AIR QUALITY IMPACT ASSESSMENT ADDITIONAL CONTINUOUS GAS-FIRED POWER GENERATION (SQE2) AT 30 DOUGLAS ROAD, MOSS VALE

Nakar Property Pty Limited

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Job Number 23111663C

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1 INTRODUCTION

Todoroski Air Sciences has prepared this report for Nakar Property Pty Limited for a proposed continuous gas-fired power generation facility at 30 Douglas Road, Moss Vale, New South Wales (NSW) (hereafter referred to as the Project).

The Project involves the construction and operation of an additional gas-fired power generation facility which will provide 16 megawatts (MW) of generation capacity at the site. The air quality impacts associated with the currently approved continuous gas-fired power generation facility at the site was assessed in **Todoroski Air Sciences (2023)**.

The report presents an assessment of potential air quality impacts associated with the Project. This air quality impact assessment has been prepared in general accordance with the New South Wales (NSW) Environment Protection Authority (EPA) document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA, 2022**).

To assess the potential air quality impacts associated with the Project, this report comprises:

- A background to the Project and description of the proposed operations;
- A review of the existing meteorological and air quality environment surrounding the site;
- A description of the dispersion modelling approach and emission estimation used to assess potential air quality impacts;
- Presentation of the predicted results and discussion of the potential air quality impacts; and,
- Estimation of potential greenhouse gas emissions associated with the operation of the Project.

2 PROJECT SETTING

The Project site is located at 30 Douglas Road, Moss Vale, NSW, approximately 4.5 kilometres (km) southeast of Berrima and 5.9km southwest of Bowral. The site is situated within a rural mixed-use area that includes both industrial and residential uses and is located within the Southern Highlands Data Campus. The Boral Berrima Cement Works is located approximately 3km to the west of the Project on Berrima Road.

The majority of residential receptors are located to the east of the site in Moss Vale. The nearest residential receptor to the Project is located approximate 0.5km northwest of the Project off Carribee Road.

Figure 2-1 presents the location of the Project with reference to the assessment locations considered in this assessment.

Table 2-1 identifies the approximate location for each of the assessment locations.

