SYD 1 Stage 2

SEARs Air Quality Report

GreenSquare DC

Reference: P529297

Revision: 2

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Document Control Record

Document prepared by:

Aurecon Australasia Pty Ltd
ABN 54 005 139 873
Level 11, 73 Miller Street
North Sydney 2060 Australia
PO Box 1319
North Sydney NSW 2059
Australia

T +61 2 9465 5599
F +61 2 9465 5598
E sydney@aurecongroup.com
W aurecongroup.com

Document control							aurecon
Report title		SEARs Air Quality Report					
Document code			**Project number**		P529297		
File path		Https://aurecongroup.sharepoint.com/sites/529297/5_WorkingFiles/01 - Combined - Cross Disciplines/New SSDA/Air Quality/GreenSquare SYD1- Stage 2- Air Quality.docx					
Client		GreenSquare DC					
Client contact		Josh Martens	**Client reference**		Technical Director		
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**	
1	2025-12-16	Test of Adequacy Submission	AJS	KS		KS	
2	2026-05-21	SSDA Submission	AJS	KS		KS	
Current revision		**2**					

Approval			
Author signature	AJ Scanlon	Approver signature	
Name	Anthony Scanlon	Name	Kaveh Soleimani
Title	Senior Mechanical Technician	Title	Design Manager

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1 Preface

1.1. Executive Summary

The 3 Brookhollow Avenue Air Quality Report has been prepared by Aurecon on behalf of Project Garden 1 Pty Ltd as trustee for the Norwest Property Trust (the applicant) in support of a State Significant Development Application (SSDA) for the proposed data centre development (SYD1 Stage 2, Proposal) located at 3 Brookhollow Avenue, Norwest (Lot 2021 DP 831173, Proposal site), within the Hills Local Government Area (LGA). Lot 2021 DP 831173 also includes an existing data centre proposed for modifications (SYD1 Stage 1) that does not form part of the SSDA, with separate approval for that obtained from the Regional Planning Panel on 4 September 2025 under DA1382/2025/JP.

Note that assessment of operational generator impacts are undertaken on the Lot, consolidating (SYD1 Stage 1 and Stage 2.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) Item 11 issued for the project. This report concludes that the proposed data centre development is suitable and warrants approval subject to the implementation of the following baseline mitigation measures:

- Construction: Management of construction activities including:
  - Communications: Develop and implement a stakeholder communications plan that includes community engagement.
  - Dust Management Plan (DMP): Develop and implement a DMP, interacting with the stakeholder communications plan, and includes procedures with respect to complaints, incidents, inspections, site management, dust suppression, surface/stockpile stabilisation, storage management, water supply, trackout measures, and so forth.
  - Vehicle/machinery:
    - All on-road vehicles shall comply with relevant vehicle emission standards.
    - When stationary, vehicles are to switch off engines.
    - Use of diesel or petrol-powered generators to minimised, in preference to mains electricity or battery powered equipment where practicable.
  - Waste: Avoid burning of waste materials on site.
  - Otherwise as detailed in Enclosure A Appendix B Table B10
- Operation
  - Fuel storage VOC emissions: Compliance with applicable Australian Standard / New Zealand Standard (AS/NZS).
  - Generator exhaust:
    - Operation of the emergency standby generators should be minimised as far as practicably possible.
    - Generator emission performance and exhaust stack discharge height shall conform with or improve on the identified baseline (Refer to Table 1-1 and Enclosure A).
    - Maintenance shall be performed in accordance with Enclosure A Section 2.3.2, and the total testing duration across SYD1 Stage 1 and SYD Stage 2 shall not exceed 200 hours per annum.

1.1.1. Air Quality Assessment

This report was prepared to address SEAR Item 11, which required assessment of air quality impacts associated with construction works and predicted operation.

1.1.1(a). Construction Activities

The construction-phase impacts associated with the Proposal have been assessed using a risk-based assessment procedure adapted from Guidance on the Assessment of Dust from Demolition and Construction developed in the United Kingdom by the Institute of Air Quality Management (IAQM, 2024), which uses a six-step process for assessing dust impact risks from construction activities as a function (product) of receptor sensitivity and potential impact magnitude and identifies key activities for control.

Based upon that assessment, the potential dust soiling and human health risks were assessed as being manageable through appropriate implementation of the recommended mitigation measures. These measures were summarised in at the start of this summary section and are detailed in Enclosure A Appendix D Table D10.

1.1.1(b). Predicted Operation

The Proposal will be a data centre with mission critical high availability requirements. Electrical utility connections will be via an on-site 132kV to 33kV substation, that is addressed by a separate planning application. Supply infrastructure will be provided from an Endeavour substation located approximately 10km from site. The electrical supply will be delivered to the site under Part 5 powers held by Endeavour as an Electricity Supply Authority.

Assessment is undertaken on the final day configuration. The operational phase assessment also includes the potential for cumulative impacts considering the proximate VOCUS SYD02 data centre

Operational on-site emissions from the data centre on a day-to-day basis are anticipated to be negligible, with the exception of potential emissions from diesel-fuelled back-up generators during periodic maintenance testing or during a power outage event.

The Proposal is anticipated to install back-up generators as summarised in Table 1-1 (refer to Enclosure A Section 2, Section 5.2, and Appendix E for further information):

Table 1-1 Proposed generator configuration

Stage	IT Load	Generator Information		Quantity Note 2	Exhaust Stack Height Note 3	
		Design Load (100% Capacity)	Reference Model Note 1		AGL Note 4	RL
SYD1 Stage 1	14.9MW	2.8MW (3.09MW)	MTU 20V4000G44LF NEA Singapore for ORDE	10	10.5m	99.998m
SYD1 Stage 2, Proposal	96MW	2.5MW (2.8MW)	Hybrid of: ■ Cummins C3750 D5 Stationary Emergency ■ CAT 3516E Standby / Tier 2	77	35.7m	130m

Note 1 **Emissions shall not exceed those of identified reference units**

Note 2 **Quantity includes redundant units**

Note 3 **Generator exhaust stack heights shall not be less than stated elevation**

Note 4 **AGL heights referenced as follows:**

- **Stage 1: 89 500 mm RL**
- **Stage 2: 94 300 mm RL**

Over a typical year, the nominal maintenance testing regime is summarised below (Refer to Enclosure A 2.3.2.1):

- Generator maintenance testing schedule to be harmonised across SYD1 Stage 1 and the Proposal site and arranged to ensure cumulative duration shall not exceed 200 hours per year.
- Maximum number of simultaneous generators per tests: Three (3) across the site suiting the load bank arrangement of one (1) at SYD1 Stage 1 and two (2) at SYD1 Stage 2.

- Testing frequency (nominal):
  - Start test: monthly
  - Full load: annual
  - Other maintenance activities:
    - Transformer maintenance: Once-per-5 years requiring associated generator to run, nominally 20% per year
    - HV ring maintenance: Arrangement does not require generators to run
- Generator run duration:
  - Full load: 40 minutes per test
  - Start test: 10 minutes per test
  - Transformer maintenance: 240 minutes to support maintenance
- Maximum tests per day:
  - Full load: 11
  - Start tests: 24
  - Transformer maintenance: 1
- Testing hours:
  - Confined to 'Day' as defined by the Noise Policy for Industry (NSW EPA, 2017b)
    - Monday to Saturday – 07:00 to 18:00
    - Sundays and Public Holidays – 08:00 to 18:00

Testing is to be coordinated across both stages so that the total generator run hours are minimised and also remain below 200hrs per annum.

The prediction of potential impacts associated with operational activities has been performed in general accordance with the requirements of the NSW Environment Protection Authority Approved Methods (NSW EPA 2022a), using an approved and appropriate dispersion modelling technique, under two operating scenarios as follows:

- Scenario 1 – Justified worst-case: Emergency operation with all generators operating at 100% capacity for all annual hours.
- Scenario 2 – Realistic operations (annual testing): Maximum of three (3 no.) generators operating simultaneously at 100% capacity running between 0700 to 1800hrs for every day of the year.

It is highlighted that in emergency operation scenario is more conservative that the units are modelled at 100% capacity, but in reality operational load would be some fraction of the design load including diversity and hot standby operation of redundant unit.

Although some exceedances of the short-term pollutant criteria have been predicted during the justified worst-case scenario, considering other factors (for example, the frequency of power outages, unlikely scenario of emergency standby generators running for an entire 24-hour period), the risk of exceedances at identified sensitive receptors is predicted to be low.

During the maintenance testing scenario, the normal operation of the data centre is not predicted to result in additional exceedances of the relevant air quality criteria at any identified receptor location. The predicted incremental air pollutant concentrations for all assessed pollutants are shown to be below the relevant criteria where the emergency standby generators are appropriately operated under the appropriate testing schedule.

To further demonstrate a proactive commitment to addressing any community concerns, a complaints management mechanism is recommended to be established.

Refer to Enclosure A Section 8 for the full discussion and conclusion of operational impacts.

1.1.1(c). Future Developments

A supplementary memo has been provided to clarify considerations of the influence of and impact on future developments. This has been attached as Enclosure B.

1.2. Abbreviations and Glossary

A list of abbreviations is provided in Enclosure A Appendix A and reproduced here for convenience.

Abbreviation	Definition
BCA	Building Code of Australia
ABS	Australian Bureau of Statistics
ACT	Australian Commonwealth Territory
AEMC	Australian Energy Market Commission
AGL	above ground level
AHD	Australian height datum
APC	air pollution control
AQI	air quality index
AQIA	air quality impact assessment
AQMS	air quality monitoring station
AQRA	air quality risk assessment
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AS/NZS	Australian Standard / New Zealand Standard
AWS	automatic weather station
BCA	Building Code of Australia
BCA	Building Code of Australia
BGL	below ground level
BOM	Bureau of Meteorology
BSP	bulk supply point
CEMP	construction environment management plan
CH4	methane
CO	carbon monoxide
CO2	carbon dioxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEM	digital elevation model
DtS	Deemed to Satisfy
EETM	emission estimation technique manual
EPA VIC	Environmental Protection Authority Victoria
EPBC	Environment Protection and Biodiversity Conservation Act
FIBC	flexible intermediate bulk container
GIS	geographical information system
HV	High voltage (66kV and above)
IAQM	UK Institute of Air Quality Management
IBC	intermediate bulk container
ID	internal diameter
IT	Information Technology equipment, the payload
kL	Kilolitre
kPa	Kilopascal
kW	Kilo Watts
L	Litre
LLV	low level waste
LoM	life of mine
LV	Low voltage (415 volt)
MSDS	Material Safety Data Sheet

Abbreviation	Definition
MV	Medium Voltage (1kV to 66kV)
MVA	Mega Volt Ampere
MW	Mega Watt
NCAA	National Clean Air Agreement
NCC	National Construction Code
NEPM	National Environment Protection Measure
NH_3	ammonia
NO	nitric oxide
no.	Number of
NO_2	nitrogen dioxide
NORM	naturally occurring radioactive material
NOX	oxides of nitrogen
NSW	New South Wales
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
NSW DPE	New South Wales Department of Planning and Environment
NSW DPHI	New South Wales Department of Planning, Housing and Infrastructure
NSW EPA	New South Wales Environment Protection Authority
NT	Northern Territory
O_3	ozone
OEMP	operational environmental management plan
OU	odour unit
$OU \cdot m^3 \cdot s^{-1}$	odour units times metres cubed per second
$OU \cdot s^{-1}$	odour units per second
Pb	lead
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 µm or less
PM_{25}	particulate matter with an aerodynamic diameter of 2.5 µm or less
ROM	run of mine
SA	South Australia
SAIDI	system average interruption duration index
SAIFI	system average interruption frequency index
SEPP	State Environmental Protection Policy
SO2	sulphur dioxide
SOX	oxides of sulphur
SRTM3	Shuttle Radar Topography Mission
SVOC	semi-volatile organic compound
TAPM	The Air Pollution Model
TAS	Tasmania
TEU	twenty-foot equivalent unit
TS	transmission substations
TSP	total suspended particulates
TVOC	total volatile organic compounds
TWA	time weighted average
US EPA	United States Environmental Protection Agency
USE	unserved energy
UTM	Universal Transverse Mercator
VIC	Victoria
VLLW	very low level waste
VOC	volatile organic compound
%	percent

2 Introduction

2.1 Purpose of this Report

This report has been prepared on behalf of Project Garden 1 Pty Ltd as trustee for the Norwest Property Trust (the applicant) in support of a State Significant Development Application (SSDA) submitted to the Department of Planning, Housing and Infrastructure (DPHI) under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The SSDA seeks development consent for the construction and operation of a data centre, with an IT load of approximately 96MW. The proposal will form part of a state-of-the-art data centre campus operated by Green Square Data Centres (GreenSquare DC), equipped to cater for growing data storage needs within Australia and the emergence of artificial intelligence (AI).

This report provides an assessment of air quality impacts associated with construction and operation and responds to the Secretary's Environmental Assessment Requirements (SEARs) issued by DPHI on 8 April 2025 in relation to the project. The SEARs requires the following in relation to the assessment of Air Quality.

Table 2-1 SEARs Requirements

Item	Description of Requirement	Section Reference (this Report)
11. Air Quality	Provide an assessment of air quality impacts, prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines.	Enclosure A: ▪ Section 3 ▪ Section 6 ▪ Section 7
	The assessment must address construction works…	Enclosure A: ▪ Section 5.1 ▪ Section 6 Enclosure B: ▪ Section 3 ▪ Section 4
	…and include modelling of emissions and air pollutants from predicted operations (including testing of the back-up power system)…	Enclosure A: ▪ Section 5.2 ▪ Section 7.1.4 ▪ Section 8.2.2 Enclosure B: ▪ Section 3 ▪ Section 4
	…and a peak emission and air pollutant scenario,…	Enclosure A: ▪ Section 5.2 ▪ Section 7.1 ▪ Section 8.2.1

Item	Description of Requirement	Section Reference (this Report)
	…and outline the proposed mitigation, management and monitoring measures that would be implemented.	Enclosure A: ▪ Section 8.2.4 ▪ Appendix B ▪ Appendix F Enclosure B: ▪ Section 4

This report will outline the technical impacts of the proposal on the air quality and describes proposed mitigation strategies for the data centre. To satisfy the Secretary's Environmental Assessment Requirements (SEARs), this report contains the following information:

- Overview of the site.
- Description of the activities carried out on the site.
- Emissions inventory.
- Meteorological data & background air quality data.
- Assessment of construction emissions.
- Dispersion modelling.
- Conclusions and recommendations.

3 The Site

3.1. Site Context

The site is known as 3 Brookhollow Avenue, Norwest (Lot 2021 DP 831173) and is in the Norwest locality, which forms part of the Hills Local Government Area (LGA). Development surrounding the site comprises of a mix of commercial, retail and residential land uses as described below:

- To the north of the site is Norwest Boulevard, commercial office buildings, an early learning centre, ‘Castle Pines’ retirement community and Castle Hill Country Club Golf Course;
- To the east of the site is Windsor Road, commercial office buildings, small pockets of residential development and industrial development;
- To the south of the site is Brookhollow Avenue, commercial developments, a hotel and medium density residential development; and
- To the west of the site is commercial development, including a shopping centre (Norwest Marketown), various retail offerings and the Norwest Metro Station.

The site is well serviced by public transport including bus and Metro. Norwest Metro Station provides connections to Tallawong in the northwest and Sydney CBD to the southeast. Bus stops along Norwest Boulevard provide connections through to Parramatta, Seven Hills and Rouse Hill.

As shown in the below mapping, the site is in proximity to Strangers Creek and Brookhollow Reserve, located at the site’s southwestern border. Norwest Lake is located approximately 90m northwest of the site.

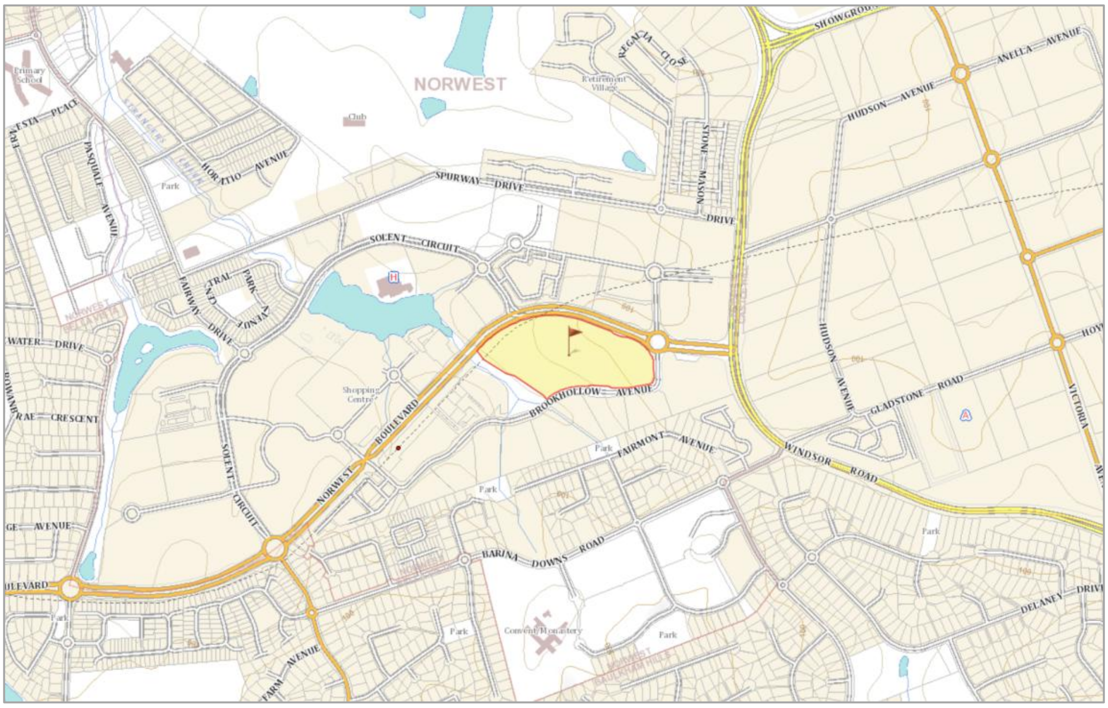

Figure 3-1- Site context map [Source: Six Maps]

3.2. Site Description

The subject site is legally described as Lot 2021 of Deposited Plan (DP) 831173. The site can be described as irregularly shaped and has a total land area of approximately 51,867sqm. A portion of the site currently comprises an existing 4MW data centre that was approved under D93/318, dated 21 June 1993.

The site is bound by Brookhollow Avenue to the south and east, Brookhollow Reserve and the Hills Corporate Centre to the west and Norwest Boulevard to the North. The primary frontage of the site is to Brookhollow Avenue, where vehicular access is provided.

Based on a review of topographical mapping, the site appears to fall from east to west from a maximum height of RL104 in the northeastern corner of the site to RL82m along the western portion of the site.

The site is located approximately 500m to the east of the Norwest Metro station, with the metro line running under the north / northwest boundary of the site.

The site is heavily vegetated, however, none of the vegetation is mapped on the biodiversity values mapping prepared under the *Biodiversity Conservation Act 2016* (BC Act). Refer to aerials of the site at Figure 3-2 below.

Figure 3-2- Aerial of the site [Source: Metro Map, 2024 (modified by Patch)]

3.3. Relevant Approvals

There are several development approvals of relevance to the SSDA include:

- Complying Development Certificate (CDC): Certificate No. 25/250218-01 which provided consent for partial demolition of the existing data centre. The CDC was issued on 9 September 2025.
- Development Application for alterations and additions to existing data centre campus (1382/2025/JP) was approved by Council on 4 September 2025.
- Development Application for substation and bulk earthworks currently being prepared for submission to Council and expected for approval by June 2026.

3.3.1. CDC (Certificate No. 25/250218-01) – Demolition of Existing Internal Structures

On 9 September 2025, a CDC, Certificate No. 25/250218-01, Council Reference 239/2026/PC was issued by Certatude which provided consent for the partial demolition of the existing data centre. Specifically, the proposed works included the demolition of internal walls, access floors, slabs and roof, across Levels 1 to 4 of the existing data centre. The demolition works were required in order to facilitate the future Stage 1 development (1382/2025/JP).

The works have since been completed.

3.3.2. Stage 1 Development Application

Stage 1 approval was obtained from the Regional Planning Panel on 4 September 2025 under DA1382/2025/JP.

Stage 1 involves significant upgrades and refurbishment of an existing data centre facility that occupies the site previously operated by IBM. The works enable the repositioning of the existing dilapidated facility to be fit-for purpose and responsive to the evolving data storage demands of the market.

3.3.3. Substation and Early Works Development Application

A planning application is currently being prepared which will seek approval for on-site power infrastructure including a substation that will transform utility power supplied via a high voltage (132 kV) line to medium voltage (33 kV). The substation will comprise of two main structures, a control building and two power transformers.

The substation is proposed to service SYD1 Stage 1 (Stage 1), with the intent to expand to Stage 2. Ahead of construction of the substation, the intent is to connect Stage 1 to the 11kV power supply, before creating a new point of connection from the proposed substation, which will be established once constructed.

Supply infrastructure will be provided from an Endeavour substation located nearby and will be delivered to the site under Part 5 powers held by Endeavour as an Electricity Supply Authority.

3.4. Overview of Proposed Development

This SSDA seeks development consent for the construction and operation of a data centre, with power consumption of approximately 96MW (IT load). The proposal will form part of a broader state-of-the-art data centre campus, equipped to cater for growing data storage needs within Australia and the emergence of artificial intelligence (AI).

In summary, approval for the following is sought:

- Minor excavation works beyond earthworks intended to be undertake under the separate Substation Development Application under assessment by The Hills Shire Council;
- Civil earthworks and the installation of relevant servicing infrastructure and utilities;
- Construction of a four (4) storey data centre with roof top plant, equating to an RL 130 and Gross Floor Area (GFA) of 16,191m²;
- Installation of 77x diesel fuel generators and associated storage;
- Provision of on-site car parking for approximately 25 spaces; and
- Landscaping, tree removal and offset tree planting.

The proposed development is depicted in Enclosure A Section 2 of this report, with full architectural details provided within the EIS, of which this report also forms an Appendix.

4 Methodology, Assessment, and Conclusion

The air quality impact assessment (AQIA) is provided in Enclosure A, with a detailed breakdown of the assessment scope provided in Enclosure A Section 1.2. A shorter summary of the major sections is provided in the table below.

Table 4-1 Major sections

Element	Sub-element	Section Reference (this Report)
Description of proposal and site emission sources		Enclosure A: ▪ Section 6 ▪ Appendix E
Relevant legislation, regulations, and policies		Enclosure A: Section 3
Existing conditions	Surrounding land uses, topography, and sensitive receptors	Enclosure A: ▪ Section 4.1 ▪ Section 4.2 ▪ Section 4.3 Enclosure B: ▪ Section 3 ▪ Section 4
	Meteorology and background air quality	Enclosure A: ▪ Section 4.3 ▪ Section 4.4 ▪ Appendix C ▪ Appendix D
	Potential cumulative sources	Enclosure A: Section 4.6 Enclosure B: Section 3
Methodology	Construction	Enclosure A: Section 5.1
	Operational phase	Enclosure A: Section 5.2
Assessment	Construction	Enclosure A: ▪ Section 6 ▪ Appendix A Enclosure B: Section 3
	Operational phase	Enclosure A: ▪ Section 7 ▪ Appendix F Enclosure B: Section 3
Conclusion		Enclosure A: Section 8 Enclosure B: Section 5

Enclosure A– Air Quality Impact Assessment

The Air Quality Impact Assessment for the proposed SYD1 Stage 2 data centre development at 3 Brookhollow Avenue, Norwest (Lot 2021 DP 831173) is attached following.

This was undertaken by Northstar as a subconsultant to Aurecon.

This document has been prepared for **Aurecon Australasia Pty Ltd** on behalf of **Project Garden 1 Pty Ltd** as trustee for the **Norwest Property Trust** by:

Northstar Air Quality Pty Ltd,
Head Office: Suite 1504, 275 Alfred Street, North Sydney, NSW 2060
Riverina Office: PO Box 483, Albury, NSW 2640

northstar-env.com | Tel: 1300 708 590

SYD1 Stage 2 Data Centre
Air Quality Impact Assessment

Addressee(s):	Aurecon Australasia Pty Ltd
Site Address:	3 Brookhollow Avenue, Norwest NSW 2153
Report Reference:	25.1143.FR1V3
Date:	20 May 2026
Status:	Final

air quality | environment | sustainability

Quality Control

Report	Version	Status	Prepared by	Reviewed by	Authorised by
SYD1 Stage 2 Data Centre – Air Quality Impact Assessment	25.1143.FR1V3	Final	Northstar	GCG, VM, AS	GCG

Report Status

Northstar References		Report Status	Report Reference	Version
Year	Job Number	(Draft: Final)	(R*x*)	(V*x*)
25	1143	Final	R1	V3
Based upon the above, the specific reference for this version of the report is:				25.1143.FR1V3

Final Authority

This report must by regarded as draft until the above study components have been each marked as final, and the document has been signed and dated below. A draft report is provided on a 'without prejudice' basis and may be subject to change.

Varun Marwaha, CAQP **20 May 2026**

Non-Technical Summary

Aurecon Australasia Pty Ltd, acting on behalf of Project Garden 1 Pty Ltd as trustee for the Norwest Property Group has commissioned Northstar Air Quality Pty Ltd to perform an air quality impact assessment to accompany a State Significant Development Application for the SYD1 Stage 2 data centre development to be located at 3 Brookhollow Avenue, Norwest NSW 2153. The proposal will form part of a state-of-the-art data centre campus operated by Green Square Data Centres.

The SYD1 Stage 2 data centre is located on the same Lot as the approved SYD1 Stage 1 data centre, that will also be operated by Green Square Data Centres. SYD1 Stage 1 will be a refurbishment of an existing data centre facility, with approval obtained from the Regional Planning Panel on 4 September 2025 under DA1382/2025/JP.

The SYD1 Stage 1 and Stage 2 data centres have been assessed in this air quality impact assessment operating concurrently.

The air quality assessment for the SYD1 Stage 1 data centre was previously assessed with an Information Technology load of 14.9 megawatts and eight (8) diesel-fuelled emergency standby generators. This air quality assessment has been based upon ten (10) generators at SYD1 Stage 1 providing the same capacity. In addition, the SYD1 Stage 2 data centre is proposed to have an Information Technology load of 96 megawatts and include a further 77 no diesel-fuelled emergency standby generators.

The air quality assessment has been performed in accordance with the NSW Planning Secretary's Environmental Assessment Requirements and the relevant guidance published by the NSW Environmental Protection Authority. This report outlines those requirements and provides specific reference to the relevant sections that address each requirement. This report addresses both the construction phase and operational phase of the proposed development. The operational phase assessment also includes the potential for cumulative impacts considering the proximate VOCUS SYD02 data centre.

The construction phase assessment has been performed using a published risk assessment methodology and concludes that the potential dust soiling and human health risks are assessed as being manageable through appropriate implementation of the recommended mitigation measures, which are provided in the report.

During the operational phase, dispersion modelling scenarios for the justified worst case and maintenance testing scenarios have been assessed.

Although some exceedances of the short-term pollutant criteria have been predicted during the justified worst-case scenario, considering other factors (for example, the frequency of power outages, unlikely scenario of emergency standby generators running for an entire 24-hour period), the risk of exceedances at identified sensitive receptors is predicted to be low.

During the maintenance testing scenario, the normal operation of the data centre is not predicted to result in additional exceedances of the relevant air quality criteria at any identified receptor location. The predicted incremental air pollutant concentrations for all assessed pollutants are shown to be below the relevant criteria where the emergency standby generators are appropriately operated under the appropriate testing schedule.

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1. INTRODUCTION

Aurecon Australasia Pty Ltd (Aurecon), acting on behalf of Project Garden 1 Pty Ltd as trustee for the Norwest Property Group (the Proponent) has commissioned Northstar Air Quality Pty Ltd (Northstar) to perform an air quality impact assessment (AQIA) to accompany a State Significant Development Application (SSDA) for the SYD1 Stage 2 data centre development ('SYD1 Stage 2' and 'the Proposal') to be located at 3 Brookhollow Avenue, Norwest NSW 2153 (the Proposal site). The proposal will form part of a state-of-the-art data centre campus operated by Green Square Data Centres (GSDC).

The Proposal site is located on the same Lot as the future SYD1 Stage 1 data centre, that will also be operated by GSDC. SYD1 Stage 1 will be a refurbishment of an existing data centre facility, with approval obtained from the Regional Planning Panel on 4 September 2025 under DA1382/2025/JP.

The AQIA is to be submitted to the NSW Department of Planning, Housing, and Infrastructure (NSW DPHI) and has been performed to comply with the NSW Planning Secretary's Environmental Assessment Requirements (see Section 1.2, Table 1), and in accordance with the NSW Environment Protection Authority (NSW EPA) "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (NSW EPA, 2022a) (see Section 1.2, Table 2).

The AQIA identifies and examines potential air quality (including odour) risks and impacts associated with the construction and operation of the Proposal and outlines mitigation and monitoring requirements commensurate with those anticipated impacts to ensure that air quality criteria are achieved at surrounding sensitive receptor locations. The operational phase assessment considers the final day build out, which includes both SYD1 Stage 1 and SYD1 Stage 2.

Appendix A presents a common list of abbreviations, nomenclature and specified units referenced within this AQIA.

1.1. Purpose of the Report

The purpose of this report is to examine and identify whether the impacts of the construction and operation of the Proposal may adversely impact on air quality in the surrounding area.

To allow assessment of the level of risk associated with the Proposal in relation to air quality, the AQIA has been performed in accordance with and with due reference to (in no order):

- *Protection of the Environment Operations Act* 1997 (POEO Act).
- *Environmental Planning and Assessment Act* 1979.
- Protection of the Environment Operations (Clean Air) Regulation 2022 (POEO CAR).
- Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024).
- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA, 2022a).

- Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (NSW EPA, 2022b).

1.2. Scope of Assessment

This report has been prepared with consideration of the NSW Planning Secretary's Environmental Assessment Requirements (SEARs) relevant to data storage centres, which have been provided for the Brookhollow Avenue Data Centre Expansion, Norwest project (SSD-81928961).

Table 1 outlines the scope of assessment for this AQIA and specifies where each consideration is addressed within the report.

Table 1 Planning Secretary's Environmental Assessment Requirements (SEARs)

Issue	Assessment Requirements	Addressed
Air Quality	Provide an assessment of air quality impacts, prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines.	Section 3 Section 6 Section 7
	The assessment must address construction works …	Section 5.1 Section 6
	… and include modelling of emissions and air pollutants from predicted operations (including testing of the emergency standby power system) …	Section 5.2 Section 7.1.4 Section 8.2.2
	… and a peak emission and air pollutant scenario …	Section 5.2 Section 7.1 Section 8.2.1
	… and outline the proposed mitigation, management and monitoring measures that would be implemented.	Section 8.2.4 Appendix B Appendix F

Section 9 of the Approved Methods outlines the NSW EPA's requirements for the information to be included in an AQIA. Table 2 summarises each requirement relevant to this type of development proposal and outlines where this information can be located in the AQIA.

Table 2 NSW EPA Approved Methods – impact assessment reporting requirements

Assessment component	Addressed
9.1 Site Plan	
Layout of the site clearly showing all unit operations	Figure 2
All emissions sources clearly identified	Figure 7 Figure 8
Plant boundary	Figure 1
Sensitive receptors (e.g. nearest residences)	Section 4.2

Assessment component	Addressed
Topography	Section 4.5 Section 5.2.1.3
9.2 Description of the activities carried out on the site	
A detailed discussion of all unit operations carried out on the site, including all possible operational variability	Section 2.3 Section 5.2.2
A detailed list of all process inputs and outputs	Section 5.1 Section 5.2
Plans, process flow diagrams and descriptions that clearly identify and explain all pollution control equipment and techniques for all processes on the premises	Section 5.2.3 Appendix F
A description of all aspects of the air emission control system, with particular regard to any fugitive emission capture systems (e.g. hooding, ducting), treatment systems (e.g. scrubbers, bag filters) and discharge systems (e.g. stacks)	Section 5.2 Appendix F
The operational parameters of all emission sources, including all operational variability, i.e. location, release type (stack, volume or area) and release parameters (e.g. stack height, stack diameter, exhaust velocity, temperature, emission concentration and rate)	Section 5.2.3
9.3 Emissions Inventory	
A detailed discussion of the methodology used to calculate the expected pollutant emission rates for each source	Section 5.2.3
Detailed calculation of pollutant emission rates for each source	Section 5.2.3
Tables showing all release parameters of stack and fugitive sources (e.g. temperature, exit velocity, stack dimensions, and emission concentrations and rates)…	Section 5.2.3
…and all pollutant emission concentrations with a comparison of the emission concentrations against the relevant requirements of the Regulation	Section 8.2.3
9.4 Meteorological data	
A detailed discussion of the prevailing dispersion meteorology at the proposed site. The report should typically include wind rose diagrams, an analysis of wind speed, wind direction, stability class, ambient temperature and mixing height; and joint frequency distributions of wind speed and wind direction as a function of stability class	Section 4.3 Appendix C
Demonstration that the site-representative data adequately describes the expected meteorological patterns at the site under investigation (e.g. wind speed, wind direction, ambient temperature, atmospheric stability class, inversion conditions and katabatic drift)	Appendix C
A description of the techniques used to prepare the meteorological data into a format for use in the dispersion modelling	Section 5.2.1.2 Appendix C
A quality assurance and quality control analysis of the meteorological data used in the dispersion modelling. Provide and discuss any relevant results of this analysis	Appendix C
9.5 Background air quality data	
A detailed discussion of the methodology used to calculate the background concentrations for each pollutant	Section 4.4 Appendix D
Tables summarising the ambient monitoring data	Appendix D

Assessment component	Addressed
9.6 Dispersion modelling	
A detailed discussion and justification of all parameters used in the dispersion modelling and the manner in which topography, building wake effects and other site-specific peculiarities that may affect plume dispersion have been treated	Section 5.2
A detailed discussion of the methodology used to account for any atmospheric pollutant formation and chemistry	Section 5.2.6
A detailed discussion of air quality impacts for all relevant pollutants, based on predicted ground-level concentrations at the plant boundary and beyond, and at all sensitive receptors	Section 7 Section 8
Ground-level concentrations, hazard index and risk isopleths (contours) and tables summarising the predicted concentrations of all relevant pollutants at sensitive receptors	Section 7

2. THE PROPOSAL

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

2.1. Environmental Setting

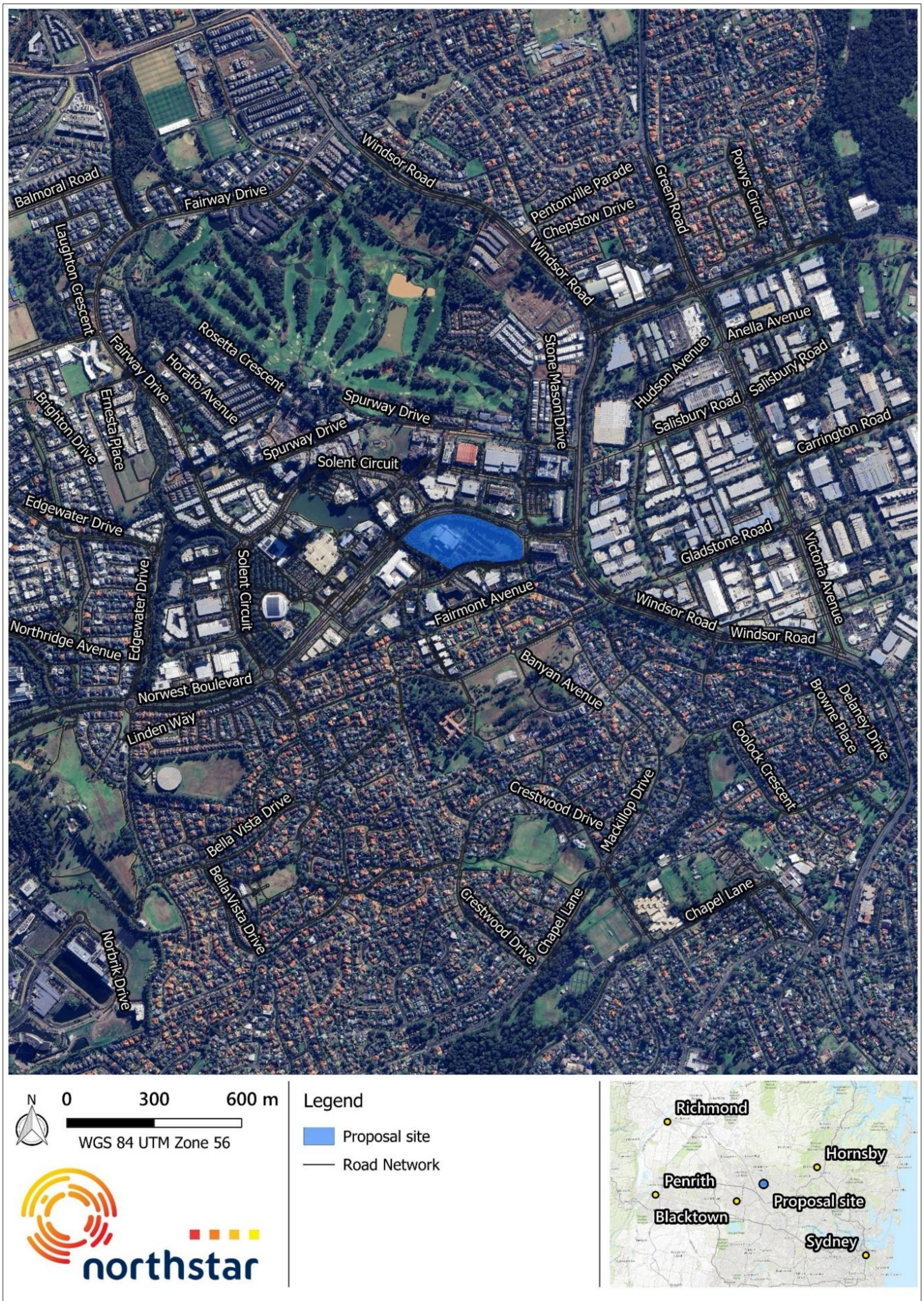
The Proposal site is situated at 3 Brookhollow Avenue, Baulkham Hills within the Local Government Area (LGA) of Hills Shire.

The Proposal site is legally defined as Lot 2021 in Deposited Plan (DP) 831173, covering an area of approximately 5.2 hectares (ha). The Proposal site is to be located at the former IBM data centre campus at the Norwest Business Park in northwest Sydney and has frontage to both Norwest Boulevard and Brookhollow Avenue. Main vehicular access to the Proposal site is gained from Brookhollow Avenue.

The Proposal site is bounded by commercial and industrial lots on Solent Circuit, Norwest Boulevard, and Brookhollow Avenue. Nearby residential areas are located to the south at Punthill Apartment Hotels, west at Solent Circuit, north along Eagleview Place and Longview Place, and south along Fairmont Avenue and Hillsborough Way. A portion of the Proposal site is occupied by the operational SYD1 Stage 1 data centre.

A map showing the location of the Proposal site is provided in Figure 1.

Figure 1 Proposal site location



Source: Northstar

2.2. Proposal Overview

The Proposal comprises of the construction and operation of a data centre with three (3) shells (Buildings B, C and D), an Information Technology (IT) load of approximately 96 MW, and 77 no diesel-fuelled emergency standby generators.

As outlined in Section , SYD1 Stage 1 has been approved as a 14.9 MW data centre delivered through 10 no diesel-fuelled emergency standby generators. SYD1 Stage 1 approval was obtained from the Regional Planning Panel on 4 September 2025 under DA1382/2025/JP. SYD1 Stage 1 involves significant upgrades and refurbishment of an existing data centre facility that occupies the site previously operated by IBM. The works enable the repositioning of the existing dilapidated facility to be fit-for purpose and responsive to the evolving data storage demands of the market.

The AQIA for the SYD1 Stage 1 data centre was based upon the worst-case comparison of two candidate emergency standby generator specifications, whereas that selection for SYD1 Stage 1 has now been confirmed. This SYD1 Stage 2 AQIA includes the relevant updates associated with SYD1 Stage 1 to facilitate the appropriate cumulative air quality assessment. These changes are discussed in Section 2.3.2.1.

A planning application is currently being prepared which will seek approval for on-site power infrastructure including a substation that will transform utility power supplied via a high voltage (132 kilovolts (kV)) line to medium voltage (33 kV). The substation will comprise of two main structures, a control building and two power transformers.

The substation is proposed to service SYD1 Stage 1, with the intent to expand to SYD1 Stage 2. Ahead of construction of the substation, the intent is to connect SYD1 Stage 1 to the 11 kV power supply, before creating a new point of connection from the proposed substation, which will be established once constructed.

Supply infrastructure will be provided from an Endeavour substation located nearby and will be delivered to the site under Part 5 powers held by Endeavour as an Electricity Supply Authority. The Development Application for substation and bulk earthworks currently being prepared for submission to Council and expected for approval by June 2026.

The Vocus SYD02 data centre is located at 12 Brookhollow Avenue, approximately 50 metres (m) to the south of the Proposal site boundary. The potential for cumulative impacts with this data centre has been assessed qualitatively in this AQIA.

A full description of the sensitivity and uses of the surrounding land, and the identification of discrete receptor locations used in the AQIA, is provided in Section 4.2.

In summary, the Proposal works comprise the following:

- Minor site preparation works including tree clearing and bulk earthworks;

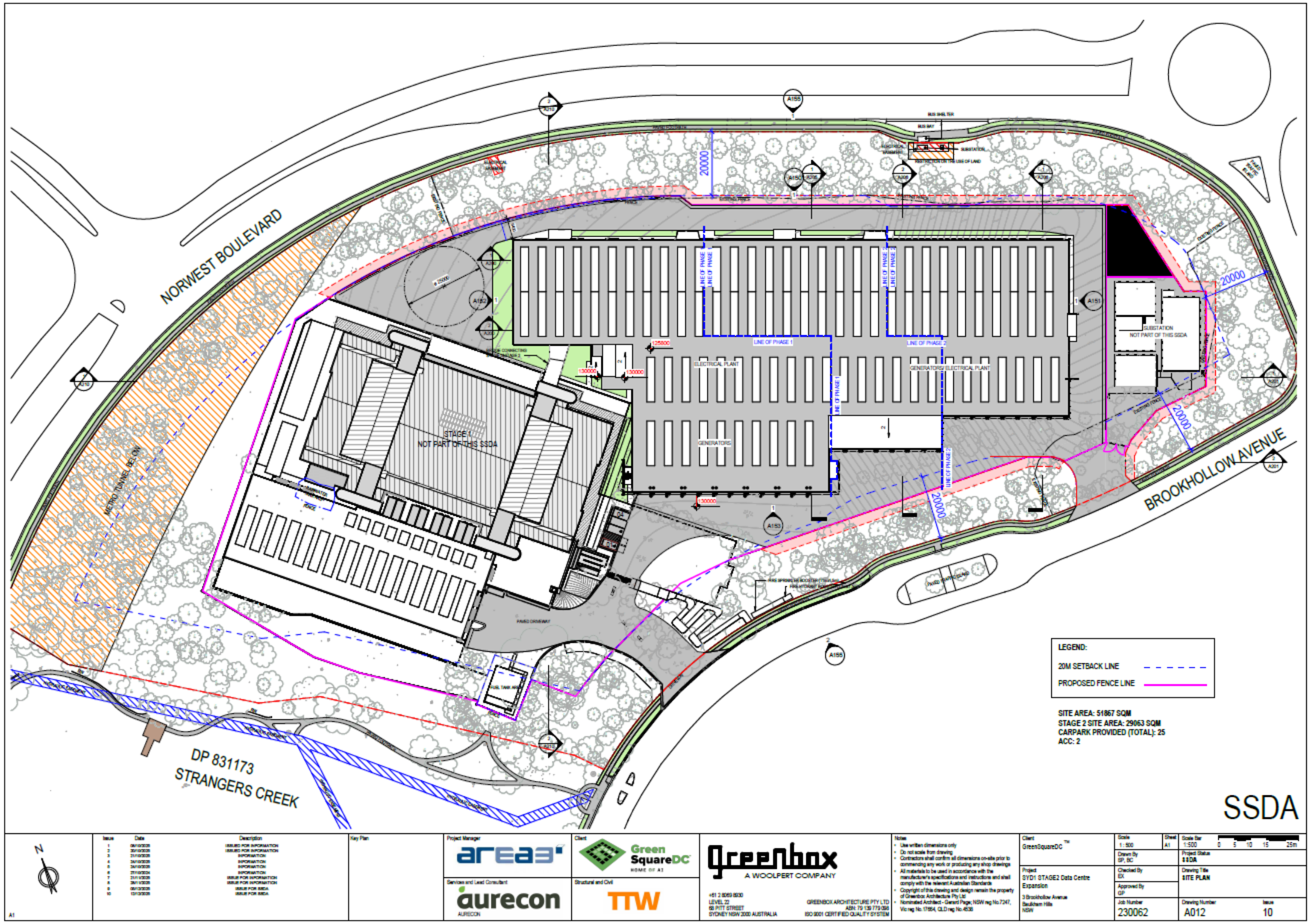
- Civil earthworks and the installation of relevant servicing infrastructure and utilities;
- Construction of a four (4) storey data centre with roof top plant;
- Installation of 77 no. diesel-fuelled emergency standby generators and associated storage;
- On-site car parking; and
- Landscaping and offset tree planting.

No demolition activities are anticipated to be performed.

In addition to the above, the Proposal consent to allow the Proposal site to operate 24 hours, 7 days a week.

Figure 2 provides an illustration of the Proposal site layout.

Figure 2 Proposal site layout



Source: Greenbox Architecture - Job Number 230062 – Drawing A012 Issue 10

2.3. Identification of Emissions to Atmosphere

Given the nature of the Proposal described above, emissions to air would be likely to be generated as described below.

2.3.1. Construction Phase

The construction of the proposal includes constructing a 96 MW data centre. This will involve site preparation, earthworks, and the development of car parking, infrastructure, access points, and landscaping. It has been assumed that there will be no demolition as part of the Proposal.

An indicative list of plant and equipment that may be used during the construction of the Proposal includes:

- Excavators and front-end loaders (FEL);
- Graders;
- Light and heavy vehicles;
- Drills and pneumatic hand, or power tools; and
- Cranes and elevated working platforms.

The assessment of the potential local air quality risks from construction phase activities is presented in Section 6, while the risk assessment methodology is presented in Appendix B.

2.3.2. Operational Phase

Operational emissions from the data centre on a day-to-day basis would be anticipated to be negligible, with the exception of air emissions from diesel-fuelled emergency standby generators during periodic maintenance testing or during a power outage event. Additionally, there is the potential for minor fugitive emissions from the storage of diesel at the Proposal site.

2.3.2.1. Emissions from Generator Use

The Proposal involves the installation of 77 no standby generators, positioned across four floor levels for operational purposes.

The emergency standby generator models to be installed at the Proposal site is not currently finalised, however two potential candidate generator sets have been specified and are listed below:

- Candidate 1: Cummins C3750 D5 diesel-fuelled generators each with a capacity of:
  - 2 800 ekW and a fuel consumption rate of 636 $L \cdot hr^{-1}$ at 100 % load; or
  - 2 100 ekW and a fuel consumption rate of 537 $L \cdot hr^{-1}$ at 75 % load.

- Candidate 2: CAT model 3516E diesel-fuelled generators each with a capacity of:
  - 2 800 ekW and a fuel consumption rate of 751 litres per hour ($L \cdot hr^{-1}$) at 100 % load; or
  - 2 100 ekW and a fuel consumption rate of 566 $L \cdot hr^{-1}$ at 75 % load.

Note: Other generators may be selected for installation as part of the Proposal, however the emissions from the potential candidate generators nominated above have been assessed in this AQIA.

For clarity, the candidate generators for SYD1 Stage 1 and Stage 2 are summarised in Table 3 below:

Table 3 Candidate generators (SYD1 Stage 1 and Stage 2)

SYD1 Stage	Assessment	Candidate 1		Candidate 2	
		Model	Rating (kW)	Model	Rating (kW)
SYD1 Stage 1 (Approved)	Candidates in the original AQIA	MTU 20V4000 G94F	3 088 - 2 317	CAT model 3516E	2 800 - 2 100
	Selection used in this AQIA	MTU 20V4000 G44LF	3 009	n/a	n/a
SYD1 Stage 2 (The Proposal)	Candidates used in this AQIA	Cummins 3750 D5	2 800 - 2 100	CAT model 3516E	2 800 - 2 100

During a power outage event, the first back up (or remediation) is that of the dual redundant power supply. If this also suffers a failure, the second back up is to utilise the generators to power the site. Essentially, the emergency standby generators serve as a secondary emergency standby to the primary provision of a dual redundant power supply, and as such their use is designed to be minimal.

Data centres incorporate redundancy to ensure continuous operation and minimise downtime by duplicating key components, so IT equipment remains operational during power failures. Redundancy levels are classified according to the Uptime Institute's four-tier system, with *N+1* redundancy being the most common setup, providing one backup for each component. However, if two or more components fail simultaneously, downtime may still occur. Other redundancy configurations, such as distributed redundancy, may provide additional resilience by distributing the load across multiple components at reduced capacity. In a distributed redundancy setup, several generators share the operational load, allowing for some generators to carry on if one or more fall offline, minimising the risk of downtime even in the event of multiple failures.

During periods when the standby generators may be required to provide power during mains power outage events, short-term emissions of combustion related pollutants may be generated. Emissions from diesel-fuelled emergency standby generators may include various air pollutants, as listed in the National Pollutant Inventory (NPI) Emission Estimation Technique Manual (NPI EETM) for combustion engines (NPI, 2008).

The pollutants of concern from the operation of the emergency standby generators includes (in no order):

- Particulate matter (PM);
- Oxides of nitrogen (NO_X);
- Carbon monoxide (CO);
- Sulphur dioxide (SO_2);
- Polycyclic aromatic hydrocarbons (PAHs);
- Volatile organic compounds (VOCs), including benzene (C_6H_6), toluene (C_7H_8) and xylene (C_8H_{10}); and,
- Formaldehyde (CH_2O).

In addition to the potential operation as a secondary emergency standby during a power outage event that also affects the dual redundant power supply, the generators will be required to be run during short-term routine maintenance testing.

The Proponent will implement a generator maintenance testing schedule that is harmonised across SYD1 Stage 1 and the Proposal site, as shown in Table 4.

It is noted that testing regime shall be arranged to ensure cumulative duration shall not exceed 200 hours per year (see Section 3.1 and section 3.2).

For this AQIA, the dispersion modelling considers the operation of three (3) generators during the specified testing hours suiting the load bank arrangement of one (1) at SYD1 Stage 1 and two (2) at SYD1 Stage 2.

It is noted that, in the event that this SSDA approval is granted, it is expected that there would be a condition requiring the periodic emissions testing of the standby generators. To comply with the requirements of the Approved Methods (NSW EPA, 2022b), emissions testing would be required to be performed over a period of at least one hour in duration.

Table 4 Generator testing regime

Test	Exercises per year	Generators		Test			Nominal load (% of design load)	Total run time (mins per year, worst case) per exercise	Maximum tests per day
		Overall quantity	Undergoing simultaneous testing	No. tests per exercise	Run time (mins) per test	Cooldown (mins) per test			
SYD1 Stage 1									
Full load run[1]	1	10	1	10	40	15	100%	400	
Start test[2, 3]	12	10	1	10	10	15	0%	1,200	
Transformer maintenance[2, 3]	0.2	10	1	10	240	15	80%	480	1
SYD1 Stage 2									
Full load run[1]	1	77	2	39	40	15	100%	1 560	11
Start test[2, 3]	11	77	2	39	10	15	0%	4 290	24
Transformer maintenance[2, 3]	0.2	77	1	77	240	15	80%	3 840	1
Total test time per annum (mins) (Stage 1 + Stage 2)								9 690	
(hours) (Stage 1 + Stage 2)								161.50	

1 Full load run of generators using load bank. There will be one (1) load bank for Stage 1 and two (2) load banks available for Stage 2.

2 A maximum of three (3) simultaneous tests will be performed ie one (1) test for Stage 1 and two (2) tests for Stage 2.

3 20% rolling maintenance on transformers would be applied to each Stage 1 and Stage 2 separately, and coordinated to minimise the total run hours per year.

2.3.2.2. Emissions from Fuel Storage

The Proposal has a capacity to store approximately 1 539 cubic metres (m^3) of fuel, which is equivalent to 1 308 tonnes (t) of fuel. The following provides a summary of the fuel storage capacity of the Proposal.

Table 5 Fuel storage capacity

Parameter	Units	Building B	Building C	Building D
Fuel rooms per building	no.	1	1	
Bulk tanks per fuel room	no.	6	11	
Day tanks per building	no.	27	25	25
Bulk tank fuel capacity	m^3	86	86	86
Day tank capacity	m^3	1	1	1
Combined bulk tank volume	m^3	516	946	
Combined day tank volume	m^3	27	25	25
Fuel volume per building	m^3	543	996	
Total fuel volume	m^3	1 539		
Total fuel mass	t	1 308		

On-site fuel storage may contribute to air emissions through fugitive VOCs during filling and dispensing of fuel, as well as from potential accidental spillages and leaks that may occur.

The tank design is expected to incorporate adequate containment (e.g. double walled / secondary containment) and automated leak detection measures in compliance with applicable Australian Standard / New Zealand Standard (AS/NZS) such as AS/NZS 1940:2017 "Storage and Handling of Flammable and Combustible Liquids" and AS/NZS 1692:2006 "Steel Tanks for Flammable and Combustible Liquids" with low sulphur content diesel fuel utilised for the standby generators. In addition to containment of tanks, spill containment will be provided around tank fill connections, pumps, and filters, where required. Given the low potential for fugitive emissions from fuel storage, no further consideration has been made in this AQIA.

