over a monthly (30 ± 2 day) period, and the results are expressed as $\text{g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$.

A typical dust deposition gauge and stand is illustrated in Figure 7.

Figure 7 Dust deposition gauge with stand



The monitoring locations will be sited in accordance with the requirements of 'AS/NZS 3580.1.1:2007 Methods for sampling and analysis of ambient air - Guide to siting equipment, and AS/NZS 3580.10.1:2016.

The monitoring of dust deposition will be performed, and quality controlled in accordance with AS/NZS 3580.10.1:2016.

For every monthly (30 ± 2 day) monitoring period the concurrent collection of all four gauges is required. The samples will be collected in accordance with AS/NZS 3580.10.1:2016.

After the NATA accredited laboratory has issued the monthly analysis report, the data will be reviewed by the site environmental representative and recorded in a database, which will be subsequently used to evaluate performance against the criteria specified in Section 5.

Unless otherwise required, an annual monitoring report will be prepared by a suitably qualified and experienced professional, describing the methodology and comparing the dust deposition monitoring against the relevant criteria. The annual report can then identify whether further monitoring is required based on whether an exceedance of criteria has occurred.

Following an exceedance of the dust deposition criterion listed in Section 5, or a dust related incident that results in a complaint, within 24 hours the site environmental representative will notify NSW DPE of the exceedance/incident. The likely causes of any exceedances will be reviewed, and additional mitigation measures to further reduce dust emissions from operations and activities on site will be investigated and implemented.

The DDG monitoring will provide details on whether the activities at the development site are being performed in accordance with development consent conditions. These measurements will be supplemented by visual inspections on a daily basis, and through the KPIs as outlined in Table 7.

6.3. Emission Control Measures

The emission control measures to be employed at the development site during construction are outlined in Table 8.

Table 8 Air quality management measures adopted during development construction

ID	Control measure	Source	Responsibility	Monitoring/audit/inspection
Identified through review of major emissions sources (Section 3.4)				
AQ1	Watercarts and handheld water sprays on site to control dust (see also AQ25, AQ30), especially on exposed surfaces and stockpiles	Section 3.4	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ2	Dust suppressant/hydromulching to areas where final level achieved	Section 3.4	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
Identified through review of (NSW EPA, 2017) and (IAQM, 2016)				
AQ3	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 manager.	(IAQM, 2016)	Site supervisor	Construction Compliance Report
AQ4	Display the head or regional office contact information.	(IAQM, 2016)	Site supervisor	Construction Compliance Report
AQ5	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.	(IAQM, 2016)	Site supervisor	Environmental inspection checklist
AQ6	Make the complaints log available to the local authority when asked.	(IAQM, 2016)	Site supervisor	Construction Compliance Report
AQ7	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	(IAQM, 2016)	Site supervisor	Environmental inspection checklist
AQ8	Undertake daily on-site and off-site inspections where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary.	(IAQM, 2016)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist

ID	Control measure	Source	Responsibility	Monitoring/audit/inspection
AQ9	Carry out regular site inspections to monitor compliance with the CAQMP / CEMP, record inspection results, and make an inspection log available to the local authority when asked.	(IAQM, 2016)	Site supervisor	Environmental inspection checklist
AQ10	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.	(IAQM, 2016)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ11	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	(IAQM, 2016)	Site supervisor	Environmental inspection checklist
AQ12	Avoid site runoff of water or mud after treatment and cleaning.	(IAQM, 2016)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ13	Keep site fencing, barriers and scaffolding clean using wet methods.	(IAQM, 2016)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ14	Cover, seed or fence stockpiles to prevent wind erosion	(IAQM, 2016)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ15	Ensure all on-road vehicles comply with relevant vehicle emission standards, where applicable	(IAQM, 2016)	Site supervisor	Construction Compliance Report
AQ16	Ensure all vehicles switch off– engines when stationary - no idling vehicles	(IAQM, 2016)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ17	Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable	(IAQM, 2016)	Site supervisor	Construction Compliance Report