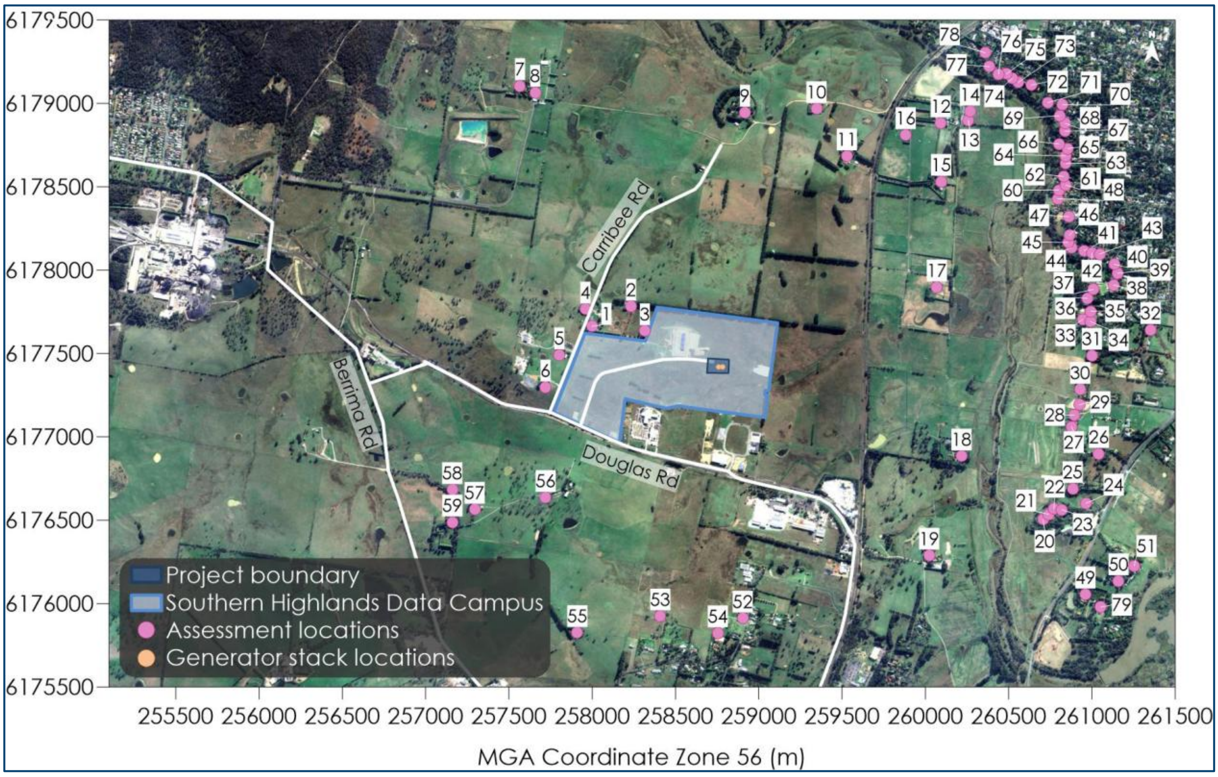

Figure 2-1: Project setting

Table 2-1: Assessment locations

Receptor ID	X coordinate (m)	Y coordinate (m)	Receptor ID	X coordinate (m)	Y coordinate (m)
1	257998	6177663	41	260955	6178116
2	258233	6177782	42	261000	6178103
3	258316	6177635	43	261046	6178097
4	257959	6177766	44	260878	6178135
5	257803	6177491	45	260857	6178166
6	257720	6177298	46	260865	6178209
7	257567	6179105	47	260861	6178321
8	257658	6179065	48	260793	6178428
9	258918	6178946	49	260961	6176056
10	259346	6178968	50	261160	6176135
11	259529	6178684	51	261254	6176226
12	260093	6178882	52	258904	6175911
13	260258	6178899	53	258409	6175924
14	260268	6178953	54	258754	6175823
15	260095	6178531	55	257911	6175825
16	259882	6178812	56	257721	6176635
17	260069	6177898	57	257294	6176564
18	260217	6176884	58	257160	6176683
19	260023	6176289	59	257161	6176488
20	260706	6176505	60	260801	6178480
21	260741	6176535	61	260843	6178511
22	260772	6176568	62	260831	6178562
23	260819	6176563	63	260844	6178640
24	260965	6176602	64	260841	6178686
25	260884	6176688	65	260855	6178730
26	261042	6176899	66	260801	6178756
27	260878	6177060	67	260839	6178833
28	260895	6177132	68	260839	6178880
29	260924	6177192	69	260806	6178925
30	260930	6177283	70	260824	6178993
31	261000	6177488	71	260736	6179005
32	261352	6177643	72	260636	6179110
33	260945	6177706	73	260556	6179126
34	260993	6177690	74	260521	6179149
35	260993	6177753	75	260487	6179177
36	260972	6177831	76	260439	6179175
37	261008	6177884	77	260384	6179220
38	261130	6177910	78	260361	6179303
39	261155	6177981	79	261054	6175979
40	261134	6178036			

Figure 2-2 presents a pseudo three-dimensional visualisation of the topography in the general vicinity of the Project. The area surrounding the Project site can be characterised as gently undulating areas in places, with increasing elevations to the north with a ridgeline aligned east-west.