2.3.3. Odour

Construction phase activities may include the operation of plant and machinery, that may pose an insignificant risk of odour in the event of accidental fuel spillage, however this risk is very minor and can be effectively managed through the provision of spill kits to promptly manage any spillages.

Operational phase activities will not result in any air emissions, except for the periodic operation of the diesel-fuelled generators for testing and tertiary emergency standby power generation purposes only, as outlined above. Air emissions of VOCs have been assessed as benzene (C_6H_6) as a principal toxic air pollutant and additionally compared against the odour impact assessment criterion for toluene (C_7H_8) and xylene (C_8H_{10}).

3. LEGISLATION, REGULATION AND GUIDANCE

The following provides an overview of the legislation and air quality criteria which are applicable to the activities being performed at the Proposal site.

3.1. Protection of the Environment Act

The *Protection of the Environment Operations Act* 1997 (POEO Act) sets the statutory framework for managing air quality in NSW, including establishing the licensing scheme for major industrial premises (scheduled activities) and a range of air pollution offences and penalties.

Schedule 1, Part 1 of the POEO Act provides definitions for scheduled activities, and the associated threshold activity rates. For the Proposal, the thresholds relevant to electricity generation (clause 17) and chemical storage (clause 9) are relevant, given the use of standby diesel-fuelled generators and storage of diesel fuel at the Proposal site.

> *17 Electricity generation*
>
> *(1) This clause applies to the following activities:*
>
> *…*
>
> *metropolitan electricity works (internal combustion engines), meaning the generation of electricity by means of electricity plant:*
>
> *(a) that is based on, or uses, an internal combustion engine, and*
>
> *(b) that is situated in the metropolitan area or in the local government area of Port Stephens, Maitland, Cessnock, Singleton, Wollondilly, or Kiama.*
>
> *(1A) However, this clause does not apply to the generation of electricity by means of electricity plant that is emergency stand-by plant operating for less than 200 hours per year.*
>
> *(2) Each activity referred to in Column 1 of the Table to this clause is declared to be a scheduled activity if it meets the criteria set out in Column 2 of that Table.*

and

> *9 Chemical storage*
>
> *(1) This clause applies to the following activities--*

"general chemicals storage", meaning the storage or packaging in containers, bulk storage facilities or stockpiles of any chemical substance classified as a dangerous good in the Transport of Dangerous Goods Code , other than the following--

...

"petroleum products storage", meaning the storage or packaging of petroleum or petroleum products in containers, bulk storage facilities or stockpiles.

(2) Each activity referred to in Column 1 of the Table to this clause is declared to be a scheduled activity if it meets the criteria set out in Column 2 of that Table.

Table

Column 1	***Column 2***
Activity	*Criteria*
...	
petroleum products storage	*capacity to store more than 200 tonnes (liquified gases) or 2,000 tonnes (chemicals in any other form)*

During times of stable external supply of electricity, the standby generators will only operate during scheduled maintenance events. On this basis, the Proposal is highly unlikely to exceed the 200-hour limit, on the generation of electricity by means of electricity plant that is emergency stand-by plant.

Further, the Proposal may be deemed to be a scheduled activity due to the quantity of diesel fuel stored at the Proposal site if the total storage capacity is more than 2 000 t (equivalent to 2 350 kilolitres (kL)). With reference to Table 5, the fuel storage capacity for the Proposal will be 1 308 t.

Based upon the anticipated annual operating hours per year being less than 200 hours and the fuel storage capacity being less than 2 000 t, it is not considered that the Proposal would be considered to be a scheduled activity under clause 17 and clause 9 of Schedule 1, part 1 of the POEO Act.

Part 5.4 of the POEO Act outlines a number of requirements associated with air pollution. These requirements generally relate to the appropriate maintenance of plant and equipment in an efficient condition and dealing with materials in a manner as to not cause air pollution.

3.2. Protection of the Environment Operations (Clean Air) Regulation

The Protection of the Environment Operations (POEO) (Clean Air) Regulation 2022 (POEO CAR) establishes requirements and concentration standards for air emissions from industrial activities in NSW. It regulates air quality issues related to various sources, including burning activities, motor vehicle fuels, fuel usage and transfer, air impurities from activities and plants, and the storage of volatile organic liquids.

Part 5 of the POEO CAR specifically addresses air impurities from activities and plant, referring to Schedule 2 to set concentration standards for both scheduled and non-scheduled premises. The standards are in-stack emission limits and are the maximum emissions permissible.

As previously discussed in Section 3.1, if the Proposal is deemed to be a scheduled activity under the POEO Act, the general standards of concentration for scheduled activities as outlined in the POEO CAR would apply. In any event, the generators would be required to achieve the Schedule 2, Part 3 standard of concentration for non-scheduled activities. Clause 73, Part 5, Division 6 of the POEO CAR provides the following in regard to the regulation of emissions from emergency electricity generation:

> *73 Exemption relating to emergency electricity generation*
>
> *Emergency standby plant is exempt from the air impurities standard for nitrogen dioxide and nitric oxide specified in Schedule 2, Part 2, Division 3 for the plant if –*
>
> *(a) the plant comprises a stationary reciprocating internal combustion engine for generating electricity, and*
>
> *(b) it is used for a total of not more than 200 hours per year.*

The Proponent has provided the specifications for the maintenance testing (refer Section 2.3.2.1), indicating committing to operation of the standby generators for less than 200 hours per year, making the POEO CAR exemption applicable to the Proposal.

The standards of concentration, and whether they are applicable to the Proposal, are summarised in Table 6.

Table 6 POEO CAR standards of concentrations for applicable air impurities

Air impurity	Activity or plant	Concentration	Applicable
Schedule 2, Part 2, Division 2 – Electricity generation (Group 6)			
Solid particles (Total)	An activity or plant using a liquid or solid standard fuel or a non-standard fuel	50 $mg{\cdot}Nm^{-3}$ (A)	No. Proposal is not a scheduled activity
Nitrogen dioxide (NO_2) or nitric oxide (NO) or both, as NO_2 equivalent	A turbine operating on a fuel other than gas, being a turbine used in connection with an electricity generating system with a capacity of 30 MW or more	90 $mg{\cdot}Nm^{-3}$ (A)	No. Proposal is not a scheduled activity and would operate for less than 200 $hrs{\cdot}year^{-1}$.
Schedule 2, Part 2, Division 3 - Scheduled premises (Group 6)			
Solid particles (Total)	An activity or plant	50 $mg{\cdot}Nm^{-3}$ (A)	No. Proposal is not a scheduled activity
Nitrogen dioxide (NO_2) or nitric oxide	Stationary reciprocating internal combustion engines	450 $mg{\cdot}Nm^{-3}$ (A)	No. Proposal is not a scheduled activity and

Air impurity	Activity or plant	Concentration	Applicable
(NO) or both, as NO_2 equivalent			would operate for less than 200 hrs·year^{-1}.
Volatile organic compounds (VOCs), as *n*-propane	A stationary reciprocating internal combustion engine using a liquid fuel	1 140 mg·Nm^{-3} (A) VOCs *or* 5 880 mg·Nm^{-3} (A) CO	No. Proposal is not a scheduled activity
Smoke	An activity or plant in connection with which liquid or gaseous fuel is burnt	20 % opacity	No. Proposal is not a scheduled activity
Schedule 2, Part 3 - Non-scheduled premises (Group C)			
Solid particles (Total)	An activity or plant	100 mg·Nm^{-3} (B)	Yes
Smoke	An activity or plant in connection with which liquid or gaseous fuel is burnt	20 % opacity	Yes

Notes (A) POEO CAR Sch2, Pt 3, Div 1: dry, 273 K, 101.3 kPa, 7 % O_2
(B) POEO CAR Sch 2, Pt 2, Div 2: dry, 273 K, 101.3 kPa, 7 % O_2

Part 4 Clause 20 of the POEO CAR requires that motor vehicles do not emit excessive air impurities which may be visible for a continuous period of more than 10-seconds when determined in accordance with the relevant standard.

All vehicles, plant and equipment to be used either at the Proposal site or to transport materials to and from the Proposal site will be maintained regularly and in accordance with manufacturers' requirements, where these vehicles are under the operational control of the Proponent.

3.3. NSW Approved Methods

State air quality guidelines are prescribed by the NSW EPA in the Approved Methods which has been consulted during the preparation of this AQIA (see Section 1.2, Table 2).

The Approved Methods lists the statutory methods that are to be used to assess emissions of criteria air pollutants in NSW. Section 7.1 and Section 7.2 of the Approved Methods clearly outlines the impact assessment criteria for those key pollutants of interest and both individual and principal toxic air pollutants. Principal toxic air pollutants are defined in the Approved Methods on the basis that they are carcinogenic, mutagenic, highly persistent, or highly toxic in the environment.

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], and World Health Organisation [WHO]).

The criteria specified in the Approved Methods are the defining ambient air quality criteria for NSW. The standards adopted to protect members of the community from health impacts in NSW for relevant individual air pollutants are presented in Table 7.

To assess the potential impact of emissions of total volatile organic compounds (VOC) (which is a complex mixture of hydrocarbons), the 1-hour impact assessment criterion for benzene (C_6H_6) of 0.029 mg·m^{-3} (29 µg·m^{-3}) as outlined in table 12 of the Approved Methods has been adopted.

Benzene (C_6H_6) is one of the primary components of TVOC emissions resulting from diesel combustion engines and correspondingly, compliance with the benzene (C_6H_6) criterion (refer Table 7) would generally result in compliance with all VOC components from a health-perspective. Formaldehyde (CH_2O) is assessed as a discrete VOC.

VOC emissions have additionally been assessed against the 1-hour odour impact assessment criteria for toluene (C_7H_8) of 0.36 mg·m^{-3} (360 µg·m^{-3}) and xylene (C_8H_{10}) of 0.19 mg·m^{-3} (190 µg m^{-3}) to address odour.

Table 8 provides a summary of impact assessment criteria for principal toxic, and both individual odorous and toxic pollutants that are referenced within this AQIA, as outlined in Section 7.2 of the Approved Methods.

Table 7 NSW EPA impact assessment criteria

Pollutant	Averaging period	Criterion µg·m^{-3} (a)		Notes
Sulphur dioxide (SO_2)	1 hour	215		Numerically equivalent to the AAQ NEPM (b) standards and goals
	24 hours	57		
	1 year	4		
Nitrogen dioxide (NO_2)	1 hour	164		
	Annual	31		
Particulates (as PM_{10})	24 hours	50		
	1 year	25		
Particulates (as $PM_{2.5}$)	24 hours	25		
	1 year	8		
Particulates (as TSP)	1 year	90		
Pollutant	**Averaging period**	**Criterion ppm (c)**	**Criterion mg·m^{-3} (d)**	**Notes**
Carbon monoxide (CO)	15 minutes	87	100	Numerically equivalent to the AAQ NEPM (b) standards and goals
	1 hour	25	30	
	8 hours	9	10	

Notes: (a): micrograms per cubic metre of air
(b): National Environment Protection (Ambient Air Quality) Measure
(c): parts per million (10^6)
(d): milligrams per cubic metre of air

Table 8 NSW EPA impact assessment criteria for principal and individual toxic pollutants

Pollutant	Averaging period	Criterion		Notes
		ppm (a)	$mg{\cdot}m^{-3}$ (b)	
Polycyclic Aromatic Hydrocarbon (PAH) as benzo(a)pyrene	1 hour	n/a	0.0004	
Benzene (C_6H_6)	1 hour	0.009	0.029	
Ethylbenzene (C_8H_{10})	1 hour	1.8	8.0	
Toluene (C_7H_8)	1 hour	0.06	0.36	Odour
Xylene (C_8H_{10})	1 hour	0.04	0.19	Odour
Formaldehyde (CH_2O)	1 hour	0.018	0.02	

Notes: (a): parts per million (10^6)

(b): milligrams per cubic metre of air

3.4. The Hills Local Environmental Plan 2019

The Hills Local Environmental Plan 2019 (HLEP2019) provides the legislative framework for developments and land use within the Hills Shire LGA. Specifically, the aims of the HLEP2019 are as follows:

(aa) to protect and promote the use and development of land for arts and cultural activity, including music and other performance arts,

(a) to guide the orderly and sustainable development of The Hills, balancing its economic, environmental and social needs,

(b) to provide strategic direction and urban and rural land use management for the benefit of the community,

(c) to provide for the development of communities that are healthy, connected and inclusive and that have services and facilities that meet their needs,

(d) to provide for well-planned and liveable neighbourhoods through efficient and safe transport infrastructure, a range of housing options, and a built environment that is compatible with the cultural and natural heritage of The Hills,

(e) to preserve and protect the natural surroundings of The Hills and to identify environmentally significant land for the benefit of future generations,

(f) to contribute to the development of a prosperous local economy through the identification and management of land to promote employment opportunities, rural productivity and tourism.

It is noted that the HLEP2019 does not outline any specific requirements for the development of data centres with regard to air quality and correspondingly, potential air quality impacts would be managed under the requirements of the POEO Act, POEO CAR and the Approved Methods.

3.5. NSW Government Air Quality Planning

NSW EPA has formed a comprehensive strategy with the objective of driving improvements in air quality across the State. This comprises several drivers, including:

- **Legislation**: formed principally through the implementation of the POEO Act and POEO CAR. The overall objective of the legislative instruments is to achieve the requirements of the National Environment Protection (Ambient Air Quality) Measure;
- **Clean Air for NSW**: The 10-year plan for the improvement in air quality;
- **Inter-agency Taskforce on Air Quality in NSW**: a vehicle to co-ordinate cross-government incentives and action on air quality;
- **Managing Particles and Improving Air Quality in NSW**; and
- **Diesel and Marine Emission Management Strategy**.

In regard to the relevance of the NSW Government's drive to maintain and improve air quality across the State and this AQIA, it is imperative that the Proposal would lead to the development of the NSW economy (in terms of activity and employment) and concomitantly not cause a detriment in air quality in achieving its objectives.

4. EXISTING CONDITIONS

The following information provides context around the location of sensitive receptor locations surrounding the Proposal site, the prevailing meteorology and air quality of the surrounding area and identifies other sources of air pollutants which have the potential to impact cumulatively with the Proposal.

4.1. Surrounding Land Sensitivity

The Proposal site is situated within an SP4 – Enterprise zone according to The HLEP 2019.

The land use immediately surrounding the Proposal site contains SP4 – Enterprise, with R3 – Medium Density Residential zones located to the south and R4 – High Density Residential land zoning to the northwest. RE1 – Public Recreation lots are located to the south at Evesham Court Reserve and Fairmount Avenue Reserve. E1 – Local Centre use is contained immediately west of the Proposal site encompassing the Norwest Marketown shopping mall.

4.2. Sensitive Receptor Locations

Air quality assessments typically use a desk-top mapping study to identify 'discrete receptor locations', which are intended to represent a selection of locations that may be susceptible to changes in air quality. In broad terms, the identification of sensitive receptors, refers to places at which humans may be present for a period representative of the averaging period for the pollutant being assessed. Typically, these locations are identified as residential properties, although other sensitive land uses may include schools, medical centres, places of employment, recreational areas, or ecologically sensitive locations.

The Approved Methods defines a sensitive receptor location to be:

> *'A location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area'.*

It is noted that the assessment criteria applied to particulates and sulphur dioxide (SO_2) (refer Table 7) are for a 24-hour averaging period, and as such the predicted impacts need to be interpreted at commercial and industrial receptor locations with care. It is atypical for a person to be at those locations for a complete 24-hour period and as such, the exposure risks associated with those pollutants at those locations would be over-estimated by adoption of those locations in the modelling assessment.

It is important to note that the selection of discrete receptor locations is not intended to represent a fully inclusive selection of all sensitive receptors across the study area. The location selected should be considered to be representative of its broader location and may be reasonably assumed to be representative of the immediate environs. In some instances, several viable receptor locations may be identified in a small area, for example a school neighbouring a medical centre. In this instance the receptor closest to the potential sources to be modelled would generally be selected and would be used to assess the risk to other sensitive land uses in the area.

In addition to the identified 'discrete' receptor locations, the entire modelling area is gridded with 'uniform' receptor locations that are used to plot out the predicted impacts, and as such the accidental non-inclusion of a location that is sensitive to changes in air quality, does not render the AQIA invalid, or otherwise incapable of assessing those potential risks.

In accordance with the requirements of the Approved Methods, several receptors have been identified and the receptors adopted for use within this AQIA are presented in Table 9 and illustrated in Figure 3 and Figure 4.

To ensure that the selection of discrete receptors for the AQIA are reflective of the locations in which the population of the area surrounding the premises reside, population density data has been examined. Population density data based on the 2024 census have been obtained from the Australian Bureau of Statistics (ABS) for a 1 square kilometre (km^2) grid, covering mainland Australia (ABS, 2025).

Using a Geographical Information System (GIS), the locations of sensitive receptor locations have been confirmed with reference to their population densities (refer Figure 3 and Figure 4).

For clarity, the ABS use the following categories to analyse population density (persons·km^{-2}):

- No population Zero (0).
- Very low Up to 500.
- Low Between 500 and 2 000.
- Medium Between 2 000 and 5 000.
- High Between 5 000 and 8 000.
- Very high More than 8 000.

Using the ABS data in a GIS, the population density around the Proposal site and its immediate vicinity is categorised as low (i.e. between 500 and 2 000 persons·km^{-2}) and medium to the west (between 2 000 to 5 000 persons·km^{-2}), reflecting a mix of commercialised, industrial and residential areas.

Table 9 Discrete sensitive receptor locations

Receptor ID	Location	Land use	Coordinates (UTM)	
			mE	mS
R1	Norwest Boulevard, Norwest	Medical	311 407	6 265 635
R2	Norwest Boulevard, Norwest	Commercial	311 569	6 265 747
R3	Columbia Way, Norwest	Commercial	311 770	6 265 812
R4	Brookhollow Avenue, Norwest	Childcare Centre	311 988	6 265 623
R5	Brookhollow Avenue, Norwest	Industrial	311 913	6 265 533
R6	Brookhollow Avenue, Norwest	Childcare Centre	311 845	6 265 535
R7	Brookhollow Avenue, Norwest	Residential	311 713	6 265 505
R8	Brookhollow Avenue, Norwest	Commercial	311 577	6 265 578
R9	Columbia Court, Norwest	Residential	312 062	6 265 727
R10	Fairmont Avenue, Norwest	Residential	312 079	6 265 541
R11	Fairmont Avenue, Norwest	Residential	311 879	6 265 461
R12	Fairmont Avenue, Norwest	Residential	311 651	6 265 374
R13	Evesham Court, Norwest	Residential	311 486	6 265 313
R14	Norwest Boulevard, Norwest	Place of Worship	311 131	6 265 421
R15	Century Circuit, Norwest	Childcare Centre	311 311	6 265 596
R16	Solent Circuit, Norwest	Medical	311 356	6 265 791
R17	Solent Circuit, Norwest	Residential	311 213	6 265 688
R18	Columbia Way, Norwest	Childcare Centre	311 921	6 265 906
R19	Spurway Drive, Norwest	Childcare Centre	312 037	6 265 882
R20	Spurway Drive, Norwest	Community	311 406	6 265 996
R21	Solent Circuit, Norwest	Recreational	311 106	6 265 836
R22	Longview Place, Norwest	Residential	311 767	6 266 045
R23	Stone Mason Drive, Norwest	Residential	312 068	6 265 988
R24	Salisbury Road, Castle Hill	Residential	312 192	6 265 849
R25	Gladstone Road, Castle Hill	Educational	312 377	6 265 466
R26	Firewheel Place, Norwest	Residential	312 081	6 265 224
R27	St Joseph's Road, Norwest	Place of Worship	311 709	6 265 038
R28	Eagleview Place, Norwest	Residential	311 553	6 266 072
R29	Hudson Avenue, Castle Hill	Educational	312 186	6 265 752
R30	Hudson Avenue, Castle Hill	Commercial	312 188	6 265 621
R31	Salisbury Road, Castle Hill	Commercial	312 511	6 265 871
R32	Victoria Avenue, Castle Hill	Commercial	312 832	6 265 540
R33	Hudson Avenue, Castle Hill	Industrial	312 197	6 266 050
R34	Hudson Avenue, Castle Hill	Industrial	312 260	6 266 293
R35	Victoria Avenue, Castle Hill	Commercial	312 708	6 266 294
R36	Carrington Road, Castle Hill	Commercial	312 933	6 265 916
R37	Anella Avenue, Castle Hill	Commercial	313 046	6 266 273
R38	Hoyle Avenue, Castle Hill	Educational	313 226	6 265 739
R39	Showground Road, Castle Hill	Recreational	313 132	6 266 559

Receptor ID	Location	Land use	Coordinates (UTM)	
			mE	mS
R40	Showground Road, Castle Hill	Recreational	313 450	6 266 452
R41	Sexton Avenue, Castle Hill	Residential	313 750	6 266 216
R42	Ashford Avenue, Castle Hill	Residential	313 543	6 265 767
R43	Patterson Avenue, Kellyville	Residential	311 536	6 267 539
R44	Excelsior Avenue, Castle Hill	Residential	313 390	6 264 876
R45	Nola Place, Castle Hill	Residential	313 010	6 265 210
R46	Leone Avenue, Baulkham Hills	Residential	312 525	6 265 288
R47	Juliana Crescent, Baulkham Hills	Residential	311 521	6 264 020
R48	Coolock Crescent, Baulkham Hills	Residential	312 671	6 265 002
R49	Crestwood Drive, Baulkham Hills	Community	312 145	6 264 608
R50	Connell Close, Baulkham Hills	Residential	311 934	6 264 403
R51	Longreach Place, Baulkham Hills	Residential	311 406	6 265 033
R52	Tulloch Place, Baulkham Hills	Residential	311 627	6 264 633
R53	Crestwood Drive, Baulkham Hills	Recreational	311 994	6 264 635
R54	Chapel Lane, Baulkham Hills	Place of Worship	312 432	6 264 553
R55	Chapel Lane, Baulkham Hills	Educational	312 361	6 264 411
R56	Chapel Lane, Baulkham Hills	Educational	312 742	6 264 633
R57	Peel Road, Baulkham Hills	Recreational	312 146	6 264 150
R58	Attunga Street, Baulkham Hills	Residential	312 721	6 264 089
R59	Providence Drive, Bella Vista	Residential	311 064	6 264 137
R60	Bella Vista Drive, Bella Vista	Recreational	311 113	6 264 508
R61	Elizabeth Macarthur Drive, Bella Vista	Recreational	310 435	6 264 773
R62	Plover Glen, Bella Vista	Residential	311 068	6 265 140
R63	Linden Way, Bella Vista	Residential	310 738	6 265 054
R64	Wainwright Mews, Bella Vista	Residential	310 849	6 264 740
R65	Solent Circuit, Norwest	Industrial	310 926	6 265 433
R66	Brookhollow Avenue, Baulkham Hills	Commercial	311 290	6 265 340
R67	Mount Bank Rise, Bella Vista	Residential	310 192	6 265 386
R68	Jardine Terrace, Bella Vista	Residential	309 880	6 265 952
R69	Ashburn Close, Bella Vista	Residential	310 665	6 265 585
R70	Gardenview Court, Bella Vista	Residential	310 068	6 266 356
R71	Stone Mason Drive, Kellyville	Residential	310 904	6 267 321
R72	Laughton Crescent, Kellyville	Residential	310 487	6 266 720
R73	Spurway Drive, Norwest	Recreational	311 325	6 266 417
R74	Fairhaven Circuit, Norwest	Residential	311 814	6 266 329
R75	Pasquale Avenue, Bella Vista	Residential	310 653	6 265 963
R76	Horatio Avenue, Norwest	Residential	311 009	6 266 082
R77	Country Club Circuit, Kellyville	Residential	311 239	6 266 829

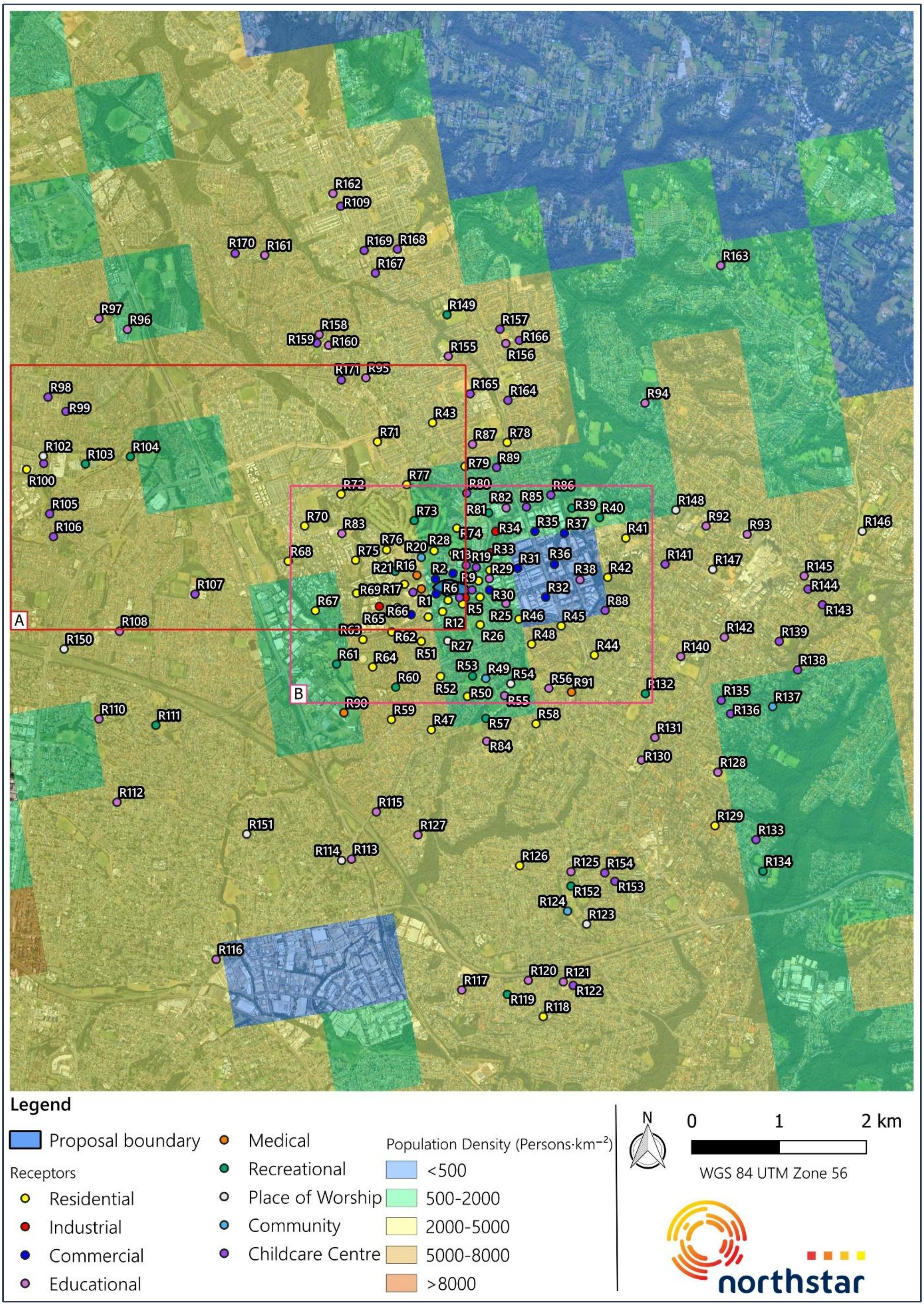
Receptor ID	Location	Land use	Coordinates (UTM)	
			mE	mS
R78	Helissio Place, Castle Hill	Residential	312 390	6 267 313
R79	St Pauls Avenue, Castle Hill	Residential	311 907	6 267 038
R80	Chepstow Drive, Castle Hill	Childcare Centre	311 927	6 266 731
R81	Showground Road, Castle Hill	Recreational	312 179	6 266 506
R82	Green Road, Castle Hill	Educational	312 379	6 266 563
R83	Free Settlers Drive, Bella Vista	Educational	310 496	6 266 269
R84	Peel Road, Baulkham Hills	Educational	312 156	6 263 888
R85	Showground Road, Castle Hill	Childcare Centre	312 611	6 266 573
R86	Kings Road, Castle Hill	Childcare Centre	312 891	6 266 710
R87	Harrington Avenue, Castle Hill	Educational	311 994	6 267 291
R88	Parsonage Road, Castle Hill	Childcare Centre	313 514	6 265 388
R89	St Pauls Avenue, Castle Hill	Childcare Centre	312 269	6 267 026
R90	Norbrik Drive, Bella Vista	Medical	310 519	6 264 215
R91	Windsor Road, Baulkham Hills	Medical	313 128	6 264 453
R92	Castle Street, Castle Hill	Educational	314 670	6 266 355
R93	Les Shore Place, Castle Hill	Educational	315 141	6 266 260
R94	Ridgecrop Drive, Castle Hill	Educational	313 970	6 267 764
R95	Windsor Road, Kellyville	Educational	310 771	6 268 054
R96	Perfection Avenue, Stanhope Gardens	Educational	308 038	6 268 608
R97	Greenwich Street, Kellyville Ridge	Educational	307 711	6 268 732
R98	Conrad Road, Kellyville Ridge	Childcare Centre	307 128	6 267 833
R99	Elmstree Road, Kellyville Ridge	Childcare Centre	307 333	6 267 668
R100	View Street, The Ponds	Residential	306 883	6 267 004
R101	Lookout Circuit, Stanhope Gardens	Childcare Centre	307 080	6 267 072
R102	View Street, Stanhope Gardens	Place of Worship	307 073	6 267 157
R103	Sentry Drive, Stanhope Gardens	Recreational	307 556	6 267 066
R104	Stanhope Parkway, Stanhope Gardens	Recreational	308 073	6 267 151
R105	Sentry Drive, Parklea	Childcare Centre	307 148	6 266 495
R106	Blackbutt Street, Parklea	Childcare Centre	307 191	6 266 233
R107	Forman Avenue, Glenwood	Childcare Centre/ Educational	308 813	6 265 574
R108	Glenwood Park Drive, Glenwood	Educational	307 947	6 265 150
R109	Hezlett Road, North Kellyville	Childcare Centre	310 484	6 270 020
R110	Kings Langley Public School	Educational	307 712	6 264 144
R111	Shanke Crescent, Kings Langley	Recreational	308 364	6 264 072
R112	Turner Street, Blacktown	Educational	307 919	6 263 190
R113	Beethoven Street, Seven Hills	Educational	310 606	6 262 538
R114	Seven Hills Road, Seven Hills	Place of Worship	310 494	6 262 522

Receptor ID	Location	Land use	Coordinates (UTM)	
			mE	mS
R115	Seven Hills Road, Baulkham Hills	Educational	310 891	6 263 079
R116	Lucas Road, Seven Hills	Educational	309 056	6 261 389
R117	Buckleys Road, Winston Hills	Educational	311 869	6 261 038
R118	Lanhams Road, Winston Hills	Residential	312 803	6 260 734
R119	Romulus Street, Winston Hills	Recreational	312 392	6 260 989
R120	Junction Road, Winston Hills	Educational	312 632	6 261 148
R121	Hillcrest Avenue, Winston Hills	Educational	313 034	6 261 131
R122	Hillcrest Avenue, Winston Hills	Childcare Centre	313 148	6 261 090
R123	Watkins Road, Baulkham Hills	Place of Worship	313 300	6 261 793
R124	Seven Hills Road, Baulkham Hills	Community	313 083	6 261 942
R125	Jasper Road, Baulkham Hills	Educational	313 122	6 262 394
R126	Seven Hills Road, Baulkham Hills	Residential	312 534	6 262 463
R127	Astoria Park Road, Baulkham Hills	Educational	311 368	6 262 815
R128	Girralong Avenue, Baulkham Hills	Educational	314 804	6 263 533
R129	Goolgung Avenue, Baulkham Hills	Residential	314 772	6 262 921
R130	Windsor Road, Baulkham Hills	Educational	313 930	6 263 673
R131	Old Northern Road, Baulkham Hills	Educational	314 084	6 263 931
R132	Mileham Avenue, Baulkham Hills	Recreational	313 975	6 264 434
R133	Witonga Crescent, Baulkham Hills	Childcare Centre	315 242	6 262 761
R134	Renown Road, Baulkham Hills	Recreational	315 322	6 262 399
R135	Excelsior Avenue, Castle Hill	Childcare Centre	314 844	6 264 358
R136	Excelsior Avenue, Castle Hill	Childcare Centre	314 952	6 264 203
R137	Howard Place, Castle Hill	Community	315 434	6 264 286
R138	Walsh Avenue, Castle Hill	Childcare Centre	315 719	6 264 707
R139	Cecil Avenue, Castle Hill	Childcare Centre	315 509	6 265 033
R140	Marie Street, Castle Hill	Educational	314 381	6 264 861
R141	Fishburn Crescent, Castle Hill	Childcare Centre	314 201	6 265 917
R142	Old Northern Road, Castle Hill	Educational	314 880	6 265 082
R143	Acer Glen, Castle Hill	Childcare Centre	316 003	6 265 453
R144	Brisbane Road, Castle Hill	Childcare Centre	315 839	6 265 632
R145	Old Northern Road, Castle Hill	Educational	315 795	6 265 783
R146	Old Northern Road, Castle Hill	Place of Worship	316 461	6 266 295
R147	Showground Road, Castle Hill	Place of Worship	314 747	6 265 857
R148	Britannia Road, Castle Hill	Place of Worship	314 323	6 266 539
R149	Marella Avenue, Kellyville	Recreational	311 701	6 268 776
R150	Meurants Lane, Glenwood	Place of Worship	307 312	6 264 946
R151	Vardys Road, Kings Langley	Place of Worship	309 405	6 262 825
R152	Seven Hills Road, Baulkham Hills	Recreational	313 121	6 262 229
R153	Owen Avenue, Baulkham Hills	Childcare Centre	313 626	6 262 283
R154	Seven Hills Road, Baulkham Hills	Childcare Centre	313 509	6 262 380

Receptor ID	Location	Land use	Coordinates (UTM)	
			mE	mS
R155	York Road, Kellyville	Educational	311 716	6 268 301
R156	Rosebery Road, Kellyville	Educational	312 375	6 268 446
R157	Craigmore Drive, Kellyville	Childcare Centre	312 308	6 268 611
R158	Redden Drive, Kellyville	Educational	310 236	6 268 549
R159	Redden Drive, Kellyville	Childcare Centre	310 209	6 268 451
R160	Diana Avenue, Kellyville	Educational	310 344	6 268 426
R161	The Parkway, Beaumont Hills	Educational	309 611	6 269 459
R162	Hezlett Road, North Kellyville	Educational	310 394	6 270 166
R163	Glenhaven Road, Glenhaven	Educational	314 838	6 269 339
R164	Wrights Road, Kellyville	Childcare Centre	312 400	6 267 795
R165	Alessandra Drive, Kellyville	Childcare Centre	311 966	6 267 870
R166	Carmelo Circuit, Kellyville	Childcare Centre	312 530	6 268 482
R167	James Mileham Drive, Kellyville	Childcare Centre	310 880	6 269 253
R168	Goodison Street, North Kellyville	Childcare Centre	311 133	6 269 528
R169	Hezlett Road, North Kellyville	Childcare Centre	310 751	6 269 512
R170	The Parkway, Beaumont Hills	Childcare Centre	309 273	6 269 478
R171	Acres Road, Kellyville	Childcare Centre	310 490	6 268 028

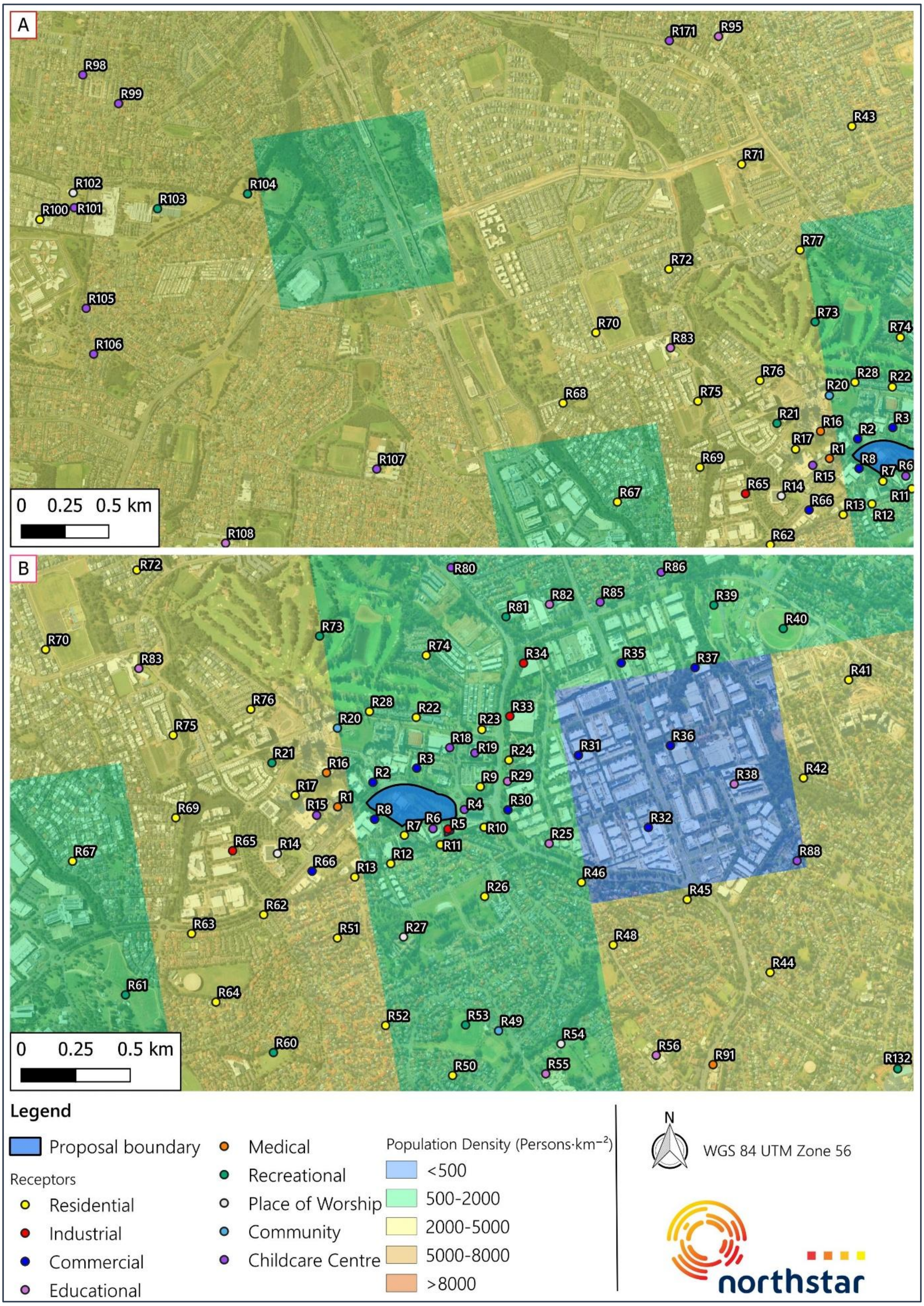
Note: The requirements of this AQIA may vary from the specific requirements of other studies, and as such the selection and naming of receptor locations, may vary between technical reports. This does not affect or reduce the validity of those assumptions.

Figure 3 Sensitive receptors surrounding the Proposal site and Population density (1 of 2)



Source: Northstar

Figure 4 Sensitive receptors surrounding the Proposal site and Population density (2 of 2)



Source: Northstar

4.3. Meteorology

In accordance with the requirements of the Approved Methods, the AQIA is required to describe and account for the influence of the prevailing meteorological conditions.

The meteorology experienced within an area can govern the generation (in the case of wind-dependent emission sources), dispersion, transport and eventual fate of pollutants in the atmosphere. The meteorological conditions surrounding the Proposal site have been characterised using data collected by surrounding Automatic Weather Stations (AWS) operated by the Australian Government Bureau of Meteorology (BoM) and Air Quality Monitoring Stations (AQMS) operated by the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW).

The most representative meteorological station relative to the Proposal site is situated at Rouse Hill AQMS (operated by NSW DCCEEW), approximately 8.0 km to the north-west of the Proposal site. Operating since mid-2019, this monitoring station provides reliable data for analysing regional weather patterns in the surrounding area.

Despite the proximity of the DCCEEW AQMS at Rouse Hill, on-site meteorological analysis is deemed necessary to inform the Proposal's baseline environmental conditions. In absence of any measured onsite meteorological data, site representative meteorological data for this Proposal was generated using the CALMET meteorological model in a format suitable for using in the CALPUFF dispersion model (refer Section 5.2.1.1).

For this AQIA, CALMET was run in no-observations ('no-obs') mode using gridded prognostic data generated by The Air Pollution Model (TAPM, v 4.0.5), developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), to determine surface and wind characteristics at the Proposal site. A summary of the inputs and outputs of the meteorological modelling assessment, including validation of those outputs is presented in Appendix C.

The projected wind characteristics predicted by CALMET at the Proposal site were compared to Rouse Hill AQMS observations from 2021 in this assessment (refer Appendix C).

The meteorological conditions measured at Rouse Hill AQMS for the period 2020 to 2024 (most recent five years of completed data) are presented in Appendix C. The annual wind roses presented in Appendix C indicate that from 2020 to 2024, winds at Rouse Hill AQMS show similar wind distribution patterns across the years assessed, with predominant north-westerly wind direction.

The majority of wind speeds experienced at Rouse Hill AQMS between 2020 and 2024 are generally in the range 0.5 meters per second ($m \cdot s^{-1}$) to 5.5 $m \cdot s^{-1}$ with the highest wind speeds (greater than 8 $m \cdot s^{-1}$) occurring from only south-easterly directions. Winds of this speed are rare and occur during 0.02 % of the observed hours during the years. Calm winds (less than 0.5 $m \cdot s^{-1}$) are more common and occur during 15.1 % of hours on average across the years between 2020 and 2024.

An analysis of the correlation coefficients between each year for wind direction and wind speed (refer Appendix C) distribution was performed to select a representative year for the meteorological modelling. Following this analysis, the year 2021 was selected as the most representative year for meteorological modelling.

4.4. Background Air Quality

The air quality experienced at any location will be a result of emissions generated by natural and anthropogenic sources on a variety of scales (local, regional and global). The relative contributions of sources at each of these scales to the air quality at a location, will vary based on a wide number of factors including the type, location, proximity and strength of the emission source(s), prevailing meteorology, land uses and other factors affecting the emission, dispersion and fate of those pollutants.

When assessing the impact of any particular source of emissions on the potential air quality at a location, the impact of all other sources of an individual pollutant, should also be assessed. These 'background' (sometimes called 'baseline') air quality conditions will vary depending on the pollutants to be assessed and can often be characterised by using representative air quality monitoring data.

The most representative air quality monitoring station relative to the Proposal site, with data available for the year 2021 (the selected representative year consistent with the meteorological modelling [refer Appendix C]) is situated at Rouse Hill AQMS (operated by NSW DCCEEW, approximately 7.0 km north-west of the Proposal site.

Appendix D provides further analysis of the background air quality monitoring data used in this AQIA.

It is noted that the Rouse Hill AQMS does not measure concentrations of TSP. This pollutant is of relevance to the expected emissions from the Proposal. Other sources of data have been adopted to allow representation of the TSP environment in the area surrounding the Proposal site, and a full discussion is provided in Appendix D.

It is noted that a number of pollutants assessed as part of this AQIA are not routinely monitored at AQMS locations in NSW including:

- Polycyclic aromatic hydrocarbons (PAHs);
- Benzene (C_6H_6);
- Toluene (C_7H_8);
- Xylene (C_8H_{10}); and,
- Formaldehyde (CH_2O).

For the purposes of this assessment, it has been assumed that background concentrations of the abovementioned pollutants are negligible. In any case, section 7 of the Approved Methods only requires the assessment of the 99.9th percentile incremental impacts for the pollutants outlined above.

A summary of the air quality monitoring data and assumptions used to produce this AQIA are presented in Table 10. It is noted that although impacts of ozone (O_3) have not been considered in this assessment, O_3 data have been adopted to assist in calculating the conversion of NO_X to NO_2 for the dispersion modelling assessment (refer Section 5.2.6).

Table 10 Summary of background air quality data used in the AQIA

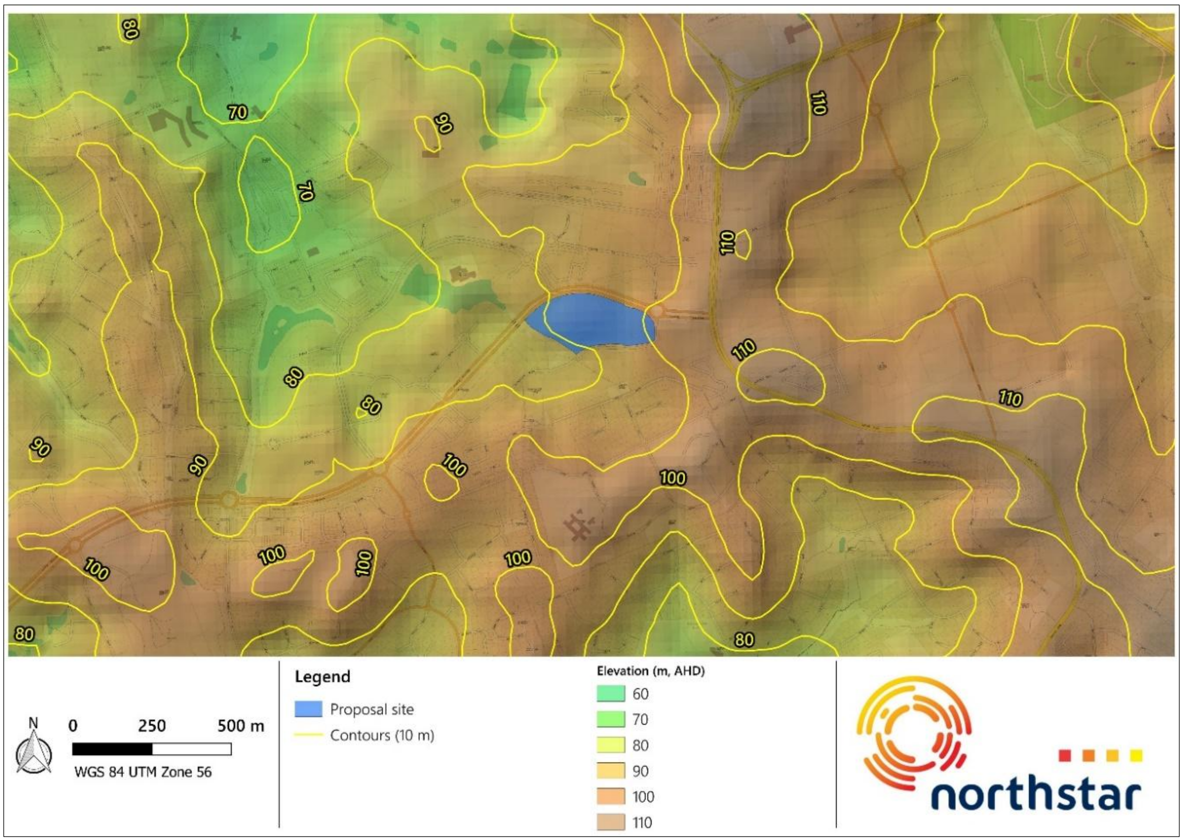
Pollutant	Averaging period	Units	Measured value	Notes
Particles (as TSP)	Annual	$\mu g \cdot m^{-3}$	30.9	Estimated on a TSP:PM_{10} ratio of 2.0551:1
Particles (as PM_{10})	24-hour	$\mu g \cdot m^{-3}$	Daily varying	The 24-hour maximum for PM_{10} in 2021 was 51.6 $\mu g \cdot m^{-3}$ (exceeding the criterion)
	Annual	$\mu g \cdot m^{-3}$	15.0	
Particles (as $PM_{2.5}$)	24-hour	$\mu g \cdot m^{-3}$	Daily varying	The 24-hour maximum for $PM_{2.5}$ in 2021 was 40.5 $\mu g \cdot m^{-3}$ (exceeding the criterion)
	Annual	$\mu g \cdot m^{-3}$	5.9	
Nitrogen dioxide (NO_2)	1-hour	$\mu g \cdot m^{-3}$	Hourly varying	Hourly maximum 1-hr average in 2021 was 69.7 $\mu g \cdot m^{-3}$
	Annual	$\mu g \cdot m^{-3}$	9.8	Annual average in 2021
Carbon monoxide (CO)	15-minutes	$mg \cdot m^{-3}$	2.5	Calculated from hourly data (refer Section 5.2.7 and Appendix C)
	1-hour	$mg \cdot m^{-3}$	1.9	Hourly maximum 1-hr average in 2021
	8-hour	$mg \cdot m^{-3}$	1.9	Maximum 8-hr rolling average in 2021
Sulphur dioxide (SO_2)	1-hour	$\mu g \cdot m^{-3}$	51.5	Hourly maximum 1-hr average in 2021
	24-hour	$\mu g \cdot m^{-3}$	7.9	The 24-hour maximum for SO_2 in 2021

Note: Reference should be made to Appendix D.

4.5. Topography

The elevation of the Proposal site ranges between approximately 86 metres (m) and 103 m Australian Height Datum (AHD) (refer Figure 5). The topography between the Proposal site and nearest sensitive receptor locations is uncomplicated (from an AQIA perspective). Nonetheless, the influence of topography has been included in the dispersion modelling assessment as described in Section 5.2.1.2.

Figure 5 Topography surrounding the Proposal site



Source: Northstar

4.6. Potential for Cumulative Impacts

The background air quality dataset described in Section 4.4 is likely to include the impact of regional sources of air pollutants (such as regional particulate matter), and sources which are local to that AQMS (such as the surrounding road network, and commercial/industrial sources). Given the separation distance between that AQMS and the Proposal site, that data may not adequately include the impacts of sources of air pollutants which are close to the Proposal site. Such sources may include existing developments, approved (not operational) developments, and/or developments currently seeking approval, which may impact cumulatively with the Proposal at the identified sensitive receptors.

To appropriately account for those sources, a desktop survey was performed to identify sources in the area surrounding the Proposal site with a similar emissions profile to the Proposal, that may potentially result in cumulative impacts at nearby sensitive receptor locations. That survey included a review of the National Pollutant Inventory (NPI) register, the NSW POEO Environment Protection Licence (EPL) register, the NSW Government Major Projects Register, and the Council DA tracker.

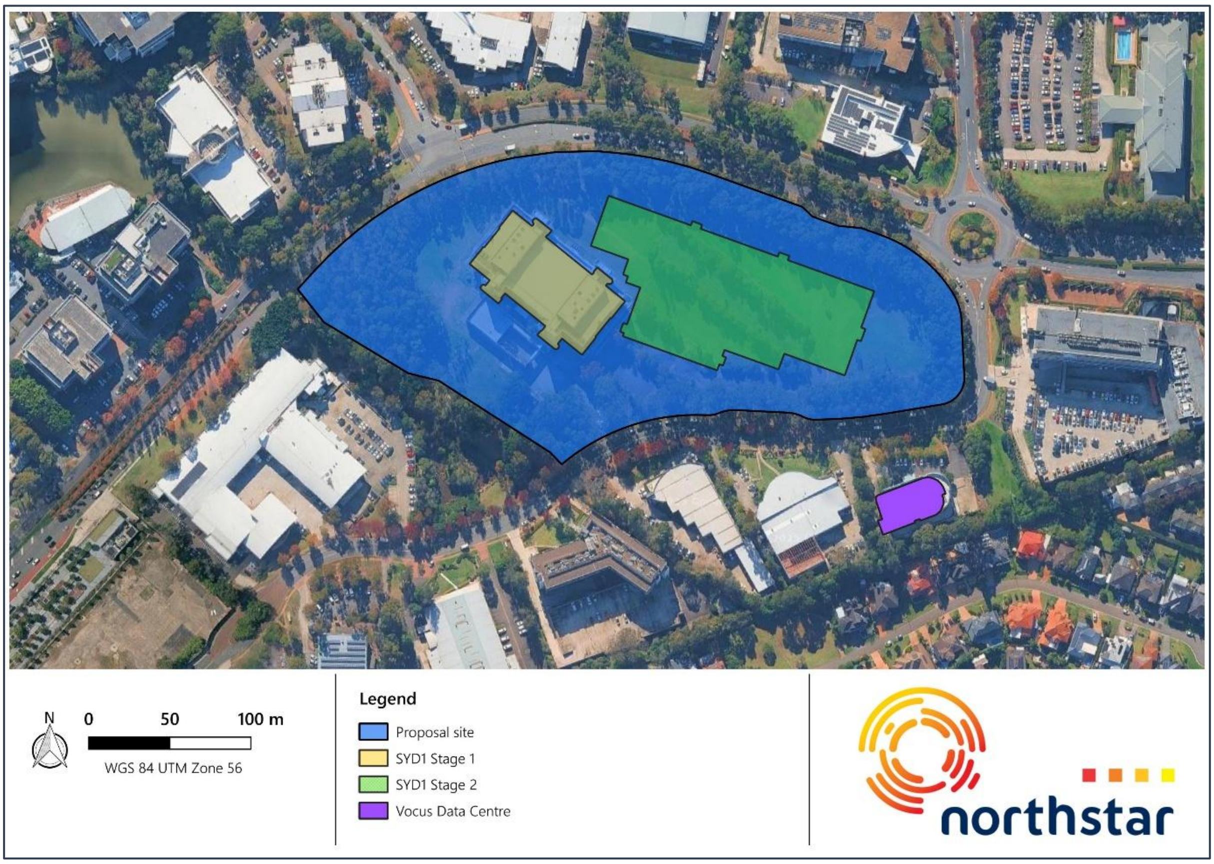
The Proposal site is located proximate to one data centre as summarised in Table 11 and illustrated in Figure 6 . Further discussion of the potential for cumulative impacts with surrounding data centres is presented in Section 5.2.8.