ID	Control measure	Source	Responsibility	Monitoring/audit/inspection
AQ18	Impose and signpost a maximum speed limit of 25 km·h ⁻¹ on surfaced roads and 15 km·h ⁻¹ on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate	(IAQM, 2016)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ19	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems	(IAQM, 2016), (NSW EPA, 2017)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ20	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using non-potable water where possible and appropriate	(IAQM, 2016), (NSW EPA, 2017)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ21	Use enclosed chutes and conveyors and covered skips	(IAQM, 2016), (NSW EPA, 2017)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ22	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate	(IAQM, 2016)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ23	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	(IAQM, 2016)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ24	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	(IAQM, 2016)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist

ID	Control measure	Source	Responsibility	Monitoring/audit/inspection
AQ25	Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	(IAQM, 2016), (NSW EPA, 2017)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ26	Ensure sand and other aggregates are stored in bunded areas and 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	(IAQM, 2016)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ27	Ensure all vehicles entering and leaving the site with loads have their loads covered	(IAQM, 2016)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
Identified through review of (Ochre, 2023)				
AQ28	The staging of activities will minimise exposure of disturbed surfaces at any one time and will implement permanent and temporary soil stabilisation measures (i.e. soil polymers, final landscape and vegetation areas), in minimising the duration of soil disturbance and exposure to wind and water erosion.	(Ochre, 2023)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ29	In the event of high winds ($\geq 15 \text{ m}\cdot\text{s}^{-1}$), additional measures may be implemented including the alteration of work activities, the application of water to disturbed areas and the covering of exposed surfaces and stockpiles will be implemented to minimize impacts to local air quality.	(Ochre, 2023)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ30	Vehicular access is to be restricted to designated access areas and existing roadways.	(Ochre, 2023)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist

ID	Control measure	Source	Responsibility	Monitoring/audit/inspection
AQ31	Stabilised site entry and egress will be provided to minimize tracking of material.	(Ochre, 2023)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ32	Cover, or otherwise stabilise from erosion, stockpiles that will be in place for more than 20 days as well as any stockpiles that are susceptible to wind or water erosion, within 10 days of forming each stockpile.	(Ochre, 2023)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ33	Stabilisation of areas in accordance with project landscaping and final landform drawings is to occur progressively in conjunction with the completion of earthworks.	(Ochre, 2023)	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
Other				
AQ34	Inspect all plant and equipment regularly to ensure that it is maintained in accordance with manufacturers specifications.	-	Site supervisor	Environmental inspection checklist
AQ35	Inspect the operation of all plant and equipment to ensure that it is being operated in a proper and efficient manner.	-	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ36	Implementation of a haulage plan to avoid dust generation on unpaved roads.	-	Site supervisor	Environmental inspection checklist
AQ37	Progressive rehabilitation as work areas become inactive or are ready for final landscaping to limit amount of exposed surface.	-	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist
AQ38	Installation of an appropriately designed truck wash.	-	Site supervisor	Environmental inspection checklist Site supervisor's daily checklist

6.4. Contingency Plan

As required by Condition C1 (e) of the Consent, a contingency plan to manage any unpredicted impacts and their consequences is required to ensure that ongoing impacts reduce to levels below the impact assessment criteria as quickly as possible.

The contingency management plan is presented in Table 9.

Table 9 Contingency management plan

Parameter	Trigger / response	Action level		
		A	B	C
Visible dust leaving the site boundary	Trigger	Daily inspection indicates no visible dust offsite	Daily inspection indicates visible dust offsite present	Daily inspection indicates visible dust offsite present multiple times a day or from multiple sources
	Response	No response	Investigate dust generating activities and implement appropriate additional emission controls	Investigate dust generating activities, progressively decrease the rate of activity or cease operations if emissions cannot be adequately controlled
Results of dust monitoring program	Trigger	Monthly review indicates no exceedances	Monthly review indicates one exceedance	Monthly review indicates more than one exceedance
	Response	No response	Investigate activities that may have contributed to exceedance and implement emission controls.	Investigate activities that may have contributed to exceedance and implement emission controls.
Complaints received regarding dust	Trigger	No complaints received	One complaint received	Multiple complaints received regarding same source
	Response	No response	Investigate dust generating activities and implement appropriate additional emission controls	Review monitoring data, progressively decrease the rate of activity or cease operations if emissions cannot be adequately controlled

6.5. Training

All personnel, including employees, contractors and sub-contractors, are required to complete a project induction containing relevant environmental information before they are authorised to work on the development.