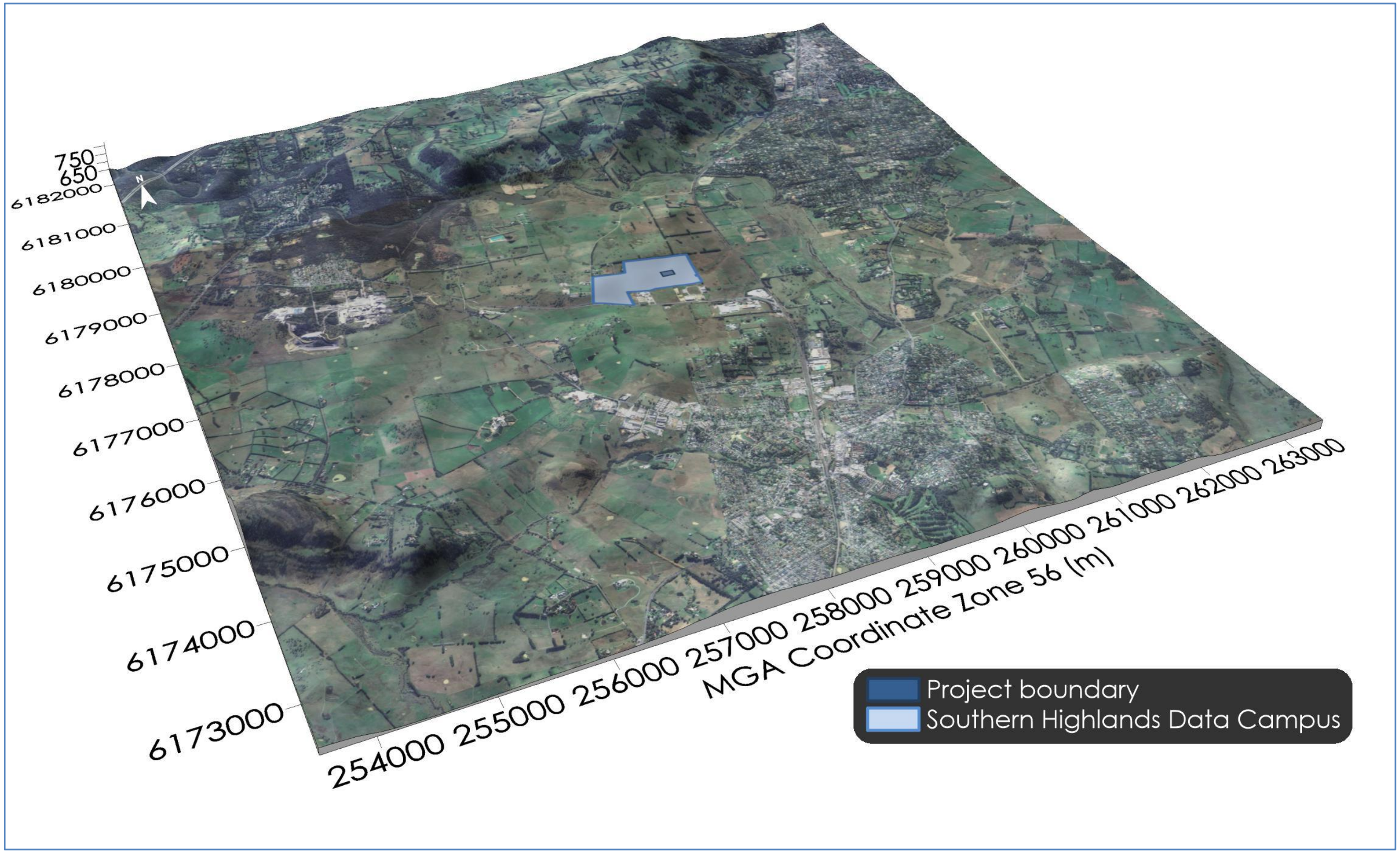

Figure 2-2: Representative visualisation of topography in the area surrounding the Project

3 PROJECT DESCRIPTION

The Project proposes to construct and operate an additional gas-fired power generation facility (SQE2) at the Southern Highlands Data Campus site.

This facility will provide approximately 16MW of generation capacity and will comprise of a generator hall and ancillary plant and equipment. The proposed facility would operate concurrently with the approved gas-fired generation facility (SQE1) at the site.

Figure 3-1 presents an indicative site layout of the Southern Highlands Data Campus site.

Figure 3-2 presents shows a close up of the Project area.