With reference to SYD1 Stage 1 (refer Section 5.2.2), it is noted that cumulative impacts have been considered within the modelling assessment.

Table 11 Potential sources of air emissions proximity to the Proposal site

Local project	Address	Industry	Approximate distance to Proposal site boundary (km)	Operational status
SYD1 Stage 1	3 Brookhollow Avenue, Norwest NSW 2153	Data centre	0	Existing
VOCUS SYD02	12 Brookhollow Avenue, Baulkham Hills	Data centre	0.05	Existing

Figure 6 Location of proximate emissions sources



Source: Northstar

5. APPROACH TO ASSESSMENT

This report provides a qualitative assessment of dust impacts (soiling and human health) during the construction phase, adapted from (IAQM, 2024), and a quantitative assessment aligned with (NSW EPA, 2022a) for evaluating operational phase air quality impacts. Cumulative impacts have been assessed in accordance with Cumulative Impact Assessment Guidelines for State Significant Projects (DPIE, 2021), for all relevant local air emission sources that may contribute to these impacts.

5.1. Construction Phase

Construction phase activities have the potential to generate short-term emissions of particulates. Generally, these are associated with uncontrolled (or 'fugitive') emissions and are typically experienced by neighbours as amenity impacts, such as dust deposition and visible dust plumes, rather than associated with health-related impacts. Localised engine-exhaust emissions from construction machinery and vehicles may also be experienced but given the scale of the proposed works, fugitive dust emissions would have the greatest potential to give rise to downwind air quality impacts.

Modelling of dust from construction Proposals is generally not considered appropriate as there is a lack of reliable emission factors from construction activities upon which to make predictive assessments, and the rates would vary significantly, depending upon local conditions. In lieu of a modelling assessment, the construction-phase impacts associated with the Proposal have been assessed using a risk-based assessment procedure. The advantage of this approach is that it determines the activities that pose the greatest risk, which allows the Construction Environmental Management Plan (CEMP) to focus controls to manage that risk appropriately and reduce the impact through proactive management.

For this risk assessment, Northstar has adapted a methodology presented in Guidance on the Assessment of Dust from Demolition and Construction developed in the United Kingdom by the Institute of Air Quality Management (IAQM, 2024). The IAQM construction phase assessment approach is commonly used for evaluating fugitive dust and particulate matter emissions from construction activities in development projects across NSW and Australia. Reference should be made to Appendix B for the methodology.

Briefly, the adapted method uses a six-step process for assessing dust impact risks from construction activities, and to identify key activities for control as outlined in Appendix B.

5.2. Operational Phase

The air emissions assessment for the operational phase of the Proposal has utilised quantitative dispersion modelling techniques. This section outlines the approach taken in the AQIA for the operational phase of the Proposal.

5.2.1.1. Dispersion Modelling Approach

A dispersion modelling assessment has been performed using the NSW EPA approved CALPUFF Atmospheric Dispersion Model. CALPUFF is a Lagrangian Gaussian (steady-state) plume dispersion model, recognised in the Approved Methods, and a widely accepted model for regulatory applications in NSW. It is used to predict pollutant concentrations from various sources typically found at industrial facilities.

The CALPUFF model uses hourly meteorological data to define conditions for plume rise, transport, diffusion, and deposition. It estimates concentrations or deposition values for each source-receptor combination on an hourly basis and calculates user-selected short-term averages. CALPUFF also accounts for local terrain, making it well-suited for modelling complex terrains, including slope flows, valley flows, terrain blocking, and kinematic effects.

Since most air quality standards are based on averages or percentiles, CALPUFF enables further analysis of results for comparison. The CALPUFF-percent post-processing utility calculates the maximum concentration of a pollutant at a specific percentile over a given period, across all receptors. This percentile approach helps omit unusual short-term meteorological events that may cause elevated concentrations, providing a more accurate representation of likely average pollutant concentrations over the averaging period.

Table 12 provides the model input configuration to assess the impact of generator emissions from the Proposal, in consideration of the Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for inclusion into the Approved Methods (Barclay & Scire, 2011).

Table 12 General model parameters for CALPUFF dispersion modelling

Model parameter	Input
Model mode	CALPUFF Refined Mode CALMET No-Observations (No-Obs) Mode
Meteorological data	Prognostic Data (TAPM) (.apl)
Terrain topography	SRTM3
Model / Grid domain size	11.6 km × 11.6 km × 4 km
Grid resolution / spacing	0.1 km

(Barclay & Scire, 2011) recommend using CALMET 'no-obs' mode for regulatory screening when good-quality gridded prognostic meteorological data are available, which has been applied in the dispersion modelling process.

Given the variable topography, the terrain data with a 3 arc-second resolution (approximately 90 m) were used, in consideration of (Barclay & Scire, 2011). The dispersion model was run over a large grid (11.6 km × 11.6 km) at ground level, encompassing the nearest sensitive receptors (see Section 4.2), covering all potentially impacted nearby land uses.

5.2.1.2. Meteorological Modelling

Section 4 of the Approved Methods requires one-year of site-specific meteorological data or site-representative meteorological data, in the absence of site-specific data, to be used for dispersion modelling.

The 3-D meteorological dataset was derived using gridded prognostic data generated from The Air Pollution Model (TAPM, v 4.0.5) as developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), in conjunction with CALMET (refer Appendix C). Section 4.5 of the Approved Methods identifies TAPM as a commonly used prognostic meteorological model in NSW.

TAPM predicts wind speed and direction, temperature, pressure, water vapour, cloud, rainwater and turbulence. The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, sea surface temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate site-specific hourly meteorological observations at user-defined levels within the atmosphere.

CALMET is a meteorological model that develops wind and temperature fields on a three-dimensional gridded modelling domain. Associated two-dimensional fields such as mixing height, surface characteristics, and dispersion properties are also included in the file produced by CALMET. The interpolated wind field is then modified within the model to account for the influences of topography, as well as differential heating and surface roughness associated with different land uses across the modelling domain. These modifications are applied to the winds at each grid point to develop a final wind field and thus the final wind field reflects the influences of local topography and current land uses.

Further discussion on the meteorological model configuration and input parameters is provided in Appendix C.

5.2.1.3. Terrain Effects

The CALPUFF model incorporates terrain information with heights being applied to all receptors and sources. In order to account for the potential influence on pollution dispersion and varying receptor elevations across the modelling domain, a gap filled and filtered (vegetation and obstacles removed) topography file with 3 second resolution (approximately 90 m) derived from the Shuttle Radar Topography Mission (SRTM) data was obtained from Geoscience Australia and was processed for use in CALPUFF.

5.2.1.4. Building Wake Effects

For dispersion modelling assessments, the influence of surrounding buildings on emission transport is a material consideration. Nearby buildings can create turbulence and a building wake that can influence pollutant dispersion and premature plume grounding ('building downwash'). The ratio of stack height to building height also impacts this effect; if the stack is significantly taller than the surrounding buildings, downwash is minimal.

Section 5.3 of the Approved Methods outlines the following requirements for determining which buildings to consider within a dispersion modelling assessment:

> *"The location and dimensions of buildings located within a distance of 5L (where L is the lesser of the height or width of the building) from each release point for buildings with a height greater than 0.4 times the stack height…"*

The Building Profile Input Program – Plume Rise Model Enhancements (BPIP-PRIME) uses building heights and corner locations near the stack to simulate effective dimensions. The BPIP-PRIME downwash algorithm computes these dimensions in ten-degree intervals, allowing CALPUFF to assess the impact on plume dispersion and ground-level concentrations. While simplified, this building geometry offers a reasonable estimate of how structures disrupt wind flow nearby.

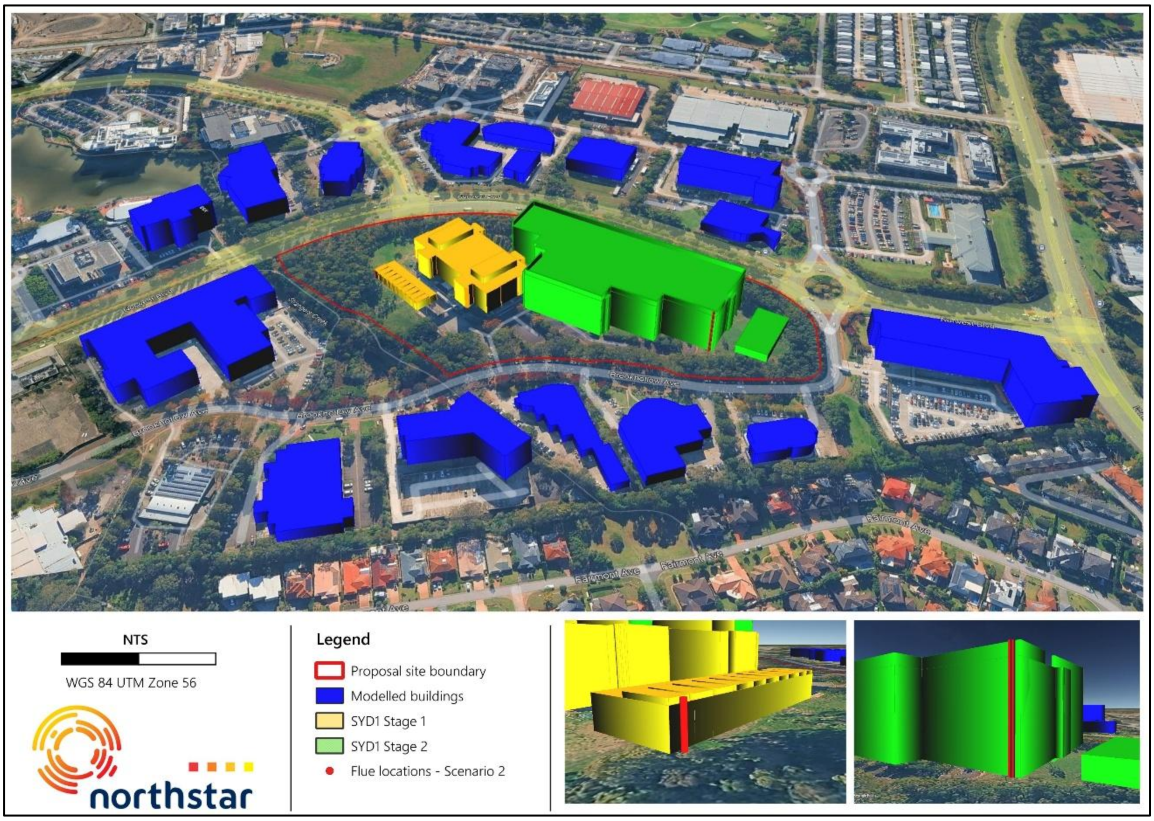
Therefore, to analyse downwash effects from point sources mimicking air emissions, the buildings surrounding the Proposal site were incorporated into the CALPUFF model.

With reference to the requirements outlined in the Approved Methods, Figure 7 and Figure 8 illustrates the locations of the buildings included in the BPIP-PRIME model for downwash calculations, which are subsequently incorporated into the CALPUFF dispersion modelling process. Also shown are the emission discharge points for each scenario modelled (refer Section 5.2.2).

Figure 7 Buildings and discharge points considered in dispersion modelling (Scenario 1)

Source: Northstar

Figure 8 Buildings and discharge points considered in dispersion modelling (Scenario 2)



Source: Northstar

5.2.2. Modelling Scenarios

The following modelling scenarios have been completed to determine the potential impact under the anticipated operational conditions of the emergency standby generators.

- **Scenario 1 – justified worst case scenario** – Operating 87 no. emergency standby generators at the specified maximum load (100 % load). More specifically, Scenario 1 considers the simultaneous operation of all emergency standby generators at both SYD1 Stage 1 (10 no. generators) and the Proposal site (77 no. generators). Given that the emergency generators from both SYD1 Stage 1 and the Proposal would become operational during a power outage event, this approach is considered appropriate for this AQIA.
    - This scenario reflects an unexpected power outage event.
    - Each emergency standby generator has been modelled as operating for all 8 760 hours of the year. Should such a power outage event occur, this is likely to be for a limited time period (e.g. 10 to 15 minutes), and therefore the modelling presents a conservative assessment of the potential impacts.
    - Since the emergency standby generators are anticipated to operate for a short duration, impacts were assessed only against short-term criteria, with no analysis against annual averages, as the results would be meaningless.
    - This AQIA provides context around how likely any exceedances of air quality criteria would be, given the likelihood of power outage events.
    - The configuration of all generators to be operated under this scenario has been advised by the Proponent as the output configuration that would operate during a power outage event.

- **Scenario 2 – realistic (maintenance testing) scenario** – 1 no. emergency standby generator modelled from SYD1 Stage 1 and 2 no. emergency standby generators modelled at the Proposal to operate at 100 % load within the specified operating hours, representing the generator testing regime at the Proposal site.
    - This scenario will occur periodically, as outlined in Section 2.3.2, where 1 no. emergency standby generator is tested from SYD1 Stage 1 and 2 no generators are tested from SYD1 Stage 2 at any one time during daytime hours (between 7:00 AM – 6:00 PM) (i.e. 3 no. generators tested concurrently over SYD1 Stages 1 and 2).
    - The generators assumed for concurrent testing is depicted in Figure 8, providing an appropriate estimate of potential maximum impacts on surrounding sensitive receptors.
    - The SYD1 Stage 2 stack was selected was the one closest to the sensitive receptors to the southeast. However, given the proximity of receptors in all directions around the Proposal site, it is not considered that the selection of this discharge point in preference to any other stacks would make a material difference to the conclusions of this assessment.

- Comparison of impacts against both short- and long-term criteria are performed, providing another level of conservatism, as the testing schedule is modelled as occurring for every one of the hours between 7:00 am and 6:00 pm, on each and every day of the year.
- As outlined in Section 2.3.2, up to 200 testing events will occur annually, with the AQIA assuming 200 events per year (up to, but not exceeding 200 total hours). The modelling assumes 3 650 events (10 hours of testing per day × 365 days). This approach is required to be performed in this manner to account for all potential combinations of emissions and meteorology. Annual average incremental predictions are therefore weighted by actual operating hours over those modelled to account for annual average emission loads.

5.2.3. Generator Emission Rates and Source Characteristics

As previously described, the specific make and model of generators to be included as part of the Proposal have not yet been selected, although the specifications for two potential candidate generators have been provided (please refer to Section 2.3.2.1 and Table 3). To ensure that the worst-case impacts associated with the choice of either generator are presented within this AQIA, the most conservative parameters from each option (CAT 3516E or C3750 D5) have been selected for use in the quantitative assessment.

The lowest emission velocity and temperature from the two generators have been adopted, while the highest calculated emission rates from each generator have been utilised in the dispersion modelling. For clarity, the modelled impacts do not reflect the actual impacts from either generator but rather the worst-case components of both, making the results conservative in nature.

A summary of the standby generator stack design components used to model SYD1 Stage 1 and SYD1 Stage 2 is provided in Table 13 and Table 14 respectively. Details of the technical specifications for the standby generators are provided in Appendix E.

For the justified worst-case scenario (Scenario 1), 87 no. emergency standby generators would operate at 100 % load, comprised of 10 no. generators at SYD1 Stage 1 and 77 no. at SYD1 Stage 2.

For the maintenance testing scenario (Scenario 2), 3 no. generators would operate at 100% load, comprised of 1 no generator at SYD1 Stage 1 and 2 no generators at SYD1 Stage 2 (refer Section 2.3.2).

The values adopted in the dispersion modelling assessment for SYD1 Stage 1 and SYD1 Stage 2 are provided in Table 13 and Table 14 respectively. For SYD1 Stage 2, the worst-case data between the two candidate generators is highlighted.

The locations of the modelled emissions sources at the Proposal site under Scenario 1 and Scenario 2 are illustrated in Figure 7 and Figure 8 respectively (refer Section 5.2.1.4).

Table 13 Emergency standby generator emissions and stack parameters adopted for the AQIA (SYD1 Stage 1)

Parameter	Units	Scenario 1 (Justified worst case)	Scenario 2(Maintenance testing)
		Emergency operations	Maintenance testing
Hour start	Hr	00:00	07:00
Hour end	Hr	23:00	18:00
% load	%	100	100
Emergency generator model		**MTU 20V4000 G44LF-NEA**	**MTU 20V4000 G44LF-NEA**
Number of generators active	no.	10	1
Diesel consumption rate (per gen)	$L \cdot hr^{-1}$	737.4	737.4
Power[(g)]	kW	3 090	3 090
Stack height	m AGL	10.50	10.50
	mm RL[(f)]	99 998	99 998
Stack diameter	mm ID	650	650
Stack CSA	m^2	0.33	0.33
Actual discharge rate	$Am^3 \cdot s^{-1}$	10.6	10.6
Exit temperature	°C	620	620
Exit velocity	$m \cdot s^{-1}$	31.9	31.9
Generator emission specification			
NO_X	$g \cdot kWh^{-1}$	8.92	8.92
CO	$g \cdot kWh^{-1}$	0.47	0.47
TVOC	$g \cdot kWh^{-1}$	0.09	0.09
PM	$g \cdot kWh^{-1}$	0.031	0.031
SO_2	$g \cdot kWh^{-1}$	-	-
Pollutant emission rates			
NO_x [(a)]	$g \cdot s^{-1}$	7.46E+00	7.46E+00

Parameter	Units	Scenario 1 (Justified worst case)	Scenario 2(Maintenance testing)
		Emergency operations	Maintenance testing
CO [a]	$g{\cdot}s^{-1}$	3.93-01	3.93-01
TVOC [a]	$g{\cdot}s^{-1}$	7.52E-02	7.52E-02
PM (PM_{10} and $PM_{2.5}$) [a][d]	$g{\cdot}s^{-1}$	2.59E-02	2.59E-02
SO_2	$g{\cdot}s^{-1}$	1.71E-06 [C]	1.71E-06 [C]
Benzene (C_6H_6) [b]	$g{\cdot}s^{-1}$	7.29-04	7.29-04
Toluene (C_7H_8) [b]	$g{\cdot}s^{-1}$	2.63E-04	2.63E-04
Xylene (C_8H_{10}) [b]	$g{\cdot}s^{-1}$	1.84-04	1.84-04
PAHs [b]	$g{\cdot}s^{-1}$	1.08-08	1.08-08
Formaldehyde (CH_2O)[b]	$g{\cdot}s^{-1}$	7.41E-05	7.41E-05

Notes: (a): Emission rates based on values contained in technical specifications (refer Appendix E).

(b): Emission rates based on emission factors from Table 43 of (NPI, 2008). See Section 5.2.4

(c): Based on sulphur content of fuel.

(d): 100 % of PM is emitted as $PM_{2.5}$, and $PM_{2.5}$ = PM_{10}.

(e) Both scenarios assume that each standby generator considered is operating at 100 % load, consistent with the emission data within the technical specifications presented in Appendix E.

(f) Base is assumed to be 89 500 mm RL.

Table 14 Emergency standby generator emissions and stack parameters adopted for the AQIA (SYD1 Stage 2)

Parameter	Units	Scenario 1 (Justified worst case)		Scenario 2 (Maintenance testing)	
		Emergency operations		Maintenance testing	
Hour start	Hr	00:00		07:00	
Hour end	Hr	23:00		18:00	
% load	%	100		100	
Emergency generator model (SYD1 Stage 2)		**OPTION 1 C3750 D5**	**OPTION 2 CAT 3516E**	**OPTION 1 C3750 D5**	**OPTION 2 CAT 3516E**
Number of generators active	no.	77		2	
Diesel consumption rate (per gen)	$L \cdot hr^{-1}$	636	750.9	636	750.9
Maximum nominal electrical capacity[g]	kW	2 800	2 800	2 800	2 800
Stack height	m AGL	35.7	35.7	35.7	35.7
	mm RL[h]	130 000	130 000	130 000	130 000
Stack diameter	mm ID	700	700	700	650
Stack CSA	m^2	0.38	0.38	0.38	0.33
Actual discharge rate	$Am^3 \cdot s^{-1}$	8.50	10.7	8.50	10.7
Exit temperature	°C	391	491	391	491
Exit velocity	$m \cdot s^{-1}$	22.1	32.1	22.1	32.1
Generator emission specification					
NO_X	$g \cdot kWh^{-1}$	9.7	6.32 [f]	9.7	6.32 [f]
CO	$g \cdot kWh^{-1}$	0.13	1.37 [f]	0.13	1.37 [f]
TVOC	$g \cdot kWh^{-1}$	0.08	0.09 [f]	0.08	0.09 [f]
PM	$g \cdot kWh^{-1}$	0.013	0.09 [f]	0.013	0.09 [f]
SO_2	$g \cdot kWh^{-1}$	0.005	-	0.005	-
Pollutant emission rates					
NO_x [a]	$g \cdot s^{-1}$	7.75E+00	5.368E+00	7.75E+00	5.368E+00

Parameter	Units	Scenario 1 (Justified worst case)		Scenario 2 (Maintenance testing)	
		Emergency operations		Maintenance testing	
CO [a]	$g \cdot s^{-1}$	1.062E-01	1.161E+00	1.062E-01	1.161E+00
TVOC [a]	$g \cdot s^{-1}$	6.370E-02	8.444E-02	6.370E-02	8.444E-02
PM (PM_{10} and $PM_{2.5}$) [a][d]	$g \cdot s^{-1}$	1.062E-02	8.408E-02	1.062E-02	8.408E-02
SO_2	$g \cdot s^{-1}$	4.247E-03	8.865E-07 [c]	4.247E-03	8.865E-07 [c]
Benzene (C_6H_6) [b]	$g \cdot s^{-1}$	6.177E-04	8.189E-04	6.177E-04	8.189E-04
Toluene (C_7H_8) [b]	$g \cdot s^{-1}$	2.230E-04	2.956E-04	2.230E-04	2.956E-04
Xylene (C_8H_{10}) [b]	$g \cdot s^{-1}$	1.554E-04	2.060E-04	1.554E-04	2.060E-04
PAHs [b]	$g \cdot s^{-1}$	9.169E-09	1.215E-08	9.169E-09	1.215E-08
Formaldehyde (CH_2O)[b]	$g \cdot s^{-1}$	6.273E-05	8.316E-05	6.273E-05	8.316E-05

Notes: (a): Emission rates based on values contained in technical specifications (refer Appendix E).

(b): Emission rates based on emission factors from Table 43 of (NPI, 2008). See Section 5.2.4

(c): Based on sulphur content of fuel.

(d): 100 % of PM is emitted as $PM_{2.5}$, and $PM_{2.5}$ = $PM_{10.}$

(e) Both scenarios assume that each standby generator considered is operating at 100 % load, consistent with the emission data within the technical specifications presented in Appendix E.

(f) Converted from $g \cdot hp\text{-}h^{-1}$

(g) Value is the nominal maximum electrical capacity, but the design output for the generators is 2.8 MW (SYD1 Stage 1) and 2.5 MW (SYD1 Stage 2)

(h) Base is assumed to be 94 300 mm RL

5.2.4. Speciated VOCs

The technical specification documents presented in Appendix E presents data for total VOCs (TVOC), which includes a range of speciated VOCs. To appropriately factor the emissions for benzene, toluene, and xylene, reference has been made to the emission factors presented in Table 43 of (NPI, 2008) which relate to stationary large (more than 450 kW) diesel engines. The emission factors for TVOC and the respective speciated VOCs have been factored to calculate the mass fractions of those species within TVOC. Table 15 presents the speciated VOC fraction assumptions that are utilised in this AQIA.

The emission factors for TVOC and the respective speciated VOCs have been factored to calculate the mass fractions of those species within TVOC. Table 15 presents the speciated VOC fraction assumptions that are used for this assessment. The impacts of odorants (toluene (C_7H_8) and xylene(C_8H_{10})) have been similarly assessed on a *pro-rata* basis as a fraction of TVOC as published in (NPI, 2008) multiplied by the measured source-specific TVOC emission rate.

Table 15 Speciated VOC fractions

Substance	Emission Factor (EF) % (of TVOC) (NPI, 2008)	Emission Factor (EF) $g \cdot s^{-1}$	
		C3750D5	CAT 3516E
TVOC	100 %	6.37E-02	8.44E-02
Benzene (C_6H_6)	0.97 %	6.18E-04	8.19E-04
Toluene (C_7H_8) (odour)	0.35 %	2.23E-04	2.96E-04
Xylene (C_8H_{10}) (odour)	0.24 %	1.55E-04	2.06E-04

Note: at 100 % load.

5.2.5. Particle Size Fractions

In regard to particulates from diesel, virtually 100 % of diesel particles are less than 1 µm in diameter (i.e. PM_1) and consequently particulates from diesel combustion are assessed as $PM_{2.5}$. In this AQIA, the emission rate of $PM_{2.5}$ will be the same as PM_{10}, as all of the PM_{10} particles are assessed as being ≤ 2.5 µm in diameter ($PM_{2.5}$).

5.2.6. NO_x to NO_2 Conversion

Emissions of NO_X have been calculated, with subsequent ground-level concentrations predicted using dispersion modelling techniques. Given that NO_X is a mixture of NO_2 and nitric oxide (NO), conversion of NO_X predictions to NO_2 concentrations is necessary to appropriately assess potential NO_2 impacts.

NO_X from a combustion process will be emitted as NO and NO_2. Over time and after the point of discharge, NO in ambient air will be transformed by secondary atmospheric reactions with atmospheric ozone (O_3) to form NO_2, and this reaction often occurs at a considerable distance downwind from the point of emission, and by which time the plume will have dispersed and diluted significantly from the concentration at point of discharge.

AQIAs need to account for the conversion of NO to NO_2 to enable a comparison against the air quality criteria for NO_2. The Approved Methods outlines various methods of assessment, which range from the simple to the more detailed. The three methods outlined in the Approved Methods are briefly outlined below:

- **Method 1 - 100 % conversion**: the most conservative assumption is to assume that 100 % of the total NO_X emitted is discharged as NO_2, and that further reactions do not occur.
- **Method 2 - Ozone limiting method (OLM)**: this method uses contemporaneous ozone data to estimate that rate at which NO is oxidised to NO_2 hour-on-hour using an established relationship.
- **Method 3 – NO to NO_2 conversion using empirical relationship**: an empirical relationship between NO and NO_2 may be used to derive 'steady state' relationships. A relationship has been developed by (Janssen, Van Wakeren, Van Duuren, & Elshout, 1988) associated with power plant plumes.

Section 8.1 of the Approved Methods outlines the approach to NO_2 assessment, which clearly indicates that each stage should be performed sequentially. That is, Method 1, Level 1 should be performed first and *'if the impact assessment criteria are exceeded, a more refined assessment should be undertaken and/or additional management practices or emission controls applied'*.

If exceedances are predicted, then Method 1, Level 2 should be performed, with the same assessment of the potential for exceedance of the 1-hour NO_2 criterion applied. The process then continues through Method 2 (Level 1 and Level 2), and Method 3 (Level 1 and Level 2).

This AQIA utilises Method 3 to approximate the conversion of NO_X to NO_2, in accordance with the empirical equation described in (NSW EPA, 2022a):

$$NO_2 \ / NO_x = A(1 - \exp(-\alpha x))$$

Where:

x = distance from the source

A and α are classified according to O_3 concentration, wind speed and season, with (Janssen, Van Wakeren, Van Duuren, & Elshout, 1988) providing values for A and α.

At each receptor, the hourly varying NO_2/NO_X relationship has been calculated, based on the season, hourly varying O_3 concentration, and wind speed. Results are presented in Section 7.1.2 and Section 7.2.2 for the maximum predicted incremental NO_X / NO_2 concentration and the maximum predicted cumulative NO_2 concentration using the relevant NO_X / NO_2 conversion method(s).

5.2.7. Short Term Pollutant Concentrations

With reference to criteria air pollutants with sub-hourly criteria (CO, refer Section 3.3), hourly dispersion model outputs are required to be adjusted to allow provision of data on those timescales. The following Power Law adjustment has been applied:

$$C_{p,t} = C_{p,60}\left[\frac{60}{t}\right]^{0.2}$$

Where:

$C_{p,t}$	=	concentration of pollutant (p) at averaging time (mins) (t)
$C_{p,60}$	=	concentration of pollutant (p) at averaging time ($60\ mins$)
t	=	time (mins)

5.2.8. Assessment of Cumulative Impacts

The cumulative impact assessment (CIA) methodology adopted for this AQIA is based on the CIA Guidelines (NSW DPIE, 2022), which recognise that cumulative assessments can be carried out at either a strategic or project level.

This AQIA represents a Project-level CIA, following the approach outlined in the CIA Guidelines. These Guidelines define cumulative impacts as those arising from the incremental, sustained, and combined effects of human actions and natural variations over time, which may be either adverse or beneficial. Such impacts can result from the compounding impacts of a single project or multiple projects in an area, and from the accumulation of impacts associated with past, present, and foreseeable future activities.

As noted in the CIA Guidelines (NSW DPIE, 2022):

> *"The cumulative impact assessment undertaken for a particular State significant projects are to be proportionate to the scale and potential significance of the cumulative impacts of the project combined with the impacts of other relevant future projects. This assessment is to focus on the key matters that could be materially affected by the cumulative impacts of the project and other relevant future projects - not on every conceivable cumulative impact on every matter."*

5.2.9. Assessment Approach

The methodology for the CIA involved the following steps:

- Identification of relevant future projects, based on publicly available information, and the associated issues that could contribute to cumulative impacts, using the screening criteria outlined in Section 3.4 of the CIA Guidelines;
- Determination of the applicable level of assessment (detailed, standard, or not applicable) for air quality matters, in accordance with Appendix B of the CIA Guidelines;
- Identification of the proposed approach and key uncertainties associated with assessing cumulative impacts; and
- Assessment and evaluation of cumulative impacts, including the recommendation of mitigation and management measures, where appropriate, to minimise the Proposal's contribution to those impacts.

In consultation with NSW EPA, one additional data centre was identified for consideration in the cumulative impact assessment. While not originally scoped, their potential for concurrent emissions was assessed qualitatively in accordance with the CIA Guidelines.

5.2.10. Study Area and Scope

The study area for the CIA assessment aligns with the dispersion modelling domain (refer Appendix C). This approach is consistent with section 2.3 of the CIA Guidelines, which state:

> *"This assessment need only focus on the key matters that are within the immediate geographical area of influence of the project (i.e. within proximity to the project site) and within the relevant strategic context. It is not practical or reasonable to require proponents to assess cumulative impacts for all matters or across large areas."*

The scope of assessment includes:

- Review of the nature and scale of potential air quality impacts anticipated during the Proposal's timeframe, based on publicly available planning documents for relevant future Proposals;
- Evaluation of the potential for cumulative air quality impacts arising from these identified projects in combination with this Proposal, including dust generation and gaseous emissions during construction, and gaseous emissions during operation; and,
- Identification and recommendation of mitigation measures, where necessary.

The assessment of cumulative impacts from this Proposal and other nearby relevant sources is presented in Section 7.4.

6. CONSTRUCTION PHASE RISK ASSESSMENT

Northstar has adapted the methodology from the IAQM construction dust guidance (IAQM, 2024) to assess construction phase risk. This approach employed a six-step process to evaluate the risks associated with dust impact from construction activities (refer Appendix B). It considers receptor sensitivity and potential impact magnitude to identify key control measures, as detailed in Section 5.1.

6.1. Risk (Pre-Mitigation)

Given the sensitivity of the identified receptors is classified as 'medium' for dust soiling, and 'low' for health impacts, and the dust emission magnitudes for the various construction phase activities as presented in Appendix B, the resulting risk of air quality impacts (without mitigation) is as presented in Table 16.

Table 16 Risk of air quality impacts from construction activities

Sensitivity of area	Dust emission magnitude					Preliminary risk				
	Demolition	Earthworks	Construction	Track-out	Const. traffic	Demolition	Earthworks	Construction	Track-out	Const. traffic
Dust soiling										
Medium	N/A	Med.	Large	Large	Large	N/A	Med.	Med.	Med.	Med.
Human health										
Low	N/A	Med.	Large	Large	Large	N/A	Low	Low	Low	Low

Note: Med. = Medium, N/A = Not Applicable

The risks summarised in Table 16 show that there are medium risks of dust soiling and low risks of human health impacts associated with all proposed construction phase activities if no mitigation measures were to be applied to control emissions associated with construction-phase activities.

6.2. Risk (Post-Mitigation)

The adapted methodology emphasises the aim of preventing significant effects on receptors during construction activities through the implementation of effective mitigation measures. Experience demonstrates that achieving this goal is feasible. Considering the size of the Proposal site, the distance to sensitive receptors, and the nature of activities involved, residual impacts related to fugitive dust emissions from the Proposal are expected to be 'negligible' if the mitigation measures outlined in Appendix B are implemented appropriately.

7. OPERATIONAL PHASE IMPACT ASSESSMENT

This section presents the results of the dispersion modelling assessment and uses the following terminology:

- **Incremental impact** – relates to the concentrations predicted as a result of the construction and operation of the Proposal in isolation.
- **Cumulative impact** – relates to the incremental concentrations predicted as a result of the operation of the Proposal PLUS the background air quality concentrations discussed in Section 4.4.

The results are presented in this manner to allow examination of the likely impact of the facility in isolation and the contribution to air quality impacts in a broader sense.

In the presentation of results, the tables included shaded cells which represent the following:

Model prediction	**Pollutant concentration / deposition rate less than the relevant criterion**	**Pollutant concentration / deposition rate equal to, or greater than the relevant criterion**

Details of each scenario under each modelled scenario are provided in Section 5.2.2.

It is noted that given the high number of identified sensitive receptors, the results for the 20 receptors with highest concentrations predicted have been presented in this section. The full results for all receptors have been presented in Appendix F.

7.1. Scenario 1 - Justified Worst-Case

The following presents the results of the modelling assessment under the assumptions of Scenario 1 (refer Section 5.2.2).

Note: Care must be applied when assessing 24-hour average impacts as the likely duration of a power outage event is likely to be significantly less than 24-hours, and as such the assessment should be considered to be highly conservative (i.e. relevant to the operation of emergency standby generators for an entire 24-hour period). The assessment against annual average criteria is essentially meaningless, given that the generators would only be operational for a small number of hours, during the justified worst-case scenario. Operation of those generators over an entire year would not occur.

Assessment of potential impacts against annual average criteria is presented under Scenario 2 (realistic operations).

7.1.1. Particulate Matter

Results are presented in this section for the predictions of particulate matter (PM_{10}, and $PM_{2.5}$) associated with Scenario 1. The averaging periods associated with the criteria for these pollutants is 24-hour as specified in Table 7. The emissions adopted for Scenario 1 reflect the operational profile of the Proposal over that averaging period (refer Section 5.2.2).

7.1.1.1. Maximum 24-Hour PM_{10} and $PM_{2.5}$ concentrations

Table 17 presents the maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations predicted to occur at the top 20 most impacted receptors, as a result of the assumptions under Scenario 1. No background concentrations are included within this table. A summary of the maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations predicted at all identified receptor locations is provided in Appendix F.

Table 17 Predicted maximum incremental 24-hour PM_{10} and $PM_{2.5}$ concentrations – Scenario 1

Receptor	Maximum 24-hour average concentration ($\mu g \cdot m^{-3}$)	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max. % of criterion	182.5	364.9
R5	91.2	91.2
R6	84.7	84.7
R9	69.7	69.7
R4	66.5	66.5
R3	58.5	58.5
R18	56.4	56.4
R27	56.2	56.2
R7	54.9	54.9
R19	51.1	51.1
R24	50.4	50.4
R29	49.5	49.5
R23	48.4	48.4
R10	46.3	46.3
R2	44.4	44.4
R22	43.7	43.7
R8	40.0	40.0
R33	37.8	37.8
R34	36.8	36.8
R20	36.7	36.7
R12	36.6	36.6

Note: all PM is assumed to be <1 μg in diameter, and therefore assessed as $PM_{2.5}$. In this instance, emissions of $PM_{2.5}$ will be the same as PM_{10} ($PM_{2.5}$ is a subset of PM_{10}) and therefore the results will be consistent between PM_{10} and $PM_{2.5}$.

Table 17 indicates that the highest 24-hour average PM_{10} and $PM_{2.5}$ incremental concentrations related to the Proposal are predicted at receptor R5.

A contemporaneous analysis of the 24-hour PM_{10} and $PM_{2.5}$ data has been performed where each predicted incremental concentration is added to the corresponding monitored background concentration, in accordance with Section 11.2.3(b) of the Approved Methods.

Table 18 and Table 19 present the predicted maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations resulting from the operation of the Proposal through Scenario 1, with the corresponding background included for each day.

Results are presented in Table 18 and Table 19 for those receptors at which the greatest impacts have been predicted (see Table 17).

The left side of the tables show the predicted maximum cumulative impacts (typically the days with the highest regional background), and the right side shows the total predicted concentration on days with the highest predicted incremental concentrations respectively.

For both PM_{10} and $PM_{2.5}$ the maximum cumulative impact (the left-hand side of Table 18 and Table 19) and the maximum incremental impact (the right-hand side of Table 18 and Table 19) are both predicted at receptor R5. Table 18 and Table 19 shows that the highest cumulative impacts are due to high incremental PM_{10} concentrations, with exceedances of the 24-hour PM_{10} and $PM_{2.5}$ criteria predicted under Scenario 1.

Contour plots of the predicted incremental 24-hour PM_{10} concentrations associated with the Proposal are presented in Figure 9 to allow examination of the distribution of particulate matter in the area surrounding the Proposal.

The number of additional exceedances of the 24-hour PM_{10} and $PM_{2.5}$ criteria predicted at various receptors resulting from emergency generator operation is presented in Section 7.1.4.

Further analysis and interpretation of the predicted results are discussed in Section 8.2.

Table 18 Summary of contemporaneous 24-hour PM_{10} concentrations – Scenario 1

Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$) – Receptor R5			Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$) – Receptor R5		
	Incr.	Bkg.	Cumul.		Incr.	Bkg.	Cumul.
17/07/2021	88.6	10.1	98.7	13/11/2021	91.2	4.5	95.7
16/07/2021	88.4	8.2	96.6	17/07/2021	88.6	10.1	98.7
13/11/2021	91.2	4.5	95.7	16/07/2021	88.4	8.2	96.6
25/07/2021	85.7	6.7	92.4	25/07/2021	85.7	6.7	92.4
12/11/2021	81.9	8.4	90.3	12/11/2021	81.9	8.4	90.3
15/10/2021	75.5	11.3	86.8	15/10/2021	75.5	11.3	86.8
18/09/2021	63.7	14.0	77.7	14/11/2021	70.6	6.5	77.1
14/11/2021	70.6	6.5	77.1	9/06/2021	65.7	3.0	68.7
22/04/2021	54.3	18.9	73.2	18/09/2021	63.7	14.0	77.7
19/09/2021	58.8	12.0	70.8	17/06/2021	61.6	4.9	66.5
These data represent the highest Cumulative Impact 24-hour PM_{10} predictions (outlined in red) as a result of the operation of the Proposal				These data represent the highest Incremental Impact 24-hour PM_{10} predictions (outlined in blue) as a result of the operation of the Proposal.			

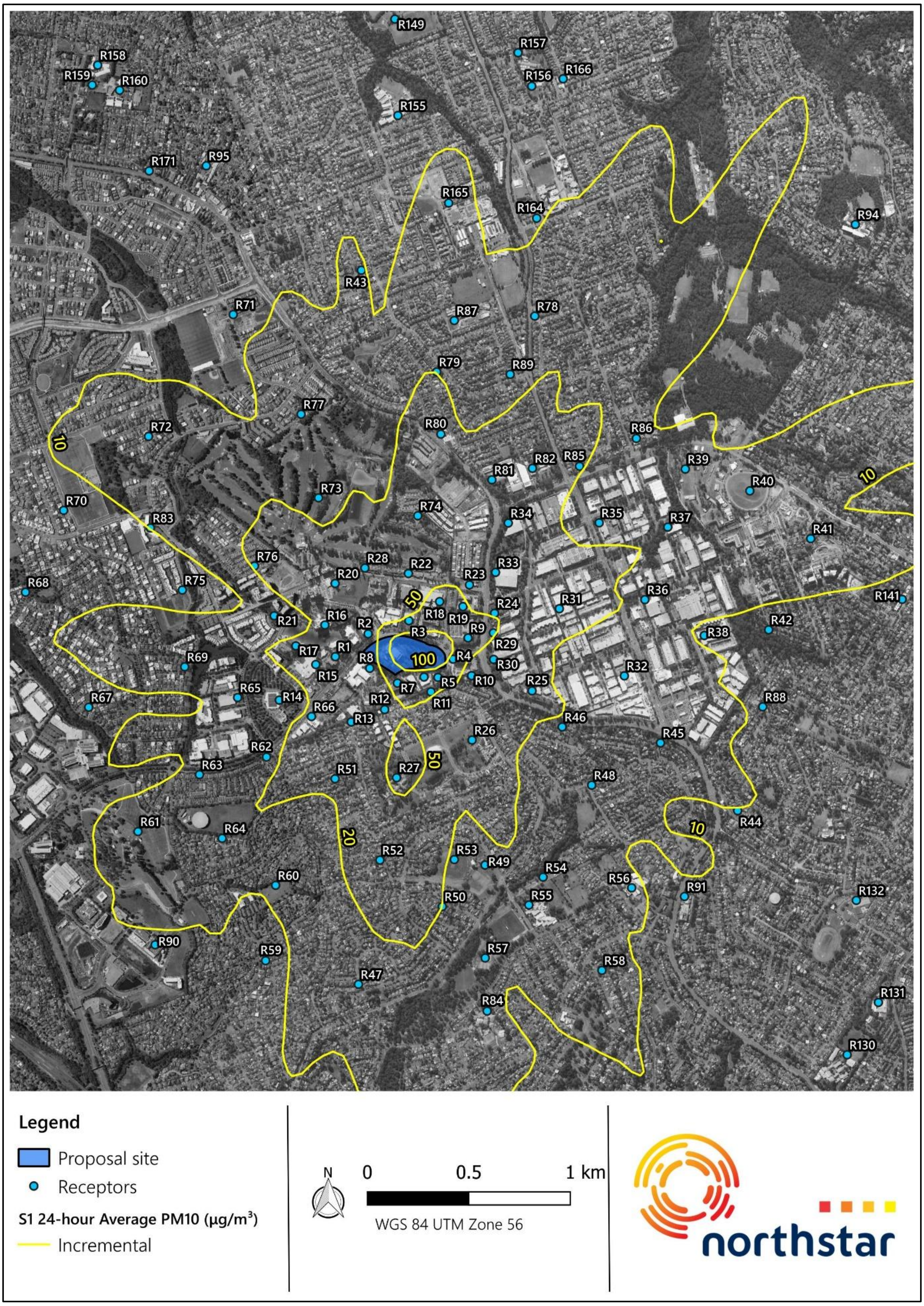
Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Table 19 Summary of contemporaneous 24-hour $PM_{2.5}$ concentrations – Scenario 1

Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$) – Receptor R5			Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$) – Receptor R5		
	Incr.	Bkg.	Cumul.		Incr.	Bkg.	Cumul.
13/11/2021	91.2	1.7	92.9	13/11/2021	91.2	1.7	92.9
17/07/2021	88.6	2.2	90.8	17/07/2021	88.6	2.2	90.8
16/07/2021	88.4	2.0	90.4	16/07/2021	88.4	2.0	90.4
25/07/2021	85.7	1.7	87.4	25/07/2021	85.7	1.7	87.4
12/11/2021	81.9	2.2	84.1	12/11/2021	81.9	2.2	84.1
15/10/2021	75.5	1.3	76.8	15/10/2021	75.5	1.3	76.8
14/11/2021	70.6	2.0	72.6	14/11/2021	70.6	2.0	72.6
18/09/2021	63.7	3.7	67.4	9/06/2021	65.7	1.3	67.0
9/06/2021	65.7	1.3	67.0	18/09/2021	63.7	3.7	67.4
19/09/2021	58.8	4.9	63.7	17/06/2021	61.6	0.5	62.1
These data represent the highest Cumulative Impact 24-hour $PM_{2.5}$ predictions (outlined in red) as a result of the operation of the Proposal.				These data represent the highest Incremental Impact 24-hour $PM_{2.5}$ predictions (outlined in blue) as a result of the operation of the Proposal.			

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Figure 9 Predicted maximum incremental 24-hour PM_{10} impacts – Scenario 1



Source: Northstar

7.1.2. Nitrogen Dioxide

Results are presented in this section for the predictions of nitrogen dioxide (NO_2) under the assumptions of Scenario 1 (refer Section 5.2.2). The averaging period associated with the criterion for NO_2 is 1-hour as specified in Table 7. Note that impacts have not been compared with the annual average criterion for NO_2 as the generators would not be operating for an entire year, and the results would be meaningless.

Emissions of NO_X have been calculated with subsequent ground-level concentrations predicted using dispersion modelling techniques. Given that NO_X is a mixture of NO_2 and nitric oxide (NO), conversion of NO_X predictions to NO_2 concentrations may be performed. Within this assessment, the Janssen method (Method 3) has been adopted as outlined in Section 5.2.6.

The predicted maximum 1-hour average NO_2 concentrations resulting from the Proposal operations under Scenario 1 at the top 20 worst-case receptors are presented in Table 20. A summary of the 1-hour average NO_2 concentrations predicted at all identified receptors is presented in Appendix F.

The results indicate that predicted incremental and cumulative concentrations of NO_2 under Scenario 1 exceed the criteria at most surrounding receptor locations (refer Appendix F).

A contour plot of the predicted maximum 1-hour incremental NO_2 impact is presented in Figure 10.

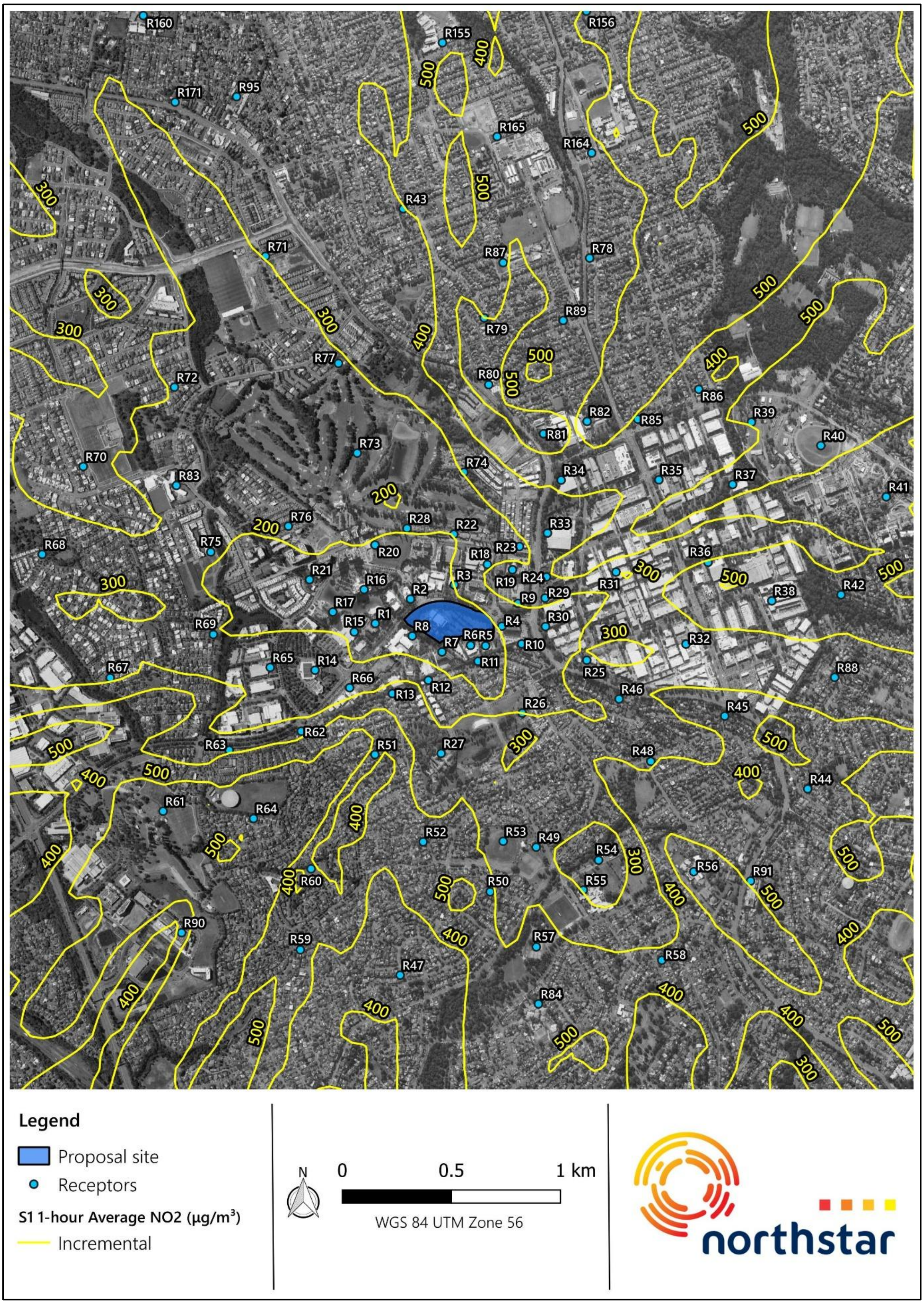
Table 20 Predicted 1-hour NO_2 concentrations – Scenario 1

Receptor	Nitrogen dioxide (NO_2) concentration ($\mu g \cdot m^{-3}$)		
	1-hour average		
	Incr.	Bkg.	Cumul.
Criterion	164		
Max % of criterion	457.7	17.5	460.2
R145	750.6	4.1	754.7
R61	683.1	2.1	685.2
R147	657.2	4.1	661.3
R40	644.7	6.2	650.9
R144	621.9	<0.1	621.9
R143	599.8	<0.1	599.9
R140	595.6	2.1	597.6
R56	594.2	2.1	596.2
R37	563.2	6.2	569.4
R135	566.5	2.1	568.5
R141	560.1	4.1	564.2
R92	561.5	<0.1	561.5
R82	542.8	4.1	546.9
R39	531.0	12.3	543.3
R63	532.7	6.2	538.8

Receptor	Nitrogen dioxide (NO_2) concentration ($\mu g \cdot m^{-3}$)		
	1-hour average		
	Incr.	Bkg.	Cumul.
R52	531.5	6.2	537.7
R64	529.4	6.2	535.5
R81	522.8	10.3	533.0
R27	523.2	6.2	529.4
R94	518.3	6.2	524.4

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Figure 10 Predicted maximum incremental 1-hour NO_2 impacts – Scenario 1



Source: Northstar

7.1.3. All Other Pollutants

The following presents the predicted ground level concentrations associated with Scenario 1 for all other pollutants assessed in this AQIA (refer Section 5.2.2). Presented in Table 21 to Table 23 are the predicted concentrations of CO, SO_2, PAHs, VOCs and formaldehyde at varying averaging periods (≤ 24 hours) at the top 20 most impacted surrounding receptors. A summary of the predicted results at all receptor locations is provided in Appendix F.

Note: care must be applied when assessing 24-hour average impacts as the likely duration of a power outage event is likely to be significantly less than 24-hours, and as such the assessment should be considered to be highly conservative (i.e. relevant to the operation of the emergency standby generators for an entire 24-hour period).

The predicted cumulative concentrations for CO are significantly below the relevant criteria for all averaging periods at all receptors as shown in Table 21.

The results presented in Table 22 indicate that predicted incremental impacts of SO_2 at all receptors are below the relevant criteria for all averaging periods. The addition of background concentrations does not result in any exceedances at any receptor.

Results presented in Table 23 show no exceedances of the 1-hour criteria for benzene are predicted at any identified receptors. The maximum predicted impact for benzene is experienced at receptor R5 (7.3 % of the relevant criterion).

A contour plot of the predicted 99.9th percentile 1-hour incremental benzene impact under Scenario 1 is presented in Figure 11.