Air quality specific information to be covered in the project induction will include:

- Obligations under the project Conditions of Approval (including the CAQMP), including the identification of potential sources of air pollutants of concern and the mitigation measures to be implemented, including measures (e.g. use of water, cover exposed areas) during weather conditions where high levels of dust are probable;
- Responsibilities relating to the management of air quality under the POEO 1997 and POEO (Clean Air) Regulation 2022;
- Typical construction activities that may impact air quality and associated environmental safeguards; and
- Incident response procedures.

7. REVIEW AND IMPROVEMENT

A daily site inspection will be performed by the Site Supervisor and will include relevant checks to ensure that the air quality management measures outlined in Table 8 are achievable. Any identified remedial actions will be promptly addressed.

Monitoring of dust emissions will be performed through the daily site inspection and visible observations by the Site Supervisor. The dust control observations will be made during the morning and repeated as required to adequately account for changing conditions. A 'Daily Checklist' will be used to record each day's visible dust plume observations, noting any potential sources that may change due to changing conditions or require further observation.

If conditions change significantly on-site subsequent to the performance of the daily check, further '*ad-hoc*' checks will also be performed and documented in the same manner.

Training of staff and contractors will include dust management as outlined in Section 6.5.

Through observations made during the site check, or through notification by staff or contractors, the Site Supervisor will have the authorisation to review operations performed on-site and alter site activities and/or additional controls necessary to effectively manage those risks.

Key Performance Indicators for the construction of the development would be associated with the triggers in Table 7.

Revision of the AQMP would be performed as per Condition C8 of the consent (as relevant to air quality management):

Within three months of:

- (a) the submission of a Compliance Report under condition C14;
- (b) the submission of an incident report under condition C10;
- (c) the approval of any modification of the conditions of consent; or
- (d) the issue of a direction of the Planning Secretary under condition A2(b) which requires a review.

The CAQMP would be subject to review after the first three months of operation, and then after every 6 months to ensure applicability to development activities. This meets the requirement of Condition C1(h) of the Conditions of consent.

7.1. Non-Compliance, Corrective and Preventive Action

Environmental inspection and observation results are interpreted to identify actual and potential non-conformances and events that may result in nuisance, environmental harm and unacceptable loss of amenity or community complaints. The Environmental Representative and/or a public authority may also raise a non-compliance or improvement notice.

Where non-compliances are identified during regular inspections, corrective actions are raised, tracked and closed out through the inspection records.

Following the identification of a non-compliance, corrective and/or preventative actions will be identified and assigned to the appropriate person with set timeframes. Timeframes will be set to ensure any damage incurred is rectified and any chance of recurrence is eliminated as soon as practicable. An appropriate register will be used to assign, track and close out corrective actions.

7.2. Complaints Handling Procedure

The GPT Group will operate a telephone complaint line during the operating hours of the development site during construction, with the number publicly notified via the GPT Group website. All complaints must be investigated, and feedback will be provided to the petitioner or the pertinent agency in a timely manner.

For any complaint received relating to air quality impacts from the construction activities, the following measures will be taken:

- GPT or a Site Supervisor to review and follow up all the complaints regarding dust within one business day of receiving the complaint;
- Fill out the appropriate complaint form, including location of complaint and noting the time and date of the complaint/s and the identity and contact details of the complainant (if agreed to provide them).
- Perform a site inspection, noting all dust producing activities taking place and the mitigation methods being used. If the complaint was related to an event in the recent past, if possible, note any dust or odour producing activities that were underway at that time and initiate any remedial action necessary.
- As soon as possible, visit the area from where the complaint originated to ascertain if the issue persists.
- It is important to verify if another source of dust other than the construction activities of the project is causing the complaint and collect appropriate evidence of this (photos and/or videos as appropriate).
- Once investigations have been completed, contact the complainant to explain any problems found and remedial actions taken.

- If necessary, update any relevant procedures to prevent any recurrence of problems and record any remedial action taken.

7.3. Record Keeping

The GPT or the Site Supervisor will keep a record of any complaint made to the development site or any employee or any agent of the development in relation to air quality from the development site. A complaint register will be maintained and will be produced to any authorised officer of the EPA if requested. Records of individual complaints will include:

- Date and time of complaint.
- Method by which the complaint was made.
- Personal details of the complainant (if provided).
- Nature of the complaint.
- The details of an initial response to the complaint.
- Action taken and any follow up actions.
- If no action was taken, the reason why no action was taken.
- Weather conditions corresponding to the time of the complaint will also be noted in the logbook for assessment purposes.