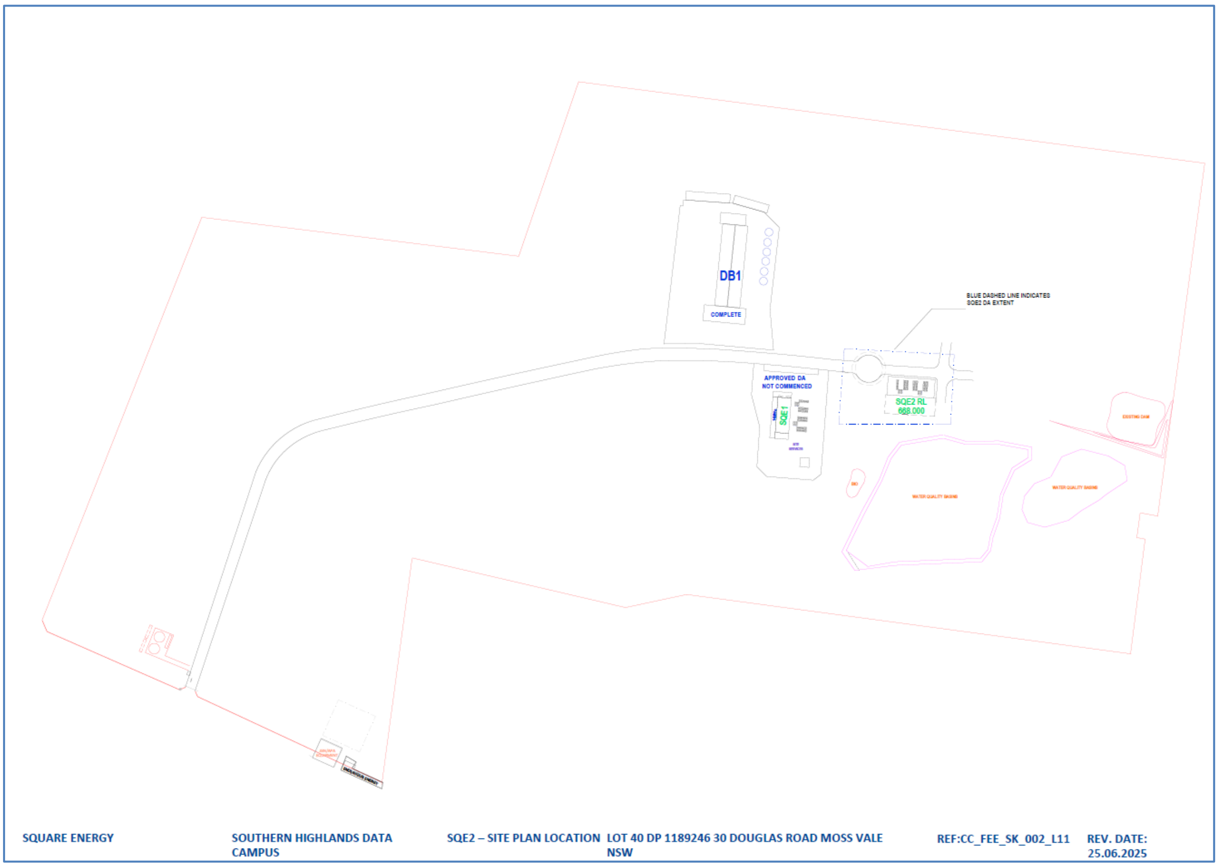

Figure 3-1: Indicative Southern Highlands Data Campus site layout

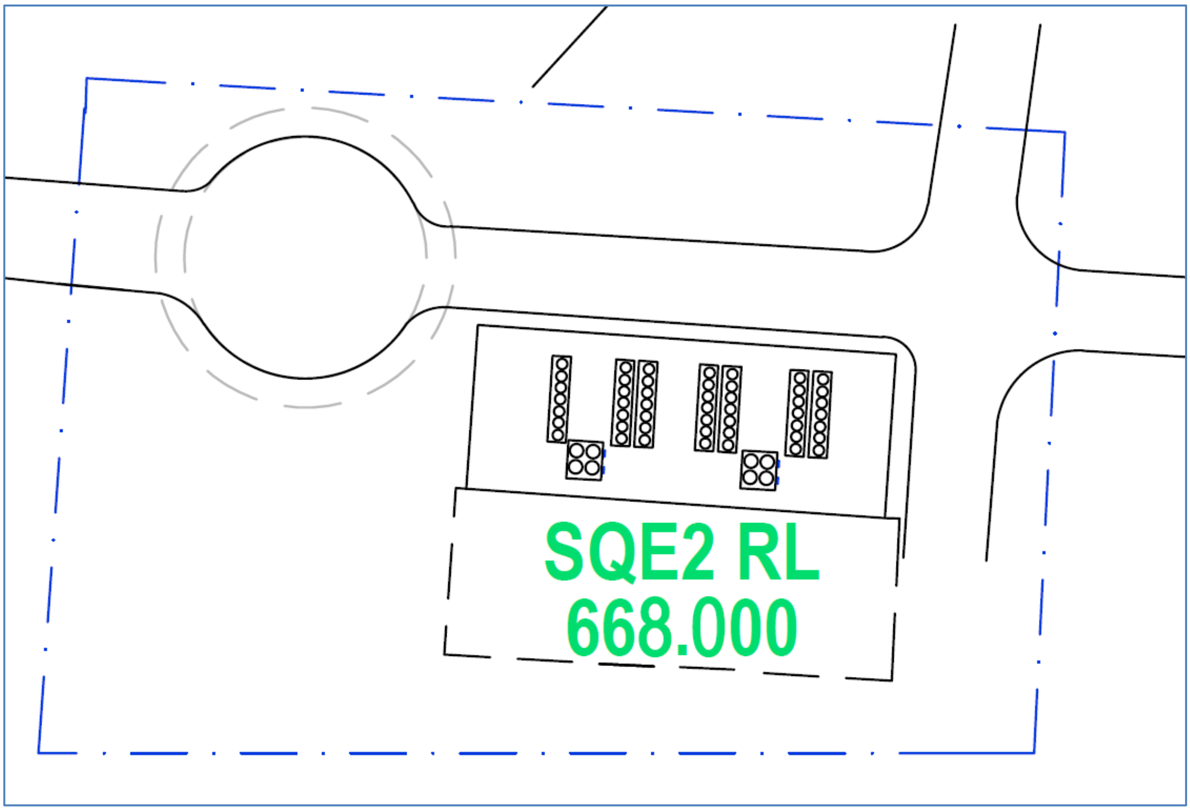

Figure 3-2: Indicative Project layout

4 AIR QUALITY CRITERIA

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The sections below identify the potential air emissions generated by the Project and the applicable air quality criteria.

4.1 Air pollutants

Emissions associated with the operation of the natural gas generators generally include nitrogen dioxide (NO_2), particulate matter and carbon monoxide (CO), and other trace pollutants.

The amount of CO and other trace pollutant emissions generated from natural gas generators at the Project site is generally considered to be too low to generate any significant off-site pollutant concentrations and have not been assessed further in this study.

NO_2 emissions from the equipment have a higher potential to cause impact considering the proximity to receptors and are considered in this assessment.

Particulate matter consists of dust particles of varying size and composition with combustion emissions generally forming particulate matter in the lower size ranges. These include PM_{10}, particulate matter with equivalent aerodynamic diameters of 10µm or less, and $PM_{2.5}$, particulate matter with equivalent aerodynamic diameters of 2.5µm or less and are considered in this assessment.

4.2 NSW EPA impact assessment criteria