Table 21 Predicted 15-minutes, 1-hour and 8-hour average CO concentrations – Scenario 1

Receptor	Carbon monoxide (CO) concentration ($mg{\cdot}m^{-3}$)								
	15-minute			1-hour			8-hour		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
Criterion	100			30			10		
Max. % of criterion	5.9	2.5	8.4	14.9	6.3	21.2	23.5	19.0	42.5
R5	5.9	2.5	8.4	4.5	1.9	6.4	2.3	1.9	4.2
R4	4.6	2.5	7.1	3.5	1.9	5.4	1.4	1.9	3.3
R6	3.9	2.5	6.4	3.0	1.9	4.9	1.9	1.9	3.8
R9	3.9	2.5	6.4	3.0	1.9	4.9	1.3	1.9	3.2
R3	3.6	2.5	6.1	2.7	1.9	4.6	1.4	1.9	3.3
R7	3.6	2.5	6.1	2.7	1.9	4.6	1.0	1.9	2.9
R8	3.2	2.5	5.7	2.4	1.9	4.3	1.0	1.9	2.9
R18	2.9	2.5	5.4	2.2	1.9	4.1	1.0	1.9	2.9
R10	2.9	2.5	5.4	2.2	1.9	4.1	1.4	1.9	3.3
R19	2.8	2.5	5.3	2.1	1.9	4.0	1.1	1.9	3.0
R29	2.5	2.5	5.0	1.9	1.9	3.8	1.2	1.9	3.1
R30	2.4	2.5	4.9	1.8	1.9	3.7	0.8	1.9	2.7
R2	2.3	2.5	4.8	1.7	1.9	3.6	0.9	1.9	2.8
R11	2.2	2.5	4.7	1.7	1.9	3.6	1.0	1.9	2.9
R24	2.2	2.5	4.7	1.6	1.9	3.5	1.0	1.9	2.9
R23	2.0	2.5	4.5	1.5	1.9	3.4	1.1	1.9	3.0
R27	1.8	2.5	4.3	1.4	1.9	3.3	1.2	1.9	3.1
R26	1.8	2.5	4.3	1.3	1.9	3.2	1.2	1.9	3.1
R33	1.8	2.5	4.3	1.3	1.9	3.2	1.0	1.9	2.9
R25	1.7	2.5	4.2	1.3	1.9	3.2	1.0	1.9	2.9

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Table 22 Predicted 1-hour and 24-hour SO_2 concentrations – Scenario 1

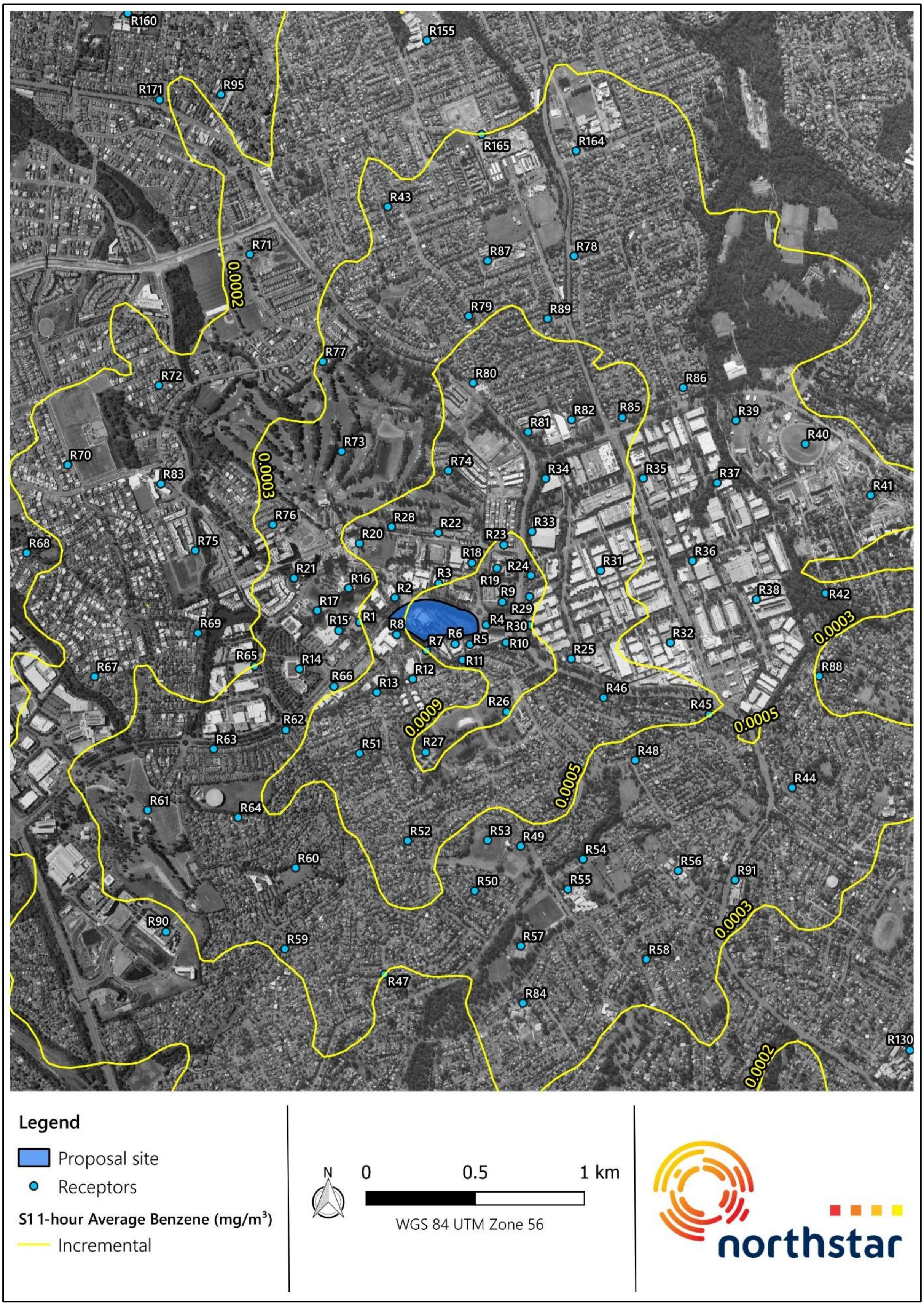
Receptor	Sulphur dioxide (SO_2) concentration ($\mu g{\cdot}m^{-3}$)					
	1-hour			24-hour		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
Criterion	215			57		
Max. % of criterion	7.3	24.0	31.2	7.4	13.9	21.2
R5	15.6	51.5	67.1	2.8	7.9	10.7
R4	12.2	51.5	63.7	4.0	7.9	11.9
R6	10.4	51.5	61.9	2.3	7.9	10.2
R9	10.3	51.5	61.8	2.1	7.9	10.0
R3	9.5	51.5	61.0	3.3	7.9	11.2
R7	9.5	51.5	61.0	3.5	7.9	11.4
R8	8.5	51.5	60.0	2.8	7.9	10.7
R18	7.6	51.5	59.1	1.8	7.9	9.7
R10	7.6	51.5	59.1	2.4	7.9	10.3
R19	7.5	51.5	59.0	1.2	7.9	9.1
R29	6.6	51.5	58.1	0.6	7.9	8.5
R30	6.3	51.5	57.8	0.8	7.9	8.7
R2	6.0	51.5	57.5	3.1	7.9	11.0
R11	5.8	51.5	57.3	2.3	7.9	10.2
R24	5.8	51.5	57.3	1.6	7.9	9.5
R23	5.2	51.5	56.7	1.8	7.9	9.7
R27	4.8	51.5	56.3	1.1	7.9	9.0
R26	4.7	51.5	56.2	1.7	7.9	9.6
R33	4.7	51.5	56.2	0.8	7.9	8.7
R25	4.6	51.5	56.1	1.2	7.9	9.1

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Table 23 Predicted incremental 1-hour PAH, benzene, toluene, xylene and formaldehyde concentrations – Scenario 1 (Proposal only)

Receptor	Predicted 1-hour (99.9th %ile) average concentration ($mg{\cdot}m^{-3}$)				
	PAHs	Benzene	Toluene (odour)	Xylene (odour)	Formaldehyde
Criterion	0.0004	0.029	0.36	0.19	0.02
Max. % of criterion	<0.1	7.6	0.2	0.3	1.1
R117	3.27E-08	2.20E-03	7.95E-04	5.54E-04	2.24E-04
R128	2.44E-08	1.64E-03	5.92E-04	4.13E-04	1.67E-04
R106	2.14E-08	1.44E-03	5.19E-04	3.62E-04	1.46E-04
R95	1.70E-08	1.14E-03	4.13E-04	2.88E-04	1.16E-04
R161	1.66E-08	1.12E-03	4.03E-04	2.81E-04	1.13E-04
R2	1.61E-08	1.08E-03	3.91E-04	2.73E-04	1.10E-04
R94	1.46E-08	9.84E-04	3.55E-04	2.47E-04	9.99E-05
R88	1.46E-08	9.83E-04	3.55E-04	2.47E-04	9.98E-05
R92	1.42E-08	9.54E-04	3.44E-04	2.40E-04	9.69E-05
R83	1.41E-08	9.48E-04	3.42E-04	2.39E-04	9.63E-05
R89	1.37E-08	9.20E-04	3.32E-04	2.31E-04	9.34E-05
R96	1.34E-08	9.00E-04	3.25E-04	2.26E-04	9.14E-05
R91	1.33E-08	8.96E-04	3.23E-04	2.25E-04	9.10E-05
R82	1.32E-08	8.92E-04	3.22E-04	2.24E-04	9.06E-05
R139	1.32E-08	8.91E-04	3.22E-04	2.24E-04	9.05E-05
R13	1.27E-08	8.59E-04	3.10E-04	2.16E-04	8.72E-05
R99	1.25E-08	8.42E-04	3.04E-04	2.12E-04	8.55E-05
R152	1.23E-08	8.27E-04	2.99E-04	2.08E-04	8.40E-05
R90	1.18E-08	7.95E-04	2.87E-04	2.00E-04	8.08E-05
R100	1.16E-08	7.81E-04	2.82E-04	1.96E-04	7.93E-05

Figure 11 Predicted 99.9th percentile incremental 1-hour benzene impacts – Scenario 1



Source: Northstar

7.1.4. Assessment of Criteria Exceedances

Presented in Table 24 and Table 25 is a summary of the number of additional exceedances of the short-term NO_2 criteria and particulate matter (PM_{10} and $PM_{2.5}$) criteria respectively, predicted under Scenario 1 (justified worst case), and those values presented as a probability (*p*) (*p*=0 being impossible, *p*=1 being certain). These values are discussed further in Section 8.2.

Table 24 Assessment of the number of additional NO_2 exceedances

Receptor	Number of additional exceedances of the criterion (no.)	Probability that an exceedance is predicted in one year (*p*)
	1- hour NO_2	1- hour NO_2
R6	428	0.0489
R7	401	0.0458
R5	265	0.0303
R4	243	0.0277
R3	242	0.0276
R27	239	0.0273
R18	230	0.0263
R9	225	0.0257
R23	216	0.0247
R19	216	0.0247
R2	215	0.0245
R12	205	0.0234
R22	203	0.0232
R11	203	0.0232
R8	202	0.0231
R29	194	0.0221
R10	190	0.0217
R20	185	0.0211
R26	182	0.0208
R24	182	0.0208

Table 25 Assessment of the number of additional particulate matter exceedances

Receptor	Number of additional exceedances of the criterion (no.)		Probability that an exceedance is predicted in one year (p)	
	24-hour PM_{10}	24-hour $PM_{2.5}$	24-hour PM_{10}	24-hour $PM_{2.5}$
R32	74	137	0.2027	0.3753
R33	59	125	0.1616	0.3425
R53	54	81	0.1479	0.2219
R85	34	71	0.0932	0.1945
R137	28	76	0.0767	0.2082
R146	25	70	0.0685	0.1918
R151	24	61	0.0658	0.1671
R171	24	57	0.0658	0.1562
R107	16	53	0.0438	0.1452
R130	13	46	0.0356	0.1260
R42	12	38	0.0329	0.1041
R69	11	84	0.0301	0.2301
R79	10	35	0.0274	0.0959
R114	9	53	0.0247	0.1452
R161	9	51	0.0247	0.1397
R133	9	35	0.0247	0.0959
R168	8	41	0.0219	0.1123
R20	7	20	0.0192	0.0548
R15	7	37	0.0192	0.1014
R96	5	21	0.0137	0.0575

Note: care must be applied when assessing 24-hour average impacts as the likely duration of a power outage event is likely to be significantly less than 24-hours, and as such the assessment should be considered to be highly conservative (i.e. relevant to the operation of emergency standby generators for an entire 24-hour period).

7.2. Scenario 2 – Maintenance Testing

Presented below are the results of the modelling assessment under the assumptions of Scenario 2 (refer Section 5.2.2) with 1 no. generator at SYD1 Stage 1 and 2 no. generators at SYD1 Stage 2 operating at 100 % load for each testing hour (8:00 am to 6:00 pm). Annual average increments under this scenario have been factored according to the anticipated number of hours of testing each year (refer Section 2.3.2).

7.2.1. Particulate Matter

7.2.1.1. Annual average TSP, PM_{10} and $PM_{2.5}$ concentrations

The predicted annual average particulate matter concentrations (as TSP, PM_{10} and $PM_{2.5}$) resulting from Scenario 2 operations are presented in Table 26. As previously mentioned, the results have been presented for the 20 receptors with the highest concentrations predicted.

Table 26 shows that predicted incremental concentrations of TSP, PM_{10} and $PM_{2.5}$ at all receptor locations are low (less than 0.3 % of the annual average TSP criterion, 1.0 % of the relevant PM_{10} criterion and 3.0 % of the relevant $PM_{2.5}$ criterion).

For clarity, the Proposal operation under the testing regime is predicted to not result in any exceedances of the relevant criteria.

Table 26 Predicted annual average TSP, PM_{10} and $PM_{2.5}$ concentrations – Scenario 2

Receptor	Annual average concentration (µg·m^{-3})								
	TSP			PM_{10}			$PM_{2.5}$		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
Criterion	90			25			8		
Max. % of criterion	0.3	34.3	34.5	1.0	60.0	61.0	3.0	73.8	76.7
R7	0.2	30.8	31.1	0.2	15.0	15.2	0.2	5.9	6.1
R3	0.2	30.8	31.0	0.2	15.0	15.2	0.2	5.9	6.1
R6	0.2	30.8	31.0	0.2	15.0	15.2	0.2	5.9	6.1
R8	0.1	30.8	31.0	0.1	15.0	15.1	0.1	5.9	6.0
R12	0.1	30.8	31.0	0.1	15.0	15.1	0.1	5.9	6.0
R11	0.1	30.8	30.9	0.1	15.0	15.1	0.1	5.9	6.0
R2	0.1	30.8	30.9	0.1	15.0	15.1	0.1	5.9	6.0
R18	<0.1	30.8	30.9	<0.1	15.0	15.1	<0.1	5.9	6.0
R4	<0.1	30.8	30.9	<0.1	15.0	15.1	<0.1	5.9	6.0
R9	<0.1	30.8	30.9	<0.1	15.0	15.1	<0.1	5.9	6.0
R22	<0.1	30.8	30.9	<0.1	15.0	15.1	<0.1	5.9	6.0
R5	<0.1	30.8	30.9	<0.1	15.0	15.1	<0.1	5.9	6.0
R13	<0.1	30.8	30.9	<0.1	15.0	15.1	<0.1	5.9	6.0

Receptor	Annual average concentration ($\mu g \cdot m^{-3}$)								
	TSP			PM_{10}			$PM_{2.5}$		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
R19	<0.1	30.8	30.9	<0.1	15.0	15.1	<0.1	5.9	6.0
R10	<0.1	30.8	30.9	<0.1	15.0	15.1	<0.1	5.9	6.0
R29	<0.1	30.8	30.9	<0.1	15.0	15.1	<0.1	5.9	6.0
R28	<0.1	30.8	30.9	<0.1	15.0	15.1	<0.1	5.9	6.0
R27	<0.1	30.8	30.9	<0.1	15.0	15.1	<0.1	5.9	6.0
R23	<0.1	30.8	30.9	<0.1	15.0	15.1	<0.1	5.9	6.0
R24	<0.1	30.8	30.9	<0.1	15.0	15.1	<0.1	5.9	6.0

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

7.2.1.2. Maximum 24-hour PM_{10} and $PM_{2.5}$ concentrations

Table 27 presents the maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations predicted to occur at the 20 receptors with the highest concentrations, as a result of the Proposal operations under Scenario 2. No background concentrations are included within this table.

Table 27 Predicted maximum incremental 24-hour PM_{10} and $PM_{2.5}$ concentrations – Scenario 2

Receptor	Maximum 24-hour average concentration ($\mu g \cdot m^{-3}$)	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max. % of criterion	3.0	6.0
R7	1.5	1.5
R6	1.3	1.3
R3	1.0	1.0
R8	0.9	0.9
R4	0.8	0.8
R2	0.8	0.8
R12	0.8	0.8
R11	0.7	0.7
R9	0.6	0.6
R18	0.6	0.6
R5	0.6	0.6
R19	0.6	0.6
R1	0.6	0.6
R10	0.6	0.6
R22	0.5	0.5
R13	0.5	0.5
R24	0.5	0.5
R27	0.5	0.5
R29	0.5	0.5

Receptor	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
R23	0.5	0.5

Note: all PM is assumed to be <1 µg in diameter, and therefore assessed as $PM_{2.5}$. In this instance, emissions of $PM_{2.5}$ will be the same as PM_{10} ($PM_{2.5}$ is a subset of PM_{10}) and therefore the results will be consistent between PM_{10} and $PM_{2.5}$.

Table 27 indicates that the highest 24-hour average PM_{10} and $PM_{2.5}$ incremental concentrations related to the Proposal are predicted at receptor R7.

As per Scenario 1, a contemporaneous analysis of the 24-hour PM_{10} and $PM_{2.5}$ data has been performed. Table 28 and Table 29 present the predicted maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations resulting from the operation of the Proposal through Scenario 2, with the corresponding background included for each day. Results are presented in Table 28 and Table 29 for those receptors at which the greatest impacts have been predicted (refer Table 27).

For PM_{10} the maximum cumulative impact (the left-hand side of Table 28) and the maximum incremental impact (the right-hand side of Table 28) are predicted at receptor R3 and R7 respectively. For $PM_{2.5}$, the maximum cumulative impact (the left-hand side of Table 29) and the maximum incremental impact (the right-hand side of Table 29) are predicted at receptor R6 and R7 respectively. Cumulative impacts are primarily due to high background PM_{10} and $PM_{2.5}$ levels, and no additional exceedances of the corresponding 24-hour average criteria are predicted under Scenario 2.

Contour plots of the predicted incremental 24-hour PM_{10} concentrations associated with the Proposal under Scenario 2 are presented in Figure 12 to allow examination of the distribution of particulate matter in the area surrounding the Proposal site.

Table 28 Summary of contemporaneous 24-hour PM_{10} concentrations – Scenario 2

Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$) – Receptor R3			Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$) – Receptor R7		
	Incr.	Bkg.	Cumul.		Incr.	Bkg.	Cumul.
09-03-21	0.4	51.6	52.0	03-01-21	1.5	11.8	13.3
05-03-21	0.5	45.1	45.6	02-11-21	1.5	16.9	18.4
21-08-21	<0.1	43.5	43.6	13-10-21	1.5	9.5	11.0
02-03-21	0.5	40.6	41.1	20-02-21	1.5	13.9	15.4
04-05-21	0.2	37.5	37.7	30-11-21	1.4	16.7	18.1
19-01-21	0.8	36.1	36.9	06-12-21	1.4	15.4	16.8
10-10-21	0.3	33.6	33.9	17-11-21	1.3	18.3	19.6
29-10-21	<0.1	33.7	33.8	24-11-21	1.2	14.9	16.1
10-03-21	0.2	31.7	31.9	01-12-21	1.2	8.7	9.9
23-01-21	<0.1	30.6	30.7	23-11-21	1.2	11.0	12.2
These data represent the highest Cumulative Impact 24-hour PM_{10} predictions (outlined in red) as a result of the operation of the Proposal				These data represent the highest Incremental Impact 24-hour PM_{10} predictions (outlined in blue) as a result of the operation of the Proposal.			

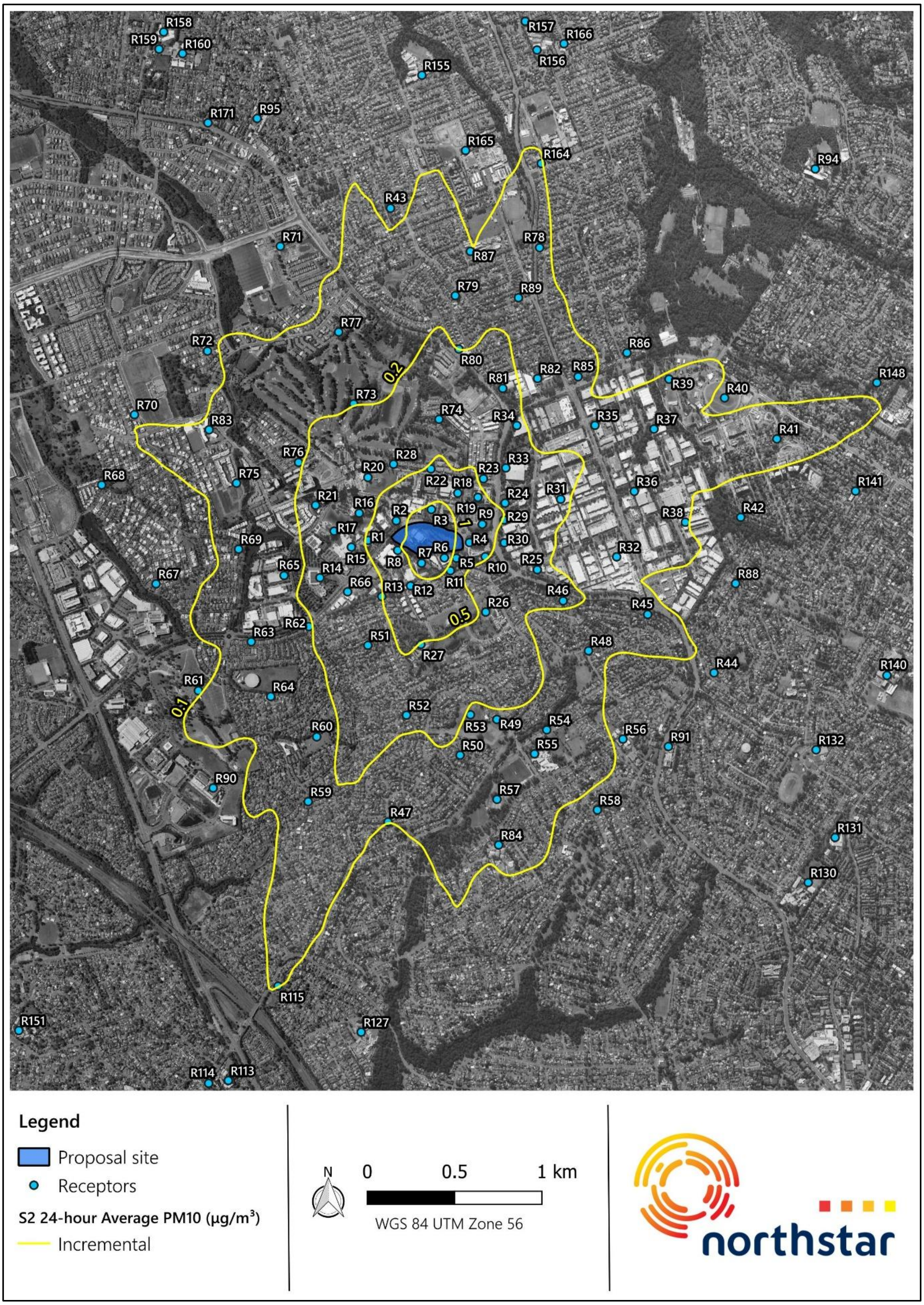
Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Table 29 Summary of contemporaneous 24-hour $PM_{2.5}$ concentrations – Scenario 2

Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$) – Receptor R6			Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$) – Receptor R7		
	Incr.	Bkg.	Cumul.		Incr.	Bkg.	Cumul.
21-08-21	0.4	40.5	40.9	03-01-21	1.5	4.3	5.8
04-05-21	0.1	28.8	28.9	02-11-21	1.5	3.7	5.2
15-08-21	0.1	27.1	27.2	13-10-21	1.5	2.2	3.7
10-10-21	<0.1	26.8	26.9	20-02-21	1.5	1.9	3.4
14-08-21	0.3	18.9	19.2	30-11-21	1.4	6.4	7.8
22-08-21	0.5	17.3	17.8	06-12-21	1.4	4.3	5.7
29-04-21	0.4	17.2	17.6	17-11-21	1.3	5.4	6.7
08-07-21	0.2	17.1	17.3	24-11-21	1.2	6.1	7.3
09-07-21	<0.1	17.0	17.1	01-12-21	1.2	2.1	3.3
29-08-21	0.3	16.7	17.0	23-11-21	1.2	4.9	6.1
These data represent the highest Cumulative Impact 24-hour $PM_{2.5}$ predictions (outlined in red) as a result of the operation of the Proposal.				These data represent the highest Incremental Impact 24-hour $PM_{2.5}$ predictions (outlined in blue) as a result of the operation of the Proposal.			

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Figure 12 Predicted maximum incremental 24-hour PM_{10} impacts – Scenario 2



Source: Northstar

7.2.2. Nitrogen Dioxide

Results are presented in this section for the predictions of nitrogen dioxide (NO_2) under Scenario 2 for the 20 receptors with the highest concentrations. The averaging periods associated with the criteria for these pollutants is 1-hour and an annual average, as specified in Table 7.

The predicted maximum 1-hour and annual average NO_2 concentrations resulting from the assumptions under Scenario 2 are presented in Table 30. The results indicate that predicted incremental and cumulative NO_2 concentrations are below the criteria at all surrounding receptor locations.

The performance of the Proposal under Scenario 2 does not result in any exceedances of the criteria for NO_2.

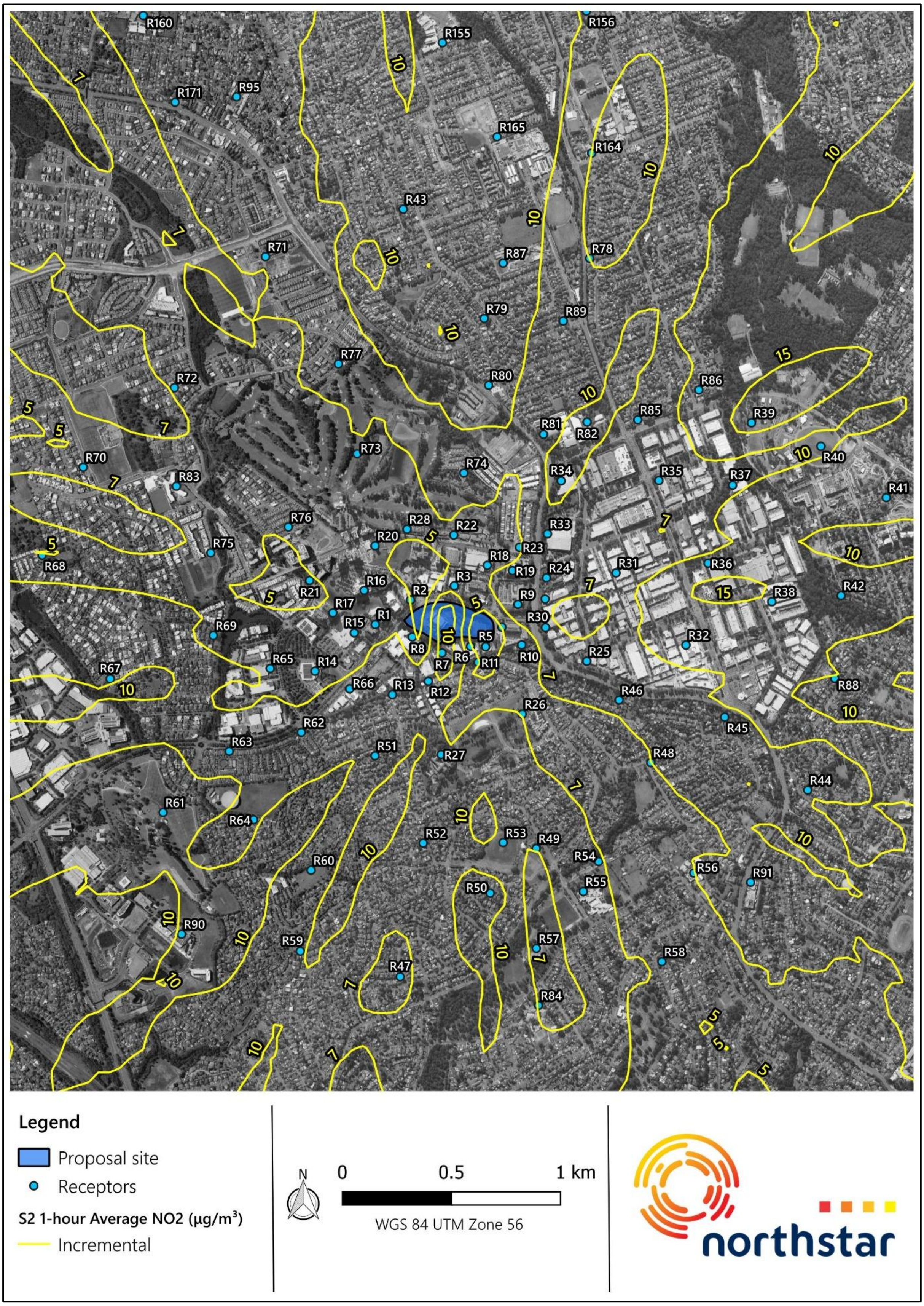
A contour plot of the predicted maximum 1-hour incremental NO_2 impact is presented in Figure 13.

Table 30 Predicted 1-hour and annual average NO_2 concentrations – Scenario 2

Receptor	Nitrogen dioxide (NO_2) concentration ($\mu g \cdot m^{-3}$)					
	1-hour average			Annual average		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
Criterion	164			31		
Max % of crit.	11.7	26.3	30.6	1.1	31.6	32.7
R65	7.1	43.1	50.1	<0.1	9.8	<9.9
R167	9.3	32.8	42.1	<0.1	9.8	<9.9
R109	8.6	32.8	41.4	<0.1	9.8	<9.9
R162	8.2	32.8	41.0	<0.1	9.8	<9.9
R169	9.4	22.6	32.0	<0.1	9.8	<9.9
R75	6.5	24.6	31.1	<0.1	9.8	<9.9
R115	8.5	22.6	31.1	<0.1	9.8	<9.9
R83	5.8	24.6	30.4	<0.1	9.8	<9.9
R70	5.3	24.6	29.9	<0.1	9.8	<9.9
R49	7.1	22.6	29.6	0.1	9.8	9.9
R39	16.8	12.3	29.1	<0.1	9.8	<9.9
R14	6.1	22.6	28.7	0.1	9.8	9.9
R32	11.8	16.4	28.2	<0.1	9.8	<9.9
R38	14.5	12.3	26.8	<0.1	9.8	<9.9
R164	10.2	16.4	26.6	<0.1	9.8	<9.9
R78	10.2	16.4	26.6	<0.1	9.8	<9.9
R88	10.1	16.4	26.5	<0.1	9.8	<9.9
R166	8.5	16.4	24.9	<0.1	9.8	<9.9
R42	12.3	12.3	24.6	<0.1	9.8	<9.9
R36	12.3	12.3	24.6	<0.1	9.8	<9.9

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Figure 13 Predicted maximum incremental 1-hour NO_2 impacts – Scenario 2



Source: Northstar

7.2.3. All Other Pollutants

The predicted ground level concentrations for Scenario 2, including CO, SO_2, PAHs, VOCs and formaldehyde at various averaging periods, are presented in Table 31 to Table 33 for the 20 receptors with the highest concentrations predicted.

The predicted incremental concentrations for all of the abovementioned pollutants are below the relevant criteria for all averaging periods at all receptors.

A contour plot of the predicted 99.9th percentile 1-hour incremental benzene impact under Scenario 2 is presented in Figure 14.

Table 31 Predicted 15-minute, 1-hour and 8-hour average CO concentrations – Scenario 2

Receptor	Carbon monoxide (CO) concentration (mg·m^{-3})								
	15-minute			1-hour			8-hour		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
Criterion	100			30			10		
Max. % of criterion	0.1	2.5	2.6	0.4	6.3	6.7	0.0	19.0	19.5
R4	0.1	2.5	2.6	0.1	1.9	2.0	<0.1	1.9	2.0
R9	0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R7	0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R3	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R8	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R6	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R5	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R10	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R2	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R19	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R29	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R18	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R24	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R30	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R11	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R31	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R26	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R12	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R33	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R25	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Table 32 Predicted 1-hour and 24-hour SO_2 concentrations – Scenario 2

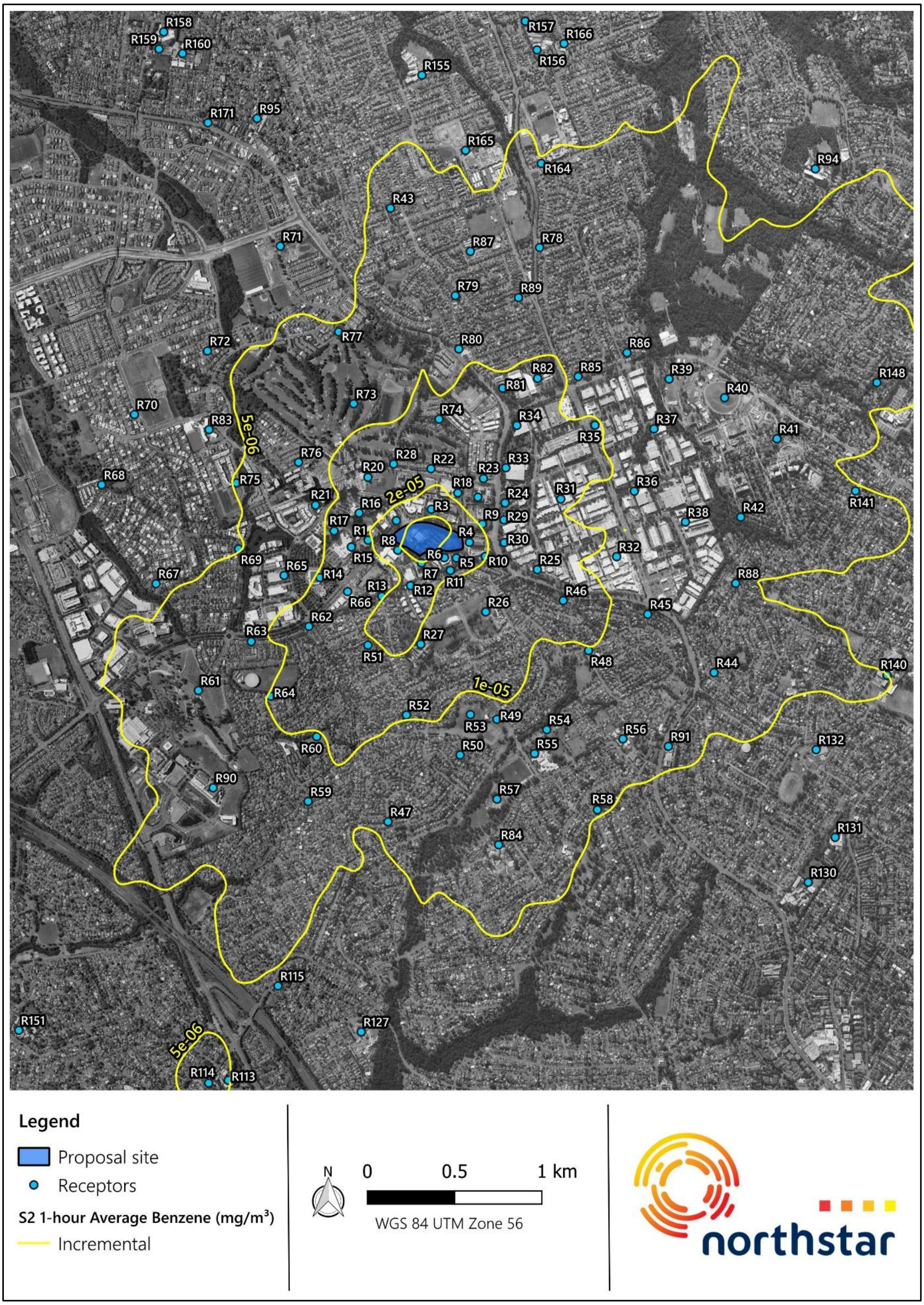
Receptor.	Sulphur dioxide (SO_2) concentration ($\mu g \cdot m^{-3}$)					
	1-hour			24-hour		
	Incr.	Bkg.	Cumul.	Incr.	Bkg.	Cumul.
Criterion	215			57		
Max. % of criterion	0.2	24.0	24.1	0.0	13.9	13.9
R4	0.4	51.5	51.9	<0.1	7.9	8.0
R9	0.3	51.5	51.8	<0.1	7.9	8.0
R7	0.2	51.5	51.7	<0.1	7.9	8.0
R3	0.2	51.5	51.7	<0.1	7.9	8.0
R8	0.2	51.5	51.7	<0.1	7.9	8.0
R6	0.2	51.5	51.7	<0.1	7.9	8.0
R5	0.2	51.5	51.7	<0.1	7.9	8.0
R10	0.2	51.5	51.7	<0.1	7.9	8.0
R2	0.2	51.5	51.7	<0.1	7.9	8.0
R19	0.2	51.5	51.7	<0.1	7.9	8.0
R29	0.2	51.5	51.7	<0.1	7.9	8.0
R18	0.2	51.5	51.7	<0.1	7.9	8.0
R24	0.2	51.5	51.7	<0.1	7.9	8.0
R30	0.2	51.5	51.7	<0.1	7.9	8.0
R11	0.1	51.5	51.6	<0.1	7.9	8.0
R31	0.1	51.5	51.6	<0.1	7.9	8.0
R26	0.1	51.5	51.6	<0.1	7.9	8.0
R12	0.1	51.5	51.6	<0.1	7.9	8.0
R33	0.1	51.5	51.6	<0.1	7.9	8.0
R25	0.1	51.5	51.6	<0.1	7.9	8.0

Notes: Incr. – Incremental, Bkg. – Background, - Cumul. – Cumulative.

Table 33 Predicted incremental 1-hour PAH, benzene, toluene, xylene and formaldehyde concentrations – Scenario 2 (Proposal only)

Receptor	Predicted 1-hour (99.9th %ile) average concentration ($mg \cdot m^{-3}$)				
	PAHs	Benzene	Toluene (odour)	Xylene (odour)	Formaldehyde
Criterion	0.0004	0.029	0.36	0.19	0.02
Max. % of criterion	<0.1	0.2	<0.1	<0.1	<0.1
R7	6.98E-10	4.70E-05	1.70E-05	1.18E-05	4.78E-06
R8	5.20E-10	3.50E-05	1.26E-05	8.81E-06	3.56E-06
R3	5.07E-10	3.42E-05	1.23E-05	8.59E-06	3.47E-06
R6	5.00E-10	3.37E-05	1.22E-05	8.47E-06	3.42E-06
R5	5.00E-10	3.37E-05	1.21E-05	8.47E-06	3.42E-06
R4	4.41E-10	2.97E-05	1.07E-05	7.48E-06	3.02E-06
R2	4.16E-10	2.80E-05	1.01E-05	7.05E-06	2.85E-06
R12	3.54E-10	2.38E-05	8.60E-06	6.00E-06	2.42E-06
R11	3.33E-10	2.24E-05	8.10E-06	5.65E-06	2.28E-06
R10	3.09E-10	2.08E-05	7.51E-06	5.23E-06	2.11E-06
R13	2.83E-10	1.91E-05	6.89E-06	4.80E-06	1.94E-06
R1	2.79E-10	1.88E-05	6.79E-06	4.73E-06	1.91E-06
R51	2.79E-10	1.88E-05	6.78E-06	4.72E-06	1.91E-06
R9	2.71E-10	1.82E-05	6.59E-06	4.59E-06	1.85E-06
R18	2.69E-10	1.82E-05	6.55E-06	4.57E-06	1.84E-06
R24	2.62E-10	1.77E-05	6.38E-06	4.45E-06	1.79E-06
R22	2.59E-10	1.75E-05	6.30E-06	4.39E-06	1.77E-06
R30	2.50E-10	1.68E-05	6.08E-06	4.24E-06	1.71E-06
R19	2.49E-10	1.68E-05	6.05E-06	4.22E-06	1.70E-06
R23	2.45E-10	1.65E-05	5.95E-06	4.15E-06	1.68E-06

Figure 14 Predicted 99.9th percentile incremental 1-hour benzene impacts – Scenario 2



Source: Northstar

7.3. Comparison with POEO (Clean Air) Regulation Standards of Concentrations

Section 3.2 outlines the context of the POEO CAR and the emission standards applicable to activities and plants, categorised as scheduled or non-scheduled under the regulation.

The Proposal is anticipated to include the following relevant characteristics:

- 77 no. standby generators (SYD1 Stage 2);
- A maintenance testing regime totalling less than 200 hours per year; and
- Maximum fuel storage capacity of less than 2 000 tonnes.

Clause 73, Part 5, Division 6 of the POEO CAR exempts emergency electricity generation using stationary reciprocal internal combustion engines from the air impurities standards for nitrogen dioxide (NO_2) and nitric oxide (NO) specified in Schedule 2, Part 2, Division 3, provided the engines operate for no more than 200 hours per year.

Based on the maintenance schedule presented in Section 2 and the anticipated diesel fuel storage capacity (refer Section 2.2) the Proposal site is considered a non-scheduled activity for electricity generation and chemical storage under the POEO Act. Correspondingly, the Proposal must comply with the concentration standards for non-scheduled activities outlined in Schedule 2, Part 3 of the POEO CAR (refer Section 3.2).

Table 34 below compares the emissions from individual data centre generators at the Proposal site against the respective concentration standards.

Table 34 POEO CAR – Standards of concentrations comparison

Air impurity	Standard of concentration ($mg \cdot Nm^{-3}$) (A)	Standby generator emissions ($mg \cdot Nm^{-3}$) (B)	
		Candidate 1: C3750D5	Candidate 2: CAT 3516E
Solid particles (total)	100	2.6 at 100 % load	24.9 at 100 % load

Notes: (A) Standard of emissions concentration under dry, 273 K, 101.3 kPa, 7 % O_2 conditions

(B) The Proposal's generator emissions above are based on the $mg \cdot Nm^{-3}$ generator emission data in Appendix E, assumed as dry, 273 K, 101.3 kPa and 5 % O_2 content, which were then converted into 7 % O_2 content as per the POEO CAR requirements.

Table 34 shows that the respective concentration standards can be met with the use of the standby diesel generators at the Proposal site.

7.4. Cumulative Impact Assessment

Table 35 presents an assessment of potential cumulative air quality impacts arising from the Proposal in combination with other relevant emission sources, as identified in Section 4.6.

The assessment considers cumulative impacts on nearby sensitive receptors during both the construction and operational phases. This includes potential dust soiling and human health effects from overlapping construction activities, as well as operational impacts under grid outage scenarios, where emergency standby generators at the Proposal site and nearby facilities may operate concurrently and during routine maintenance testing, which may also present limited potential for overlap.

While the CIA Guidelines (NSW DPIE, 2022) recommend consideration of all relevant future projects, this assessment adopts a proportionate approach based on the status and likely influence of surrounding data centre developments. Background air quality data has been used to characterise existing ambient conditions, independent of the Proposal. However, given the location of the Rouse Hill AQMS (i.e. ~7 km from the Proposal site (refer Section 4.4), and their separation from identified sources (refer Figure 6), emissions from some nearby operations, particularly those newly approved, under construction, or still in planning may not be fully representative in the adopted background dataset.

Accordingly, one additional data centre is discussed in Table 35. Reference should be made to Section 8.3 which discusses the outcomes of the CIA.

Table 35 Local air pollutant sources with potential for cumulative impacts

Reference / Project	Approx. distance to Proposal site (km)	Project status / indicative timeframe / overlap	Potential overlap between impact of Proposal on assessment matter and impact of other project on the same assessment matter	Potential cumulative risk
VOCUS SYD02 Data Centre 12 Brookhollow Avenue, Norwest	0.05	The Vocus SYD02 data centre is a 6 MW facility, and is located approximately 50 m southeast of the Proposal site boundary (refer Figure 6). It has been operational since 2003.	There is no potential for cumulative air quality impacts during construction, as this development is already constructed and operational.	The Proposal does not result in cumulative air quality impacts during construction.
			There is potential for cumulative operational impacts between this data centre (~6 MW) and the Proposal (~87 MW combined under SYD1 Stages 1 and 2), particularly under emergency conditions. In the event of a widespread grid outage affecting the area, it is likely that both facilities would be impacted simultaneously, triggering concurrent operation of backup generators. Generator testing schedule is unknown, however likely to be between daytime business hours (ie 9:00 am to 5:00 pm). Therefore, there is limited potential for cumulative impacts if testing overlaps with this project's schedule, though this is considered unlikely due to limited duration and staggered operation.	The Proposal may result in significant cumulative air quality impacts. Most likely in winds with south-easterly components, impacting the identified sensitive receptors to the northwest.

8. DISCUSSION AND CONCLUSION

Northstar was engaged by GSDC to perform an AQIA for the proposed construction and operation of a data centre, to be located at 3 Brookhollow Avenue, Norwest 2153.

The assessment evaluates the potential air quality impacts during both construction and operation phases, with a focus on dust soiling and increased ambient PM_{10} (including $PM_{2.5}$) concentrations due to dust arising from construction activities on the Proposal site, and combustion emissions from standby diesel generator engines during operations.

Data provided by the Proponent and publicly available environmental data were used. Operational impacts were evaluated based on a realistic and justified worst case emissions scenarios.

8.1. Construction Phase Risk Assessment

The construction phase risk assessment for the Proposal, presented in Section 6 indicates that dust soiling impacts are associated with low risks for earthworks and medium risks of all other construction phase activities while human health impacts are associated with negligible risks for earthworks and low risks of all other construction phase activities if no mitigation measures were to be applied to control emissions.

Based upon that assessment, a range of mitigation measures are recommended for site communications and management, monitoring, preparing and maintaining the site, vehicle operations, equipment operations, waste management, earthworks, construction and track-out. These mitigation measures are to minimise short-term impacts associated with construction phase activities. A detailed list of these mitigation measures as presented in Appendix B.

8.2. Operational Phase Impact Assessment

The predicted impacts of operational phase activities under a worst-case scenario (Scenario 1) and realistic operational scenario (Scenario 2) are presented in Section 7.

8.2.1. Scenario 1 – Justified Worst-Case

Under the justified worst-case emergency standby generator operational scenario (Scenario 1), a number of additional exceedances of the short-term air quality criteria for NO_2, PM_{10} and $PM_{2.5}$ are predicted.

It is noted that care must be applied when assessing 24-hour average impacts as the likely duration of a power outage event is likely to be significantly less than 24-hours, and as such the assessment should be considered to be highly conservative (i.e. relevant to the operation of the emergency standby generators for an entire 24-hour period).

Scenario 1 assumes that all 87 generators would be operational at one time (77 no. generators at the Proposal and 10 no. generators at SYD1 Stage 1). The predicted incremental concentrations under Scenario 1 show exceedances of particulate matter and NO_2 at sensitive receptor locations if a power outage occurred, and all 87 emergency generators were operating continuously (refer Section 5.2.2) to assess emissions under all potential meteorological conditions.

An assessment of the probability (p) of an exceedance of the relevant short-term criteria has been performed and is presented in Section 7.1. As a maximum across all receptors, the probability of an exceedance of the NO_2, PM_{10} or $PM_{2.5}$ criterion (where p=0 is an impossible event, and p=1 is a certain event) in any year is:

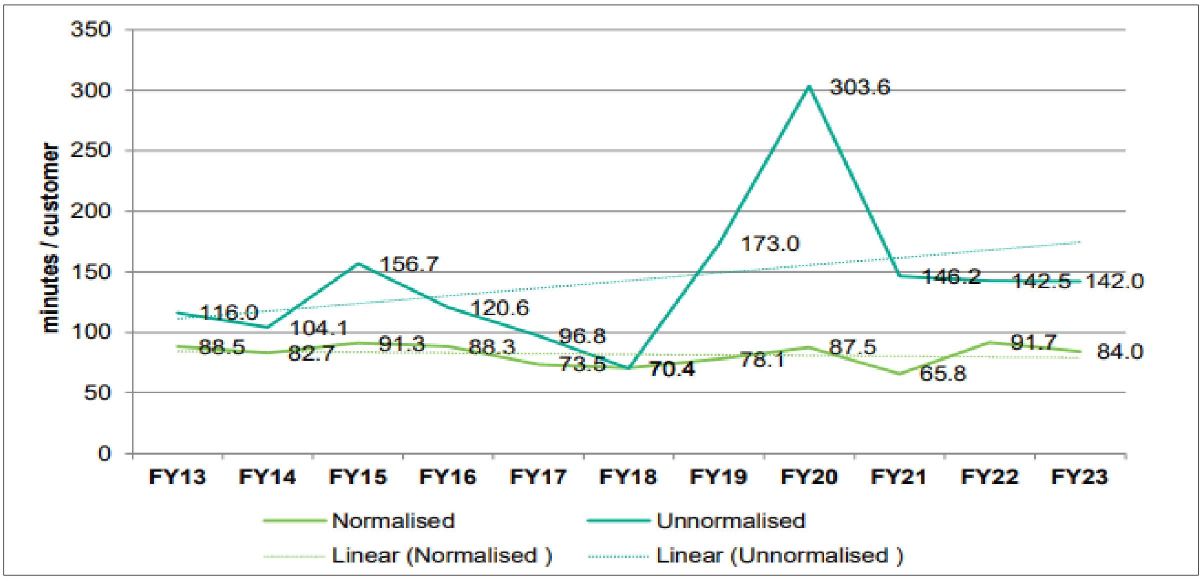
- NO_2: p = 0.0489 (see Table 24);
- PM_{10}: p = 0.2027 (see Table 25); and,
- $PM_{2.5}$: p = 0.3753 (see Table 25).

To predict the likelihood of exceedances under the worst-case scenario (i.e. all 87 generators operating continuously), the reliability of the power network has been considered against the latest information contained in the Endeavour Energy 2024 Distribution Annual Planning Report (DAPR) (Endeavour Energy, 2024).

Based on the DAPR and associated network reliability statistics, the average unplanned outage duration per year per customer from financial-year 2013 to financial-year 2023 equates to approximately 82.0 minutes, although exact duration of power outages requiring standby generators cannot be determined. Correspondingly, the likelihood of power interruptions occurring is approximately 0.016 % of the time per year (82.0 / (8 760 × 60)) or have a probability of p=0.00016.

Figure 15 depicts the normalised (i.e. Major Event Days data excluded) system average interruption duration index (SAIDI, in minutes) and unnormalised (i.e. inclusion of all events) SAIDI trends over an eleven financial-year period from 2013 to 2023.

Figure 15 Endeavour Energy SAIDI Performance Information



Source: (Endeavour Energy, 2023)

The probability of both the interruption to both the power supply and the dual redundant power can be calculated through the multiplication of the probability of each event occurring. Those values are incredibly small and have been placed into context by calculating the percentage chance that the event could occur in a number of years. Table 36 presents the results of those calculations.

Table 36 Chance of an exceedance during a power outage

Number of years	Probability of an additional exceedance of the short-term criterion during a power outage (expressed as %)		
	NO_2	PM_{10}	$PM_{2.5}$
100	0.32%	0.58%	0.08%
200	0.63%	1.16%	0.15%
500	1.57%	2.89%	0.38%
1 000	3.11%	5.69%	0.76%
1 250	3.88%	7.06%	0.95%

8.2.2. Scenario 2 – Maintenance Testing

Predicted incremental concentrations for Scenario 2 show that no exceedances are predicted to occur at all surrounding receptors for all assessed pollutants. Correspondingly, it is anticipated that under operation of the testing schedule, as outlined in Section 2.3.2, that no significant air quality impacts are predicted to be experienced at sensitive receptors during operations.

8.2.3. POEO (Clean Air) Regulation – Standard of Concentrations

Section 7.3 assesses generator emissions against the applicable POEO CAR concentration standards for non-scheduled activities, demonstrating compliance with the total solid particle standards. Although the operations may be exempt from the relevant emission limit regulations for scheduled activities, the Proponent would not be exempt from standards of concentration for non-scheduled premises (refer Section 3.2 and Table 6), and ensuring the emissions do not exceed ambient air quality criteria.

8.2.4. Recommended Mitigation Measures

Based on the findings of the dispersion modelling assessment under Scenario 2, it is considered that the operation of the testing schedule would not result in exceedances being experienced at sensitive receptor locations surrounding the Proposal site.

To ensure air quality impacts experienced at sensitive receptors resulting from the operation of the Proposal site are minimised, maintenance under the testing schedule must be performed as outlined in Section 2.3.2. Operation of the emergency standby generators should be minimised as far as practicably possible.

As part of the operating conditions, the Proponent is required to implement all reasonable and feasible air quality management measures to minimise odour, fume, and dust emissions from the development. To further demonstrate a proactive commitment to addressing any community concerns, a complaints management mechanism is recommended to be established.

All complaints made will be recorded, and a complaint register will be maintained for the Proposal site to be publicly accessible to authorised Council officers upon request. Records will include, at a minimum:

- Date and time of the complaint;
- Method of complaint submission;
- Complainant's personal details (if provided);
- Nature of the complaint;
- Initial response details;
- Actions taken by GSDC and any follow-up actions; and,
- Reasons for inaction, if applicable.

This initiative will enhance transparency and provide a structured approach for community members to voice their concerns, allowing the Proponent to respond effectively and address issues in a timely manner.

8.3. Cumulative Impacts

The potential for cumulative air quality impacts has been evaluated in accordance with relevant CIA guidance (NSW DPIE, 2022), as presented in Section 7.4. The assessment identifies potential cumulative operational air quality impacts arising from the nearby VOCUS SYD02 data centre.

While the assessment procedure highlights the potential for cumulative impacts, it does not provide detailed guidance on quantifying the risk of such impacts. Consideration of cumulative risk incorporates factors such as:

- The physical distance between the contributing sources;
- The incidence of contributing sources operating on common electricity power supplies;
- The system average interruption duration indices (SAIDI) for the respective power supplies;
- The physical distance from the contributing sources and common receptors along common wind vectors;
- The location and presence of identified sensitive receptors;
- The prevalence of those wind vectors occurring; and,
- The probability of emissions from (a) emergency operation and (b) during routine testing;

There is the potential for cumulative air quality impacts to arise from the VOCUS SYD02 data centre during concurrent operations (refer Section 7.4), particularly in the event of a regional grid outage where all facilities, including the Proposal, simultaneously activate standby diesel generators. Such emergency operation scenarios, which may occur during widespread grid failures, are recognised by NSW EPA and subject to regulatory allowances. The probability of concurrent power feeder failures is considered to be low, particularly as it is common for data centres to be served by multiple power supply feeders to reduce this risk.

Routine maintenance testing may also contribute to cumulative impacts since most facilities conduct tests during daytime hours. Due to the distance between the VOCUS SYD 02 and the Proposal, and sensitive receptors, as well as the low likelihood of concurrent testing with emissions transported downwind, these impacts are anticipated to be limited. Furthermore, the POEO Act restricts generator operating hours to 200 hours per year, with testing regulated to control pollutant emissions.