7.4. Reporting to the Environmental Representative

As required by Condition A34, the Applicant will provide the Environmental Representative (ER) with all documentation requested to perform their functions, including:

- Air quality monitoring data;
- Complaints data (as per Section 7.3).

8. REFERENCES

- DSEWPC. (2012). *National Pollutant Inventory Emission Estimation Technique Manual for Mining Version 3.1*.
- IAQM. (2016). *Guidance on the assessment of dust from demolition and construction*.
- Northstar Air Quality. (2021). *Air Quality Impact Assessment - GPT Industrial Estate, Kemps Creek*.
- NSW DPIE. (2021). *New South Wales Annual Compliance Report 2020*.
- NSW EPA. (2017). *Local Government Air Quality Toolkit, Air quality guidance note, Construction sites*.
- NSW EPA. (2022). *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*.
- Ochre. (2023). *Yiribana Logistics Estate - Erosion and Sediment Control Plan*.
- US EPA. (1995). *Compilation of Air Pollutant Emission Factors*.

APPENDIX A

CV

Martin Doyle

Director

martin@northstar-env.com

0447 452 777



qualifications

- PhD Air Quality Meteorology (University of East Anglia, UK, 2004)
- BSc (Hons) Environmental Science (University of East Anglia, UK, 1998)
- Certified Air Quality Professional (CAQP), Clean Air Society of Australia and New Zealand (CASANZ)

special expertise

Martin provides a range of expertise including:

- Air quality and greenhouse gas impact assessment
- Dispersion modelling studies including a range of specialist software
- Ambient air quality and meteorology studies
- Satellite remote sensing
- Geographical Information Systems (GIS)
- Indoor air quality and occupational exposure assessment
- Process & air pollution control due diligence and testing
- Odour impact assessment and audit
- Climate change impact assessment
- Expert testimony and witness
- Independent peer review and audit

Martin has almost 25 years of experience in the field of air quality, from academic research to public and private environmental consultancy. He completed his doctorate in 2004 in air pollution meteorology and was a Senior Research Associate at the University of East Anglia, which has the UK's highest rating for the quality of environmental research undertaken. His work has been included in UK Department of the Environment, Food and Rural Affairs Air Quality Expert Group state-of-science reports on PM₁₀ and NO₂.

His major areas of expertise include air quality monitoring (including monitoring network design and data analysis), emissions inventory development, atmospheric dispersion modelling (using TAPM, CALPUFF, AUSPLUME, CALINE and AERMOD), greenhouse gas assessment and climate change impact assessment, independent peer review and performance of audits.

Martin has significant experience across all sectors (see overleaf) and broad experience in assessment of air pollutants including odour.

Use of Geographical Information Systems (GIS) and other software to present data to non-specialists in easy to understand formats is one of Martin's key interests.

background

Northstar Martin Doyle CV 202203
1/5

Northstar Air Quality Pty Ltd
www.northstar-env.com

Martin Doyle

selected project experience



Agribusiness

- Intensive Poultry Facility, Peer Review, NSW
- Blayney Abattoir, NSW
- Bourke Small Stock Abattoir, NSW
- The Ranch Poultry Complex, NSW
- Abattoir and Rendering Plant, NSW
- Maylands Poultry Farm, NSW
- Milk Production Facility, NSW
- Serpentine Poultry Farm Expansion, WA
- Westmere Grains, VIC

Clients in this sector include: CAPRA Development, Dairy Farmers, Darmad, Saines Lucas Solicitors, Scolexia, Thomas Foods International Tamworth.