Table 4-1 summarises the air quality goals that are relevant to this assessment as outlined in the NSW EPA document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA, 2022**).

The incremental criterion relates to impact from the Project alone. The air quality criteria for total impact relate to the total pollution burden in the air and not just the pollution from the Project. Consideration of background dust levels is required when using these criteria to assess total potential impacts.

The NSW EPA impact assessment criteria for the assessed pollutants in **Table 4-1** are numerically the same to the air quality standards of the National Environment Protection Measures (NEPMs) Ambient Air Quality (**Australian Government, 2021**).

Table 4-1: NSW EPA air quality impact assessment criteria

Pollutant	Averaging Period	Criterion
NO_2	1 hour	164µg/m³
	Annual	32µg/m³
PM_{10}	24 hour	50µg/m³
	Annual	25µg/m³
$PM_{2.5}$	24 hour	25µg/m³
	Annual	8µg/m³

Source: **NSW EPA, 2022**
µg/m³ = micrograms per cubic metre

5 EXISTING ENVIRONMENT

This section describes the existing environment including the climate and ambient air quality in the area surrounding the Project.

5.1 Local climatic conditions

Long-term climatic data from the Bureau of Meteorology (BoM) weather station at Moss Vale (Hoskins Street) (Site No. 068045) were analysed to characterise the local climate in the proximity of the Project. The Moss Vale (Hoskins Street) weather station located approximately 2.7km south-southeast of the Project.