No cumulative impacts during Proposal construction are anticipated as the VOCUS SYD02 data centre is already constructed and operational.

8.4. Conclusion

During the construction phase, the potential dust soiling and human health risks are assessed as being manageable through appropriate implementation of the recommended mitigation measures.

During the operational phase, dispersion modelling scenarios for the justified worst-case and maintenance testing emission scenarios have been assessed.

Although some exceedances of the short-term pollutant criteria have been predicted during the justified worst case scenario, considering other factors (e.g. frequency of power outages, unlikely scenario of emergency standby generators running for an entire 24-hour period etc), the risk of exceedances at identified sensitive receptors is predicted to be low.

During the maintenance testing program, based upon the information presented in this AQIA, the normal operation of the Proposal is not predicted to result in additional exceedances of the relevant air quality criteria at any identified receptor location during operations. The predicted incremental concentrations for all assessed pollutants are shown to be below the relevant criteria under realistic operations where the emergency standby generators are operated under the appropriate testing schedule.

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APPENDIX A

Commonly used Abbreviations and Units

Units Used in the Report

Units presented in the report follow the International System of Units (SI) conventions, unless derived from references using non-SI units.

Commonly used SI units

The following units are commonly used in Northstar reports.

Symbol	Name	Quantity
SI base units		
K	Kelvin	thermodynamic temperature
kg	kilogram	mass
m	metre	length
mol	mole	amount of substance
s	seconds	time
Non-SI units mentioned in the SI or accepted for use		
°	degree	plane angle
d	day	time
h	hour	time
ha	hectare	area
J	joule	energy
L	litre	volume
min	minute	time
N	newton	force or weight
t	tonne	mass
V	volt	electrical potential
W	watt	power

Multiples of SI and non-SI units

The following prefixes are added to unit names to produce multiples and sub-multiples of units:

Prefix	Symbol	Factor
T	tera-	10^{12}
G	giga-	10^{9}
M	mega-	10^{6}
k	kilo-	10^{3}
h	hector-	10^{2}
da	deca-	10^{1}

Prefix	Symbol	Factor
p	pico-	10^{-12}
n	nano-	10^{-9}
μ	micro-	10^{-6}
m	milli-	10^{-3}
c	centi-	10^{-2}
d	deci-	10^{-1}

In this report, units formed by the division of SI and non-SI units are expressed as a negative exponent, and do not use the solidus (/) symbol.

For example:

- 50 micrograms per cubic metre would be presented as 50 $\mu g \cdot m^{-3}$ and not 50 $\mu g/m^3$; and,
- 0.2 kilograms per hectare per hour would be presented as 0.2 $kg \cdot ha^{-1} \cdot hr^{-1}$ and not 0.2 kg/ha/hr.

Commonly used SI-derived and non-SI units

Symbol	Name	Quantity
$g \cdot m^{-2} \cdot s^{-1}$	gram per square metre per second	rate of mass deposition per unit area
$g \cdot s^{-1}$	gram per second	rate of mass emission
$kg \cdot ha^{-1} \cdot hr^{-1}$	kilogram per hectare per hour	rate of mass deposition per unit area
$kg \cdot m^{-3}$	kilogram per cubic metre	density
$L \cdot s^{-1}$	litres per second	volumetric rate
m^2	square metre	area
m^3	cubic metre	volume
$m \cdot s^{-1}$	metre per second	speed and velocity
$mg \cdot m^{-3}$	milligram per cubic metre	mass concentration per unit volume
$mg \cdot Nm^{-3}$	milligram per normalised cubic metre (of air)	mass concentration per unit volume
$\mu g \cdot m^{-3}$	microgram per cubic metre	mass concentration per unit volume
$mg \cdot m^{-3}$	milligram per cubic metre	mass concentration per unit volume
Pa	pascal	pressure
ppb	parts per billion ($1x10^{-9}$)	volumetric concentration
pphm	parts per hundred million (1×10^{-5})	volumetric concentration
ppm	parts per million ($1x10^{-6}$)	volumetric concentration

Commonly used abbreviations

Abbreviation	Term
ABS	Australian Bureau of Statistics
ACT	Australian Commonwealth Territory
AEMC	Australian Energy Market Commission
AGL	above ground level
AHD	Australian height datum
APC	air pollution control
AQI	air quality index
AQIA	air quality impact assessment
AQMS	air quality monitoring station
AQRA	air quality risk assessment
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AS/NZS	Australian Standard / New Zealand Standard
AWS	automatic weather station
BCA	Building Code of Australia
BGL	below ground level

Abbreviation	Term
BOM	Bureau of Meteorology
BSP	bulk supply point
CEMP	construction environment management plan
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEM	digital elevation model
EETM	emission estimation technique manual
EPA VIC	Environmental Protection Authority Victoria
EPBC	Environment Protection and Biodiversity Conservation Act
FIBC	flexible intermediate bulk container
GIS	geographical information system
IAQM	UK Institute of Air Quality Management
IBC	intermediate bulk container
ID	internal diameter
LLV	low level waste
LoM	life of mine
MSDS	Material Safety Data Sheet
NCAA	National Clean Air Agreement
NEPM	National Environment Protection Measure
NH_3	ammonia
NO	nitric oxide
NO_X	oxides of nitrogen
NO_2	nitrogen dioxide
NORM	naturally occurring radioactive material
NSW	New South Wales
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
NSW DPE	New South Wales Department of Planning and Environment
NSW DPHI	New South Wales Department of Planning, Housing and Infrastructure
NSW EPA	New South Wales Environment Protection Authority
NT	Northern Territory
OEMP	operational environmental management plan
O_3	ozone
OU	odour unit
$OU{\cdot}m^3{\cdot}s^{-1}$	odour units times metres cubed per second
$OU{\cdot}s^{-1}$	odour units per second
Pb	lead
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 µm or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 µm or less

Abbreviation	Term
ROM	run of mine
SA	South Australia
SAIDI	system average interruption duration index
SAIFI	system average interruption frequency index
SEPP	State Environmental Protection Policy
SO_X	oxides of sulphur
SO_2	sulphur dioxide
SRTM3	Shuttle Radar Topography Mission
SVOC	semi-volatile organic compound
TAPM	The Air Pollution Model
TAS	Tasmania
TEU	twenty-foot equivalent unit
TS	transmission substations
TSP	total suspended particulates
TVOC	total volatile organic compounds
TWA	time weighted average
USE	unserved energy
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VIC	Victoria
VLLW	very low level waste
VOC	volatile organic compound
%	percent

APPENDIX B

Construction Phase Air Quality Risk Assessment

Provided below is a summary of the risk assessment methodology used in this assessment. It is based upon IAQM (2024) *Guidance on the assessment of dust from demolition and construction* (version 2.2) and adapted by Northstar.

Adaptions to the Published Methodology Made by Northstar Air Quality

The adaptions made by Northstar Air Quality from the IAQM published methodology are:

- **PM_{10} criterion**: an amended criterion representing the annual average PM_{10} criterion relevant to Australia rather than the UK;
- **Nomenclature**: a change in nomenclature from 'receptor sensitivity' to 'land use value' to avoid misinterpretation of values attributed to 'receptor sensitivity' and 'sensitivity of the area' which may be assessed as having different values;
- **Construction traffic**: the separation of construction vehicle movements as a discrete risk assessment profile from those associated with the 'on-site' activities of demolition, earthworks and construction. The IAQM methodology considers four risk profiles of: 'demolition', 'earthworks', 'construction' and 'trackout'. The adaption by Northstar Air Quality introduces a fifth risk assessment profile of 'construction traffic' to the existing four risk profiles; and,
- **Tables**: minor adjustments in the visualisation of some tables.

Step 1 – Screening Based on Separation Distance

The Step 1 screening criteria provided by the IAQM guidance suggests screening out any assessment of impacts from construction activities where sensitive receptors are located:

- Beyond a distance of 250 m from the Proposal site boundary; and,
- At a distance greater than 50 m from the route used by construction vehicles on public roads, beginning from the Proposal site entrance and extending past 250 m from the entrance.

This step is noted as having deliberately been chosen to be conservative and would require assessments for most developments.

Table B1 overleaf presents the identified discrete sensitive receptors, with the corresponding estimated screening distances as compared to the screening criteria. It is noted that only the first 30 receptors have been assessed in the construction phase air quality assessment given the volume of receptors and that all the receptors past R30 are beyond a distance of 250 m from the Proposal site boundary, entrance and construction route.

Table B1 Construction phase impact screening criteria distances

Receptor ID	Location	Land use	Screening distance (m)		
			Proposal site boundary (250 m)	Proposal site entrance (250 m)	Proposal site construction route(s) (50m)
R1	Norwest Boulevard, Norwest	Medical	133	474	474
R2	Norwest Boulevard, Norwest	Commercial	52	356	356
R3	Columbia Way, Norwest	Commercial	79	268	249
R4	Brookhollow Avenue, Norwest	Childcare Centre	39	126	30
R5	Brookhollow Avenue, Norwest	Industrial	44	50	37
R6	Brookhollow Avenue, Norwest	Childcare Centre	39	45	45
R7	Brookhollow Avenue, Norwest	Residential	42	174	174
R8	Brookhollow Avenue, Norwest	Commercial	36	299	299
R9	Columbia Court, Norwest	Residential	141	246	67
R10	Fairmont Avenue, Norwest	Residential	139	205	124
R11	Fairmont Avenue, Norwest	Residential	111	105	105
R12	Fairmont Avenue, Norwest	Residential	178	296	296
R13	Evesham Court, Norwest	Residential	313	465	465
R14	Norwest Boulevard, Norwest	Place of Worship	469	759	759
R15	Century Circuit, Norwest	Childcare Centre	235	565	565
R16	Solent Circuit, Norwest	Medical	229	566	566
R17	Solent Circuit, Norwest	Residential	328	674	674
R18	Columbia Way, Norwest	Childcare Centre	214	343	243
R19	Spurway Drive, Norwest	Childcare Centre	237	354	217
R20	Spurway Drive, Norwest	Community	349	636	636
R21	Solent Circuit, Norwest	Recreational	470	816	816
R22	Longview Place, Norwest	Residential	309	491	430
R23	Stone Mason Drive, Norwest	Residential	346	464	327
R24	Salisbury Road, Castle Hill	Residential	318	424	236
R25	Gladstone Road, Castle Hill	Educational	445	511	382
R26	Firewheel Place, Norwest	Residential	386	399	377
R27	St Joseph's Road, Norwest	Place of Worship	506	553	553
R28	Eagleview Place, Norwest	Residential	357	600	583
R29	Hudson Avenue, Castle Hill	Educational	262	361	165
R30	Hudson Avenue, Castle Hill	Commercial	238	317	145

With reference to Table B1, sensitive receptors are noted to be within the screening distance thresholds and therefore require further risk assessment as summarised in Table B2.

Table B2 Application of Step 1 screening

Construction impact	Screening criteria	Step 1 screening	Comments
Demolition	250 m from boundary, 250 m from site entrance	Screened	No demolition activities are proposed.
Earthworks	250 m from boundary, 250 m from site entrance	Not screened	Receptors identified within the screening distance.
Construction	250 m from boundary, 250 m from site entrance		
Trackout	250 m from site entrance		
Construction Traffic	50 m from roadside, 250 m from site entrance		

Step 2 – Risk from Construction Activities

Step 2 of the assessment provides 'dust emissions magnitudes' for each of the dust generating activities; demolition, earthworks, construction, and track-out (the movement of site material onto public roads by vehicles) and construction traffic.

The magnitudes are: Small, Medium, or Large with suggested definitions for each category as follows:

Table B3 Dust emission magnitude activities

Activity	Small	Medium	Large
Demolition			
Total building volume	< 12 000 m^3	12 000 m^3 to 75 000 m^3	> 75 000 m^3
Demolition height	< 6 m AGL	6 m and 12 m AGL	> 12 m AGL
Onsite crushing	no	no	yes
Onsite screening	no	no	yes
Demolition of materials with high dust potential	no	yes	yes
Demolition timing	wet months only	any time of the year	any time of the year
Earthworks			
Total site area	< 18 000m^2	18 000 m^2 to 110 000 m^2	> 110 000 m^2
Soil types	soil type with large grain size (e.g. sand)	moderately dusty soil type (e.g. silt)	potentially dusty soil type (e.g. clay which would be prone to suspension when dry due to small particle size)
Heavy earth moving vehicles	< 5 heavy earth moving vehicles active at any one time	5 to 10 heavy earth moving vehicles active at any one time	> 10 heavy earth moving vehicles active at any time
Formation of bunds	< 3 m AGL	3 m to 6 m AGL	> 6 m AGL
Material moved	< 20 000 t	20 000 t to 100 000 t	> 100 000 t

Activity	Small	Medium	Large
Earthworks timing	wet months only	any time of the year	any time of the year
Construction			
Total building volume	< 12 000 m^3	12 000 m^3 to 75 000 m^3	> 75 000 m^3
Piling	no	yes	yes
Concrete batching	no	yes	yes
Sandblasting	no	no	yes
Materials	metal cladding or timber	concrete	concrete
Trackout (within 100 m of construction site entrance)			
Outward heavy vehicles movements per day	< 20	20 to 50	> 50
Surface materials	low potential	moderate potential	high potential
Unpaved road length	< 50 m	50 m to 100 m	> 100 m
Construction traffic (from construction site entrance to construction vehicle origin)			
Demolition traffic - total building volume	< 12 000 m^3	12 000 m^3 to 75 000 m^3	> 75 000 m^3
Earthworks traffic - total area	< 18 000m^2	18 000 m^2 to 110 000 m^2	> 110 000 m^2
Earthworks traffic - soil types	soil type with large grain size (e.g. sand)	moderately dusty soil type (e.g. silt)	potentially dusty soil type (e.g. clay which would be prone to suspension when dry due to small particle size)
Earthworks traffic – material moved	< 20 000 t	20 000 t to 100 000 t	> 100 000 t
Construction traffic - total building volume	< 12 000 m^3	12 000 m^3 to 75 000 m^3	> 75 000 m^3
Total traffic heavy vehicles movements per day when compared to existing heavy vehicle traffic	< 10 % of heavy vehicle movement contribution by Proposal	10 % to 50 % of heavy vehicle movement contribution by Proposal	> 50 % of heavy vehicle movement contribution by Proposal

The construction phase of the Proposal would involve construction of a three (3) storey data centre building with inclusion of an ancillary office, amenities, loading docks, on-site carparking, and an electrical substation and other associated infrastructure. Construction phase activities would involve bulk earthworks for site preparation and associated vehicle movements.

As outlined previously, no demolition activities are anticipated to be performed.

The affected areas of earthworks have been estimated using Geographic Information System (GIS) software and are based on the provided site layout (refer Figure 2). For earthworks activities, the impacted area is estimated as being approximately 19 200 m^2, corresponding to a 'medium' dust emission magnitude.

Based on review of the layout provided in Figure 2, the proposed buildings are anticipated to be greater than 75 000 m^3, which aligns with the 'large' dust emission magnitude category. Given the volume of construction to be performed, it is expected that the number of vehicle movements to service the Proposal site each day would be greater than 50 movements. This aligns with a 'large' dust emission magnitude.

Based upon the above assumptions and the assessment criteria presented in Table B3, the dust emission magnitudes are as presented in Table B4.

Table B4 Construction phase impact categorisation of dust emission magnitude

Activity	Dust emission magnitude
Demolition	N/A
Earthworks and enabling works	Medium
Construction	Large
Track-out	Large
Construction traffic routes	Large

Step 3 – Sensitivity of the Area

Step 3 of the assessment process requires the sensitivity of the area to be defined. The sensitivity of the area considers:

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

When assessing the area, sensitivity to dust impacts and soiling, human health receptors are evaluated independently.

Land Use Value

Individual receptor locations may be attributed different land use values based on the land use of the land, and may be classified as having low, medium or high values relative to dust deposition and human health impacts (ecological receptors are not addressed using this approach).

Essentially, land use value is a metric of the level of amenity expectations for that land use.

The IAQM methodology provides guidance on the land use value with regard to dust soiling and human health impacts and is shown in Table B5 below. It is noted that user expectations of amenity levels (dust soiling) are dependent on existing deposition levels.

Receptors within 100 m of the Proposal site are mainly commercial in nature and are considered to have a 'medium' land use value. In contrast, receptors within 250 m include residential lots to the south, childcare centres to the east and south, and a hotel to the south. For a conservative assessment, a 'high' land use value overall has been attributed given that residential and childcare facilities are contained within 250 m of the Proposal site boundary.

Table B5 IAQM guidance for categorising land use value

Land use value	Low	Medium	High
Dust soiling	The enjoyment of amenity would not reasonably be expected; or Property would not reasonably be expected to be diminished in appearance, aesthetics, or value by soiling; or There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or The appearance, aesthetics or value of their property could be diminished by soiling; or The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal land use pattern.	Users can reasonably expect a high level of amenity; or The appearance, aesthetics or value of their property would be diminished by soiling, and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land.
Examples	*Playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.*	*Parks and places of work.*	*Dwellings, museums, and other culturally important collections, medium- and long-term car parks and car showrooms*

Land use value	Low	Medium	High
Health impacts	Locations where human exposure is transient.	Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for 8 hours or more in a day).	Locations where the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for 8 hours or more in a day).
Examples	*Public footpaths, playing fields, parks, and shopping street.*	*Office and shop workers but would generally not include workers occupationally exposed to PM_{10}.*	*Residential properties, hospitals, schools, and residential care homes.*

Dust Soiling Impacts

To assess dust soiling impacts, the sensitivity of the local area is determined by considering the receptors and their quantity, as detailed in Table B6 below.

Table B6 IAQM guidance for categorising the sensitivity of an area to dust soiling impacts

Land use value	Number of receptors[a]	Distance from the source (m)[b]			
		< 20	< 50	< 100	< 250
High	> 100	High	High	Medium	Low
	10 – 100	High	Medium	Low	Low
	1 – 10	Medium	Low	Low	Low
Medium	> 1	Medium	Low	Low	Low
Low	> 1	Low	Low	Low	Low

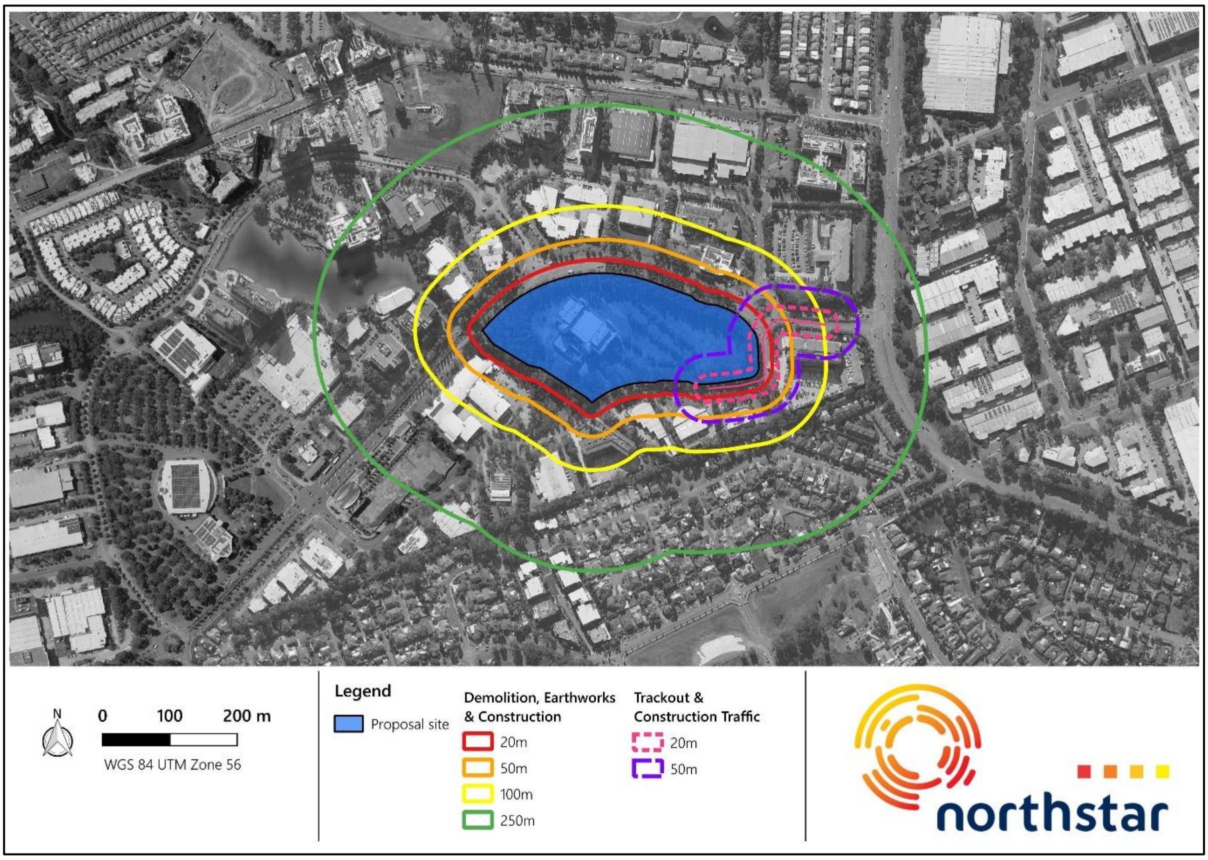
Notes: (a) Estimate the total number of receptors within the stated distance. Only the highest level of area sensitivity from the table needs to be considered.
(b) With regard to potential 'construction traffic' impacts, the distance criteria of less than 20 m and less than 50 m from the source (roadside) are used (i.e. the first two columns only). Any locations beyond 50 m may be screened out of the assessment (as per Step 1) and the corresponding sensitivity is negligible'.

Figure B1 illustrates the extent of works considered for this AQIA, delineating the outer envelope boundary of the anticipated construction works, the IAQM distance bands and the positions of receptors.

The IAQM guidance does not necessitate precise counting of human receptors. Instead, it advises using professional judgment to estimate the approximate number of buildings within each distance band and that only the highest level of area sensitivity from Table B6 needs to be considered.

It is estimated that up to 10 receptors are within 100 m and less than 100 receptors within a distance of 250 m from the Proposal site boundary. Considering both the sensitivity of receptors and their numbers within specified distances from the footprint, the sensitivity to dust soiling impacts is assessed as 'medium'.

Figure B1 Scope of construction activities, buffer distances and surrounding environment



Source: Northstar

Human Health Impacts

The assessed land use value (as described in Table B5) is then used to assess the sensitivity of the area surrounding the active construction area, considering the proximity and number of those receptors, and the local background PM_{10} concentration (in the case of potential health impacts) and other site-specific factors.

Additional factors to consider when determining the sensitivity of the area include:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant, the season during which the works would take place;
- Any conclusions drawn from local topography;
- duration of the potential impact, as a receptor may become more sensitive over time; and
- Any known specific receptor sensitivities which go beyond the classifications given in (IAQM, 2024).

The IAQM guidance for assessing the sensitivity of an area of human health impacts is shown in Table B7.

The background annual average PM_{10} concentration measured at Rouse Hill AQMS in 2021 was 15.0 $\mu g{\cdot}m^{-3}$ (refer Table D2). Together with the calculated land use value, this classifies the areas sensitivity as 'low' for dust health impacts.

Table B7 IAQM guidance for categorising the sensitivity of an area of human health impacts

Land use value	Annual mean PM_{10} concentration ($\mu g{\cdot}m^{-3}$)	Number of receptors[(a)]	Distance from the source (m)[(b)]			
			< 20	< 50	< 100	< 250
High	> 30	> 100	High	High	High	Medium
		10 – 100	High	High	Medium	Low
		1 – 10	High	Medium	Low	Low
	26 – 30	> 100	High	High	Medium	Low
		10 – 100	High	Medium	Low	Low
		1 – 10	High	Medium	Low	Low
	22 – 26	> 100	High	Medium	Low	Low
		10 – 100	High	Medium	Low	Low
		1 – 10	Medium	Low	Low	Low
	≤ 22	> 100	Medium	Low	Low	Low
		10 – 100	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low
Medium	> 30	> 10	High	Medium	Low	Low
		1 – 10	Medium	Low	Low	Low
	26 – 30	> 10	Medium	Low	Low	Low
		1 – 10	Low	Low	Low	Low
	22 – 26	> 10	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low
	≤ 22	> 10	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low
Low	-	≤ 1	Low	Low	Low	Low

Notes: (a) Estimate the total within the stated distance (e.g. the total within 250 m and not the number between 100 m and 250 m), noting that only the highest level of area sensitivity from the table needs to be considered. In the case of high sensitivity areas with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties.

(b) With regard to potential 'construction traffic' impacts, the distance criteria of less than 20 m and less than 50 m from the source (roadside) are used (i.e. the first two columns only). Any locations beyond 50 m may be screened out of the assessment (as per Step 1) and the corresponding sensitivity is negligible'.

Step 4 - Risk Assessment (Pre-Mitigation)

The matrices shown in Table B8 for each activity determine the risk category with no mitigation applied.

Table B8 Pre-mitigated risk of dust impacts from construction related activities

Sensitivity of area	Pre-mitigated dust emission magnitude		
	Small	Medium	Large
Demolition			
Low	Negligible	Low risk	Medium risk
Medium	Low risk	Medium risk	High risk
High	Medium risk	Medium risk	High risk
Earthworks, Construction and Trackout			
Low	Negligible	Low risk	Low risk
Medium	Low risk	Medium risk	Medium risk
High	Low risk	Medium risk	High risk
Construction traffic (from construction site entrance to origin)			
Low	Negligible	Low risk	Low risk
Medium	Negligible	Low risk	Medium risk
High	Low Risk	Medium risk	High risk

Given the sensitivity of the identified receptors is classified as medium for dust soiling and low for human health impacts, and the dust emission magnitudes for the various construction phase activities as shown in Table B4, the resulting risk of air quality impacts (without mitigation) is as presented in Table B9.

Table B9 Risk of air quality impacts from construction activities

Sensitivity of area	Dust emission magnitude					Preliminary risk				
	Demolition	Earthworks	Construction	Track-out	Const. traffic	Demolition	Earthworks	Construction	Track-out	Const. traffic
Dust soiling										
Medium	N/A	Med.	Large	Large	Large	N/A	Med.	Med.	Med.	Med.
Human health										
Low	N/A	Med.	Large	Large	Large	N/A	Low	Low	Low	Low

Note: Med. = Medium, N/A = Not Applicable

The risks summarised in Table B9 show that there are medium risks of dust soiling and low risks of human health impacts associated with all proposed construction phase activities if no mitigation measures were to be applied to control emissions associated with construction-phase activities.

The dust risk assessment therefore provides recommendations for construction phase mitigation, commensurate with those identified risks.

Step 5 – Identify Mitigation

Once the risk categories are determined for each of the relevant activities, site-specific management measures can be identified based on whether the site is a low, medium or high-risk site.

The identified mitigation measures are presented as follows:

N = not required (although they may be implemented voluntarily)

D = desirable (to be considered as part of the CEMP, but may be discounted if justification is provided);

H = highly recommended (to be implemented as part of the CEMP and should only be discounted if site-specific conditions render the requirement invalid or otherwise undesirable).

Table B10 represents a selection of recommended mitigation measures recommended by the IAQM methodology for construction activities commensurate with the risks identified in Table B9.

Step 6 – Risk Assessment (post-mitigation)

Following Step 5, the residual impact is then determined.

The objective of the mitigation is to manage the construction phase risks to an acceptable level, and therefore it is assumed that application of the identified mitigation would result in a low or negligible residual risk (post mitigation).

Given the size of the Proposal site, the distance to sensitive receptors and the activities to be performed, residual impacts associated with fugitive dust emissions from the Proposal would be anticipated to be 'negligible', should the implementation of the mitigation measures outlined above be performed appropriately.

Table B10 Site specific management and mitigation measures

	Identified mitigation	Unmitigated risk
1	**Communications**	**Medium**
1.1	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	H
1.2	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H
1.3	Display the head or regional office contact information.	H
1.4	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the relevant regulatory bodies.	H
2	**Site management**	**Medium**
2.1	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	H
2.2	Make the complaints log available to the relevant authority when asked.	H
2.3	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.	H
2.4	Hold regular liaison meetings with other high-risk construction sites within 500 m of the site boundary, to ensure plans are coordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.	N
3	**Monitoring**	**Medium**
3.1	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 relevant 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.	D
3.2	Carry out regular site inspections to monitor compliance with the dust management plan / CEMP, record inspection results, and maintain an inspection log available to the relevant authority when asked.	H
3.3	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.	H
4	**Preparing and maintaining the site**	**Medium**
4.1	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H
4.2	Erect solid screens or barriers around dusty activities or the site boundary that they are at least as high as any stockpiles on site.	H
4.3	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.	H
4.4	Avoid site runoff of water or mud.	H
4.5	Keep site fencing, barriers and scaffolding clean using wet methods.	H

	Identified mitigation	Unmitigated risk
4.6	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below	H
4.7	Cover, seed or fence stockpiles to prevent wind erosion	H
5	**Operating vehicle/machinery and sustainable travel**	**Medium**
5.1	Ensure all on-road vehicles comply with relevant vehicle emission standards, where applicable	H
5.2	Ensure all vehicles switch off engines when stationary - no idling vehicles	H
5.3	Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable	H
5.4	Impose and signpost a maximum-speed-limit of 25 $km{\cdot}h^{-1}$ on surfaced and 15 $km{\cdot}h^{-1}$ 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 relevant authority, where appropriate	D
5.5	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	N
5.6	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	D
6	**Operations**	**Medium**
6.1	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	H
6.2	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using non-potable water where possible and appropriate	H
6.3	Use enclosed chutes and conveyors and covered skips	H
6.4	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate	H
6.5	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.	H
7	**Waste management**	**Medium**
7.1	Avoid bonfires and burning of waste materials.	H
8	**Measures specific to earthworks**	**Low**
8.1	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	D
8.2	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.	D
8.3	Only remove the cover in small areas during work and not all at once	D
9	**Measures specific to construction**	**Medium**
9.1	Avoid scabbling (roughening of concrete surfaces) if possible	D

Identified mitigation		Unmitigated risk
9.2	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	H
9.3	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	D
9.4	For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust	D
10	**Measures specific to Track-out**	**Medium**
10.1	Use water-assisted dust sweeper(s) on the access and local roads to remove, as necessary, any material tracked out of the site.	H
10.2	Avoid dry sweeping of large areas.	H
10.3	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	H
10.4	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	H
10.5	Record all inspections of haul routes and any subsequent action in a site log book.	H
10.6	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	H
10.7	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	H
10.8	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permit.	H
10.9	Access gates to be located at least 10 m from receptors where possible.	H

APPENDIX C

Meteorology

Meteorological Stations

As discussed in Section 4.3, a meteorological modelling exercise has been performed to characterise the meteorology of the Proposal site in the absence of site-specific measurements. The meteorological monitoring has been based on measurements acquired from surrounding automatic weather stations (AWS) operated by the Australian Government Bureau of Meteorology (BoM) and Air Quality Monitoring Stations (AQMS) operated by the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW).

As discussed in Section 4.3, meteorological conditions at Rouse Hill AQMS, approximately 8.0 km to the north-west of the Proposal site, have been examined to determine a 'typical' or representative dataset for use in dispersion modelling.

Parramatta North AQMS (approximately 7.8 km from the Proposal site) and Prospect AQMS (approximately 8.3 km from the Proposal site) were considered due to their proximity to the site, however meteorological modelling through CALMET showed that the Rouse Hill wind rose was the most similar to the Proposal Site wind rose, with Parramatta North and Prospect wind roses showing different wind patterns to the Proposal site, thus Rouse Hill AQMS was determined to be most representative of the Proposal site.

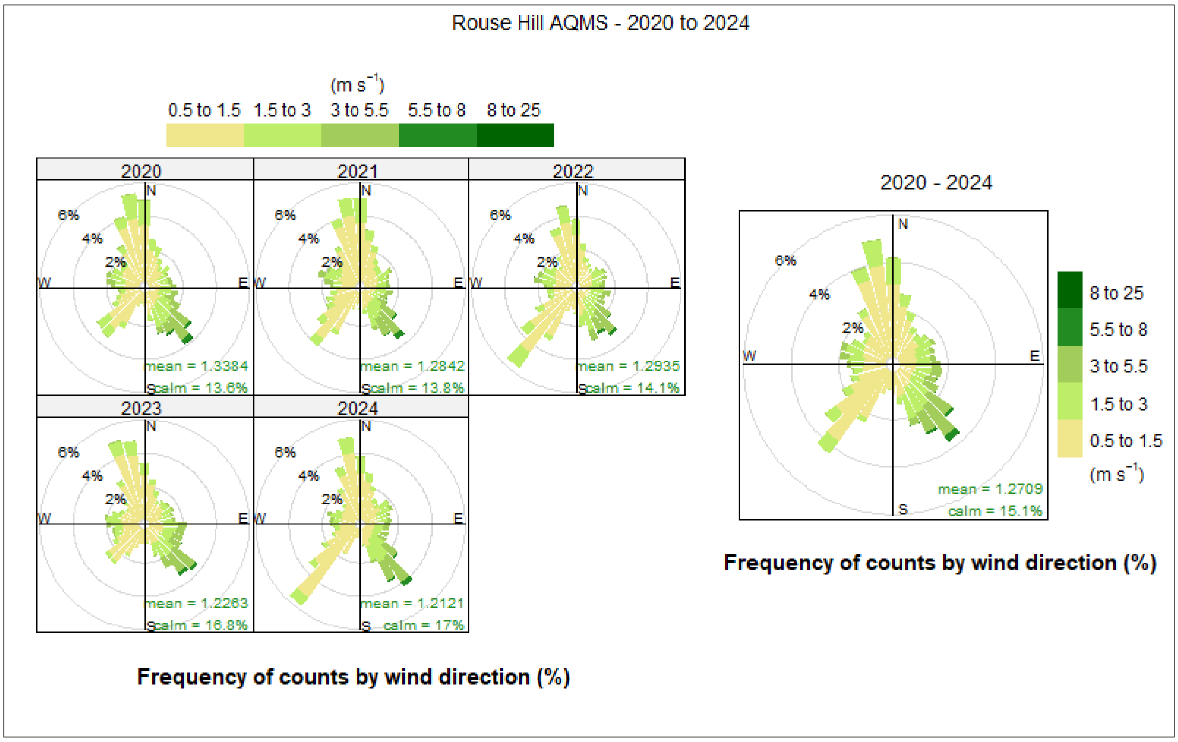
Annual wind roses for the most recent years of data (2020 to 2024) at Rouse Hill AQMS are presented in Figure C1. The annual wind speed frequency distribution for the five-year period is presented in Figure C2.

The correlation coefficient between each year and the five-year period for the distribution of wind direction, wind speed, PM_{10} and $PM_{2.5}$ are summarised in Table C1. The correlation coefficients were ranked and aggregated to select the representative year for the meteorological modelling. The rankings are also presented in Table C1.

The wind roses indicate that from 2020 to 2024, winds at Rouse Hill AQMS show generally similar wind distribution patterns across the years assessed, with predominant north-westerly wind directions evident.

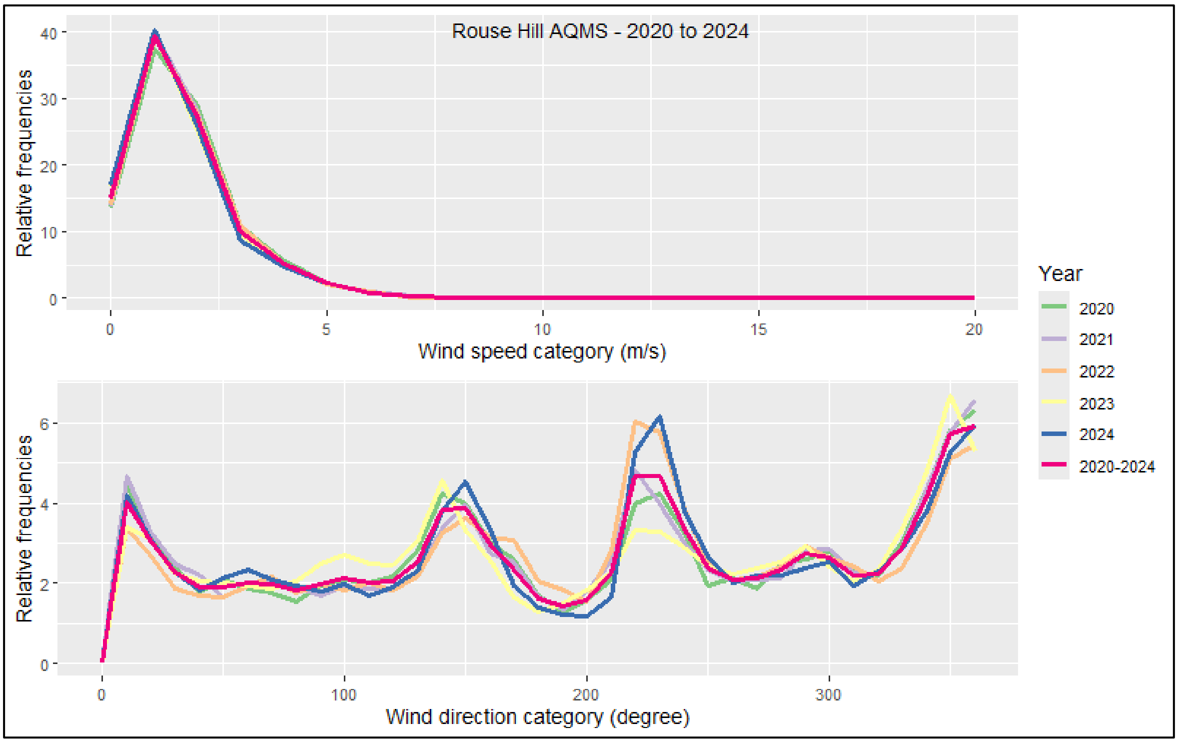
The majority of wind speeds experienced at Rouse Hill AQMS between 2020 and 2023 are generally in the range 0.5 meters per second ($m \cdot s^{-1}$) to 5.5 $m \cdot s^{-1}$ with the highest wind speeds (greater than 8 $m \cdot s^{-1}$) occurring from only south-easterly directions. Winds of this speed are rare and occur during 0.02 % of the observed hours during the years. Calm winds (less than 0.5 $m \cdot s^{-1}$) are more common and occur during 15.1 % of hours on average across the years between 2020 and 2024.

Figure C1 Annual wind roses – Rouse Hill AQMS (2020 to 2024)



Source: Northstar

Figure C2 Annual wind speed and direction distributions –Rouse Hill AQMS (2020 to 2024)



Source: Northstar

Table C1 Correlation coefficient analysis – Rouse Hill AQMS (2020 – 2024)

Parameter	Wind speed		Wind direction		PM_{10}		$PM_{2.5}$		Aggregated rank
	Corr.	Rank	Corr.	Rank	Corr.	Rank	Corr.	Rank	
2020	0.9977	5	0.9819	1	0.9947	2	0.9917	2	2
2021	0.9995	2	0.9781	2	0.9964	1	0.9971	1	1
2022	0.9995	1	0.9324	4	0.9398	5	0.9713	4	3
2023	0.9982	4	0.9063	5	0.9933	3	0.9879	3	=4
2024	0.9983	3	0.9647	3	0.9739	4	0.9632	5	=4
2020-2024	1	-	1	-	1	-	1	-	-

Note: Corr. = correlation

Wind speed observations for each year correlated well against the wind speed over the five-year period, with each year having a correlation coefficient greater than 0.99. The year 2022 is the highest ranked for correlation against the wind speed over the five-year period.

Wind direction observations for each year are well correlated against the wind direction over the five-year period, with each year having a correlation coefficient greater than of 0.90. The year 2020 is the highest ranked for correlation against the wind direction over the five-year period.

Particulate matter concentrations for each year are also well correlated against particulate matter concentrations over the five-year period. Each year resulted in having a correlation coefficient greater than 0.93. The year 2021 is the highest rank for both PM_{10} and $PM_{2.5}$.

The correlation coefficient analysis indicates that 2021 is the most appropriate representative year for meteorological modelling.

Meteorological Processing

The BoM data adequately covers the issues of data quality assurance; however, it is limited by its location compared to the Proposal site. To address these uncertainties, a multi-phased assessment of the meteorology data has been performed.

In absence of any measured onsite meteorological data, site representative meteorological data for this Proposal was generated using the CALMET meteorological processor in a format suitable for using in the CALPUFF dispersion model (refer Section 5.2.1.1).

CALMET is a meteorological data processor that generates three-dimensional wind and temperature fields across a gridded modelling domain. It serves as the meteorological pre-processor for the CALPUFF modelling system. Associated two-dimensional fields such as mixing height, surface characteristics, and dispersion properties are also included in the file produced by CALMET. The interpolated wind field is then modified within the model to account for the influences of topography, as well as differential heating and surface roughness associated with different land uses across the modelling domain. These modifications are applied to the winds at each grid point to develop a final wind field and thus the final wind field reflects the influences of local topography and current land uses.

For this AQIA, CALMET has been run in no-observations (no-obs) mode using gridded prognostic data generated by The Air Pollution Model (TAPM, v 4.0.5), developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The TAPM model is cited in the 'Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the 'Approved Methods for the Modelling and Assessments of Air Pollutants in NSW, Australia' (Barclay & Scire, 2011) as a suitable prognostic meteorological model for applications involving complex meteorological conditions.

TAPM is a prognostic model which predicts wind speed and direction, temperature, pressure, water vapour, cloud, rainwater, and turbulence. The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, sea surface temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate site-specific hourly meteorological observations at user-defined levels within the atmosphere.

It is noted that the outputs from an initial TAPM modelling run were compared to observed meteorological monitoring data collected at Rouse Hill AQMS. These data generally compare well and correspondingly, the initial TAPM modelling run is considered sufficient to represent meteorological parameters at the Proposal site for use in CALMET.

The parameters used in TAPM and CALMET modelling are presented in Table C2. Further, as per (Barclay & Scire, 2011), the seven critical parameters used in the CALMET modelling are presented in Table C3.

Table C2 CALMET and TAPM meteorological parameters

TAPM v 4.0.5	
Modelling period	1 January 2021 to 1 January 2022
Centre of analysis	310 825 mE, 6 266 539 mS (UTM Coordinates)
Number of grid points	40 × 40 × 25
Number of grids (spacing)	5 (30 km, 10 km, 3 km, 1 km, 0.3 km)
Terrain	AUSLIG 9 second DEM
Data assimilation	No data assimilation
CALMET	
Modelling period	1 January 2021 to 1 January 2022
Southwest corner of analysis	304 875 mE, 6 260 539 mS (UTM Coordinates)
Meteorological grid domain (resolution)	11.6 km × 11.6 km (0.1 km)
Vertical resolution (cell heights)	10 (0 m, 20 m, 40 m, 80 m, 160 m, 320 m, 640 m, 1 200 m, 2 000 m, 3 000 m, 4 000 m)
Data assimilation	No-obs approach using TAPM – 3D.DAT file

Table C3 Seven critical meteorological parameters used in CALMET

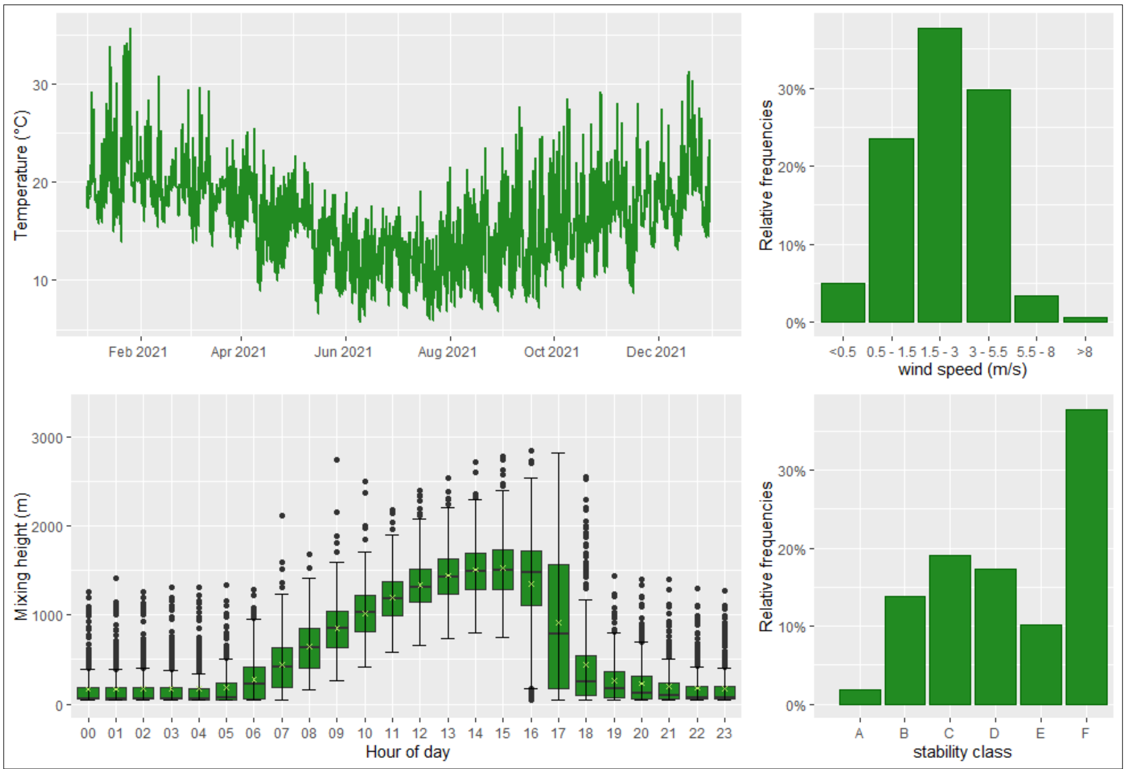
Parameter	Value
TERRAD	3.0
IEXTRP	1
BIAS (NZ)	0 × 10
R1 and R2	0, 0
RMAX1 and RMAX2	0, 0

As generally required by NSW EPA, the following provides a summary of the modelled meteorological dataset. Given the nature of the pollutant emission sources at the Proposal site, detailed discussion of the humidity, evaporation, cloud cover, katabatic air drainage and air recirculation potential of the Proposal site has not been provided. Details of the predictions of wind speed and direction, mixing height and temperature at the Proposal site are provided below.

Diurnal variations in maximum and average mixing heights predicted by CALMET at the Proposal site during 2021 period are illustrated in Figure C3.

As expected, an increase in mixing height during the morning is apparent, arising due to the onset of vertical mixing following sunrise. Maximum mixing heights occur in the mid to late afternoon, due to the dissipation of ground-based temperature inversions and growth of the convective mixing layer.

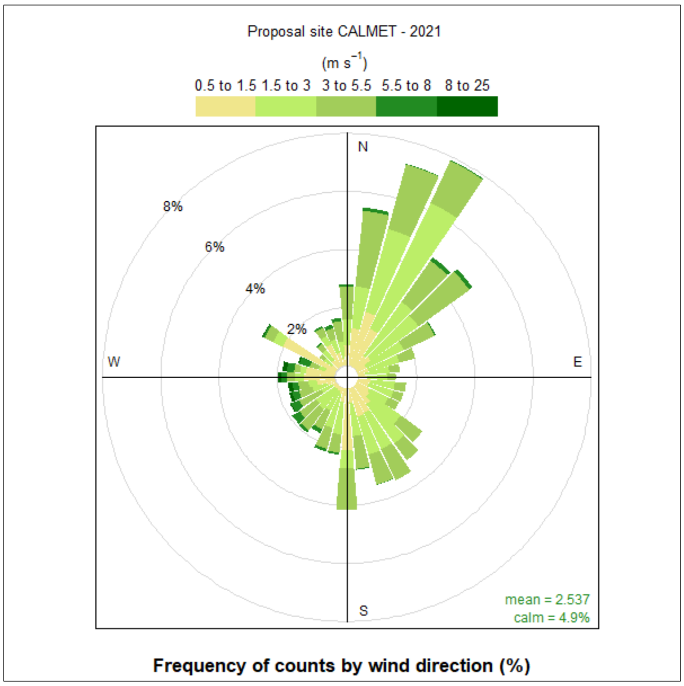
Figure C3 Predicted mixing height, wind speed and stability class frequency at the Proposal site (2021)



Source: Northstar

The modelled wind speed and direction at the Proposal site during 2021 are presented in Figure C4.

Figure C4 Predicted wind speed and direction – Proposal site (2021)



Source: Northstar

APPENDIX D

Background Air Quality

Air quality is not monitored at the Proposal site and therefore air quality monitoring data measured at a representative location has been adopted for the purposes of this AQIA. Determination of data to be used as a location representative of the Proposal site and during a representative year can be complicated by factors which include:

- The sources of air pollutant emissions around the Proposal site and representative AQMS; and
- The variability of particulate matter concentrations (often impacted by natural climate variability).

Air quality monitoring is performed by the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) at air quality monitoring stations (AQMS) within 10 km of the Proposal site. The most representative air quality monitoring station relative to the Proposal site, with data available for the year 2020 (the selected representative year consistent with the meteorological modelling [refer Appendix C]) is situated at Rouse Hill AQMS, approximately 8.0 km north-west of the Proposal site.

Particulate matter data for the period 2020 to 2024 has been analysed. The annual frequency distribution for the five-year period is presented in Figure D1.

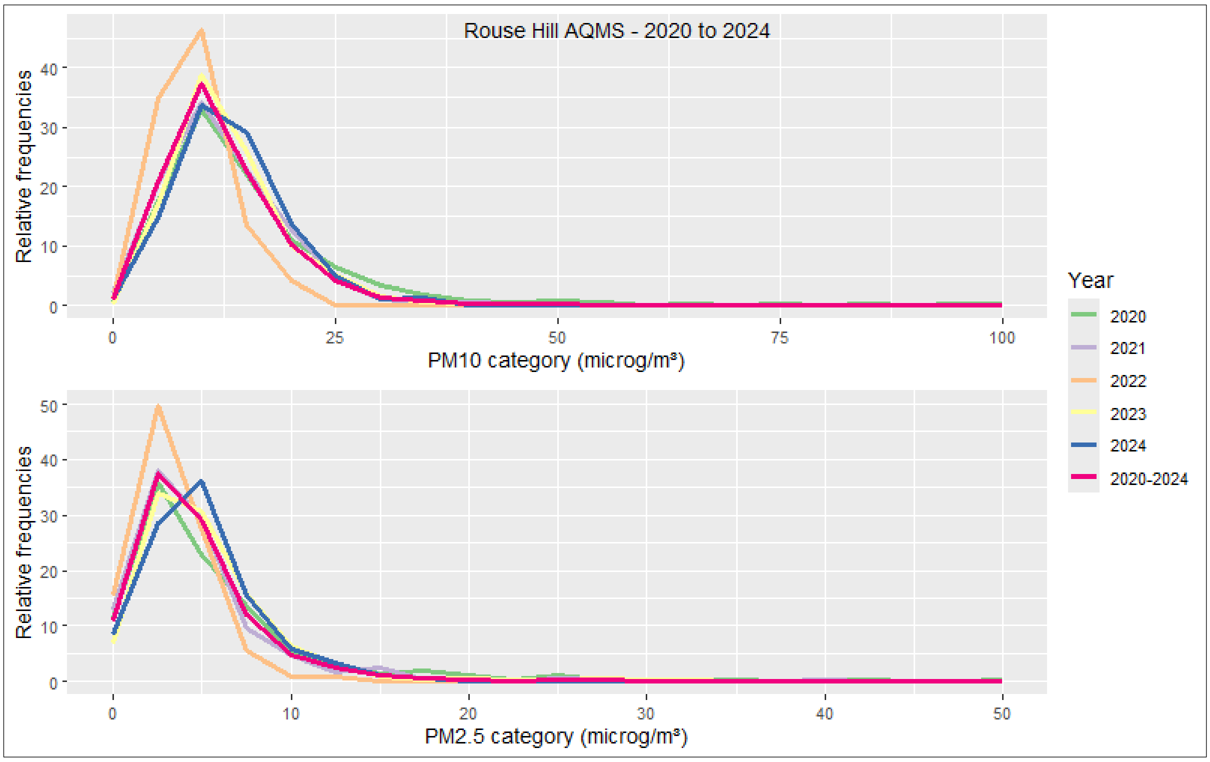
Concentrations of TSP are not measured at any AQMS surrounding the Proposal site. An analysis of co-located measurements of TSP and PM_{10} in the Lower Hunter (1999 to 2011), Illawarra (2002 to 2004), and Sydney Metropolitan (1999 to 2004) regions is presented in Figure D2.

The analysis concludes that, on the basis of the measurements collected in all regions between 1999 to 2011, the derivation of a broad TSP:PM_{10} ratio of 2.0551 : 1 (i.e. PM_{10} represents ~49% of TSP) from the Sydney Metropolitan location is appropriate. In the absence of any more specific information, this ratio has been adopted within this AQIA, resulting in a background annual average TSP concentration of 30.9 $\mu g \cdot m^{-3}$ being adopted.

Summary statistics for the selected data are presented in Table D1.