Resources & Waste

- Great White Kaolin Project, AQIA, SA
- Dubbo Project, AQIA, NSW
- Dargues Gold Mine, AQIA, NSW
- Wyangle Quarry, AQIA, NSW
- Glenella Quarry, AQIA, NSW
- Milbrae Quarries (various), AQIA, NSW
- Albion Park Quarry AQMP, NSW
- Albion Park Quarry Expansion AQIA, NSW
- Karuah South Quarry, AQIA, NSW
- Bangus Quarry, AQIA, Tumblong, NSW
- Ralston Quarry, AQIA, NSW
- North Star Quarry, AQIA, NSW
- Glenella Quarry, AQIA, NSW
- Woodview Quarry, AQIA, NSW
- Willowtree Quarry, AQIA, NSW
- Doves Quarry, AQIA and PRP, NSW
- Ralston Quarry, AQIA, NSW
- Gow Street Recycling Centre, NSW Dust Audit & Management Plan
- Sunnyside Processing Facility, AQIA and PRP, NSW
- Frank Bragg Gravel Quarries, AQIA, NSW
- Copi Mineral Sand Project, AQIA, NSW
- Thorley Quarry RRF, AQIA, NSW
- Bin City Recycling Centre, AQIA, NSW
- Curby Pilot Program, AQRA, NSW
- WormTech Carrathool, AQIA, NSW
- Kariong Sand and Soil Supplies RRF, NSW
- Bingo Eastern Creek Flare Project, NSW
- Resource Recovery Facility, St Marys NSW
- Materials Recycling Facility, Operational Dust Management Plan, Padstow
- SUEZ Lucas Heights Leachate Treatment Plant, NSW
- SR Solutions Glass Recycling Facility, NSW
- Traco Tyre Recycling Facility, NSW
- MET Construction Materials Recycling Facility, NSW
- Confidential, Integrated Mining and Waste Development, NT
- East Arm Waste Transfer Station Risk Assessment, NT
- Erskine Park Waste Transfer Station, NSW
- Bingo Waste Transfer Stations (St Marys, Mortdale), NSW
- Bingo Waste Transfer Station, Greenacre NSW, Odour and Dust Audit
- Poochera Kaolin Project, AQIA, SA
- Bingo, Eastern Creek NSW, AQMP and Odour Audit
- Glenfield Waste Services Materials Recycling Facility, NSW
- Kemps Creek Alternative Waste Treatment Facility, NSW
- Stopwaste, GHG Assessment
- Stopwaste, Soft Plastic Pilot Program, AQRA
- Wastewise, Odour Management Plan, VIC
- Brooks Parade WWPS, Odour Assessment, NSW
- Bin City Recycling Centre, AQIA, NSW
- Polytrade Smithfield MRF, AQIA, NSW
- Polytrade Smithfield Drilling Mud Dewatering, AQRA, NSW
- BRS Liquid Waste Odour Management Pan, NSW
- Tomingley Gold Extension, AQIA, NSW

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- Twinza Oil Project, PNG (GHG)
- Wafi Golpu Project, PNG (GHG)
- P'nyang Project, PNG (GHG)
- Freida River Project, PNG
- Mandalong Southern Extension Project, NSW
- Springvale Mine Extension Project, NSW
- Angus Place Mine Extension Project, NSW
- Lidsdale Siding Extension Project, NSW
- Airly Mine Extension Project, NSW
- Clarence Colliery REA V Project, NSW
- Northern Coal Logistics Project, NSW
- Neubeck Coal Project, NSW
- Karuah Quarry East Expansion Project, NSW
- Jandra Quarry Expansion Project, NSW
- Woodsreef Mine Rehabilitation Project, NSW
- Eastern Creek Organic Resource Recovery Facility, NSW
- Centennial Coal Company, PRP Assessments, NSW
- Peabody Energy, PRP Assessments, NSW
- Solomon Project, WA
- Carrow/Koppio Project, SA
- Area C Iron Ore Mine, WA
- Ace Landscapes Dust Management, NSW
- Redhill Waste Management Facility, WA
- Dromana Landfill, Mornington Peninsula, VIC
- Tropicana Gold Mine, WA
- Woodlawn Bioreactor Project, NSW
- Bigryli Uranium Exploration Project, NT
- Narrabri Coal Project, NSW
- Roy Hill Iron Ore Project, WA
- Glebe Island Bulk Sands Project, NSW
- Duralie Coal Mine Extension Project, NSW
- Cavehill Quarry, VIC
- Central Coast Sands, NSW
- Donalds Mineral Sands, VIC
- Brickworks (Client Confidential), VIC
- Sepon Gold and Copper Mine, Laos
- Werris Creek Coal Mine, NSW
- East Guyong Quarry, NSW
- Darling Downs Sand Extraction Project, QLD
- Belmont and Sunnyside Coal, NSW