It is to be noted that there is insufficient average 3pm relative humidity data measured at the Moss Vale (Hoskins Street) weather station to calculate a long-term average, therefore data from the Moss Vale Automatic Weather Station (AWS) (located approximately 4.9km east-southeast of the Project) has been incorporated into the dataset to supplement the 3pm relative humidity data.

Table 5-1 and **Figure 5-1** present a summary of data from the Moss Vale (Hoskins Street) collected over a 33-to-151-year period for the various meteorological parameters. The 3pm relative humidity data from the Moss Vale AWS was collected over approximately a 9-year period.

The data indicate that January is the hottest month with a mean maximum temperature of 25.8 degrees Celsius (°C) and July is the coldest month with a mean minimum temperature of 1.3°C.

Rainfall decreases during the months of July, August and September, with an annual average rainfall of 961.5 millimetres (mm) over 93.0 days. The data indicate that June is the wettest month with an average rainfall of 100.5mm over 7.8 days and September is the driest month with an average rainfall of 58.6mm over 7.3 days.

Relative humidity levels exhibit variability over the day and seasonal fluctuations. Mean 9am relative humidity measured at Moss Vale (Hoskins Street) ranges from 60 percent (%) in November to 82% in May. Mean 3pm relative humidity measured at Moss Vale AWS levels range from 51% in January, September and October to 63% in June.

Wind speeds exhibit seasonal variations with lower wind speed records for 9am and higher observations for 3pm conditions. Mean 9am wind speeds range from 9.3 kilometres per hour (km/h) in February to 13.5km/h in September. Mean 3pm wind speeds range from 10.6km/h in February to 15.6km/h in July.

Table 5-1: Monthly climate statistics summary – Moss Vale (Hoskins Street) & Moss Vale AWS

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Temperature													
Mean max. temp. (ºC)	25.8	25.2	23.1	19.2	15.3	12.3	11.8	13.4	16.7	19.9	22.6	25.0	19.2
Mean min. temp. (ºC)	12.4	12.6	10.8	7.4	4.3	2.3	1.3	2.0	4.0	6.5	8.8	11.1	7.0
Rainfall													
Rainfall (mm)	87.6	96.9	92.6	79.3	82.6	100.5	74.4	65.8	58.6	73.2	73.3	77.1	961.5
No. of rain days (≥1mm)	8.4	8.5	8.5	7.4	7.2	7.8	7.0	7.0	7.3	7.9	8.1	7.9	93.0
9am conditions													
Mean temp. (ºC)	18.5	18.4	16.8	13.1	9.2	6.5	5.5	7.1	10.7	13.7	16.0	18.2	12.8
Mean R.H. (%)	70.0	75.0	81.0	80.0	82.0	81.0	79.0	73.0	66.0	64.0	60.0	62.0	73.0
Mean W.S. (km/h)	10.6	9.3	10.0	10.7	11.7	10.7	12.8	13.2	13.5	12.3	12.8	10.4	11.5
3pm conditions													
Mean temp. (ºC)	22.9	22.6	20.8	17.9	13.7	11.2	10.5	11.5	14.6	17.0	19.4	21.6	17.0
Mean R.H. (%)*	51.0	60.0	59.0	58.0	60.0	63.0	61.0	53.0	51.0	51.0	56.0	52.0	56.0
Mean W.S. (km/h)	12.5	10.6	11.4	12.0	13.7	13.4	15.6	15.5	14.9	13.6	14.4	12.5	13.3