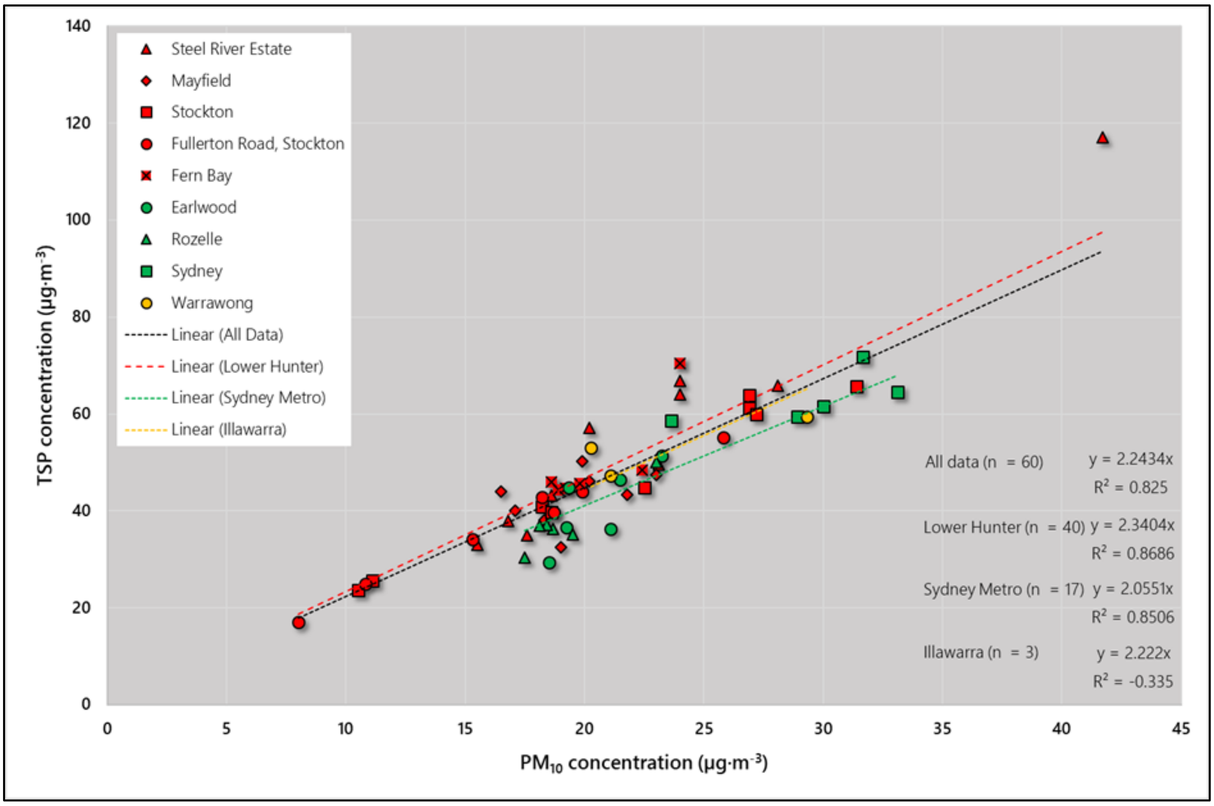
Graphs presenting the daily varying PM_{10} and $PM_{2.5}$ data, and 1-hour average NO_2 data, recorded at Rouse Hill AQMS in 2021 are presented in Figure D3, Figure D4 and Figure D5 respectively.

Figure D1 Annual distribution at Rouse Hill AQMS for PM_{10} and $PM_{2.5}$ (2020 to 2024)



Source: Northstar

Figure D2 Co-located TSP and PM_{10} measurements – Lower Hunter, Sydney Metro and Illawarra



Source: Northstar

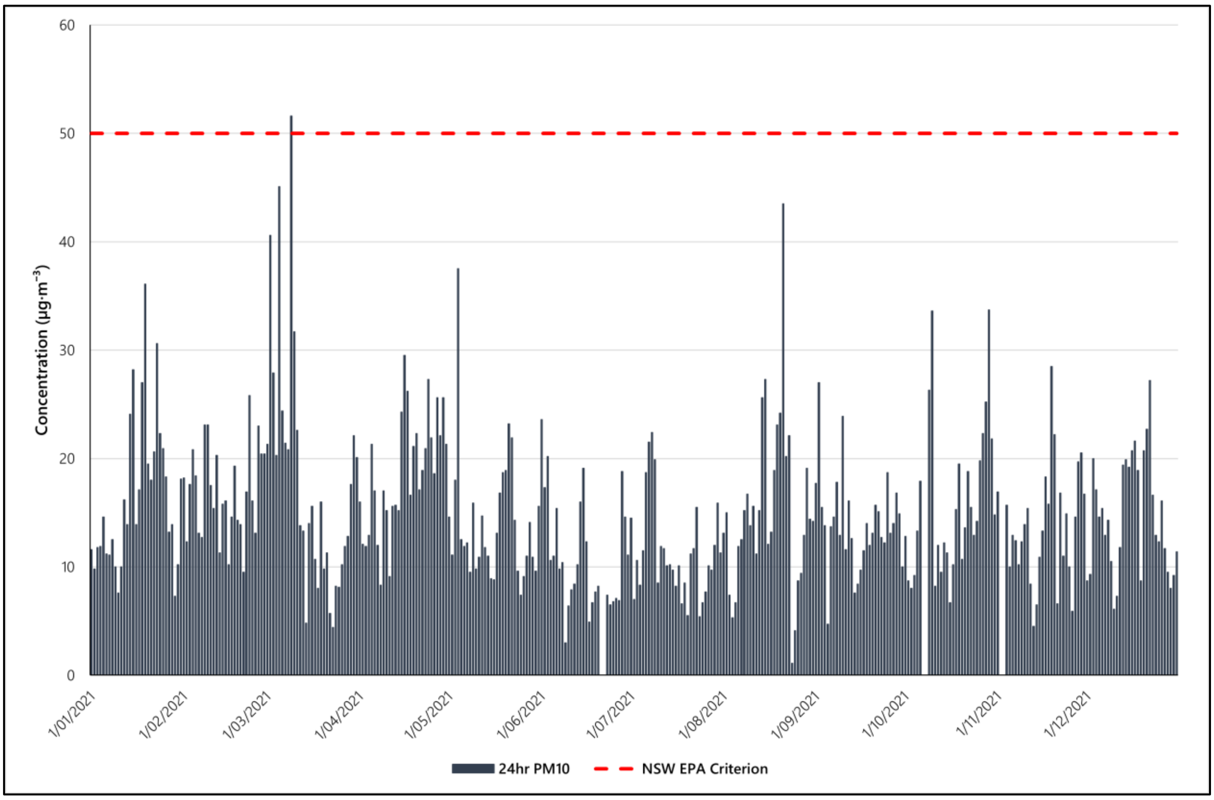
Table D1 Background air quality statistics – Rouse Hill AQMS (2021)

Pollutant	TSP	PM_{10}	$PM_{2.5}$	SO_2	SO_2	NO_2	CO	CO	CO	O_3
Averaging period	Annual	24 hour	24 hour	24 hour	1 hour	1 hour	15 minute	1 hour	8 hour (rolling)	1 hour
Units	$\mu g{\cdot}m^{-3}$	$\mu g{\cdot}m^{-3}$	$\mu g{\cdot}m^{-3}$	$\mu g{\cdot}m^{-3}$	$\mu g{\cdot}m^{-3}$	$\mu g{\cdot}m^{-3}$	$mg{\cdot}m^{-3}$	$mg{\cdot}m^{-3}$	$mg{\cdot}m^{-3}$	$\mu g{\cdot}m^{-3}$
Statistics										
Data Points (no.)	-	359	358	361	8285	8291	8180	8180	8530	8117
Mean	30.9	15.0	5.9	1.2	1.3	9.8	0.3	0.2	0.2	40.2
Standard deviation	-	6.8	4.2	1.8	3.0	9.5	0.2	0.1	0.1	22.8
Skew[1]	-	*1.4*	*3.2*	*1.3*	*4.7*	*1.8*	*3.6*	*3.6*	*3.0*	*0.5*
Kurtosis[2]	-	*4.0*	*17.4*	*2.0*	*38.1*	*4.0*	*31.1*	*31.1*	*26.4*	*0.8*
Minimum	-	1.1	0.2	-2.6	-5.7	0.0	-0.3	-0.3	-0.1	-2.1
25^{th}	-	10.2	3.4	0.0	0.0	2.1	0.2	0.1	0.1	23.5
50^{th}	-	13.9	5.0	0.0	0.0	6.2	0.3	0.3	0.3	40.7
75^{th}	-	18.8	7.0	2.6	2.9	14.4	0.3	0.3	0.3	55.6
90^{th}	-	23.0	10.3	2.6	2.9	22.6	0.5	0.4	0.4	68.5
95^{th}	-	27.0	13.0	5.2	5.7	28.7	0.5	0.4	0.4	77.0
97^{th}	-	28.8	16.3	5.2	8.6	34.9	0.7	0.5	0.5	85.6
98^{th}	-	33.3	17.1	5.2	8.6	36.9	0.7	0.5	0.5	92.0
99^{th}	-	38.8	22.3	7.9	14.3	43.1	0.8	0.6	0.6	102.7
Maximum	**-**	**51.6**	**40.5**	**7.9**	**51.5**	**69.7**	**2.5**	**1.9**	**1.9**	**179.8**
Data Capture (%)	**98.1**	**98.1**	**97.8**	**98.6**	**94.3**	**94.4**	**93.1**	**93.1**	**97.1**	**92.4**

Notes: 1: Skew represents an expression of the distribution of measured values around the derived mean. Positive skew represents a distribution tending towards values higher than the mean, and negative skew represents a distribution tending towards values lower than the mean. Skew is dimensionless.

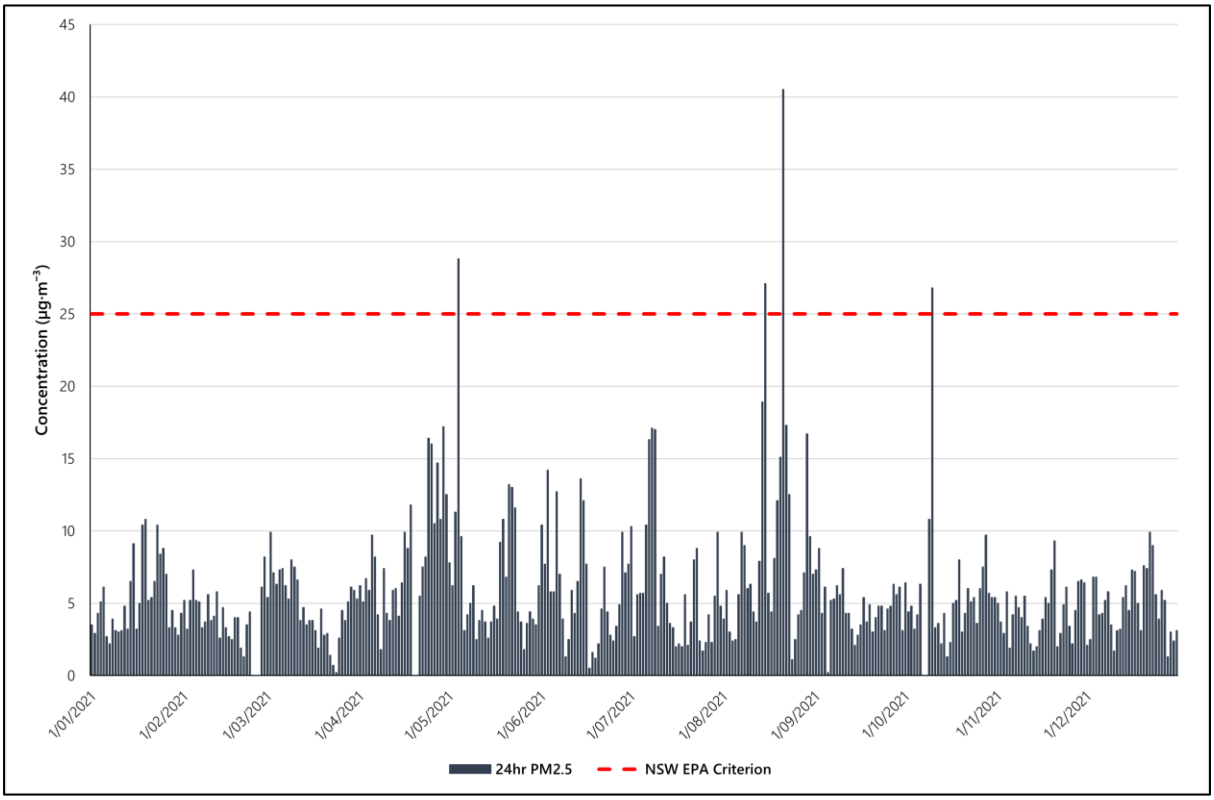
2: Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive kurtosis represents a more peaked distribution, and negative kurtosis represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

Figure D3 24-hour PM_{10} measurements – Rouse Hill AQMS (2021)



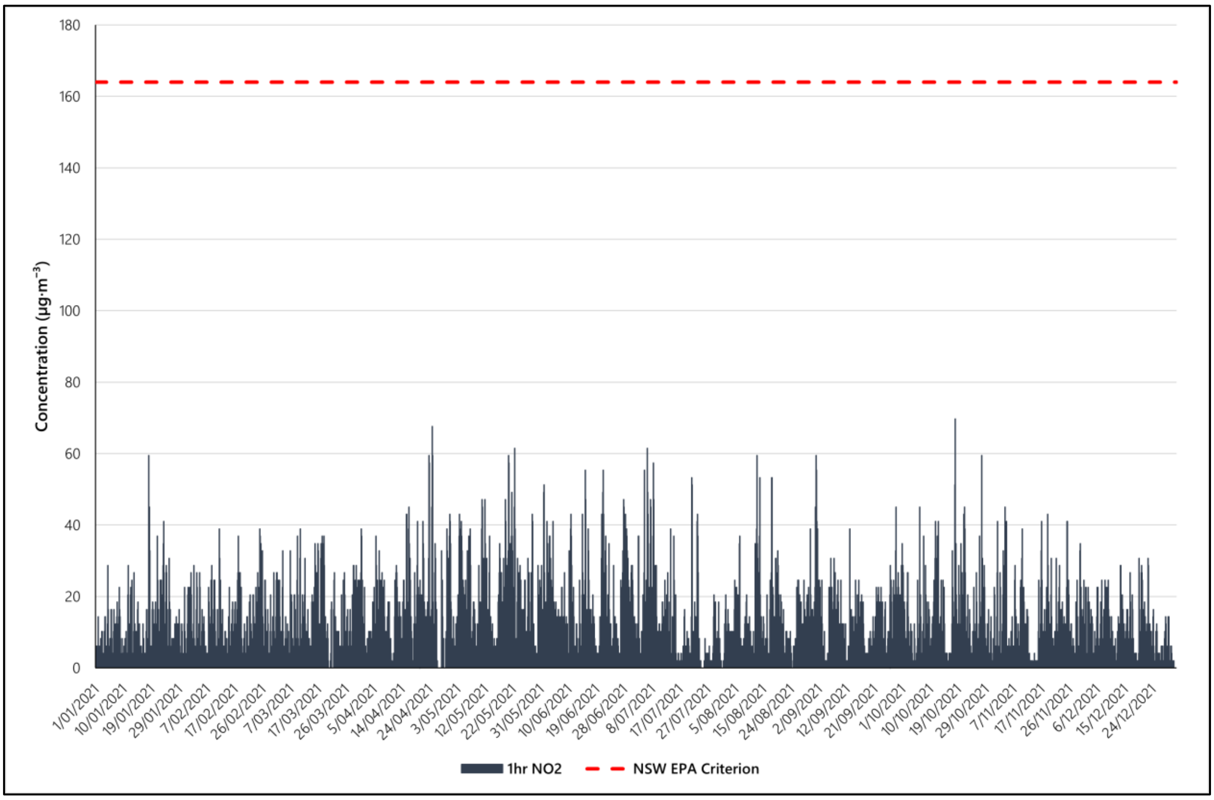
Source: Northstar

Figure D4 24-hour $PM_{2.5}$ measurements –Rouse Hill AQMS (2021)



Source: Northstar

Figure D5 1-hour NO_2 measurements – Rouse Hill AQMS (2021)



Source: Northstar

During 2021, Rouse Hill AQMS recorded one exceedance of the EPA NSW 24-hour PM_{10} criterion and four exceedances of the EPA NSW 24-hour $PM_{2.5}$ criterion. Table D2 provides commentary on the likely sources of these exceedances, based on the NSW Annual Compliance Report 2021 (NSW DPE, 2023).

At Rouse Hill AQMS, all four exceedances of $PM_{2.5}$ were due to hazard reduction burning, and the exceedance of PM_{10} was due to local dust.

Given the likely sources of particulates affecting measurements at Rouse Hill AQMS, such as local dust, similar sources may influence the area around the Proposal site. Therefore, using data from these AQMS sites to characterise air quality near Norwest and the Proposal site is appropriate.

This review examines all particulate measurements from the background dataset, including exceedances, and evaluates the Proposal's potential impact on air quality. Impacts are discussed in terms of incremental and cumulative effects and additional exceedances that may result from the Proposal. The above exceedances have been included in the background air quality statistics (Table D2), however as outlined by the NSW EPA, in circumstances where existing ambient air pollutant concentrations exceed the impact assessment criteria, it must be demonstrated that operation of the Proposal will not result in any additional exceedances of the impact assessment criteria (refer Section 7).

Table D2 Calendar days in 2021 when 24-hour PM_{10} and $PM_{2.5}$ criterion was exceeded

Date	24-hour PM_{10} concentration ($\mu g{\cdot}m^{-3}$)	24-hour $PM_{2.5}$ concentration ($\mu g{\cdot}m^{-3}$)	Comments on PM exceedance (NSW DPE, 2023)
9 March 2021	51.6	8.0	Non-exceptional – Local Dust
4 May 2021	37.5	28.8	Exceptional – Hazard Reduction Burning (HRB)
15 August 2021	27.3	27.1	Exceptional – Hazard Reduction Burning (HRB)
21 August 2021	43.5	40.5	Exceptional – Hazard Reduction Burning (HRB)
10 November 2021	33.6	26.8	Exceptional – Hazard Reduction Burning (HRB)

APPENDIX E

Generator Technical Specification – SYD1 Stage 1

Edition 3/25/2025
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Technical Sales Document

- Product Data -

A Rolls-Royce solution

Name	20V4000G44LF	**Speed [rpm]**	1500
Application Group	3F	**Nominal power [kW]**	3007
Dataset	Ref. 25°C/45°C	**Nominal power [bhp]**	4032
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	50
Exhaust Regulations	NEA Singapore for ORDE;		

5. Combustion air / exhaust gas

No.	Description	Index	Value	Unit
8	Charge-air pressure before cylinder - CP	R	3.88	bar abs
9	Combustion air volume flow - CP	R	4.4	m³/s
11	Exhaust volume flow (at exhaust temperature) - CP	R	10.6	m³/s
13	Exhaust temperature before turbocharger - CP	R	620	°C
4084	Exhaust temperature after engine - CP (Position of interface according to installation drawing)	R	440 *	°C

A Rolls-Royce solution

Engine data

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	20V4000G44LF				
Fuel type	EN590				
Application Group	3B, 3E, 3F				
Legislative body	NEA Singapore for ORDE				
Test cycle	D2				
Fuel sulphur content [ppm]	7				
mg/mN^3 values base on residual oxygen value of [%]	5				

Not to exceed emission values*

Cycle point	[-]	n1	n2	n3	n4	n5
Power	kW	3009	2256	1504	753	301
Power relative	[-]	1	0.75	0.5	0.25	0.1
Engine speed	1/min	1501	1501	1501	1501	1501
Engine speed relative	[-]	1	1	1	1	1
NO_X concentration corr. (5% O_2)	ppm	1442	1237	936	969	2052
Carbon monoxide (CO) (5% O_2)	ppm	133	269	617	682	1318
Hydrocarbon (HC) (5% O_2)	ppm	50	60	89	179	965
NO_X mass flow	kg/h	26.85	17.44	9.28	5.18	5.25
CO mass flow	kg/h	1.4	2.16	3.5	2.1	1.98
HC_1 mass flow	kg/h	0.28	0.26	0.27	0.29	0.75
NMHC mass flow	kg/h	0.28	0.25	0.26	0.28	
NO_X+HC_1 mass flow	kg/h	27.13	17.69	9.55	5.47	6

PDF	Name	Project no.	Size
Configurator	Lenhof, Torsten (TRC)	Order no.	A4
Approver1	Kneifel, Alexander (TSLE)	EDS-ID	
Approver2	Fraser, Neil (TS)	2696-02.06.2023	
Approver3			
Approver4			
User	FN2hummerj		

Description of Revision | Frequency

Data generated by EDS Creator version 1.0 and uniplot.
Ref.-dataset: 420122_384_NEA_G44LF_D2.nc for 296 in EDS platform.

Engine model
20V4000G44LF

Title
Emission data sheet

Emissionstage
NEA Singapore for ORDE

Emissionstage basis
NEA Singapore for ORDE

Sheet
of

Configuration-ID
296

Documentation

A Rolls-Royce solution

Engine data

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	20V4000G44LF				
Fuel type	EN590				
Application Group	3B, 3E, 3F				
Legislative body	NEA Singapore for ORDE				
Test cycle	D2				
Fuel sulphur content [ppm]	7				
mg/mN³ values base on residual oxygen value of [%]	5				

Not to exceed emission values*

Cycle point	[-]	n1	n2	n3	n4	n5
Power	kW	3009	2256	1504	753	301
Power relative	[-]	1	0.75	0.5	0.25	0.1
Engine speed	1/min	1501	1501	1501	1501	1501
Engine speed relative	[-]	1	1	1	1	1
NO_X concentration corr. (5% O_2)	ppm	1442	1237	936	969	2052
Carbon monoxide (CO) (5% O_2)	ppm	133	269	617	682	1318
Hydrocarbon (HC) (5% O_2)	ppm	50	60	89	179	965
NO_X mass flow	kg/h	26.85	17.44	9.28	5.18	5.25
CO mass flow	kg/h	1.4	2.16	3.5	2.1	1.98
HC_1 mass flow	kg/h	0.28	0.26	0.27	0.29	0.75
NMHC mass flow	kg/h	0.28	0.25	0.26	0.28	
NO_X+HC_1 mass flow	kg/h	27.13	17.69	9.55	5.47	6

PDF | Name | Project no. | Size
Configurator | Lenhof, Torsten (TRC) | Order no. | A4
Approver1 | Kneifel, Alexander (TSLE) | EDS-ID
Approver2 | Fraser, Neil (TS) | 2696-02.06.2023
Approver3
Approver4
User | FN2hummel

Description of Revision | Frequency

Engine model: **20V4000G44LF**

Title: **Emission data sheet**

Data generated by EDS Creator version 1.0 and uniplot.
Ref.-dataset: 420122_364_NEA_G44LF_D2.nc for 296 in EDS platform.

Emissionstage: **NEA Singapore for ORDE**

Sheet | of

Configuration-ID: **296** | Documentation

Emissionstage basis: **NEA Singapore for ORDE**

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NO_X+NMHC-Emissions (based on $_5$% O_2)	mg/m³N	3303	2830	2149	2254	
PT-Emissions (based on $_5$% O_2)	mg/m³N	10.9	23.8	48.9	71	59.5

PDF | Name | Project no. | Size
Configurator | Lenhof, Torsten (TRC) | Order no. | A4
Approver1 | Kneifel, Alexander (TSLE) | EDS-ID
Approver2 | Fraser, Neil (TS) | 2696-02.06.2023
Approver3
Approver4
User | FN2hummel

Description of Revision | Frequency

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Engine model: **20V4000G44LF**

Title: **Emission data sheet**

Data generated by EDS Creator version 1.0 and uniplot.
Ref.-dataset: 420122_364_NEA_G44LF_D2.nc for 296 in EDS platform.

Emissionstage: **NEA Singapore for ORDE**

Sheet | of

Configuration-ID: **296** | Documentation

Emissionstage basis: **NEA Singapore for ORDE**

Generator Technical Specifications – SYD1 Stage 2

Cat® 3516E

Diesel Generator Sets

CAT®

Image shown may not reflect actual configuration

Bore – mm (in)	170 (6.69)
Stroke – mm (in)	215 (8.46)
Displacement – L (in^3)	78.1 (4766)
Compression Ratio	14.7:1
Aspiration	ATAAC
Fuel System	EUI
Governor Type	ADEM™ A5

Standby / Mission Critical 50 Hz kVA (ekW)	Emissions Performance
3500 (2800)	Tier 2 (U.S. EPA Stationary Emergency)

Package Performance

Performance	Standby		Mission Critical	
Engine Speed	1800 rpm		1800 rpm	
Frequency	50 Hz		50 Hz	
Gen set power rating with fan	2800 ekW		2800 ekW	
Gen set power rating with fan @ 0.8 power factor	3500 kVA		3500 kVA	
Emissions	Tier 2 (EPA ESE)		Tier 2 (EPA ESE)	
Performance number	EM7054-05		EM7058-02	
Fuel Consumption				
100% load with fan – L/hr (gal/hr)	750.9	(198.4)	750.9	(198.4)
75% load with fan – L/hr (gal/hr)	566.3	(149.6)	566.3	(149.6)
50% load with fan – L/hr (gal/hr)	413.1	(109.1)	413.1	(109.1)
25% load with fan – L/hr (gal/hr)	241.1	(63.7)	241.1	(63.7)
Cooling System				
Radiator air flow restriction (system) – kPa (in. water)	0.12	(0.48)	0.12	(0.48)
Radiator air flow – m^3/min (cfm)	2922	(103189)	2922	(103189)
Engine coolant capacity – L (gal)	233.2	(61.6)	233.2	(61.6)
Radiator coolant capacity – L (gal)	202.0	(53.4)	202.0	(53.4)
Total coolant capacity – L (gal)	435.2	(115.0)	435.2	(115.0)
Inlet Air				
Combustion air inlet flow rate – m^3/min (cfm)	239.5	(8455.3)	239.5	(8455.3)
Exhaust System				
Exhaust stack gas temperature – °C (°F)	490.6	(915.1)	490.6	(915.1)
Exhaust gas flow rate – m^3/min (cfm)	639.6	(22584.9)	639.6	(22584.9)
Exhaust system backpressure (maximum allowable) – kPa (in. water)	6.7	(27.0)	6.7	(27.0)
Heat Rejection				
Heat rejection to jacket water – kW (Btu/min)	926	(52636)	926	(52636)
Heat rejection to exhaust (total) – kW (Btu/min)	3102	(176400)	3102	(176400)
Heat rejection to aftercooler – kW (Btu/min)	982	(55872)	982	(55872)
Heat rejection to atmosphere from engine – kW (Btu/min)	171	(9736)	171	(9736)
Heat rejection from alternator – kW (Btu/min)	111	(6307)	111	(6307)
Emissions* (Nominal) - Full Load				
NOx mg/Nm^3 (g/hp-h)	2203.9	(4.71)	2203.9	(4.71)
CO mg/Nm^3 (g/hp-h)	472.2	(1.02)	472.2	(1.02)
HC mg/Nm^3 (g/hp-h)	30.1	(0.07)	30.1	(0.07)
PM mg/Nm^3 (g/hp-h)	28.5	(0.07)	28.5	(0.07)
Emissions* (Potential Site Variation) - Full Load				
NOx mg/Nm^3 (g/hp-h)	2644.7	(5.65)	2644.7	(5.65)
CO mg/Nm^3 (g/hp-h)	661.1	(1.42)	661.1	(1.42)
HC mg/Nm^3 (g/hp-h)	40.0	(0.10)	40.0	(0.10)
PM mg/Nm^3 (g/hp-h)	39.8	(0.10)	39.8	(0.10)

**mg/Nm^3 levels are corrected to 5% O_2. Contact your local Cat dealer for further information.*

MTU 20V4000G94F

Application data [1]

Engine

Manufacturer	*mtu*
Model	20V4000G94F
Type	4-cycle
Arrangement	20V
Displacement: l	95.4
Bore: mm	170
Stroke: mm	210
Compression ratio	16.4
Rated speed: rpm	1500
Engine governor	ECU 9
Max power: kWm	3088
Air cleaner	dry

Fuel system

Fuel specification	EN 590, Grade No.1-D/2-D (ASTM D975-00), EN 15940 (e.g. HVO)
Maximum fuel lift: m	5
Total fuel flow: l/min	27

Fuel consumption [2]	l/hr	g/kwh
At 100% of power rating:	756	203
At 75% of power rating:	578	207
At 50% of power rating:	402	216

Liquid capacity (lubrication)

Total oil system capacity: l	390
Engine jacket water capacity: l	260
Intercooler coolant capacity: l	50

Combustion air requirements

Combustion air volume: m^3/s	4.5
Max. air intake restriction: mbar	30

Cooling/radiator system

Coolant flow rate (HT circuit): m3/hr	80
Coolant flow rate (LT circuit): m3/hr	44
Heat rejection to coolant: kW	1140
Heat radiated to charge air cooling: kW	890
Heat radiated to ambient: kW	105
Fan power for electr. radiator (40°C): kW	105

Exhaust system

Exhaust gas temp. (after engine, max.): °C	550
Exhaust gas temp. (before turbocharger): °C	642
Exhaust gas volume: m3/s	11.1
Maximum allowable back pressure: mbar	50
Minimum allowable back pressure: mbar	-

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	20V4000G94F				
Rated power [kW]	3088				
Rated speed [rpm]	1500				
Application Group	3D				
Legislative body	NEA Singapore for ORDE				
Test cycle	D2				
Data Set No.	XZ54954100066				
Data Set Basis	NEA Singapore for ORDE				
Fuel sulphur content [ppm]	7				

Engine raw emissions*

Cycle point	[-]	n1	n2	n3	n4	n5
Power	kW	3090	2317	1545	772	309
Power relative	[-]	1	0.75	0.5	0.25	0.1
Engine speed	1/min	1501	1501	1501	1501	1500
Engine speed relative	[-]	1	1	1	1	1
Filter smoke number	Bosch	0.18	0.2	0.7	0.89	0.04
Exhaust temperature after ETC	grdC	453	420.8	421	378.5	259
Exhaust back pressure after ETC (static)	mbar	34	23	11	5	2
Exhaust back pressure after ETC (total)	mbar	52	35	16	5	0
Exhaust mass flow wet	kg/h	18499.9	15818.7	11326.3	7149.8	5283.9
NOX-Emissions specific	g/kWh	6.46	5.32	4.78	4.56	9.18
SO2-Emissions specific	g/kWh	0.003	0.003	0.003	0.003	0.004
CO-Emissions specific	g/kWh	0.23	0.29	1.1	1.36	3.2
HC1-Emissions specific	g/kWh	0.07	0.08	0.1	0.18	0.84
NMHC-Emissions specific	g/kWh	0.07	0.08	0.1	0.18	0.82

APPENDIX F

AQIA Results - All Receptors – Scenario 1

Table F1 Maximum 24-Hour PM_{10} and $PM_{2.5}$ concentrations for all receptors - Scenario 1

Receptor	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max. % of criterion	3.0	6.0
R1	35.6	35.6
R2	44.4	44.4
R3	58.5	58.5
R4	66.5	66.5
R5	91.2	91.2
R6	84.7	84.7
R7	54.9	54.9
R8	40.0	40.0
R9	69.7	69.7
R10	46.3	46.3
R11	35.6	35.6
R12	36.6	36.6
R13	34.1	34.1
R14	15.8	15.8
R15	27.4	27.4
R16	21.9	21.9
R17	23.9	23.9
R18	56.4	56.4
R19	51.1	51.1
R20	36.7	36.7
R21	13.0	13.0
R22	43.7	43.7
R23	48.4	48.4
R24	50.4	50.4
R25	24.9	24.9
R26	31.5	31.5
R27	56.2	56.2
R28	31.9	31.9
R29	49.5	49.5
R30	30.8	30.8
R31	25.8	25.8

Receptor	Maximum 24-hour average concentration ($\mu g \cdot m^{-3}$)	
	PM_{10}	$PM_{2.5}$
R32	14.3	14.3
R33	37.8	37.8
R34	36.8	36.8
R35	16.8	16.8
R36	19.6	19.6
R37	17.3	17.3
R38	9.6	9.6
R39	10.5	10.5
R40	15.7	15.7
R41	13.2	13.2
R42	8.0	8.0
R43	10.6	10.6
R44	9.8	9.8
R45	13.3	13.3
R46	18.2	18.2
R47	12.7	12.7
R48	13.4	13.4
R49	13.9	13.9
R50	20.2	20.2
R51	22.5	22.5
R52	29.1	29.1
R53	19.0	19.0
R54	14.6	14.6
R55	14.8	14.8
R56	10.8	10.8
R57	11.2	11.2
R58	12.7	12.7
R59	8.5	8.5
R60	10.8	10.8
R61	12.7	12.7
R62	17.9	17.9
R63	12.8	12.8
R64	16.6	16.6
R65	11.8	11.8
R66	23.4	23.4
R67	6.2	6.2
R68	7.1	7.1
R69	12.8	12.8
R70	6.8	6.8

Receptor	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
R71	9.3	9.3
R72	11.8	11.8
R73	18.1	18.1
R74	33.8	33.8
R75	6.6	6.6
R76	20.7	20.7
R77	12.8	12.8
R78	12.1	12.1
R79	20.0	20.0
R80	24.5	24.5
R81	34.7	34.7
R82	24.8	24.8
R83	10.2	10.2
R84	12.2	12.2
R85	22.1	22.1
R86	10.3	10.3
R87	15.1	15.1
R88	9.1	9.1
R89	14.7	14.7
R90	8.5	8.5
R91	9.0	9.0
R92	9.9	9.9
R93	8.5	8.5
R94	6.2	6.2
R95	5.9	5.9
R96	4.2	4.2
R97	3.9	3.9
R98	2.2	2.2
R99	2.3	2.3
R100	2.1	2.1
R101	2.3	2.3
R102	2.3	2.3
R103	2.4	2.3
R104	2.2	2.4
R105	2.4	2.2
R106	3.3	2.4
R107	4.3	3.3
R108	2.7	4.3
R109	3.7	2.7

Receptor	Maximum 24-hour average concentration ($\mu g{\cdot}m^{-3}$)	
	PM_{10}	$PM_{2.5}$
R110	2.3	3.7
R111	2.5	2.3
R112	3.7	2.5
R113	5.1	3.7
R114	5.7	5.1
R115	6.8	5.7
R116	3.2	6.8
R117	6.3	3.2
R118	4.1	6.3
R119	6.2	4.1
R120	4.8	6.2
R121	5.0	4.8
R122	5.2	5.0
R123	4.2	5.2
R124	5.8	4.2
R125	3.9	5.8
R126	6.1	3.9
R127	6.2	6.1
R128	5.0	6.2
R129	3.6	5.0
R130	5.3	3.6
R131	7.1	5.3
R132	4.8	7.1
R133	3.1	4.8
R134	2.8	3.1
R135	5.7	2.8
R136	4.9	5.7
R137	4.2	4.9
R138	4.4	4.2
R139	5.7	4.4
R140	7.5	5.7
R141	7.4	7.5
R142	7.0	7.4
R143	4.0	7.0
R144	5.2	4.0
R145	5.5	5.2
R146	3.4	5.5
R147	5.8	3.4
R148	8.5	5.8

Receptor	Maximum 24-hour average concentration (µg·m^{-3})	
	PM_{10}	$PM_{2.5}$
R149	5.6	8.5
R150	3.3	5.6
R151	4.0	3.3
R152	3.8	4.0
R153	5.9	3.8
R154	6.0	5.9
R155	6.9	6.0
R156	8.0	6.9
R157	6.9	8.0
R158	5.8	6.9
R159	5.8	5.8
R160	6.2	5.8
R161	3.5	6.2
R162	3.6	3.5
R163	5.0	3.6
R164	9.8	5.0
R165	11.6	9.8
R166	7.8	11.6
R167	4.3	7.8
R168	5.3	4.3
R169	4.2	5.3
R170	3.2	4.2
R171	7.4	3.2

Table F2 Predicted 1-hour and annual average NO2 concentrations for all receptors – Scenario 1

Receptor	NO2 Concentration (µg·m-3)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
Criterion	164			31		
Max % of crit.	457.7	17.5	460.2	76.2	31.6	107.8
R1	154.3	16.4	170.7	3.4	9.8	13.2
R2	133.2	8.2	141.4	4.6	9.8	14.4
R3	206.1	12.3	218.4	10.1	9.8	19.9
R4	215.8	2.1	217.8	5.7	9.8	15.5
R5	153.8	4.1	157.9	5.2	9.8	15.0
R6	114.6	10.3	124.9	7.2	9.8	17.0
R7	164.1	6.2	170.2	8.9	9.8	18.7
R8	111.4	2.1	113.4	3.0	9.8	12.8
R9	300.1	12.3	312.4	8.9	9.8	18.7
R10	238.0	2.1	240.0	6.7	9.8	16.5
R11	118.6	10.3	128.8	5.7	9.8	15.5
R12	262.1	6.2	268.2	11.7	9.8	21.5
R13	378.0	6.2	384.2	12.3	9.8	22.1
R14	337.8	10.3	348.1	5.3	9.8	15.1
R15	187.5	16.4	203.9	4.0	9.8	13.8
R16	169.0	14.4	183.4	4.5	9.8	14.3
R17	149.8	14.4	164.2	3.7	9.8	13.5
R18	294.8	12.3	307.1	12.4	9.8	22.2
R19	309.5	12.3	321.8	11.8	9.8	21.6
R20	209.0	10.3	219.2	8.6	9.8	18.4
R21	184.7	6.2	190.8	4.1	9.8	13.9
R22	213.1	8.2	221.3	11.7	9.8	21.5
R23	312.0	4.1	316.1	13.5	9.8	23.3
R24	416.3	6.2	422.5	10.7	9.8	20.5
R25	362.4	2.1	364.5	8.0	9.8	17.8
R26	280.3	2.1	282.4	8.9	9.8	18.7
R27	523.2	6.2	529.4	23.6	9.8	33.4
R28	207.4	4.1	211.5	10.1	9.8	19.9
R29	345.5	12.3	357.8	9.2	9.8	19.0
R30	251.0	12.3	263.3	7.2	9.8	17.0
R31	379.6	12.3	391.9	8.2	9.8	18.0

Receptor	NO2 Concentration ($\mu g \cdot m^{-3}$)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R32	356.6	<0.1	356.6	6.9	9.8	16.7
R33	328.8	4.1	332.9	13.1	9.8	22.9
R34	458.1	4.1	462.2	14.0	9.8	23.8
R35	455.2	2.1	457.3	9.2	9.8	19.0
R36	408.5	4.1	412.6	7.2	9.8	17.0
R37	563.2	6.2	569.4	7.5	9.8	17.3
R38	469.2	4.1	473.3	6.2	9.8	16.0
R39	531.0	12.3	543.3	8.1	9.8	17.9
R40	644.7	6.2	650.9	7.5	9.8	17.3
R41	478.3	12.3	490.6	7.4	9.8	17.2
R42	459.3	4.1	463.4	6.0	9.8	15.8
R43	397.4	6.2	403.6	7.8	9.8	17.6
R44	482.2	2.1	484.2	7.1	9.8	16.9
R45	429.9	4.1	434.0	7.3	9.8	17.1
R46	367.8	2.1	369.8	7.7	9.8	17.5
R47	390.2	8.2	398.4	13.7	9.8	23.5
R48	393.3	4.1	397.4	6.8	9.8	16.6
R49	337.6	2.1	339.6	7.7	9.8	17.5
R50	483.7	8.2	491.9	12.6	9.8	22.4
R51	402.8	10.3	413.1	14.9	9.8	24.7
R52	531.5	6.2	537.7	20.6	9.8	30.4
R53	296.0	2.1	298.0	9.9	9.8	19.7
R54	307.5	4.1	311.6	5.9	9.8	15.7
R55	297.7	2.1	299.7	6.2	9.8	16.0
R56	594.2	2.1	596.2	7.5	9.8	17.3
R57	470.7	10.3	481.0	8.4	9.8	18.2
R58	429.7	2.1	431.7	6.4	9.8	16.2
R59	454.6	16.4	471.0	10.6	9.8	20.4
R60	452.2	10.3	462.4	10.9	9.8	20.7
R61	683.1	2.1	685.2	8.7	9.8	18.5
R62	349.7	4.1	353.8	9.5	9.8	19.3
R63	532.7	6.2	538.8	7.3	9.8	17.1
R64	529.4	6.2	535.5	11.3	9.8	21.1
R65	372.5	10.3	382.7	4.4	9.8	14.2

Receptor	NO2 Concentration (µg·m-3)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R66	310.8	4.1	314.9	8.4	9.8	18.2
R67	304.6	10.3	314.9	3.7	9.8	13.5
R68	248.3	9.8	258.1	2.9	9.8	12.7
R69	192.9	10.3	203.2	3.6	9.8	13.4
R70	356.8	6.2	363.0	4.2	9.8	14.0
R71	305.3	6.2	311.5	6.2	9.8	16.0
R72	285.4	6.2	291.5	6.1	9.8	15.9
R73	231.8	4.1	235.9	8.4	9.8	18.2
R74	329.5	8.2	337.7	11.0	9.8	20.8
R75	241.9	6.2	248.1	3.6	9.8	13.4
R76	217.2	6.2	223.4	6.1	9.8	15.9
R77	307.9	2.1	310.0	7.6	9.8	17.4
R78	464.5	12.3	476.8	10.2	9.8	20.0
R79	467.5	8.2	475.7	10.0	9.8	19.8
R80	518.4	2.1	520.4	11.6	9.8	21.4
R81	522.8	10.3	533.0	14.0	9.8	23.8
R82	542.8	4.1	546.9	12.8	9.8	22.6
R83	260.3	6.2	266.4	4.6	9.8	14.4
R84	497.5	10.3	507.8	9.2	9.8	19.0
R85	499.9	4.1	504.0	11.5	9.8	21.3
R86	397.6	4.1	401.7	9.5	9.8	19.3
R87	499.5	2.1	501.6	9.5	9.8	19.3
R88	410.9	<0.1	410.9	6.2	9.8	16.0
R89	462.1	8.2	470.3	10.8	9.8	20.6
R90	482.3	6.2	488.4	8.9	9.8	18.7
R91	471.0	2.1	473.1	7.1	9.8	16.9
R92	561.5	<0.1	561.5	6.6	9.8	16.4
R93	477.8	2.1	479.9	6.1	9.8	15.9
R94	518.3	6.2	524.4	7.7	9.8	17.5
R95	374.3	2.1	376.4	5.6	9.8	15.4
R96	340.0	6.2	346.2	4.1	9.8	13.9
R97	307.6	6.2	313.8	3.9	9.8	13.7
R98	397.7	4.1	401.8	3.0	9.8	12.8
R99	431.0	4.1	435.1	3.1	9.8	12.9

Receptor	NO2 Concentration ($\mu g \cdot m^{-3}$)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R100	301.9	8.2	310.1	2.0	9.8	11.8
R101	283.1	8.2	291.3	2.1	9.8	11.9
R102	288.4	8.2	296.6	2.2	9.8	12.0
R103	294.7	6.2	300.9	2.2	9.8	12.0
R104	358.3	6.2	364.4	2.6	9.8	12.4
R105	327.5	9.8	337.3	2.1	9.8	11.9
R106	365.1	9.8	374.9	2.3	9.8	12.1
R107	260.3	9.8	270.1	2.7	9.8	12.5
R108	318.7	2.1	320.8	2.6	9.8	12.4
R109	331.6	6.2	337.8	4.7	9.8	14.5
R110	405.0	2.1	407.0	2.6	9.8	12.4
R111	419.2	6.2	425.4	3.5	9.8	13.3
R112	409.0	6.2	415.1	4.2	9.8	14.0
R113	467.9	4.1	472.0	10.5	9.8	20.3
R114	466.3	18.5	484.7	10.3	9.8	20.1
R115	387.8	6.2	394.0	10.8	9.8	20.6
R116	389.5	6.2	395.6	6.1	9.8	15.9
R117	441.2	8.2	449.4	11.3	9.8	21.1
R118	327.4	14.4	341.8	6.7	9.8	16.5
R119	435.9	6.2	442.1	9.2	9.8	19.0
R120	341.4	4.1	345.5	8.0	9.8	17.8
R121	400.5	6.2	406.6	7.0	9.8	16.8
R122	423.1	6.2	429.3	6.6	9.8	16.4
R123	447.1	8.2	455.3	5.8	9.8	15.6
R124	478.4	8.2	486.6	6.4	9.8	16.2
R125	381.8	2.1	383.9	4.9	9.8	14.7
R126	385.9	2.1	387.9	7.0	9.8	16.8
R127	446.0	8.2	454.2	11.6	9.8	21.4
R128	450.8	2.1	452.8	5.4	9.8	15.2
R129	414.9	<0.1	414.9	4.8	9.8	14.6
R130	469.3	<0.1	469.4	6.0	9.8	15.8
R131	509.8	2.1	511.8	6.2	9.8	16.0
R132	361.8	<0.1	361.9	5.5	9.8	15.3
R133	417.5	2.1	419.6	4.7	9.8	14.5

Receptor	NO2 Concentration (µg·m⁻³)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R134	404.1	<0.1	404.1	4.5	9.8	14.3
R135	566.5	2.1	568.5	6.1	9.8	15.9
R136	487.4	2.1	489.4	5.9	9.8	15.7
R137	391.2	2.1	393.2	4.9	9.8	14.7
R138	404.1	2.1	406.2	5.3	9.8	15.1
R139	483.8	<0.1	483.8	5.6	9.8	15.4
R140	595.6	2.1	597.6	7.1	9.8	16.9
R141	560.1	4.1	564.2	6.3	9.8	16.1
R142	500.3	2.1	502.4	6.1	9.8	15.9
R143	599.8	<0.1	599.9	5.1	9.8	14.9
R144	621.9	<0.1	621.9	6.0	9.8	15.8
R145	750.6	4.1	754.7	6.1	9.8	15.9
R146	365.2	2.1	367.3	3.7	9.8	13.5
R147	657.2	4.1	661.3	5.9	9.8	15.7
R148	444.4	2.1	446.4	6.9	9.8	16.7
R149	485.7	6.2	491.9	5.9	9.8	15.7
R150	330.4	2.1	332.5	2.7	9.8	12.5
R151	410.7	6.2	416.9	6.4	9.8	16.2
R152	428.3	2.1	430.3	5.3	9.8	15.1
R153	456.4	2.1	458.4	4.7	9.8	14.5
R154	445.9	2.1	448.0	4.8	9.8	14.6
R155	486.3	6.2	492.4	6.3	9.8	16.1
R156	508.8	8.2	517.0	8.8	9.8	18.6
R157	460.6	6.2	466.7	8.2	9.8	18.0
R158	353.5	2.1	355.5	5.1	9.8	14.9
R159	378.5	2.1	380.6	5.3	9.8	15.1
R160	337.7	4.1	341.8	5.2	9.8	15.0
R161	312.0	2.1	314.0	4.2	9.8	14.0
R162	343.5	6.2	349.6	4.7	9.8	14.5
R163	475.7	4.1	479.8	6.2	9.8	16.0
R164	492.6	8.2	500.8	9.5	9.8	19.3
R165	437.7	8.2	445.9	7.8	9.8	17.6
R166	503.4	8.2	511.6	8.9	9.8	18.7
R167	323.8	2.1	325.8	5.4	9.8	15.2

Receptor	NO2 Concentration ($\mu g \cdot m^{-3}$)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R168	380.7	8.2	388.9	5.7	9.8	15.5
R169	333.8	28.7	362.5	5.3	9.8	15.1
R170	302.5	4.1	306.6	4.6	9.8	14.4
R171	386.0	2.1	388.0	5.9	9.8	15.7

Table F3 Predicted 15-minutes, 1-hour and 8-hour average CO concentrations for all receptors – Scenario 1

Rec.	Carbon monoxide (CO) concentration (mg·m^{-3})								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
Criterion	100			30			10		
Max. % of criterion	5.9	2.5	8.4	14.9	6.3	21.2	23.5	19.0	42.5
R1	1.4	2.5	3.9	1.0	1.9	2.9	0.6	1.9	2.5
R2	2.3	2.5	4.8	1.7	1.9	3.6	0.9	1.9	2.8
R3	3.6	2.5	6.1	2.7	1.9	4.6	1.4	1.9	3.3
R4	4.6	2.5	7.1	3.5	1.9	5.4	1.4	1.9	3.3
R5	5.9	2.5	8.4	4.5	1.9	6.4	2.3	1.9	4.2
R6	3.9	2.5	6.4	3.0	1.9	4.9	1.9	1.9	3.8
R7	3.6	2.5	6.1	2.7	1.9	4.6	1.0	1.9	2.9
R8	3.2	2.5	5.7	2.4	1.9	4.3	1.0	1.9	2.9
R9	3.9	2.5	6.4	3.0	1.9	4.9	1.3	1.9	3.2
R10	2.9	2.5	5.4	2.2	1.9	4.1	1.4	1.9	3.3
R11	2.2	2.5	4.7	1.7	1.9	3.6	1.0	1.9	2.9
R12	1.6	2.5	4.1	1.2	1.9	3.1	0.7	1.9	2.6
R13	1.6	2.5	4.1	1.2	1.9	3.1	0.7	1.9	2.6
R14	1.0	2.5	3.5	0.8	1.9	2.7	0.4	1.9	2.3
R15	1.1	2.5	3.6	0.8	1.9	2.7	0.5	1.9	2.4
R16	1.2	2.5	3.7	0.9	1.9	2.8	0.5	1.9	2.4
R17	0.9	2.5	3.4	0.7	1.9	2.6	0.4	1.9	2.3
R18	2.9	2.5	5.4	2.2	1.9	4.1	1.0	1.9	2.9
R19	2.8	2.5	5.3	2.1	1.9	4.0	1.1	1.9	3.0

Rec.	Carbon monoxide (CO) concentration ($mg \cdot m^{-3}$)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R20	1.3	2.5	3.8	1.0	1.9	2.9	0.7	1.9	2.6
R21	0.7	2.5	3.2	0.6	1.9	2.5	0.3	1.9	2.2
R22	1.4	2.5	3.9	1.1	1.9	3.0	0.7	1.9	2.6
R23	2.0	2.5	4.5	1.5	1.9	3.4	1.1	1.9	3.0
R24	2.2	2.5	4.7	1.6	1.9	3.5	1.0	1.9	2.9
R25	1.7	2.5	4.2	1.3	1.9	3.2	1.0	1.9	2.9
R26	1.8	2.5	4.3	1.3	1.9	3.2	1.2	1.9	3.1
R27	1.8	2.5	4.3	1.4	1.9	3.3	1.2	1.9	3.1
R28	1.2	2.5	3.7	0.9	1.9	2.8	0.8	1.9	2.7
R29	2.5	2.5	5.0	1.9	1.9	3.8	1.2	1.9	3.1
R30	2.4	2.5	4.9	1.8	1.9	3.7	0.8	1.9	2.7
R31	1.5	2.5	4.0	1.2	1.9	3.1	0.7	1.9	2.6
R32	1.1	2.5	3.6	0.8	1.9	2.7	0.4	1.9	2.3
R33	1.8	2.5	4.3	1.3	1.9	3.2	1.0	1.9	2.9
R34	1.6	2.5	4.1	1.2	1.9	3.1	0.9	1.9	2.8
R35	1.3	2.5	3.8	1.0	1.9	2.9	0.6	1.9	2.5
R36	1.1	2.5	3.6	0.9	1.9	2.8	0.6	1.9	2.5
R37	0.8	2.5	3.3	0.6	1.9	2.5	0.4	1.9	2.3
R38	1.1	2.5	3.6	0.8	1.9	2.7	0.3	1.9	2.2
R39	1.0	2.5	3.5	0.8	1.9	2.7	0.4	1.9	2.3
R40	0.8	2.5	3.3	0.6	1.9	2.5	0.4	1.9	2.3
R41	0.8	2.5	3.3	0.6	1.9	2.5	0.4	1.9	2.3
R42	0.8	2.5	3.3	0.6	1.9	2.5	0.3	1.9	2.2
R43	0.6	2.5	3.1	0.5	1.9	2.4	0.4	1.9	2.3

Rec.	Carbon monoxide (CO) concentration ($mg \cdot m^{-3}$)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R44	0.8	2.5	3.3	0.6	1.9	2.5	0.4	1.9	2.3
R45	1.0	2.5	3.5	0.8	1.9	2.7	0.6	1.9	2.5
R46	1.3	2.5	3.8	1.0	1.9	2.9	0.7	1.9	2.6
R47	0.8	2.5	3.3	0.6	1.9	2.5	0.3	1.9	2.2
R48	1.2	2.5	3.7	0.9	1.9	2.8	0.5	1.9	2.4
R49	1.3	2.5	3.8	1.0	1.9	2.9	0.4	1.9	2.3
R50	1.1	2.5	3.6	0.9	1.9	2.8	0.5	1.9	2.4
R51	1.3	2.5	3.8	1.0	1.9	2.9	0.7	1.9	2.6
R52	1.2	2.5	3.7	0.9	1.9	2.8	0.7	1.9	2.6
R53	1.4	2.5	3.9	1.0	1.9	2.9	0.4	1.9	2.3
R54	0.7	2.5	3.2	0.6	1.9	2.5	0.4	1.9	2.3
R55	0.9	2.5	3.4	0.7	1.9	2.6	0.4	1.9	2.3
R56	1.1	2.5	3.6	0.8	1.9	2.7	0.4	1.9	2.3
R57	1.0	2.5	3.5	0.8	1.9	2.7	0.3	1.9	2.2
R58	0.8	2.5	3.3	0.6	1.9	2.5	0.4	1.9	2.3
R59	0.9	2.5	3.4	0.7	1.9	2.6	0.3	1.9	2.2
R60	1.0	2.5	3.5	0.7	1.9	2.6	0.3	1.9	2.2
R61	0.8	2.5	3.3	0.6	1.9	2.5	0.3	1.9	2.2
R62	0.9	2.5	3.4	0.7	1.9	2.6	0.4	1.9	2.3
R63	0.9	2.5	3.4	0.7	1.9	2.6	0.3	1.9	2.2
R64	0.9	2.5	3.4	0.7	1.9	2.6	0.4	1.9	2.3
R65	0.6	2.5	3.1	0.5	1.9	2.4	0.3	1.9	2.2
R66	1.4	2.5	3.9	1.1	1.9	3.0	0.5	1.9	2.4
R67	0.6	2.5	3.1	0.4	1.9	2.3	0.2	1.9	2.1