- Whitehaven CHPP, NSW
- Wagga Wagga Sand and Gravel Extraction, NSW
- Roy Hill Iron Ore, WA
- Solomon Iron Ore Project, WA
- Leongatha Quarry Extension, VIC (GHG)
- Narrabri CSG Power Plant, NSW (GHG)
- Sunnyside Coal Project, NSW (GHG)

Clients in this sector include: Ace Landscapes, Anglo Gold Ashanti, APP Corporation, BHP BIO, Boral, Centennial Coal Company, Cleanaway, Cleary Bros, Coffey International, Energy Metals, Environmental Earth Sciences, Environmental Property Services, EMRC, Erias Group, ExxonMobil, Fortescue Metals Group, Groundwork plus, Hanson, Holcim, NSW Department of Mines, Peabody Energy, Roy Hill Iron Ore, RW Corkerys, SUEZ Australia, Tellus Holdings Ltd, Veolia, Whitehaven Coal, Xstrata.

Property

- Data centre developments (various), NSW
- Modular Brewery, Odour Assessment, WA
- Eastern Creek Retail Park, Odour Advice, NSW
- Baked Provisions Odour Assessment, NSW
- Newcastle Golf Club Retirement Village AQRA, NSW
- Frango Chickens (various), AQIA, NSW
- Horsley Drive Business Park Warehouse and Distribution Facility, NSW
- Anzac Parade Student Accommodation, Risk Assessment, NSW
- Greystanes Industrial Development, AQIA, NSW
- Kemps Creek Precinct, AQIA, NSW
- Woolworths Distribution Centres (various), AQIA, NSW
- Childcare Centre Air Quality Assessment (numerous), NSW
- Poultry Farm Odour Assessment, Austral NSW
- Marsden Park North Development, NSW
- Survitec Development Application, NSW
- Tyres4U Development Application, NSW

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- Leppington Precinct Development, NSW
- Emerald Hills Development, NSW
- Trinity Point Marina Project, NSW
- South Orange Urban Release Area, NSW
- Warehouse & Distribution Facility, Chullora NSW
- Berrys Bay Marina Project, NSW
- Culburra STP, NSW
- Oakdale Central Development, NSW
- Oakdale West Development, NSW
- Acacia Ridge Campus AQ Investigation, QLD
- Wilton Junction Land Use Mapping, NSW
- Bungaribee Estate Data Centre, NSW
- Orange Pump Station No.1, NSW
- North Orange Pump Station, NSW
- Crowne Plaza Newcastle Brewery Odour, NSW
- Crowne Plaza Hunter Valley Brewery Odour Assessment, NSW
- P&N Beverages Odour Assessment, NSW
- Hurricanes Bar & Grill Odour Management, Darling Harbour, Bondi, Brighton-le-Sands, NSW
- Ridges World Square Schwartz Brewery Odour Audit, NSW
- Newtown Hotel Odour Audit, NSW
- Club Burwood, Smoking Balcony AQ Assessment, NSW
- Leppington Part Precinct, NSW
- Currarong Sewerage Scheme - CEMP audit, NSW
- Brooklyn Child Care Centre, NSW
- Emirates Wolgan Valley Resort - CEMP audit, NSW
- Fairfield RSL - Environmental Audit, NSW
- VOC Monitoring, Reserve Bank of Australia, NSW
- Great Barrier Reef Marine Park Authority, QLD (GHG)

Clients in this sector include: ADW Johnson, Cardno, City of Sydney Council, Commercial & Industrial Property Group, Elton Consulting, Frasers Property Group, Geolyse, Goodman, Hosking Munro, JBA Planning, Meriton, Mirvac, QLD DPW, Shine Pre-School, Urbis, Worley Parsons.