Rec.	Carbon monoxide (CO) concentration ($mg \cdot m^{-3}$)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R68	0.4	2.5	2.9	0.3	1.9	2.2	0.2	1.9	2.1
R69	0.6	2.5	3.1	0.5	1.9	2.4	0.3	1.9	2.2
R70	0.5	2.5	3.0	0.4	1.9	2.3	0.3	1.9	2.2
R71	0.5	2.5	3.0	0.4	1.9	2.3	0.3	1.9	2.2
R72	0.5	2.5	3.0	0.4	1.9	2.3	0.2	1.9	2.1
R73	0.7	2.5	3.2	0.6	1.9	2.5	0.4	1.9	2.3
R74	1.2	2.5	3.7	0.9	1.9	2.8	0.6	1.9	2.5
R75	0.6	2.5	3.1	0.5	1.9	2.4	0.3	1.9	2.2
R76	0.7	2.5	3.2	0.5	1.9	2.4	0.4	1.9	2.3
R77	0.7	2.5	3.2	0.5	1.9	2.4	0.4	1.9	2.3
R78	0.7	2.5	3.2	0.6	1.9	2.5	0.5	1.9	2.4
R79	0.9	2.5	3.4	0.7	1.9	2.6	0.5	1.9	2.4
R80	1.3	2.5	3.8	1.0	1.9	2.9	0.6	1.9	2.5
R81	1.6	2.5	4.1	1.2	1.9	3.1	1.0	1.9	2.9
R82	1.5	2.5	4.0	1.2	1.9	3.1	0.7	1.9	2.6
R83	0.5	2.5	3.0	0.4	1.9	2.3	0.3	1.9	2.2
R84	0.9	2.5	3.4	0.7	1.9	2.6	0.3	1.9	2.2
R85	1.2	2.5	3.7	0.9	1.9	2.8	0.6	1.9	2.5
R86	0.8	2.5	3.3	0.6	1.9	2.5	0.4	1.9	2.3
R87	0.8	2.5	3.3	0.6	1.9	2.5	0.4	1.9	2.3
R88	0.6	2.5	3.1	0.4	1.9	2.3	0.3	1.9	2.2
R89	0.9	2.5	3.4	0.7	1.9	2.6	0.6	1.9	2.5
R90	0.5	2.5	3.0	0.4	1.9	2.3	0.2	1.9	2.1
R91	0.8	2.5	3.3	0.6	1.9	2.5	0.4	1.9	2.3

Rec.	Carbon monoxide (CO) concentration ($mg \cdot m^{-3}$)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R92	0.5	2.5	3.0	0.4	1.9	2.3	0.3	1.9	2.2
R93	0.4	2.5	2.9	0.3	1.9	2.2	0.3	1.9	2.2
R94	0.5	2.5	3.0	0.4	1.9	2.3	0.2	1.9	2.1
R95	0.5	2.5	3.0	0.4	1.9	2.3	0.2	1.9	2.1
R96	0.2	2.5	2.7	0.2	1.9	2.1	<0.1	1.9	2.0
R97	0.2	2.5	2.7	0.1	1.9	2.0	0.1	1.9	2.0
R98	0.2	2.5	2.7	0.2	1.9	2.1	<0.1	1.9	2.0
R99	0.2	2.5	2.7	0.2	1.9	2.1	<0.1	1.9	2.0
R100	0.2	2.5	2.7	0.2	1.9	2.1	<0.1	1.9	2.0
R101	0.2	2.5	2.7	0.1	1.9	2.0	<0.1	1.9	2.0
R102	0.2	2.5	2.7	0.1	1.9	2.0	<0.1	1.9	2.0
R103	0.2	2.5	2.7	0.2	1.9	2.1	<0.1	1.9	2.0
R104	0.2	2.5	2.7	0.2	1.9	2.1	<0.1	1.9	2.0
R105	0.2	2.5	2.7	0.2	1.9	2.1	<0.1	1.9	2.0
R106	0.2	2.5	2.7	0.2	1.9	2.1	0.1	1.9	2.0
R107	0.3	2.5	2.8	0.2	1.9	2.1	0.1	1.9	2.0
R108	0.3	2.5	2.8	0.2	1.9	2.1	0.1	1.9	2.0
R109	0.3	2.5	2.8	0.2	1.9	2.1	0.1	1.9	2.0
R110	0.3	2.5	2.8	0.2	1.9	2.1	<0.1	1.9	2.0
R111	0.3	2.5	2.8	0.2	1.9	2.1	0.1	1.9	2.0
R112	0.3	2.5	2.8	0.2	1.9	2.1	0.1	1.9	2.0
R113	0.5	2.5	3.0	0.4	1.9	2.3	0.2	1.9	2.1
R114	0.5	2.5	3.0	0.3	1.9	2.2	0.2	1.9	2.1
R115	0.5	2.5	3.0	0.3	1.9	2.2	0.2	1.9	2.1

Rec.	Carbon monoxide (CO) concentration ($mg \cdot m^{-3}$)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R116	0.3	2.5	2.8	0.2	1.9	2.1	0.1	1.9	2.0
R117	0.4	2.5	2.9	0.3	1.9	2.2	0.2	1.9	2.1
R118	0.2	2.5	2.7	0.2	1.9	2.1	0.1	1.9	2.0
R119	0.3	2.5	2.8	0.3	1.9	2.2	0.2	1.9	2.1
R120	0.3	2.5	2.8	0.2	1.9	2.1	0.2	1.9	2.1
R121	0.3	2.5	2.8	0.2	1.9	2.1	0.2	1.9	2.1
R122	0.3	2.5	2.8	0.2	1.9	2.1	0.1	1.9	2.0
R123	0.4	2.5	2.9	0.3	1.9	2.2	0.1	1.9	2.0
R124	0.4	2.5	2.9	0.3	1.9	2.2	0.2	1.9	2.1
R125	0.3	2.5	2.8	0.3	1.9	2.2	0.1	1.9	2.0
R126	0.3	2.5	2.8	0.3	1.9	2.2	0.2	1.9	2.1
R127	0.5	2.5	3.0	0.4	1.9	2.3	0.2	1.9	2.1
R128	0.4	2.5	2.9	0.3	1.9	2.2	0.2	1.9	2.1
R129	0.3	2.5	2.8	0.3	1.9	2.2	0.2	1.9	2.1
R130	0.5	2.5	3.0	0.4	1.9	2.3	0.3	1.9	2.2
R131	0.5	2.5	3.0	0.4	1.9	2.3	0.2	1.9	2.1
R132	0.5	2.5	3.0	0.4	1.9	2.3	0.2	1.9	2.1
R133	0.3	2.5	2.8	0.2	1.9	2.1	0.2	1.9	2.1
R134	0.3	2.5	2.8	0.2	1.9	2.1	0.2	1.9	2.1
R135	0.5	2.5	3.0	0.4	1.9	2.3	0.3	1.9	2.2
R136	0.5	2.5	3.0	0.4	1.9	2.3	0.2	1.9	2.1
R137	0.3	2.5	2.8	0.2	1.9	2.1	0.2	1.9	2.1
R138	0.3	2.5	2.8	0.3	1.9	2.2	0.2	1.9	2.1
R139	0.4	2.5	2.9	0.3	1.9	2.2	0.2	1.9	2.1

Rec.	Carbon monoxide (CO) concentration ($mg \cdot m^{-3}$)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R140	0.7	2.5	3.2	0.5	1.9	2.4	0.4	1.9	2.3
R141	0.6	2.5	3.1	0.5	1.9	2.4	0.3	1.9	2.2
R142	0.5	2.5	3.0	0.4	1.9	2.3	0.3	1.9	2.2
R143	0.5	2.5	3.0	0.4	1.9	2.3	0.2	1.9	2.1
R144	0.6	2.5	3.1	0.4	1.9	2.3	0.2	1.9	2.1
R145	0.5	2.5	3.0	0.4	1.9	2.3	0.2	1.9	2.1
R146	0.3	2.5	2.8	0.2	1.9	2.1	0.1	1.9	2.0
R147	0.6	2.5	3.1	0.5	1.9	2.4	0.2	1.9	2.1
R148	0.6	2.5	3.1	0.4	1.9	2.3	0.3	1.9	2.2
R149	0.5	2.5	3.0	0.3	1.9	2.2	0.2	1.9	2.1
R150	0.2	2.5	2.7	0.2	1.9	2.1	0.1	1.9	2.0
R151	0.4	2.5	2.9	0.3	1.9	2.2	0.1	1.9	2.0
R152	0.4	2.5	2.9	0.3	1.9	2.2	0.1	1.9	2.0
R153	0.3	2.5	2.8	0.3	1.9	2.2	0.2	1.9	2.1
R154	0.4	2.5	2.9	0.3	1.9	2.2	0.2	1.9	2.1
R155	0.5	2.5	3.0	0.4	1.9	2.3	0.2	1.9	2.1
R156	0.6	2.5	3.1	0.4	1.9	2.3	0.3	1.9	2.2
R157	0.5	2.5	3.0	0.4	1.9	2.3	0.3	1.9	2.2
R158	0.3	2.5	2.8	0.3	1.9	2.2	0.2	1.9	2.1
R159	0.4	2.5	2.9	0.3	1.9	2.2	0.2	1.9	2.1
R160	0.4	2.5	2.9	0.3	1.9	2.2	0.2	1.9	2.1
R161	0.2	2.5	2.7	0.2	1.9	2.1	<0.1	1.9	2.0
R162	0.3	2.5	2.8	0.2	1.9	2.1	0.1	1.9	2.0
R163	0.3	2.5	2.8	0.3	1.9	2.2	0.2	1.9	2.1

Rec.	Carbon monoxide (CO) concentration ($mg \cdot m^{-3}$)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R164	0.7	2.5	3.2	0.5	1.9	2.4	0.4	1.9	2.3
R165	0.6	2.5	3.1	0.4	1.9	2.3	0.3	1.9	2.2
R166	0.5	2.5	3.0	0.4	1.9	2.3	0.3	1.9	2.2
R167	0.3	2.5	2.8	0.2	1.9	2.1	0.2	1.9	2.1
R168	0.3	2.5	2.8	0.2	1.9	2.1	0.2	1.9	2.1
R169	0.3	2.5	2.8	0.2	1.9	2.1	0.2	1.9	2.1
R170	0.2	2.5	2.7	0.2	1.9	2.1	0.1	1.9	2.0
R171	0.4	2.5	2.9	0.3	1.9	2.2	0.2	1.9	2.1

Table F4 Predicted 1-hour and 24-hour SO2 concentrations for all receptors – Scenario 1

Rec.	Sulfphur dioxide (SO_2) concentration ($mg{\cdot}m^{-3}$)					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
Criterion	215			57		
Max. % of criterion	7.3	24.0	31.2	7.4	13.9	21.2
R1	3.7	51.5	55.2	4.2	7.9	12.1
R2	6.0	51.5	57.5	3.1	7.9	11.0
R3	9.5	51.5	61.0	3.3	7.9	11.2
R4	12.2	51.5	63.7	4.0	7.9	11.9
R5	15.6	51.5	67.1	2.8	7.9	10.7
R6	10.4	51.5	61.9	2.3	7.9	10.2
R7	9.5	51.5	61.0	3.5	7.9	11.4
R8	8.5	51.5	60.0	2.8	7.9	10.7
R9	10.3	51.5	61.8	2.1	7.9	10.0
R10	7.6	51.5	59.1	2.4	7.9	10.3
R11	5.8	51.5	57.3	2.3	7.9	10.2
R12	4.2	51.5	55.7	1.4	7.9	9.3
R13	4.2	51.5	55.7	2.3	7.9	10.2
R14	2.7	51.5	54.2	1.7	7.9	9.6
R15	2.9	51.5	54.4	2.4	7.9	10.3
R16	3.2	51.5	54.7	2.3	7.9	10.2
R17	2.3	51.5	53.8	2.7	7.9	10.6
R18	7.6	51.5	59.1	1.8	7.9	9.7
R19	7.5	51.5	59.0	1.2	7.9	9.1
R20	3.5	51.5	55.0	1.5	7.9	9.4
R21	2.0	51.5	53.5	1.9	7.9	9.8
R22	3.7	51.5	55.2	1.2	7.9	9.1
R23	5.2	51.5	56.7	1.8	7.9	9.7
R24	5.8	51.5	57.3	1.6	7.9	9.5
R25	4.6	51.5	56.1	1.2	7.9	9.1
R26	4.7	51.5	56.2	1.7	7.9	9.6
R27	4.8	51.5	56.3	1.1	7.9	9.0
R28	3.3	51.5	54.8	0.9	7.9	8.8
R29	6.6	51.5	58.1	0.6	7.9	8.5
R30	6.3	51.5	57.8	0.8	7.9	8.7
R31	4.1	51.5	55.6	1.7	7.9	9.6
R32	2.9	51.5	54.4	1.7	7.9	9.6
R33	4.7	51.5	56.2	0.8	7.9	8.7
R34	4.3	51.5	55.8	1.1	7.9	9.0
R35	3.5	51.5	55.0	2.1	7.9	10.0

Rec.	Sulfphur dioxide (SO_2) concentration (mg·m^{-3})					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R36	3.0	51.5	54.5	0.6	7.9	8.5
R37	2.0	51.5	53.5	1.1	7.9	9.0
R38	2.8	51.5	54.3	1.4	7.9	9.3
R39	2.8	51.5	54.3	1.6	7.9	9.5
R40	2.1	51.5	53.6	1.1	7.9	9.0
R41	2.0	51.5	53.5	1.6	7.9	9.5
R42	2.1	51.5	53.6	1.0	7.9	8.9
R43	1.7	51.5	53.2	0.9	7.9	8.8
R44	2.1	51.5	53.6	0.7	7.9	8.6
R45	2.6	51.5	54.1	0.5	7.9	8.4
R46	3.6	51.5	55.1	0.9	7.9	8.8
R47	2.1	51.5	53.6	0.4	7.9	8.3
R48	3.3	51.5	54.8	0.5	7.9	8.4
R49	3.5	51.5	55.0	0.8	7.9	8.7
R50	3.0	51.5	54.5	1.3	7.9	9.2
R51	3.4	51.5	54.9	0.5	7.9	8.4
R52	3.3	51.5	54.8	0.6	7.9	8.5
R53	3.6	51.5	55.1	0.5	7.9	8.4
R54	1.9	51.5	53.4	0.9	7.9	8.8
R55	2.4	51.5	53.9	0.7	7.9	8.6
R56	3.0	51.5	54.5	0.6	7.9	8.5
R57	2.6	51.5	54.1	0.4	7.9	8.3
R58	2.1	51.5	53.6	0.7	7.9	8.6
R59	2.4	51.5	53.9	0.5	7.9	8.4
R60	2.6	51.5	54.1	0.6	7.9	8.5
R61	2.2	51.5	53.7	0.9	7.9	8.8
R62	2.3	51.5	53.8	0.7	7.9	8.6
R63	2.3	51.5	53.8	0.8	7.9	8.7
R64	2.4	51.5	53.9	0.4	7.9	8.3
R65	1.7	51.5	53.2	0.6	7.9	8.5
R66	3.7	51.5	55.2	0.5	7.9	8.4
R67	1.5	51.5	53.0	0.6	7.9	8.5
R68	1.1	51.5	52.6	1.1	7.9	9.0
R69	1.7	51.5	53.2	0.4	7.9	8.3
R70	1.3	51.5	52.8	0.7	7.9	8.6
R71	1.4	51.5	52.9	0.6	7.9	8.5
R72	1.3	51.5	52.8	0.6	7.9	8.5
R73	2.0	51.5	53.5	0.9	7.9	8.8
R74	3.2	51.5	54.7	0.6	7.9	8.5

Rec.	Sulfphur dioxide (SO_2) concentration (mg·m^{-3})					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R75	1.6	51.5	53.1	0.8	7.9	8.7
R76	1.9	51.5	53.4	0.7	7.9	8.6
R77	1.9	51.5	53.4	0.6	7.9	8.5
R78	2.0	51.5	53.5	0.4	7.9	8.3
R79	2.5	51.5	54.0	0.6	7.9	8.5
R80	3.4	51.5	54.9	1.0	7.9	8.9
R81	4.2	51.5	55.7	0.5	7.9	8.4
R82	4.0	51.5	55.5	0.5	7.9	8.4
R83	1.4	51.5	52.9	0.3	7.9	8.2
R84	2.4	51.5	53.9	0.6	7.9	8.5
R85	3.2	51.5	54.7	0.6	7.9	8.5
R86	2.2	51.5	53.7	0.3	7.9	8.2
R87	2.2	51.5	53.7	0.3	7.9	8.2
R88	1.6	51.5	53.1	0.3	7.9	8.2
R89	2.4	51.5	53.9	0.5	7.9	8.4
R90	1.4	51.5	52.9	0.4	7.9	8.3
R91	2.1	51.5	53.6	0.4	7.9	8.3
R92	1.4	51.5	52.9	0.2	7.9	8.1
R93	1.2	51.5	52.7	0.3	7.9	8.2
R94	1.4	51.5	52.9	0.3	7.9	8.2
R95	1.2	51.5	52.7	0.4	7.9	8.3
R96	0.5	51.5	52.0	0.4	7.9	8.3
R97	0.5	51.5	52.0	0.3	7.9	8.2
R98	0.6	51.5	52.1	0.5	7.9	8.4
R99	0.6	51.5	52.1	0.3	7.9	8.2
R100	0.5	51.5	52.0	0.4	7.9	8.3
R101	0.5	51.5	52.0	0.3	7.9	8.2
R102	0.5	51.5	52.0	0.5	7.9	8.4
R103	0.5	51.5	52.0	0.2	7.9	8.1
R104	0.6	51.5	52.1	0.3	7.9	8.2
R105	0.5	51.5	52.0	0.3	7.9	8.2
R106	0.7	51.5	52.2	0.3	7.9	8.2
R107	0.7	51.5	52.2	0.3	7.9	8.2
R108	0.7	51.5	52.2	0.3	7.9	8.2
R109	0.7	51.5	52.2	0.4	7.9	8.3
R110	0.7	51.5	52.2	0.2	7.9	8.1
R111	0.8	51.5	52.3	0.2	7.9	8.1
R112	0.7	51.5	52.2	0.3	7.9	8.2
R113	1.3	51.5	52.8	0.3	7.9	8.2

Rec.	Sulphur dioxide (SO_2) concentration ($mg{\cdot}m^{-3}$)					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R114	1.2	51.5	52.7	0.2	7.9	8.1
R115	1.2	51.5	52.7	0.6	7.9	8.5
R116	0.8	51.5	52.3	0.4	7.9	8.3
R117	1.0	51.5	52.5	0.3	7.9	8.2
R118	0.6	51.5	52.1	0.3	7.9	8.2
R119	0.9	51.5	52.4	0.3	7.9	8.2
R120	0.8	51.5	52.3	0.3	7.9	8.2
R121	0.8	51.5	52.3	0.3	7.9	8.2
R122	0.8	51.5	52.3	0.3	7.9	8.2
R123	1.0	51.5	52.5	0.2	7.9	8.1
R124	1.1	51.5	52.6	0.2	7.9	8.1
R125	0.9	51.5	52.4	0.3	7.9	8.2
R126	0.9	51.5	52.4	0.3	7.9	8.2
R127	1.4	51.5	52.9	0.2	7.9	8.1
R128	1.0	51.5	52.5	0.2	7.9	8.1
R129	0.9	51.5	52.4	0.3	7.9	8.2
R130	1.3	51.5	52.8	0.2	7.9	8.1
R131	1.4	51.5	52.9	0.3	7.9	8.2
R132	1.2	51.5	52.7	0.2	7.9	8.1
R133	0.8	51.5	52.3	0.2	7.9	8.1
R134	0.8	51.5	52.3	0.3	7.9	8.2
R135	1.3	51.5	52.8	0.3	7.9	8.2
R136	1.3	51.5	52.8	0.2	7.9	8.1
R137	0.8	51.5	52.3	0.3	7.9	8.2
R138	0.9	51.5	52.4	0.1	7.9	8.0
R139	1.1	51.5	52.6	0.2	7.9	8.1
R140	1.8	51.5	53.3	0.3	7.9	8.2
R141	1.6	51.5	53.1	0.2	7.9	8.1
R142	1.4	51.5	52.9	0.2	7.9	8.1
R143	1.3	51.5	52.8	0.2	7.9	8.1
R144	1.5	51.5	53.0	0.2	7.9	8.1
R145	1.4	51.5	52.9	0.2	7.9	8.1
R146	0.7	51.5	52.2	0.2	7.9	8.1
R147	1.6	51.5	53.1	0.2	7.9	8.1
R148	1.5	51.5	53.0	0.2	7.9	8.1
R149	1.2	51.5	52.7	0.1	7.9	8.0
R150	0.6	51.5	52.1	0.1	7.9	8.0
R151	0.9	51.5	52.4	0.1	7.9	8.0
R152	1.0	51.5	52.5	0.2	7.9	8.1

Rec.	Sulfphur dioxide (SO_2) concentration (mg·m^{-3})					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R153	0.9	51.5	52.4	0.2	7.9	8.1
R154	0.9	51.5	52.4	0.2	7.9	8.1
R155	1.4	51.5	52.9	0.2	7.9	8.1
R156	1.5	51.5	53.0	0.2	7.9	8.1
R157	1.4	51.5	52.9	0.2	7.9	8.1
R158	0.9	51.5	52.4	0.2	7.9	8.1
R159	1.0	51.5	52.5	0.1	7.9	8.0
R160	0.9	51.5	52.4	0.2	7.9	8.1
R161	0.6	51.5	52.1	0.1	7.9	8.0
R162	0.7	51.5	52.2	0.1	7.9	8.0
R163	0.9	51.5	52.4	0.2	7.9	8.1
R164	1.8	51.5	53.3	0.1	7.9	8.0
R165	1.6	51.5	53.1	0.1	7.9	8.0
R166	1.4	51.5	52.9	0.1	7.9	8.0
R167	0.8	51.5	52.3	0.2	7.9	8.1
R168	0.8	51.5	52.3	<0.1	7.9	8.0
R169	0.8	51.5	52.3	0.1	7.9	8.0
R170	0.6	51.5	52.1	0.1	7.9	8.0
R171	1.1	51.5	52.6	0.2	7.9	8.1

Table F5 Predicted incremental 1-hour PAH, benzene, toluene, xylene and formaldehyde concentrations for all receptors – Scenario 1

c	99.9th percentile 1-hour average concentration (mg·m-3)				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
Criterion	0.0004	0.029	0.36	0.19	0.02
R1	7.43E-09	5.01E-04	1.81E-04	1.26E-04	5.09E-05
R2	1.61E-08	1.08E-03	3.91E-04	2.73E-04	1.10E-04
R3	1.32E-09	8.87E-05	3.20E-05	2.23E-05	9.01E-06
R4	1.42E-09	9.56E-05	3.45E-05	2.41E-05	9.71E-06
R5	1.32E-09	8.89E-05	3.21E-05	2.24E-05	9.03E-06
R6	1.42E-09	9.59E-05	3.46E-05	2.41E-05	9.74E-06
R7	1.59E-09	1.07E-04	3.87E-05	2.70E-05	1.09E-05
R8	1.49E-09	1.00E-04	3.63E-05	2.53E-05	1.02E-05
R9	1.56E-09	1.05E-04	3.80E-05	2.65E-05	1.07E-05
R10	1.81E-09	1.22E-04	4.40E-05	3.07E-05	1.24E-05
R11	1.58E-09	1.07E-04	3.85E-05	2.68E-05	1.08E-05
R12	1.99E-09	1.34E-04	4.84E-05	3.37E-05	1.36E-05
R13	1.27E-08	8.59E-04	3.10E-04	2.16E-04	8.72E-05
R14	1.47E-09	9.91E-05	3.58E-05	2.49E-05	1.01E-05
R15	1.94E-09	1.31E-04	4.71E-05	3.29E-05	1.33E-05
R16	1.93E-09	1.30E-04	4.69E-05	3.27E-05	1.32E-05
R17	3.39E-09	2.29E-04	8.25E-05	5.75E-05	2.32E-05
R18	3.46E-09	2.33E-04	8.41E-05	5.86E-05	2.37E-05
R19	3.43E-09	2.31E-04	8.34E-05	5.82E-05	2.35E-05
R20	1.70E-09	1.14E-04	4.12E-05	2.87E-05	1.16E-05
R21	2.33E-09	1.57E-04	5.66E-05	3.94E-05	1.59E-05
R22	1.82E-09	1.23E-04	4.43E-05	3.09E-05	1.25E-05
R23	2.22E-09	1.50E-04	5.40E-05	3.77E-05	1.52E-05
R24	9.01E-09	6.07E-04	2.19E-04	1.53E-04	6.16E-05
R25	2.03E-09	1.37E-04	4.94E-05	3.45E-05	1.39E-05
R26	2.23E-09	1.50E-04	5.43E-05	3.79E-05	1.53E-05
R27	2.17E-09	1.46E-04	5.28E-05	3.68E-05	1.48E-05
R28	2.71E-09	1.83E-04	6.59E-05	4.59E-05	1.85E-05
R29	3.05E-09	2.05E-04	7.41E-05	5.16E-05	2.08E-05
R30	2.39E-09	1.61E-04	5.81E-05	4.05E-05	1.63E-05
R31	2.62E-09	1.77E-04	6.38E-05	4.44E-05	1.79E-05
R32	2.76E-09	1.86E-04	6.70E-05	4.67E-05	1.89E-05
R33	2.81E-09	1.89E-04	6.83E-05	4.76E-05	1.92E-05
R34	2.27E-09	1.53E-04	5.52E-05	3.85E-05	1.55E-05
R35	9.78E-09	6.59E-04	2.38E-04	1.66E-04	6.69E-05
R36	3.37E-09	2.27E-04	8.18E-05	5.70E-05	2.30E-05

c	99.9th percentile 1-hour average concentration (mg·m-3)				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R37	3.64E-09	2.45E-04	8.84E-05	6.16E-05	2.49E-05
R38	3.35E-09	2.26E-04	8.14E-05	5.67E-05	2.29E-05
R39	2.05E-09	1.38E-04	4.98E-05	3.47E-05	1.40E-05
R40	1.99E-09	1.34E-04	4.84E-05	3.38E-05	1.36E-05
R41	3.53E-09	2.38E-04	8.59E-05	5.99E-05	2.42E-05
R42	3.30E-09	2.23E-04	8.03E-05	5.60E-05	2.26E-05
R43	2.23E-09	1.50E-04	5.42E-05	3.78E-05	1.53E-05
R44	2.47E-09	1.66E-04	6.00E-05	4.18E-05	1.69E-05
R45	2.88E-09	1.94E-04	7.01E-05	4.89E-05	1.97E-05
R46	5.48E-09	3.69E-04	1.33E-04	9.29E-05	3.75E-05
R47	5.08E-09	3.42E-04	1.24E-04	8.61E-05	3.48E-05
R48	4.14E-09	2.79E-04	1.01E-04	7.02E-05	2.83E-05
R49	3.55E-09	2.39E-04	8.64E-05	6.02E-05	2.43E-05
R50	2.54E-09	1.71E-04	6.17E-05	4.30E-05	1.74E-05
R51	3.19E-09	2.15E-04	7.77E-05	5.41E-05	2.19E-05
R52	3.42E-09	2.30E-04	8.30E-05	5.79E-05	2.34E-05
R53	1.65E-09	1.11E-04	4.00E-05	2.79E-05	1.13E-05
R54	3.51E-09	2.37E-04	8.54E-05	5.95E-05	2.40E-05
R55	3.56E-09	2.40E-04	8.65E-05	6.03E-05	2.43E-05
R56	2.85E-09	1.92E-04	6.93E-05	4.83E-05	1.95E-05
R57	6.26E-09	4.22E-04	1.52E-04	1.06E-04	4.28E-05
R58	1.71E-09	1.15E-04	4.15E-05	2.89E-05	1.17E-05
R59	1.96E-09	1.32E-04	4.78E-05	3.33E-05	1.34E-05
R60	2.55E-09	1.72E-04	6.21E-05	4.32E-05	1.75E-05
R61	2.48E-09	1.67E-04	6.02E-05	4.20E-05	1.69E-05
R62	2.55E-09	1.72E-04	6.19E-05	4.32E-05	1.74E-05
R63	3.33E-09	2.24E-04	8.09E-05	5.64E-05	2.28E-05
R64	4.10E-09	2.76E-04	9.96E-05	6.94E-05	2.80E-05
R65	3.50E-09	2.36E-04	8.52E-05	5.94E-05	2.40E-05
R66	2.24E-09	1.51E-04	5.45E-05	3.80E-05	1.53E-05
R67	2.29E-09	1.54E-04	5.57E-05	3.88E-05	1.57E-05
R68	6.64E-09	4.47E-04	1.61E-04	1.12E-04	4.54E-05
R69	2.36E-09	1.59E-04	5.73E-05	4.00E-05	1.61E-05
R70	1.53E-09	1.03E-04	3.72E-05	2.59E-05	1.05E-05
R71	1.93E-09	1.30E-04	4.69E-05	3.27E-05	1.32E-05
R72	2.13E-09	1.43E-04	5.18E-05	3.61E-05	1.46E-05
R73	4.79E-09	3.23E-04	1.16E-04	8.11E-05	3.28E-05
R74	4.48E-09	3.02E-04	1.09E-04	7.59E-05	3.06E-05
R75	3.95E-09	2.66E-04	9.60E-05	6.69E-05	2.70E-05

c	99.9th percentile 1-hour average concentration (mg·m-3)				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R76	2.33E-09	1.57E-04	5.67E-05	3.95E-05	1.60E-05
R77	2.49E-09	1.68E-04	6.05E-05	4.22E-05	1.70E-05
R78	2.21E-09	1.49E-04	5.37E-05	3.75E-05	1.51E-05
R79	5.33E-09	3.59E-04	1.30E-04	9.03E-05	3.65E-05
R80	1.68E-09	1.13E-04	4.09E-05	2.85E-05	1.15E-05
R81	2.79E-09	1.88E-04	6.79E-05	4.73E-05	1.91E-05
R82	1.32E-08	8.92E-04	3.22E-04	2.24E-04	9.06E-05
R83	1.41E-08	9.48E-04	3.42E-04	2.39E-04	9.63E-05
R84	1.02E-08	6.85E-04	2.47E-04	1.72E-04	6.96E-05
R85	8.17E-09	5.50E-04	1.99E-04	1.38E-04	5.59E-05
R86	4.88E-09	3.29E-04	1.19E-04	8.28E-05	3.34E-05
R87	9.85E-09	6.63E-04	2.39E-04	1.67E-04	6.74E-05
R88	1.46E-08	9.83E-04	3.55E-04	2.47E-04	9.98E-05
R89	1.37E-08	9.20E-04	3.32E-04	2.31E-04	9.34E-05
R90	1.18E-08	7.95E-04	2.87E-04	2.00E-04	8.08E-05
R91	1.33E-08	8.96E-04	3.23E-04	2.25E-04	9.10E-05
R92	1.42E-08	9.54E-04	3.44E-04	2.40E-04	9.69E-05
R93	9.35E-09	6.30E-04	2.27E-04	1.58E-04	6.40E-05
R94	1.46E-08	9.84E-04	3.55E-04	2.47E-04	9.99E-05
R95	1.70E-08	1.14E-03	4.13E-04	2.88E-04	1.16E-04
R96	1.34E-08	9.00E-04	3.25E-04	2.26E-04	9.14E-05
R97	8.76E-09	5.90E-04	2.13E-04	1.48E-04	5.99E-05
R98	6.62E-09	4.46E-04	1.61E-04	1.12E-04	4.53E-05
R99	1.25E-08	8.42E-04	3.04E-04	2.12E-04	8.55E-05
R100	1.16E-08	7.81E-04	2.82E-04	1.96E-04	7.93E-05
R101	6.97E-09	4.70E-04	1.70E-04	1.18E-04	4.77E-05
R102	6.51E-09	4.38E-04	1.58E-04	1.10E-04	4.45E-05
R103	5.46E-09	3.68E-04	1.33E-04	9.25E-05	3.74E-05
R104	5.21E-09	3.51E-04	1.27E-04	8.82E-05	3.56E-05
R105	5.06E-09	3.41E-04	1.23E-04	8.57E-05	3.46E-05
R106	2.14E-08	1.44E-03	5.19E-04	3.62E-04	1.46E-04
R107	5.00E-09	3.37E-04	1.21E-04	8.47E-05	3.42E-05
R108	4.98E-09	3.35E-04	1.21E-04	8.43E-05	3.40E-05
R109	4.61E-09	3.11E-04	1.12E-04	7.82E-05	3.16E-05
R110	4.67E-09	3.15E-04	1.14E-04	7.91E-05	3.19E-05
R111	5.67E-09	3.82E-04	1.38E-04	9.61E-05	3.88E-05
R112	6.65E-09	4.48E-04	1.62E-04	1.13E-04	4.55E-05
R113	9.74E-09	6.56E-04	2.37E-04	1.65E-04	6.66E-05
R114	4.36E-09	2.94E-04	1.06E-04	7.39E-05	2.98E-05

c	99.9th percentile 1-hour average concentration (mg·m-3)				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R115	6.42E-09	4.32E-04	1.56E-04	1.09E-04	4.39E-05
R116	6.35E-09	4.28E-04	1.54E-04	1.08E-04	4.34E-05
R117	3.27E-08	2.20E-03	7.95E-04	5.54E-04	2.24E-04
R118	6.53E-09	4.40E-04	1.59E-04	1.11E-04	4.47E-05
R119	9.45E-09	6.37E-04	2.30E-04	1.60E-04	6.47E-05
R120	9.37E-09	6.31E-04	2.28E-04	1.59E-04	6.41E-05
R121	6.36E-09	4.28E-04	1.55E-04	1.08E-04	4.35E-05
R122	5.24E-09	3.53E-04	1.27E-04	8.88E-05	3.58E-05
R123	5.02E-09	3.38E-04	1.22E-04	8.51E-05	3.44E-05
R124	5.60E-09	3.77E-04	1.36E-04	9.49E-05	3.83E-05
R125	4.94E-09	3.33E-04	1.20E-04	8.38E-05	3.38E-05
R126	5.33E-09	3.59E-04	1.30E-04	9.04E-05	3.65E-05
R127	4.55E-09	3.06E-04	1.11E-04	7.71E-05	3.11E-05
R128	2.44E-08	1.64E-03	5.92E-04	4.13E-04	1.67E-04
R129	5.06E-09	3.41E-04	1.23E-04	8.57E-05	3.46E-05
R130	5.56E-09	3.74E-04	1.35E-04	9.42E-05	3.80E-05
R131	6.50E-09	4.38E-04	1.58E-04	1.10E-04	4.45E-05
R132	4.94E-09	3.33E-04	1.20E-04	8.37E-05	3.38E-05
R133	6.29E-09	4.24E-04	1.53E-04	1.07E-04	4.30E-05
R134	4.45E-09	3.00E-04	1.08E-04	7.54E-05	3.04E-05
R135	7.14E-09	4.81E-04	1.74E-04	1.21E-04	4.88E-05
R136	3.32E-09	2.24E-04	8.07E-05	5.62E-05	2.27E-05
R137	2.66E-09	1.79E-04	6.47E-05	4.51E-05	1.82E-05
R138	3.60E-09	2.43E-04	8.76E-05	6.10E-05	2.46E-05
R139	1.32E-08	8.91E-04	3.22E-04	2.24E-04	9.05E-05
R140	3.47E-09	2.34E-04	8.45E-05	5.89E-05	2.38E-05
R141	3.35E-09	2.26E-04	8.14E-05	5.68E-05	2.29E-05
R142	3.16E-09	2.13E-04	7.68E-05	5.36E-05	2.16E-05
R143	5.37E-09	3.62E-04	1.31E-04	9.10E-05	3.67E-05
R144	8.21E-09	5.53E-04	2.00E-04	1.39E-04	5.61E-05
R145	3.47E-09	2.34E-04	8.43E-05	5.88E-05	2.37E-05
R146	4.82E-09	3.25E-04	1.17E-04	8.18E-05	3.30E-05
R147	4.50E-09	3.03E-04	1.09E-04	7.63E-05	3.08E-05
R148	5.62E-09	3.79E-04	1.37E-04	9.53E-05	3.85E-05
R149	7.01E-09	4.72E-04	1.70E-04	1.19E-04	4.80E-05
R150	1.16E-08	7.80E-04	2.82E-04	1.96E-04	7.92E-05
R151	8.68E-09	5.84E-04	2.11E-04	1.47E-04	5.94E-05
R152	1.23E-08	8.27E-04	2.99E-04	2.08E-04	8.40E-05
R153	9.13E-09	6.15E-04	2.22E-04	1.55E-04	6.25E-05

c	99.9th percentile 1-hour average concentration (mg·m^{-3})				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R154	3.46E-09	2.33E-04	8.42E-05	5.87E-05	2.37E-05
R155	4.81E-09	3.24E-04	1.17E-04	8.16E-05	3.29E-05
R156	8.39E-09	5.66E-04	2.04E-04	1.42E-04	5.74E-05
R157	5.82E-09	3.92E-04	1.41E-04	9.86E-05	3.98E-05
R158	5.95E-09	4.01E-04	1.45E-04	1.01E-04	4.07E-05
R159	4.32E-09	2.91E-04	1.05E-04	7.32E-05	2.95E-05
R160	6.75E-09	4.54E-04	1.64E-04	1.14E-04	4.62E-05
R161	1.66E-08	1.12E-03	4.03E-04	2.81E-04	1.13E-04
R162	3.68E-09	2.48E-04	8.95E-05	6.24E-05	2.52E-05
R163	5.30E-09	3.57E-04	1.29E-04	8.99E-05	3.63E-05
R164	3.86E-09	2.60E-04	9.38E-05	6.54E-05	2.64E-05
R165	3.19E-09	2.15E-04	7.75E-05	5.40E-05	2.18E-05
R166	3.95E-09	2.66E-04	9.62E-05	6.70E-05	2.71E-05
R167	2.70E-09	1.82E-04	6.57E-05	4.58E-05	1.85E-05
R168	1.40E-09	9.40E-05	3.39E-05	2.37E-05	9.55E-06
R169	1.33E-09	8.95E-05	3.23E-05	2.25E-05	9.09E-06
R170	1.50E-09	1.01E-04	3.65E-05	2.54E-05	1.03E-05
R171	1.60E-09	1.08E-04	3.89E-05	2.71E-05	1.09E-05

AQIA Results - All Receptors – Scenario 2

Table F6 Maximum 24-Hour PM_{10} and $PM_{2.5}$ concentrations for all receptors – Scenario 2

Receptor	Maximum 24-hour average concentration ($\mu g \cdot m^{-3}$)	
	PM_{10}	$PM_{2.5}$
Criterion	50	25
Max % of crit.	3.0	6.0
R1	0.6	0.6
R2	0.8	0.8
R3	1.0	1.0
R4	0.8	0.8
R5	0.6	0.6
R6	1.3	1.3
R7	1.5	1.5
R8	0.9	0.9
R9	0.6	0.6
R10	0.6	0.6
R11	0.7	0.7
R12	0.8	0.8
R13	0.5	0.5
R14	0.2	0.2
R15	0.4	0.4
R16	0.4	0.4
R17	0.3	0.3
R18	0.6	0.6
R19	0.6	0.6
R20	0.4	0.4
R21	0.2	0.2
R22	0.5	0.5
R23	0.5	0.5
R24	0.5	0.5
R25	0.3	0.3
R26	0.5	0.5
R27	0.5	0.5
R28	0.4	0.4
R29	0.5	0.5
R30	0.4	0.4
R31	0.2	0.2
R32	0.1	0.1
R33	0.3	0.3
R34	0.2	0.2
R35	0.1	0.1
R36	0.2	0.2
R37	0.1	0.1

Receptor	Maximum 24-hour average concentration ($\mu g \cdot m^{-3}$)	
	PM_{10}	$PM_{2.5}$
R38	0.1	0.1
R39	0.1	0.1
R40	<0.1	<0.1
R41	0.1	0.1
R42	<0.1	<0.1
R43	<0.1	<0.1
R44	<0.1	<0.1
R45	0.1	0.1
R46	0.2	0.2
R47	0.1	0.1
R48	0.1	0.1
R49	0.2	0.2
R50	0.2	0.2
R51	0.3	0.3
R52	0.2	0.2
R53	0.2	0.2
R54	0.2	0.2
R55	0.1	0.1
R56	0.1	0.1
R57	0.1	0.1
R58	<0.1	<0.1
R59	0.1	0.1
R60	0.2	0.2
R61	<0.1	<0.1
R62	0.2	0.2
R63	0.1	0.1
R64	0.1	0.1
R65	0.2	0.2
R66	0.3	0.3
R67	<0.1	<0.1
R68	<0.1	<0.1
R69	0.1	0.1
R70	<0.1	<0.1
R71	<0.1	<0.1
R72	<0.1	<0.1
R73	0.2	0.2
R74	0.4	0.4
R75	0.1	0.1
R76	0.2	0.2
R77	0.1	0.1

Receptor	Maximum 24-hour average concentration ($\mu g \cdot m^{-3}$)	
	PM_{10}	$PM_{2.5}$
R78	0.1	0.1
R79	0.2	0.2
R80	0.2	0.2
R81	0.3	0.3
R82	0.1	0.1
R83	0.1	0.1
R84	0.1	0.1
R85	0.1	0.1
R86	<0.1	<0.1
R87	<0.1	<0.1
R88	<0.1	<0.1
R89	0.2	0.2
R90	<0.1	<0.1
R91	<0.1	<0.1
R92	<0.1	<0.1
R93	<0.1	<0.1
R94	<0.1	<0.1
R95	<0.1	<0.1
R96	<0.1	<0.1
R97	<0.1	<0.1
R98	<0.1	<0.1
R99	<0.1	<0.1
R100	<0.1	<0.1
R101	<0.1	<0.1
R102	<0.1	<0.1
R103	<0.1	<0.1
R104	<0.1	<0.1
R105	<0.1	<0.1
R106	<0.1	<0.1
R107	<0.1	<0.1
R108	<0.1	<0.1
R109	<0.1	<0.1
R110	<0.1	<0.1
R111	<0.1	<0.1
R112	<0.1	<0.1
R113	<0.1	<0.1
R114	<0.1	<0.1
R115	0.1	0.1
R116	<0.1	<0.1

Receptor	Maximum 24-hour average concentration ($\mu g \cdot m^{-3}$)	
	PM_{10}	$PM_{2.5}$
R117	<0.1	<0.1
R118	<0.1	<0.1
R119	<0.1	<0.1
R120	<0.1	<0.1
R121	<0.1	<0.1
R122	<0.1	<0.1
R123	<0.1	<0.1
R124	<0.1	<0.1
R125	<0.1	<0.1
R126	<0.1	<0.1
R127	<0.1	<0.1
R128	<0.1	<0.1
R129	<0.1	<0.1
R130	<0.1	<0.1
R131	<0.1	<0.1
R132	<0.1	<0.1
R133	<0.1	<0.1
R134	<0.1	<0.1
R135	<0.1	<0.1
R136	<0.1	<0.1
R137	<0.1	<0.1
R138	<0.1	<0.1
R139	<0.1	<0.1
R140	<0.1	<0.1
R141	<0.1	<0.1
R142	<0.1	<0.1
R143	<0.1	<0.1
R144	<0.1	<0.1
R145	<0.1	<0.1
R146	<0.1	<0.1
R147	<0.1	<0.1
R148	<0.1	<0.1
R149	<0.1	<0.1
R150	<0.1	<0.1
R151	<0.1	<0.1
R152	<0.1	<0.1
R153	<0.1	<0.1
R154	<0.1	<0.1
R155	<0.1	<0.1
R156	<0.1	<0.1

Receptor	Maximum 24-hour average concentration ($\mu g \cdot m^{-3}$)	
	PM_{10}	$PM_{2.5}$
R157	<0.1	<0.1
R158	<0.1	<0.1
R159	<0.1	<0.1
R160	<0.1	<0.1
R161	<0.1	<0.1
R162	<0.1	<0.1
R163	<0.1	<0.1
R164	0.1	0.1
R165	<0.1	<0.1
R166	<0.1	<0.1
R167	<0.1	<0.1
R168	<0.1	<0.1
R169	<0.1	<0.1
R170	<0.1	<0.1
R171	<0.1	<0.1

Table F7 Predicted 1-hour and annual average NO_2 concentrations for all receptors – Scenario 2

Receptor	NO2 Concentration (mg·m^{-3})					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
Criterion	164			31		
Max % of crit.	11.7	26.3	30.6	1.1	31.6	32.7
R1	6.4	14.4	20.8	0.1	9.8	9.9
R2	5.1	8.2	13.3	0.2	9.8	10.0
R3	7.7	6.2	13.8	0.3	9.8	10.1
R4	5.3	2.1	7.3	<0.1	9.8	<9.9
R5	4.1	4.1	8.2	<0.1	9.8	<9.9
R6	6.4	4.1	10.5	<0.1	9.8	<9.9
R7	10.5	2.1	12.6	0.3	9.8	10.1
R8	6.7	2.1	8.7	0.2	9.8	10.0
R9	8.3	12.3	20.6	0.1	9.8	9.9
R10	6.3	2.1	8.3	0.1	9.8	9.9
R11	7.7	4.1	11.8	0.1	9.8	9.9
R12	8.5	4.1	12.6	0.3	9.8	10.1
R13	7.8	2.1	9.9	0.2	9.8	10.0
R14	6.1	22.6	28.7	0.1	9.8	9.9
R15	6.8	14.4	21.1	0.1	9.8	9.9
R16	6.1	14.4	20.5	0.1	9.8	9.9
R17	5.2	14.4	19.5	<0.1	9.8	<9.9
R18	6.6	12.3	18.9	0.2	9.8	10.0
R19	7.3	12.3	19.6	0.2	9.8	10.0
R20	5.6	6.2	11.8	0.2	9.8	10.0
R21	5.0	14.4	19.3	<0.1	9.8	<9.9
R22	6.7	6.2	12.8	0.3	9.8	10.1
R23	6.4	12.3	18.7	0.2	9.8	10.0
R24	8.4	12.3	20.7	0.2	9.8	10.0
R25	7.7	9.8	17.5	0.1	9.8	9.9
R26	6.1	4.1	10.2	0.1	9.8	9.9
R27	9.2	4.1	13.3	0.2	9.8	10.0
R28	5.4	12.3	17.7	0.2	9.8	10.0
R29	7.4	12.3	19.7	0.1	9.8	9.9
R30	6.5	12.3	18.8	0.1	9.8	9.9
R31	8.1	12.3	20.4	0.1	9.8	9.9

Receptor	NO2 Concentration (mg·m^{-3})					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R32	11.8	16.4	28.2	<0.1	9.8	<9.9
R33	8.3	12.3	20.6	0.2	9.8	10.0
R34	11.9	6.2	18.0	0.1	9.8	9.9
R35	8.2	<0.1	8.3	0.1	9.8	9.9
R36	12.3	12.3	24.6	<0.1	9.8	<9.9
R37	8.6	10.3	18.8	<0.1	9.8	<9.9
R38	14.5	12.3	26.8	<0.1	9.8	<9.9
R39	16.8	12.3	29.1	<0.1	9.8	<9.9
R40	9.3	14.4	23.6	<0.1	9.8	<9.9
R41	13.3	6.2	19.4	<0.1	9.8	<9.9
R42	12.3	12.3	24.6	<0.1	9.8	<9.9
R43	11.9	6.2	18.1	0.1	9.8	9.9
R44	10.2	<0.1	10.2	<0.1	9.8	<9.9
R45	8.1	2.1	10.1	<0.1	9.8	<9.9
R46	7.7	9.8	17.5	<0.1	9.8	<9.9
R47	6.5	8.2	14.7	0.1	9.8	9.9
R48	7.4	10.3	17.6	<0.1	9.8	<9.9
R49	7.1	22.6	29.6	0.1	9.8	9.9
R50	14.0	8.2	22.2	0.1	9.8	9.9
R51	9.2	2.1	11.2	0.2	9.8	10.0
R52	8.0	8.2	16.2	0.2	9.8	10.0
R53	8.4	8.2	16.6	0.1	9.8	9.9
R54	7.4	8.2	15.6	<0.1	9.8	<9.9
R55	9.3	8.2	17.5	<0.1	9.8	<9.9
R56	7.4	8.2	15.6	<0.1	9.8	<9.9
R57	6.4	12.3	18.7	0.1	9.8	9.9
R58	6.3	<0.1	6.4	<0.1	9.8	<9.9
R59	9.9	4.1	14.0	0.1	9.8	9.9
R60	8.3	4.1	12.4	0.1	9.8	9.9
R61	12.9	6.2	19.0	0.1	9.8	9.9
R62	8.0	6.2	14.2	0.2	9.8	10.0
R63	9.0	10.3	19.3	0.1	9.8	9.9
R64	9.6	4.1	13.7	0.1	9.8	9.9
R65	7.1	43.1	50.1	<0.1	9.8	<9.9
R66	7.8	2.1	9.9	0.2	9.8	10.0
R67	9.9	4.1	14.0	<0.1	9.8	<9.9

Receptor	NO2 Concentration (mg·m^{-3})					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R68	5.3	8.2	13.5	<0.1	9.8	<9.9
R69	6.1	6.2	12.3	<0.1	9.8	<9.9
R70	5.3	24.6	29.9	<0.1	9.8	<9.9
R71	8.6	6.2	14.7	<0.1	9.8	<9.9
R72	6.4	4.1	10.5	<0.1	9.8	<9.9
R73	6.3	6.2	12.4	0.2	9.8	10.0
R74	7.8	8.2	16.0	0.2	9.8	10.0
R75	6.5	24.6	31.1	<0.1	9.8	<9.9
R76	5.5	4.1	9.6	0.1	9.8	9.9
R77	8.1	6.2	14.3	0.1	9.8	9.9
R78	10.2	16.4	26.6	<0.1	9.8	<9.9
R79	12.3	8.2	20.5	0.1	9.8	9.9
R80	11.2	8.2	19.4	0.1	9.8	9.9
R81	9.8	4.1	13.9	0.1	9.8	9.9
R82	10.9	6.2	17.0	0.1	9.8	9.9
R83	5.8	24.6	30.4	<0.1	9.8	<9.9
R84	7.0	14.4	21.3	<0.1	9.8	<9.9
R85	8.8	2.1	10.9	0.1	9.8	9.9
R86	11.4	9.8	21.2	<0.1	9.8	<9.9
R87	11.5	10.3	21.7	0.1	9.8	9.9
R88	10.1	16.4	26.5	<0.1	9.8	<9.9
R89	7.5	4.1	11.6	<0.1	9.8	<9.9
R90	10.5	4.1	14.6	0.1	9.8	9.9
R91	7.4	2.1	9.5	<0.1	9.8	<9.9
R92	13.2	6.2	19.3	<0.1	9.8	<9.9
R93	9.4	<0.1	9.5	<0.1	9.8	<9.9
R94	11.1	6.2	17.2	<0.1	9.8	<9.9
R95	7.2	6.2	13.3	<0.1	9.8	<9.9
R96	6.1	4.1	10.2	<0.1	9.8	<9.9
R97	6.6	4.1	10.7	<0.1	9.8	<9.9
R98	4.8	12.3	17.1	<0.1	9.8	<9.9
R99	4.6	16.4	21.0	<0.1	9.8	<9.9
R100	7.5	9.8	17.3	<0.1	9.8	<9.9
R101	7.9	9.8	17.7	<0.1	9.8	<9.9
R102	7.6	9.8	17.3	<0.1	9.8	<9.9

Receptor	NO2 Concentration ($mg \cdot m^{-3}$)					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R103	6.6	9.8	16.4	<0.1	9.8	<9.9
R104	4.2	16.4	20.6	<0.1	9.8	<9.9
R105	3.4	8.2	11.6	<0.1	9.8	<9.9
R106	3.9	8.2	12.1	<0.1	9.8	<9.9
R107	7.9	6.2	14.1	<0.1	9.8	<9.9
R108	10.4	4.1	14.5	<0.1	9.8	<9.9
R109	8.6	32.8	41.4	<0.1	9.8	<9.9
R110	7.5	4.1	11.6	<0.1	9.8	<9.9
R111	12.0	4.1	16.1	<0.1	9.8	<9.9
R112	8.1	6.2	14.2	<0.1	9.8	<9.9
R113	10.8	4.1	14.9	<0.1	9.8	<9.9
R114	12.7	4.1	16.8	<0.1	9.8	<9.9
R115	8.5	22.6	31.1	<0.1	9.8	<9.9
R116	9.8	2.1	11.9	<0.1	9.8	<9.9
R117	7.1	8.2	15.3	<0.1	9.8	<9.9
R118	5.8	8.2	14.0	<0.1	9.8	<9.9
R119	7.0	2.1	9.0	<0.1	9.8	<9.9
R120	5.8	14.4	20.1	<0.1	9.8	<9.9
R121	8.0	8.2	16.2	<0.1	9.8	<9.9
R122	7.8	8.2	16.0	<0.1	9.8	<9.9
R123	11.4	2.1	13.4	<0.1	9.8	<9.9
R124	8.7	2.1	10.7	<0.1	9.8	<9.9
R125	8.3	2.1	10.4	<0.1	9.8	<9.9
R126	6.5	8.2	14.7	<0.1	9.8	<9.9
R127	7.0	14.4	21.4	<0.1	9.8	<9.9
R128	7.1	2.1	9.1	<0.1	9.8	<9.9
R129	6.1	2.1	8.1	<0.1	9.8	<9.9
R130	7.3	2.1	9.4	<0.1	9.8	<9.9
R131	7.6	2.1	9.7	<0.1	9.8	<9.9
R132	6.9	4.1	11.0	<0.1	9.8	<9.9
R133	7.4	2.1	9.4	<0.1	9.8	<9.9
R134	6.0	4.1	10.1	<0.1	9.8	<9.9
R135	10.6	2.1	12.7	<0.1	9.8	<9.9
R136	11.3	<0.1	11.4	<0.1	9.8	<9.9
R137	9.7	2.1	11.8	<0.1	9.8	<9.9

Receptor	NO2 Concentration (mg·m^{-3})					
	1 hour			Annual		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
R138	10.1	2.1	12.2	<0.1	9.8	<9.9
R139	12.5	<0.1	12.5	<0.1	9.8	<9.9
R140	18.2	2.1	20.3	<0.1	9.8	<9.9
R141	13.8	4.1	17.9	<0.1	9.8	<9.9
R142	10.6	<0.1	10.7	<0.1	9.8	<9.9
R143	17.1	2.1	19.1	<0.1	9.8	<9.9
R144	19.2	2.1	21.2	<0.1	9.8	<9.9
R145	18.7	2.1	20.7	<0.1	9.8	<9.9
R146	7.7	4.1	11.8	<0.1	9.8	<9.9
R147	15.3	4.1	19.4	<0.1	9.8	<9.9
R148	13.4	4.1	17.5	<0.1	9.8	<9.9
R149	13.1	8.2	21.3	<0.1	9.8	<9.9
R150	11.0	4.1	15.1	<0.1	9.8	<9.9
R151	9.6	4.1	13.7	<0.1	9.8	<9.9
R152	9.7	2.1	11.7	<0.1	9.8	<9.9
R153	7.0	4.1	11.1	<0.1	9.8	<9.9
R154	6.5	4.1	10.6	<0.1	9.8	<9.9
R155	13.0	8.2	21.2	<0.1	9.8	<9.9
R156	9.9	2.1	11.9	<0.1	9.8	<9.9
R157	10.2	10.3	20.5	<0.1	9.8	<9.9
R158	7.8	6.2	14.0	<0.1	9.8	<9.9
R159	7.6	12.3	19.9	<0.1	9.8	<9.9
R160	8.1	6.2	14.2	<0.1	9.8	<9.9
R161	6.1	12.3	18.4	<0.1	9.8	<9.9
R162	8.2	32.8	41.0	<0.1	9.8	<9.9
R163	9.3	2.1	11.3	<0.1	9.8	<9.9
R164	10.2	16.4	26.6	<0.1	9.8	<9.9
R165	10.7	8.2	18.9	<0.1	9.8	<9.9
R166	8.5	16.4	24.9	<0.1	9.8	<9.9
R167	9.3	32.8	42.1	<0.1	9.8	<9.9
R168	11.0	6.2	17.1	<0.1	9.8	<9.9
R169	9.4	22.6	32.0	<0.1	9.8	<9.9
R170	5.8	8.2	14.0	<0.1	9.8	<9.9
R171	8.3	6.2	14.4	<0.1	9.8	<9.9

Table F8 Predicted 15-minute, 1-hour and 8-hour average CO concentrations for all receptors – Scenario 2

Rec.	Carbon monoxide (CO) concentration ($mg \cdot m^{-3}$)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
Criterion	100			30			10		
Max. % of criterion	0.1	2.5	2.6	0.4	6.3	6.7	0.0	19.0	19.5
R1	0.1	2.5	2.6	0.1	1.9	2.0	<0.1	1.9	2.0
R2	0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R3	0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R4	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R5	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R6	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R7	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R8	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R9	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R10	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R11	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R12	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R13	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R14	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R15	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R16	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R17	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R18	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R19	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0

Rec.	Carbon monoxide (CO) concentration (mg·m^{-3})								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R20	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R21	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R22	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R23	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R24	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R25	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R26	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R27	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R28	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R29	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R30	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R31	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R32	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R33	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R34	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R35	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R36	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R37	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R38	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R39	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R40	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R41	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R42	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R43	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0

Rec.	Carbon monoxide (CO) concentration ($mg \cdot m^{-3}$)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R44	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R45	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R46	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R47	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R48	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R49	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R50	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R51	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R52	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R53	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R54	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R55	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R56	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R57	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R58	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R59	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R60	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R61	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R62	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R63	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R64	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R65	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R66	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R67	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0

Rec.	Carbon monoxide (CO) concentration ($mg \cdot m^{-3}$)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R68	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R69	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R70	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R71	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R72	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R73	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R74	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R75	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R76	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R77	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R78	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R79	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R80	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R81	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R82	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R83	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R84	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R85	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R86	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R87	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R88	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R89	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R90	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R91	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0

Rec.	Carbon monoxide (CO) concentration (mg·m^{-3})								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R92	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R93	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R94	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R95	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R96	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R97	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R98	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R99	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R100	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R101	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R102	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R103	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R104	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R105	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R106	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R107	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R108	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R109	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R110	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R111	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R112	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R113	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R114	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R115	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0

Rec.	Carbon monoxide (CO) concentration ($mg{\cdot}m^{-3}$)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R116	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R117	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R118	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R119	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R120	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R121	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R122	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R123	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R124	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R125	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R126	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R127	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R128	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R129	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R130	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R131	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R132	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R133	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R134	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R135	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R136	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R137	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R138	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R139	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0

Rec.	Carbon monoxide (CO) concentration ($mg \cdot m^{-3}$)								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R140	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R141	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R142	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R143	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R144	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R145	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R146	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R147	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R148	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R149	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R150	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R151	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R152	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R153	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R154	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R155	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R156	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R157	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R158	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R159	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R160	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R161	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R162	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R163	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0

Rec.	Carbon monoxide (CO) concentration (mg·m^{-3})								
	15 min			1 hour			8 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative	Increment	Background	Cumulative
R164	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R165	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R166	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R167	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R168	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R169	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R170	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0
R171	<0.1	2.5	2.6	<0.1	1.9	2.0	<0.1	1.9	2.0

Table F9 Predicted 1-hour and 24-hour SO2 concentrations for all receptors – Scenario 2

Rec.	Sulfphur dioxide (SO_2) concentration ($mg{\cdot}m^{-3}$)					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
Criterion	215			57		
Max. % of criterion	0.2	24.0	24.1	0.0	13.9	13.9
R1	0.1	51.5	51.6	<0.1	7.9	8.0
R2	0.2	51.5	51.7	<0.1	7.9	8.0
R3	0.2	51.5	51.7	<0.1	7.9	8.0
R4	0.4	51.5	51.9	<0.1	7.9	8.0
R5	0.2	51.5	51.7	<0.1	7.9	8.0
R6	0.2	51.5	51.7	<0.1	7.9	8.0
R7	0.2	51.5	51.7	<0.1	7.9	8.0
R8	0.2	51.5	51.7	<0.1	7.9	8.0
R9	0.3	51.5	51.8	<0.1	7.9	8.0
R10	0.2	51.5	51.7	<0.1	7.9	8.0
R11	0.1	51.5	51.6	<0.1	7.9	8.0
R12	0.1	51.5	51.6	<0.1	7.9	8.0
R13	0.1	51.5	51.6	<0.1	7.9	8.0
R14	<0.1	51.5	51.6	<0.1	7.9	8.0
R15	<0.1	51.5	51.6	<0.1	7.9	8.0
R16	<0.1	51.5	51.6	<0.1	7.9	8.0
R17	<0.1	51.5	51.6	<0.1	7.9	8.0
R18	0.2	51.5	51.7	<0.1	7.9	8.0
R19	0.2	51.5	51.7	<0.1	7.9	8.0
R20	<0.1	51.5	51.6	<0.1	7.9	8.0
R21	<0.1	51.5	51.6	<0.1	7.9	8.0
R22	0.1	51.5	51.6	<0.1	7.9	8.0
R23	0.1	51.5	51.6	<0.1	7.9	8.0
R24	0.2	51.5	51.7	<0.1	7.9	8.0
R25	0.1	51.5	51.6	<0.1	7.9	8.0
R26	0.1	51.5	51.6	<0.1	7.9	8.0
R27	0.1	51.5	51.6	<0.1	7.9	8.0
R28	<0.1	51.5	51.6	<0.1	7.9	8.0
R29	0.2	51.5	51.7	<0.1	7.9	8.0
R30	0.2	51.5	51.7	<0.1	7.9	8.0
R31	0.1	51.5	51.6	<0.1	7.9	8.0
R32	0.1	51.5	51.6	<0.1	7.9	8.0
R33	0.1	51.5	51.6	<0.1	7.9	8.0
R34	0.1	51.5	51.6	<0.1	7.9	8.0

Rec.	Sulfphur dioxide (SO_2) concentration (mg·m^{-3})					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R35	<0.1	51.5	51.6	<0.1	7.9	8.0
R36	<0.1	51.5	51.6	<0.1	7.9	8.0
R37	<0.1	51.5	51.6	<0.1	7.9	8.0
R38	<0.1	51.5	51.6	<0.1	7.9	8.0
R39	<0.1	51.5	51.6	<0.1	7.9	8.0
R40	<0.1	51.5	51.6	<0.1	7.9	8.0
R41	<0.1	51.5	51.6	<0.1	7.9	8.0
R42	<0.1	51.5	51.6	<0.1	7.9	8.0
R43	<0.1	51.5	51.6	<0.1	7.9	8.0
R44	<0.1	51.5	51.6	<0.1	7.9	8.0
R45	<0.1	51.5	51.6	<0.1	7.9	8.0
R46	<0.1	51.5	51.6	<0.1	7.9	8.0
R47	<0.1	51.5	51.6	<0.1	7.9	8.0
R48	<0.1	51.5	51.6	<0.1	7.9	8.0
R49	<0.1	51.5	51.6	<0.1	7.9	8.0
R50	<0.1	51.5	51.6	<0.1	7.9	8.0
R51	0.1	51.5	51.6	<0.1	7.9	8.0
R52	<0.1	51.5	51.6	<0.1	7.9	8.0
R53	<0.1	51.5	51.6	<0.1	7.9	8.0
R54	<0.1	51.5	51.6	<0.1	7.9	8.0
R55	<0.1	51.5	51.6	<0.1	7.9	8.0
R56	<0.1	51.5	51.6	<0.1	7.9	8.0
R57	<0.1	51.5	51.6	<0.1	7.9	8.0
R58	<0.1	51.5	51.6	<0.1	7.9	8.0
R59	<0.1	51.5	51.6	<0.1	7.9	8.0
R60	<0.1	51.5	51.6	<0.1	7.9	8.0
R61	<0.1	51.5	51.6	<0.1	7.9	8.0
R62	<0.1	51.5	51.6	<0.1	7.9	8.0
R63	<0.1	51.5	51.6	<0.1	7.9	8.0
R64	<0.1	51.5	51.6	<0.1	7.9	8.0
R65	<0.1	51.5	51.6	<0.1	7.9	8.0
R66	0.1	51.5	51.6	<0.1	7.9	8.0
R67	<0.1	51.5	51.6	<0.1	7.9	8.0
R68	<0.1	51.5	51.6	<0.1	7.9	8.0
R69	<0.1	51.5	51.6	<0.1	7.9	8.0
R70	<0.1	51.5	51.6	<0.1	7.9	8.0
R71	<0.1	51.5	51.6	<0.1	7.9	8.0
R72	<0.1	51.5	51.6	<0.1	7.9	8.0
R73	<0.1	51.5	51.6	<0.1	7.9	8.0

Rec.	Sulfphur dioxide (SO_2) concentration ($mg{\cdot}m^{-3}$)					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R74	<0.1	51.5	51.6	<0.1	7.9	8.0
R75	<0.1	51.5	51.6	<0.1	7.9	8.0
R76	<0.1	51.5	51.6	<0.1	7.9	8.0
R77	<0.1	51.5	51.6	<0.1	7.9	8.0
R78	<0.1	51.5	51.6	<0.1	7.9	8.0
R79	<0.1	51.5	51.6	<0.1	7.9	8.0
R80	<0.1	51.5	51.6	<0.1	7.9	8.0
R81	0.1	51.5	51.6	<0.1	7.9	8.0
R82	<0.1	51.5	51.6	<0.1	7.9	8.0
R83	<0.1	51.5	51.6	<0.1	7.9	8.0
R84	<0.1	51.5	51.6	<0.1	7.9	8.0
R85	<0.1	51.5	51.6	<0.1	7.9	8.0
R86	<0.1	51.5	51.6	<0.1	7.9	8.0
R87	<0.1	51.5	51.6	<0.1	7.9	8.0
R88	<0.1	51.5	51.6	<0.1	7.9	8.0
R89	<0.1	51.5	51.6	<0.1	7.9	8.0
R90	<0.1	51.5	51.6	<0.1	7.9	8.0
R91	<0.1	51.5	51.6	<0.1	7.9	8.0
R92	<0.1	51.5	51.6	<0.1	7.9	8.0
R93	<0.1	51.5	51.6	<0.1	7.9	8.0
R94	<0.1	51.5	51.6	<0.1	7.9	8.0
R95	<0.1	51.5	51.6	<0.1	7.9	8.0
R96	<0.1	51.5	51.6	<0.1	7.9	8.0
R97	<0.1	51.5	51.6	<0.1	7.9	8.0
R98	<0.1	51.5	51.6	<0.1	7.9	8.0
R99	<0.1	51.5	51.6	<0.1	7.9	8.0
R100	<0.1	51.5	51.6	<0.1	7.9	8.0
R101	<0.1	51.5	51.6	<0.1	7.9	8.0
R102	<0.1	51.5	51.6	<0.1	7.9	8.0
R103	<0.1	51.5	51.6	<0.1	7.9	8.0
R104	<0.1	51.5	51.6	<0.1	7.9	8.0
R105	<0.1	51.5	51.6	<0.1	7.9	8.0
R106	<0.1	51.5	51.6	<0.1	7.9	8.0
R107	<0.1	51.5	51.6	<0.1	7.9	8.0
R108	<0.1	51.5	51.6	<0.1	7.9	8.0
R109	<0.1	51.5	51.6	<0.1	7.9	8.0
R110	<0.1	51.5	51.6	<0.1	7.9	8.0
R111	<0.1	51.5	51.6	<0.1	7.9	8.0
R112	<0.1	51.5	51.6	<0.1	7.9	8.0

Rec.	Sulfphur dioxide (SO_2) concentration (mg·m^{-3})					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R113	<0.1	51.5	51.6	<0.1	7.9	8.0
R114	<0.1	51.5	51.6	<0.1	7.9	8.0
R115	<0.1	51.5	51.6	<0.1	7.9	8.0
R116	<0.1	51.5	51.6	<0.1	7.9	8.0
R117	<0.1	51.5	51.6	<0.1	7.9	8.0
R118	<0.1	51.5	51.6	<0.1	7.9	8.0
R119	<0.1	51.5	51.6	<0.1	7.9	8.0
R120	<0.1	51.5	51.6	<0.1	7.9	8.0
R121	<0.1	51.5	51.6	<0.1	7.9	8.0
R122	<0.1	51.5	51.6	<0.1	7.9	8.0
R123	<0.1	51.5	51.6	<0.1	7.9	8.0
R124	<0.1	51.5	51.6	<0.1	7.9	8.0
R125	<0.1	51.5	51.6	<0.1	7.9	8.0
R126	<0.1	51.5	51.6	<0.1	7.9	8.0
R127	<0.1	51.5	51.6	<0.1	7.9	8.0
R128	<0.1	51.5	51.6	<0.1	7.9	8.0
R129	<0.1	51.5	51.6	<0.1	7.9	8.0
R130	<0.1	51.5	51.6	<0.1	7.9	8.0
R131	<0.1	51.5	51.6	<0.1	7.9	8.0
R132	<0.1	51.5	51.6	<0.1	7.9	8.0
R133	<0.1	51.5	51.6	<0.1	7.9	8.0
R134	<0.1	51.5	51.6	<0.1	7.9	8.0
R135	<0.1	51.5	51.6	<0.1	7.9	8.0
R136	<0.1	51.5	51.6	<0.1	7.9	8.0
R137	<0.1	51.5	51.6	<0.1	7.9	8.0
R138	<0.1	51.5	51.6	<0.1	7.9	8.0
R139	<0.1	51.5	51.6	<0.1	7.9	8.0
R140	<0.1	51.5	51.6	<0.1	7.9	8.0
R141	<0.1	51.5	51.6	<0.1	7.9	8.0
R142	<0.1	51.5	51.6	<0.1	7.9	8.0
R143	<0.1	51.5	51.6	<0.1	7.9	8.0
R144	<0.1	51.5	51.6	<0.1	7.9	8.0
R145	<0.1	51.5	51.6	<0.1	7.9	8.0
R146	<0.1	51.5	51.6	<0.1	7.9	8.0
R147	<0.1	51.5	51.6	<0.1	7.9	8.0
R148	<0.1	51.5	51.6	<0.1	7.9	8.0
R149	<0.1	51.5	51.6	<0.1	7.9	8.0
R150	<0.1	51.5	51.6	<0.1	7.9	8.0
R151	<0.1	51.5	51.6	<0.1	7.9	8.0

Rec.	Sulfphur dioxide (SO_2) concentration ($mg{\cdot}m^{-3}$)					
	1 hour			24 h		
	Increment	Background	Cumulative	Increment	Background	Cumulative
R152	<0.1	51.5	51.6	<0.1	7.9	8.0
R153	<0.1	51.5	51.6	<0.1	7.9	8.0
R154	<0.1	51.5	51.6	<0.1	7.9	8.0
R155	<0.1	51.5	51.6	<0.1	7.9	8.0
R156	<0.1	51.5	51.6	<0.1	7.9	8.0
R157	<0.1	51.5	51.6	<0.1	7.9	8.0
R158	<0.1	51.5	51.6	<0.1	7.9	8.0
R159	<0.1	51.5	51.6	<0.1	7.9	8.0
R160	<0.1	51.5	51.6	<0.1	7.9	8.0
R161	<0.1	51.5	51.6	<0.1	7.9	8.0
R162	<0.1	51.5	51.6	<0.1	7.9	8.0
R163	<0.1	51.5	51.6	<0.1	7.9	8.0
R164	<0.1	51.5	51.6	<0.1	7.9	8.0
R165	<0.1	51.5	51.6	<0.1	7.9	8.0
R166	<0.1	51.5	51.6	<0.1	7.9	8.0
R167	<0.1	51.5	51.6	<0.1	7.9	8.0
R168	<0.1	51.5	51.6	<0.1	7.9	8.0
R169	<0.1	51.5	51.6	<0.1	7.9	8.0
R170	<0.1	51.5	51.6	<0.1	7.9	8.0
R171	<0.1	51.5	51.6	<0.1	7.9	8.0

Table F10 Predicted incremental 1-hour PAH, benzene, toluene, xylene and formaldehyde concentrations for all receptors – Scenario 2

Receptor	99.9th percentile 1-hour average concentration (mg·m^{-3})				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
Criterion	0.0004	0.029	0.36	0.19	0.02
Max. % of criterion	0.0	0.2	0.0	0.0	0.0
R1	6.98E-10	4.70E-05	1.70E-05	1.18E-05	4.78E-06
R2	5.20E-10	3.50E-05	1.26E-05	8.81E-06	3.56E-06
R3	5.07E-10	3.42E-05	1.23E-05	8.59E-06	3.47E-06
R4	5.00E-10	3.37E-05	1.22E-05	8.47E-06	3.42E-06
R5	5.00E-10	3.37E-05	1.21E-05	8.47E-06	3.42E-06
R6	4.41E-10	2.97E-05	1.07E-05	7.48E-06	3.02E-06
R7	4.16E-10	2.80E-05	1.01E-05	7.05E-06	2.85E-06
R8	3.54E-10	2.38E-05	8.60E-06	6.00E-06	2.42E-06
R9	3.33E-10	2.24E-05	8.10E-06	5.65E-06	2.28E-06
R10	3.09E-10	2.08E-05	7.51E-06	5.23E-06	2.11E-06
R11	2.83E-10	1.91E-05	6.89E-06	4.80E-06	1.94E-06
R12	2.79E-10	1.88E-05	6.79E-06	4.73E-06	1.91E-06
R13	2.79E-10	1.88E-05	6.78E-06	4.72E-06	1.91E-06
R14	2.71E-10	1.82E-05	6.59E-06	4.59E-06	1.85E-06
R15	2.69E-10	1.82E-05	6.55E-06	4.57E-06	1.84E-06
R16	2.62E-10	1.77E-05	6.38E-06	4.45E-06	1.79E-06
R17	2.59E-10	1.75E-05	6.30E-06	4.39E-06	1.77E-06
R18	2.50E-10	1.68E-05	6.08E-06	4.24E-06	1.71E-06
R19	2.49E-10	1.68E-05	6.05E-06	4.22E-06	1.70E-06
R20	2.45E-10	1.65E-05	5.95E-06	4.15E-06	1.68E-06
R21	2.41E-10	1.62E-05	5.86E-06	4.09E-06	1.65E-06
R22	2.38E-10	1.60E-05	5.79E-06	4.03E-06	1.63E-06
R23	2.22E-10	1.49E-05	5.40E-06	3.76E-06	1.52E-06
R24	2.17E-10	1.46E-05	5.28E-06	3.68E-06	1.48E-06
R25	2.14E-10	1.44E-05	5.21E-06	3.63E-06	1.47E-06
R26	2.13E-10	1.43E-05	5.17E-06	3.60E-06	1.45E-06
R27	2.11E-10	1.42E-05	5.13E-06	3.58E-06	1.44E-06
R28	2.08E-10	1.40E-05	5.05E-06	3.52E-06	1.42E-06
R29	2.06E-10	1.39E-05	5.01E-06	3.49E-06	1.41E-06
R30	2.06E-10	1.38E-05	5.00E-06	3.48E-06	1.41E-06
R31	1.98E-10	1.33E-05	4.82E-06	3.36E-06	1.36E-06
R32	1.83E-10	1.23E-05	4.45E-06	3.10E-06	1.25E-06
R33	1.80E-10	1.21E-05	4.38E-06	3.06E-06	1.23E-06
R34	1.79E-10	1.20E-05	4.34E-06	3.03E-06	1.22E-06

Receptor	99.9th percentile 1-hour average concentration				
	($mg \cdot m^{-3}$)				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R35	1.71E-10	1.15E-05	4.15E-06	2.89E-06	1.17E-06
R36	1.68E-10	1.13E-05	4.09E-06	2.85E-06	1.15E-06
R37	1.64E-10	1.10E-05	3.98E-06	2.77E-06	1.12E-06
R38	1.63E-10	1.10E-05	3.97E-06	2.77E-06	1.12E-06
R39	1.57E-10	1.06E-05	3.82E-06	2.66E-06	1.08E-06
R40	1.55E-10	1.05E-05	3.78E-06	2.63E-06	1.06E-06
R41	1.54E-10	1.04E-05	3.75E-06	2.61E-06	1.06E-06
R42	1.52E-10	1.02E-05	3.70E-06	2.58E-06	1.04E-06
R43	1.50E-10	1.01E-05	3.64E-06	2.54E-06	1.03E-06
R44	1.45E-10	9.79E-06	3.53E-06	2.46E-06	9.94E-07
R45	1.41E-10	9.49E-06	3.43E-06	2.39E-06	9.64E-07
R46	1.38E-10	9.27E-06	3.35E-06	2.33E-06	9.42E-07
R47	1.36E-10	9.17E-06	3.31E-06	2.31E-06	9.32E-07
R48	1.34E-10	9.06E-06	3.27E-06	2.28E-06	9.20E-07
R49	1.34E-10	9.00E-06	3.25E-06	2.27E-06	9.15E-07
R50	1.33E-10	8.94E-06	3.23E-06	2.25E-06	9.08E-07
R51	1.31E-10	8.84E-06	3.19E-06	2.22E-06	8.98E-07
R52	1.28E-10	8.61E-06	3.11E-06	2.17E-06	8.75E-07
R53	1.27E-10	8.56E-06	3.09E-06	2.15E-06	8.70E-07
R54	1.27E-10	8.56E-06	3.09E-06	2.15E-06	8.69E-07
R55	1.27E-10	8.56E-06	3.09E-06	2.15E-06	8.69E-07
R56	1.26E-10	8.48E-06	3.06E-06	2.13E-06	8.61E-07
R57	1.23E-10	8.31E-06	3.00E-06	2.09E-06	8.44E-07
R58	1.20E-10	8.05E-06	2.91E-06	2.03E-06	8.18E-07
R59	1.18E-10	7.92E-06	2.86E-06	1.99E-06	8.04E-07
R60	1.17E-10	7.87E-06	2.84E-06	1.98E-06	7.99E-07
R61	1.15E-10	7.77E-06	2.80E-06	1.95E-06	7.89E-07
R62	1.15E-10	7.74E-06	2.79E-06	1.95E-06	7.86E-07
R63	1.15E-10	7.72E-06	2.79E-06	1.94E-06	7.84E-07
R64	1.13E-10	7.60E-06	2.74E-06	1.91E-06	7.72E-07
R65	1.13E-10	7.59E-06	2.74E-06	1.91E-06	7.71E-07
R66	1.12E-10	7.58E-06	2.73E-06	1.91E-06	7.69E-07
R67	1.12E-10	7.54E-06	2.72E-06	1.90E-06	7.65E-07
R68	1.09E-10	7.33E-06	2.65E-06	1.84E-06	7.44E-07
R69	1.06E-10	7.14E-06	2.58E-06	1.80E-06	7.26E-07
R70	1.02E-10	6.90E-06	2.49E-06	1.74E-06	7.01E-07
R71	1.01E-10	6.83E-06	2.47E-06	1.72E-06	6.94E-07
R72	1.00E-10	6.76E-06	2.44E-06	1.70E-06	6.87E-07
R73	9.59E-11	6.46E-06	2.33E-06	1.63E-06	6.56E-07

Receptor	99.9th percentile 1-hour average concentration (mg·m^{-3})				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R74	9.56E-11	6.44E-06	2.32E-06	1.62E-06	6.54E-07
R75	9.50E-11	6.40E-06	2.31E-06	1.61E-06	6.50E-07
R76	9.37E-11	6.31E-06	2.28E-06	1.59E-06	6.41E-07
R77	9.05E-11	6.10E-06	2.20E-06	1.53E-06	6.19E-07
R78	8.72E-11	5.88E-06	2.12E-06	1.48E-06	5.97E-07
R79	8.67E-11	5.84E-06	2.11E-06	1.47E-06	5.93E-07
R80	8.41E-11	5.67E-06	2.04E-06	1.43E-06	5.75E-07
R81	8.23E-11	5.55E-06	2.00E-06	1.40E-06	5.63E-07
R82	8.13E-11	5.48E-06	1.98E-06	1.38E-06	5.56E-07
R83	8.08E-11	5.44E-06	1.96E-06	1.37E-06	5.53E-07
R84	7.88E-11	5.31E-06	1.92E-06	1.34E-06	5.39E-07
R85	7.87E-11	5.30E-06	1.91E-06	1.33E-06	5.38E-07
R86	7.68E-11	5.18E-06	1.87E-06	1.30E-06	5.26E-07
R87	7.54E-11	5.08E-06	1.83E-06	1.28E-06	5.16E-07
R88	7.52E-11	5.06E-06	1.83E-06	1.27E-06	5.14E-07
R89	7.39E-11	4.98E-06	1.80E-06	1.25E-06	5.06E-07
R90	7.30E-11	4.92E-06	1.78E-06	1.24E-06	5.00E-07
R91	7.14E-11	4.81E-06	1.74E-06	1.21E-06	4.88E-07
R92	7.03E-11	4.74E-06	1.71E-06	1.19E-06	4.81E-07
R93	7.01E-11	4.72E-06	1.70E-06	1.19E-06	4.79E-07
R94	6.89E-11	4.64E-06	1.68E-06	1.17E-06	4.71E-07
R95	6.86E-11	4.62E-06	1.67E-06	1.16E-06	4.69E-07
R96	6.80E-11	4.58E-06	1.65E-06	1.15E-06	4.65E-07
R97	6.76E-11	4.55E-06	1.64E-06	1.15E-06	4.62E-07
R98	6.72E-11	4.52E-06	1.63E-06	1.14E-06	4.60E-07
R99	6.06E-11	4.08E-06	1.47E-06	1.03E-06	4.14E-07
R100	6.01E-11	4.05E-06	1.46E-06	1.02E-06	4.11E-07
R101	5.98E-11	4.03E-06	1.46E-06	1.01E-06	4.09E-07
R102	5.89E-11	3.97E-06	1.43E-06	9.99E-07	4.03E-07
R103	5.86E-11	3.95E-06	1.43E-06	9.93E-07	4.01E-07
R104	5.81E-11	3.91E-06	1.41E-06	9.84E-07	3.97E-07
R105	5.69E-11	3.83E-06	1.38E-06	9.64E-07	3.89E-07
R106	5.36E-11	3.61E-06	1.30E-06	9.08E-07	3.66E-07
R107	5.07E-11	3.42E-06	1.23E-06	8.60E-07	3.47E-07
R108	5.05E-11	3.40E-06	1.23E-06	8.57E-07	3.46E-07
R109	4.95E-11	3.33E-06	1.20E-06	8.39E-07	3.39E-07
R110	4.95E-11	3.33E-06	1.20E-06	8.38E-07	3.39E-07
R111	4.88E-11	3.29E-06	1.19E-06	8.27E-07	3.34E-07
R112	4.86E-11	3.27E-06	1.18E-06	8.24E-07	3.33E-07

Receptor	99.9th percentile 1-hour average concentration (mg·m^{-3})				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R113	4.79E-11	3.23E-06	1.16E-06	8.12E-07	3.28E-07
R114	4.73E-11	3.18E-06	1.15E-06	8.01E-07	3.23E-07
R115	4.68E-11	3.15E-06	1.14E-06	7.93E-07	3.20E-07
R116	4.68E-11	3.15E-06	1.14E-06	7.93E-07	3.20E-07
R117	4.65E-11	3.13E-06	1.13E-06	7.88E-07	3.18E-07
R118	4.61E-11	3.11E-06	1.12E-06	7.81E-07	3.15E-07
R119	4.51E-11	3.04E-06	1.10E-06	7.65E-07	3.09E-07
R120	4.45E-11	3.00E-06	1.08E-06	7.54E-07	3.05E-07
R121	4.43E-11	2.98E-06	1.08E-06	7.50E-07	3.03E-07
R122	3.86E-11	2.60E-06	9.38E-07	6.54E-07	2.64E-07
R123	3.68E-11	2.48E-06	8.95E-07	6.24E-07	2.52E-07
R124	3.65E-11	2.46E-06	8.88E-07	6.19E-07	2.50E-07
R125	3.45E-11	2.33E-06	8.39E-07	5.85E-07	2.36E-07
R126	3.44E-11	2.31E-06	8.36E-07	5.82E-07	2.35E-07
R127	3.39E-11	2.28E-06	8.24E-07	5.74E-07	2.32E-07
R128	3.37E-11	2.27E-06	8.20E-07	5.71E-07	2.31E-07
R129	3.34E-11	2.25E-06	8.13E-07	5.67E-07	2.29E-07
R130	3.34E-11	2.25E-06	8.12E-07	5.66E-07	2.28E-07
R131	3.23E-11	2.18E-06	7.86E-07	5.48E-07	2.21E-07
R132	3.15E-11	2.12E-06	7.67E-07	5.35E-07	2.16E-07
R133	3.12E-11	2.10E-06	7.58E-07	5.28E-07	2.13E-07
R134	3.10E-11	2.09E-06	7.54E-07	5.25E-07	2.12E-07
R135	3.07E-11	2.07E-06	7.46E-07	5.20E-07	2.10E-07
R136	3.03E-11	2.04E-06	7.37E-07	5.14E-07	2.07E-07
R137	2.94E-11	1.98E-06	7.16E-07	4.99E-07	2.01E-07
R138	2.92E-11	1.97E-06	7.10E-07	4.95E-07	2.00E-07
R139	2.91E-11	1.96E-06	7.09E-07	4.94E-07	1.99E-07
R140	2.91E-11	1.96E-06	7.07E-07	4.93E-07	1.99E-07
R141	2.90E-11	1.95E-06	7.05E-07	4.91E-07	1.98E-07
R142	2.89E-11	1.95E-06	7.03E-07	4.90E-07	1.98E-07
R143	2.83E-11	1.91E-06	6.88E-07	4.80E-07	1.94E-07
R144	2.62E-11	1.76E-06	6.36E-07	4.44E-07	1.79E-07
R145	2.50E-11	1.69E-06	6.09E-07	4.24E-07	1.71E-07
R146	2.43E-11	1.63E-06	5.90E-07	4.11E-07	1.66E-07
R147	2.40E-11	1.62E-06	5.84E-07	4.07E-07	1.64E-07
R148	2.34E-11	1.58E-06	5.70E-07	3.97E-07	1.60E-07
R149	2.26E-11	1.52E-06	5.49E-07	3.82E-07	1.54E-07
R150	2.22E-11	1.50E-06	5.41E-07	3.77E-07	1.52E-07
R151	2.14E-11	1.44E-06	5.20E-07	3.63E-07	1.46E-07

Receptor	99.9th percentile 1-hour average concentration				
	(mg·m^{-3})				
	PAH	Benzene	Toluene	Xylene	Formaldehyde
R152	2.11E-11	1.42E-06	5.13E-07	3.58E-07	1.44E-07
R153	2.09E-11	1.41E-06	5.07E-07	3.53E-07	1.43E-07
R154	2.05E-11	1.38E-06	4.99E-07	3.48E-07	1.40E-07
R155	1.96E-11	1.32E-06	4.76E-07	3.32E-07	1.34E-07
R156	1.85E-11	1.25E-06	4.51E-07	3.14E-07	1.27E-07
R157	1.80E-11	1.21E-06	4.37E-07	3.05E-07	1.23E-07
R158	1.78E-11	1.20E-06	4.33E-07	3.02E-07	1.22E-07
R159	1.71E-11	1.15E-06	4.17E-07	2.90E-07	1.17E-07
R160	1.64E-11	1.11E-06	4.00E-07	2.79E-07	1.12E-07
R161	1.47E-11	9.90E-07	3.57E-07	2.49E-07	1.01E-07
R162	1.42E-11	9.59E-07	3.46E-07	2.41E-07	9.74E-08
R163	1.34E-11	9.03E-07	3.26E-07	2.27E-07	9.17E-08
R164	1.11E-11	7.49E-07	2.70E-07	1.89E-07	7.61E-08
R165	1.08E-11	7.26E-07	2.62E-07	1.83E-07	7.37E-08
R166	9.78E-12	6.59E-07	2.38E-07	1.66E-07	6.69E-08
R167	9.78E-12	6.59E-07	2.38E-07	1.66E-07	6.69E-08
R168	9.03E-12	6.09E-07	2.20E-07	1.53E-07	6.18E-08
R169	9.02E-12	6.08E-07	2.19E-07	1.53E-07	6.17E-08
R170	8.84E-12	5.96E-07	2.15E-07	1.50E-07	6.05E-08
R171	8.64E-12	5.82E-07	2.10E-07	1.46E-07	5.91E-08

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air quality	Northstar specialises in all aspects of air quality, dust, and odour management, covering monitoring, modelling and assessment, due diligence and process specification, licencing and regulatory advice, peer review and expert witness.
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Head Office

Suite 1504, 275 Alfred Street,
North Sydney NSW 2060

Riverina Office

PO Box 483
Albury NSW 2640

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Tel: 1300 708 590 | admin@northstar-env.com | northstar-env.com

Enclosure B– Memo: SYD1 Stage 2 Data Centre – Review of Additional Developments

A supplemental memo is attached following discussing the influence of and impact on future developments.

This was undertaken by Northstar as a subconsultant to Aurecon.

Letter

Head Office: Suite 1504, 275 Alfred Street, North Sydney, NSW 2060
Riverina Office: PO Box 483, Albury, NSW 2640
Web: northstar-env.com | Tel: 1300 708 590

air quality | environment | sustainability

Date: Thursday, 12 February 2026

Aurecon Australasia Pty Ltd
Level 5, 863 Hay Street, Perth Australia 6000

FAO: Anthony Scanlon

Project Name:	**SYD1 Stage 2 Data Centre – Review of Additional Developments**
Reference:	**25.1143.DR2V1**
Status	**Draft**

The following letter has been prepared by Northstar Air Quality Pty Ltd on behalf of Aurecon Australasia Pty Ltd and provides a response to comments regarding the air quality impact assessment performed for the SYD1 Stage 2 Data Centre.

If you require any further information or clarification, please do not hesitate to contact the undersigned at your convenience.

For and on behalf of

Northstar Air Quality Pty Ltd

N.P.G.

Nicholas Phillips-Glyde

Senior Air Quality Scientist

Reviewed by: Gary Graham

1. INTRODUCTION

Aurecon Australasia Pty Ltd (Aurecon), acting on behalf of Project Garden 1 Pty Ltd as trustee for the Norwest Property Group (the Proponent) commissioned Northstar Air Quality Pty Ltd (Northstar) to perform an air quality impact assessment (AQIA) to accompany a State Significant Development Application (SSDA) for the SYD1 Stage 2 data centre development (the Proposal) to be located at 3 Brookhollow Avenue, Norwest NSW 2153 (the Proposal site).

This letter has been prepared in response to comments received by the Department of Planning, Housing and Infrastructure (DPHI) following submission of the AQIA requesting additional review of the potential for cumulative impacts to be experienced at surrounding land uses with future developments and the Proposal.

2. AQIA SUMMARY

The AQIA was performed in accordance with the NSW Planning Secretary's Environmental Assessment Requirements (SEARs) and the relevant guidance published by the NSW Environmental Protection Authority (NSW EPA). The AQIA addressed both the construction phase and operational phase of the Proposal.

The construction phase assessment was performed using a published risk assessment methodology and concluded that the potential dust soiling and human health risks were determined as being manageable through appropriate implementation of the recommended mitigation measures.

During the operational phase, dispersion modelling scenarios for the justified worst case and maintenance testing scenarios were assessed. It is noted that although some exceedances of the short-term pollutant criteria were predicted during the justified worst-case scenario, considering other factors (for example, the frequency of power outages, unlikely scenario of emergency standby generators running for an entire 24-hour period), the risk of exceedances at identified sensitive receptors was predicted to be low.

During the maintenance testing scenario, the normal operation of the data centre was not predicted to result in additional exceedances of the relevant air quality criteria at any identified receptor location. The predicted incremental air pollutant concentrations for all assessed pollutants were predicted to be below the relevant criteria where the emergency standby generators are appropriately operated under the appropriate testing schedule.

With reference to potential cumulative impacts, it is noted that the Proposal is located on the same lot as the approved SYD1 Stage 1 data centre, that will also be operated by Green Square Data Centres. Correspondingly, cumulative impacts with SYD Stage 1 were considered within the modelling assessment. Additionally, the existing VOCUS SYD02 data centre was identified as being locate within close proximity to the Proposal and as such, potential cumulative impacts with the Proposal were assessed in accordance with the cumulative impact assessment (CIA) guidelines as published by the NSW Department of Planning, Industry and Environment (NSW DPIE, 2022).

The assessment concluded that there is potential for cumulative air quality impacts to arise from the VOCUS SYD02 data centre during concurrent operations, particularly in the event of a regional grid outage where all facilities, including the Proposal, simultaneously activate standby diesel generators. Such emergency operation scenarios, which may occur during widespread grid failures, are recognised by NSW EPA and subject to regulatory allowances. The probability of concurrent power feeder failures, however, is considered to be low, particularly as it is common for data centres to be served by multiple power supply feeders to reduce this risk.

Routine maintenance testing may also contribute to cumulative impacts since most facilities conduct tests during daytime hours. Due to the distance between the VOCUS SYD 02 and the Proposal, and sensitive receptors, as well as the low likelihood of concurrent testing with emissions transported downwind, these impacts are anticipated to be limited. Furthermore, the POEO Act restricts generator operating hours to 200 hours per year, with testing regulated to control pollutant emissions.

3. POTENTIAL CUMULATIVE IMPACTS

A number of future developments within the area surrounding the Proposal have been identified. The identified developments include local development, planning proposal and state significant projects as presented in Table 1, and shown in Figure 1.

From the information presented in Table 1, it would be reasonable to conclude that none of the identified developments have a significant potential for air emissions during their operational phase (except for changes to local traffic movements associated with those developments), and as such, potential air emissions would be predominantly associated with construction dust during their construction. Correspondingly, it is concluded that emissions associated with the identified future developments would not contribute towards cumulative impacts with generator emissions resulting from the Proposal.

Figure 1 Identified future developments

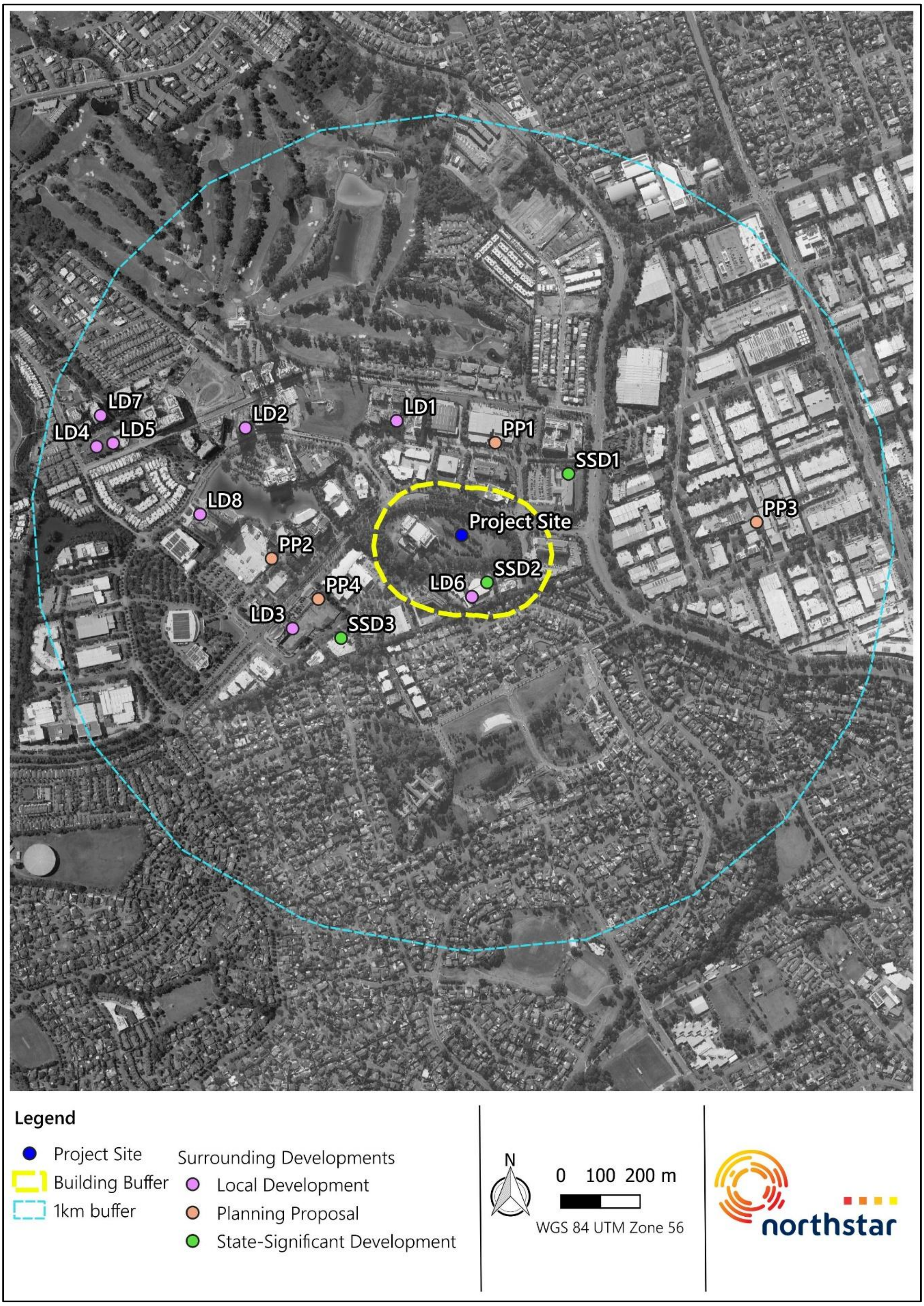

Table 1 Identified future developments

ID	Application number	Address	Description	Status
Local Development				
LD1	105/2026/PO	8 Maitland Place, Norwest	Construction of 4 x Six to Twenty-Five Storey Residential Flat Buildings comprising 290 Units and 4 Levels of Basement Car Parking Split of Level 23 apartment into SOUs Property Unit Numbering 240042/08	Approved
LD2	1231/2025/JP	40-42 Solent Circuit, Norwest	Concept Development Application for Norwest Quarter. The development will be constructed in five stages, with the first stage under construction. The overall development will comprise nine residential flat buildings with a total of 935 dwellings.	Approved
LD3	908/2025/JP	25-31Brookhollow Avenue, Norwest	Commercial Tower and Public Plaza. (Stage 1)	Deferred Commencement Consent
LD4	2059/2022/JP	104 Fairway Drive, Norwest	The proposed Stage 4 development comprises 3 to 19 storey buildings A to F to be constructed in three stages, with 583 apartments in a mix of 1, 2, 3 and 4 bedrooms.	Approved
LD5	237/2025/JP	104 Fairway Drive, Norwest	Residential Flat Building Development containing 209 units and Community Title Subdivision (Stage 5 of The Orchards Development).	Approved
LD6	426/2024/JP	14-16 Brookhollow Avenue, Norwest	Mixed Use Development Including a Hotel, Commercial Premises, Food and Drink Premises, Gymnasium and Childcare Centre.	Approved
LD7	282/2018/JP	100 Fairway Drive, Norwest	The Development Application is for the construction of 4 x seven to twelve storey residential flat buildings comprising 217 units and 3 levels of basement car parking. The development comprises 53 x 1 bedroom units, 120 x 2 bedroom units and 44 x 3 bedroom units with associated car parking containing 320 car parking spaces.	Approved
LD8	1395/2016/JP/ D	11-13 Solent Circuit, Norwest	Demolition of existing structures and the construction of two mixed use buildings- CC3- and remainder of works excluding basement level storage area, ground floor retails sanitary facilities and gym (removed) and level 3 gym and sanitary facilities	Approved

ID	Application number	Address	Description	Status
Planning Proposal				
PP1	PP-2021-5974	7-15 Columbia Way, Norwest.	Proposed The Hills Local Environmental Plan 2019 (Amendment No. (#)) – to increase the maximum Floor Space Ratio from 1:1 to 4:1 and increase the maximum Height of Building from RL 116 metres to RL 150.8 metres for land at 7-15 Columbia Way, Norwest.	Finalisation – date of publication 12 August 2025 NB: Not declared HAD pathway.
PP2	PP-2023- 2869	4-6 Century Circuit, Norwest	The planning proposal seeks to facilitate a high-density mixed use development comprising 117,330sqm of retail and commercial floor space and up to 854 residential dwellings within a built form of up to 36 storeys, as well as a 5,700sqm park adjoining Norwest Lake.	Pre-exhibition
PP3	PP-2025-1236	Norwest Service / Showground Precinct - Hudson Avenue, 1-3 Packard Avenue and 2A Victoria Avenue	Proposed amendments to The Hills LEP 2019 include rezoning to MU1 Mixed Use, introducing a maximum incentive FSR of 5:1, increasing the maximum building height to RL 216m and introducing Additional Permitted Uses to the site.	Finalisation
PP4	PP-2020- 3005	25-31 Brookhollow Avenue, Norwest	Amendments to HELP 2019 increase FSR from 1:1 to part 4.1:1 and part 6.5:1, increase height of buildings from RL 116m to part RL 135.65m and part RL 184.25m, reduce lot size map from 8,000m^2 to 3,500m^2 and amend Schedule 1 and the associated Additional Permitted Uses Map to permit 'neighbourhood supermarkets' (up to 1,000m^2) as an additional permitted use on the site.	Approved
State Significant Development				
SSD1	SSD- 78670213	1 Columbia Court Norwest	Demolition of existing structures and staged construction of four buildings comprising 393 independent living units (ILUs) and 30 residential care facility beds, basement car parking and associated retail, recreation and administrative spaces.	Prepare EIS Not declared HDA Pathway
SSD2	SSD- 98063208	14-16 Brookhollow Avenue, Norwest	Construction and operation of shop top housing. In accordance with the HDA declaration, amendments are sought to The Hills Shire Local Environmental Plan 2019 (HLEP 2019) as part of	SEARs

ID	Application number	Address	Description	Status
			the concurrent rezoning process facilitated by the HDA planning Pathway. The PP seeks to include and amend: - Shop-top housing' as an additional permitted land use at the site, under Schedule 1 of HLEP 2019. - The maximum permitted building height under Clause 4.3 of the HLEP 2019 (RL 129.2m) to a maximum RL 171.6m RL (80.6m). - The floor space ratio (FSR) under Clause 4.4 of HLEP 2019 (2.65:1) to an FSR of 4.61:1.	
SSD3	SSD- 96934458	28 Brookhollow Avenue, Norwest	Construction of Shop-Top Housing development In accordance with the HDA declaration, amendments are sought to The Hills Shire Local Environmental Plan 2019 (HLEP 2019) as part of the concurrent rezoning process facilitated by the HDA planning Pathway. The PP seeks to include and amend: - The maximum permitted building height under Clause 4.3 of the HLEP 2019 (RL 116m) to varying heights up to RL 181.6m. - The floor space ratio (FSR) under Clause 4.4 of HLEP 2019 (1:1) to an incentive FSR of 4.97:1.	Prepare EIS Declared SSDA Pathway by Minister (HAD Pathway)

4. POTENTIAL BUILDING WAKE EFFECTS

As previously outlined, it is not expected that the identified developments would contribute towards cumulative impacts with the Proposal. However, it is noted that a number of the identified developments are high-rise, and the potential for building wake effects to influence plume dispersion from the Proposal has been examined. The NSW EPA Approved Methods recommends using the US EPA building wake algorithm BPIP-PRIME, which has been used in the AQIA. The limitations on BPIP-PRIME for the inclusion of influencing buildings and structures has been adopted in the AQIA and also in this subsequent review.

> *"The location and dimensions of buildings located within a distance of 5L (where L is the lesser of the height or width of the building) from each release point for buildings with a height greater than 0.4 times the stack height should be entered in BPIP."*

For the Proposal, *5L* is assessed as being 158 m which has been presented with consideration of the identified future developments in Figure 2. It is noted that LD6 and SSD2 (refer Table 1) are captured within *5L* in accordance with the NSW EPA Approved Methods.

A review of the documentation associated with the Council assessment for LD6 under 426/2024/JP indicates that the approved building height is anticipated to increase from an existing height of approximately 9 m to 51.4 m. It is noted that the status of the SSD2 application at the time of this letter is currently at "Prepare SEARs" and no building layouts or architectural drawings are publicly available.

An analysis of the receptor locations included within the AQIA indicates that a number of receptors that are situated at downwind locations from the Proposal generators and the approved LD6 building may be impacted by the potential change of dispersion conditions and specifically building downwash. To examine the potential influence of the approved LD6 building on the predicted concentrations presented in the AQIA, the maintenance testing scenario (Scenario 2) included within the AQIA a sensitivity test has been performed to the results with an elevated building at the location of SSD2. To perform this test, the increased building heights at SSD2 have been included within the model and BPIP-PRIME, and the modelling repeated to examine the level of change predicted.

The predicted 1-hour average incremental concentrations of nitrogen oxides (NO_X) at R11 (the most affected downwind receptor location (a) predicted in the AQIA model and (b) with the amended model including increased building heights at SSD2 are illustrated in Table 2.

Table 2 Predicted 1-hour average NO_X concentrations

Receptor	Predicted incremental concentration ($\mu g{\cdot}m^{-3}$)		Difference (factor)
	AQIA model	Amended model	
R11	284.7	689.2	2.42

Figure 2 Influencing building buffer and identified future development locations

Source: Northstar

It is determined that at R11, the rate of incremental NO_X would change by a factor of 2.42. With reference to Table F7, Appendix F of the AQIA the incremental 1-hour NO_2 concentration was predicted to be 7.7 $\mu g \cdot m^{-3}$, which would (everything else being equal) increase the increment at R11 to 18.6 $\mu g \cdot m^{-3}$ and a predicted cumulative impact of 22.7 $\mu g \cdot m^{-3}$.

The same rate of potential increase with other pollutants would be expected, with reducing influence (i.e. reducing factors of change) with increased averaging times. Nonetheless, assuming this same level of increase for all incremental predictions would not result in any change to the conclusions of the AQIA.

More specifically, increasing the predicted incremental concentrations of all pollutants presented in the AQIA by a factor of 2.42 would not result in any additional exceedances of the NSW EPA assessment criteria.

5. CONCLUSION

As outlined in Section 3, a number of future developments have been identified within the area surrounding the Proposal site. Review of the proposed works associated with each of the identified developments indicates that potential emissions associated with those developments would not contribute to any significant cumulative impacts with the Proposal.

A sensitivity test has been performed to quantify the level of change anticipated with the increased building heights at SSD2. That sensitivity test demonstrates that the building height adjustments would not change the conclusions of the AQIA.

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Head Office

Suite 1504, 275 Alfred Street,

North Sydney NSW 2060

Riverina Office

PO Box 483

Albury NSW 2640

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Tel: 1300 708 590 | admin@northstar-env.com | northstar-env.com

Document prepared by

Aurecon Australasia Pty Ltd
ABN 54 005 139 873
Level 11, 73 Miller Street
North Sydney 2060 Australia
PO Box 1319
North Sydney NSW 2059
Australia

T +61 2 9465 5599
F +61 2 9465 5598
E sydney@aurecongroup.com
W aurecongroup.com

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