Transport & Infrastructure

- Sydney Metro EIS Peer Review, NSW
- WestConnex Peer Review, NSW
- NorthConnex Peer Review, NSW
- Lower Main North Quadruplication Lite, NSW
- Epping to Chatswood Rail Line, NSW
- Enfield Intermodal Logistics Centre, NSW
- Northern Coal Logistics, NSW
- Capital Metro Stage 1 EIS, ACT
- Solomon Project Road Transportation Study, WA
- Sydney Harbour Bridge Lead Paint Removal Compliance and Verification, NSW
- North Ryde Transport Orientated Development, NSW
- Enfield to Chatswood Rail Line, NSW
- M1 Motorway Service Station, NSW
- Mitchell's Transportation Efficiency Project, WA
- Enfield Intermodal Logistics Centre, NSW
- M2 Upgrade, Sydney NSW
- Majura Parkway, ACT
- Clarrie Hermes Drive Extension, ACT

Clients in this sector include: Strathfield Council, Centennial Coal, EG Property Group, Fortescue Metals Group, Goodman, Hornsby Shire Council, Leightons Contractors, McDonalds Australia, Mitchell's, NSW Ports, P&N Beverages, Parsons Brinkerhoff, SMEC, Strathfield Council, Sydney Harbour Bridge Alliance, Transport for NSW, Urbis.



Industry

- E-waste recycling centre, NSW
- Asphalt Plant and Storage Yard, Tomago NSW
- Capital Asphalt, Independent Review, ACT
- Pre-cast Concrete Facility, Wetherill Park, NSW
- Somerton Fuel Depot, AQIA, VIC
- Concrete Batching Plant, Picton NSW
- Crematorium, Mayfield NSW
- Crematorium, Kemps Creek NSW

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- Boral Kooragang Island Materials Recycling Facility, NSW
- Frenchs Forest Bushland Crematorium, NSW
- Boral Scoresby Opportunities and Constraints assessment, VIC
- BlueScope Steel PRP Assessment, NSW
- Pentarch Munitions Disposal Project, NSW
- Shoalhaven Starches Odour Audit, NSW
- Boral Granville Concrete Batching Plant, NSW
- Tuggeranong Crematorium, ACT
- Vopak Terminals PRP Assessment, NSW
- Eastern Asphalt Plant, Bairnsdale VIC
- Givaudan Odour Management, NSW
- Allens Asphalt, QLD
- SIMS Metal, QLD
- Metals Recycling Facility, NSW

Clients in this sector include: Austral Bricks, BlueScope Steel, Boral, Canberra Cemeteries, Environmental Property Services, Givaudan, Ignite Architects, Pentarch, Shoalhaven Starches, Vopak.



Energy

- Reeves Plains Power Station, SA
- Port Hedland Power Station, WA
- Solomon Project, WA
- West Qurna II Gas Field Development, Iraq
- Munmorah & Bayswater B Independent Peer Review, NSW
- Santos Fairview CS1&2 LNG, QLD
- Bamarang Power Station, NSW (including Plume Rise Assessment)
- Powergen, UK
- TXU Energi, UK

Clients in this sector include: Alinta Energy, Coffey International, Fortescue Metals Group, GHD, NSW Department of Planning and Environment, Infratil Energy, Santos.

publications

Rahaman F, Lawrence K, Starke G, Graham G & Doyle M, *Estimation of Odour Emissions from Broiler Farms – An Alternative Approach* Proceedings of the 21st Clean Air Society for Australia and New Zealand, Sydney 2013

Graham G, Lawrence K & Doyle M, *Development of Odour Impact Assessment Methodologies Accounting for Odour 'Offensiveness' or Hedonic Tone* Proceedings of the 21st Clean Air Society for Australia and New Zealand, Sydney 2013

Doyle M & Dorling SR, *Particulate Pollution: New Perspectives on Measurement, Source Apportionment and Policy*, Proceedings of the 5th Urban Air Quality Conference, Valencia, Spain, 2005

Doyle M & and Dorling SR, *Meteorological Classification and Aggregation Approaches in Support of Models-3 Air Quality Simulations*, Proceedings of the 4th International Conference on Urban Air Quality. Prague, Czech Republic, pp424-427, 2003

Chatterton T, Dorling SR, Doyle M et al. *A Rigorous Inter-comparison of Ground-level Ozone Predictions*, Atmospheric Environment 37, 3237-3253, 2003

Doyle M & and Dorling SR, *Visibility Trends in the UK 1950 -1997*, Atmospheric Environment, 36, 3161-3172, 2002

Doyle M & and Dorling SR, *Satellite and Ground Based Monitoring of Aerosol Plumes*, Water, Air and Soil Pollution, Volume 2, Numbers 5-6, pp615-629, 2002