Source: **Bureau of Meteorology, 2025**

R.H. – Relative Humidity, W.S. – wind speed

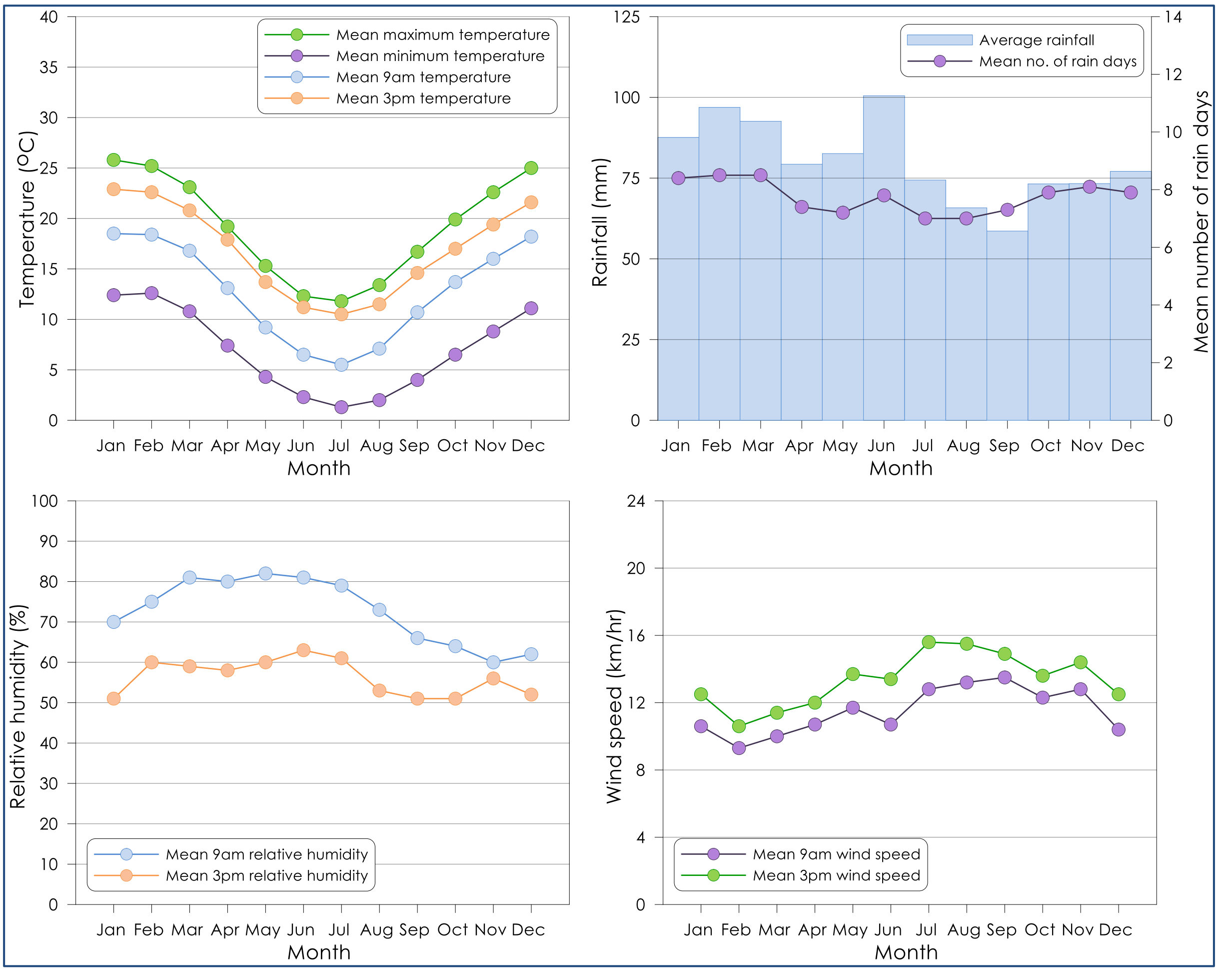

Figure 5-1: Monthly climate statistics summary – Moss Vale

5.2 Local meteorological conditions

Annual and seasonal windroses for the Moss Vale AWS during the 2021 calendar period are presented in **Figure 5-2**.

The 2021 calendar year was selected as the meteorological year for the dispersion modelling based on an analysis of data trends in meteorological data recorded for the area as outlined in **Appendix A**.

Analysis of the annual windrose shows winds predominately occur from the west and north-northeast with varied winds in other directions. The summer wind distribution occurs along a clockwise direction from the north-northeast to the south-southeast, with a lower proportion of winds occurring from the west. The autumn and spring wind distribution show a similar pattern to the annual windrose, with the greatest proportion of winds occurring from the west and north-northeast. During winter, the most dominant winds occur from the west.

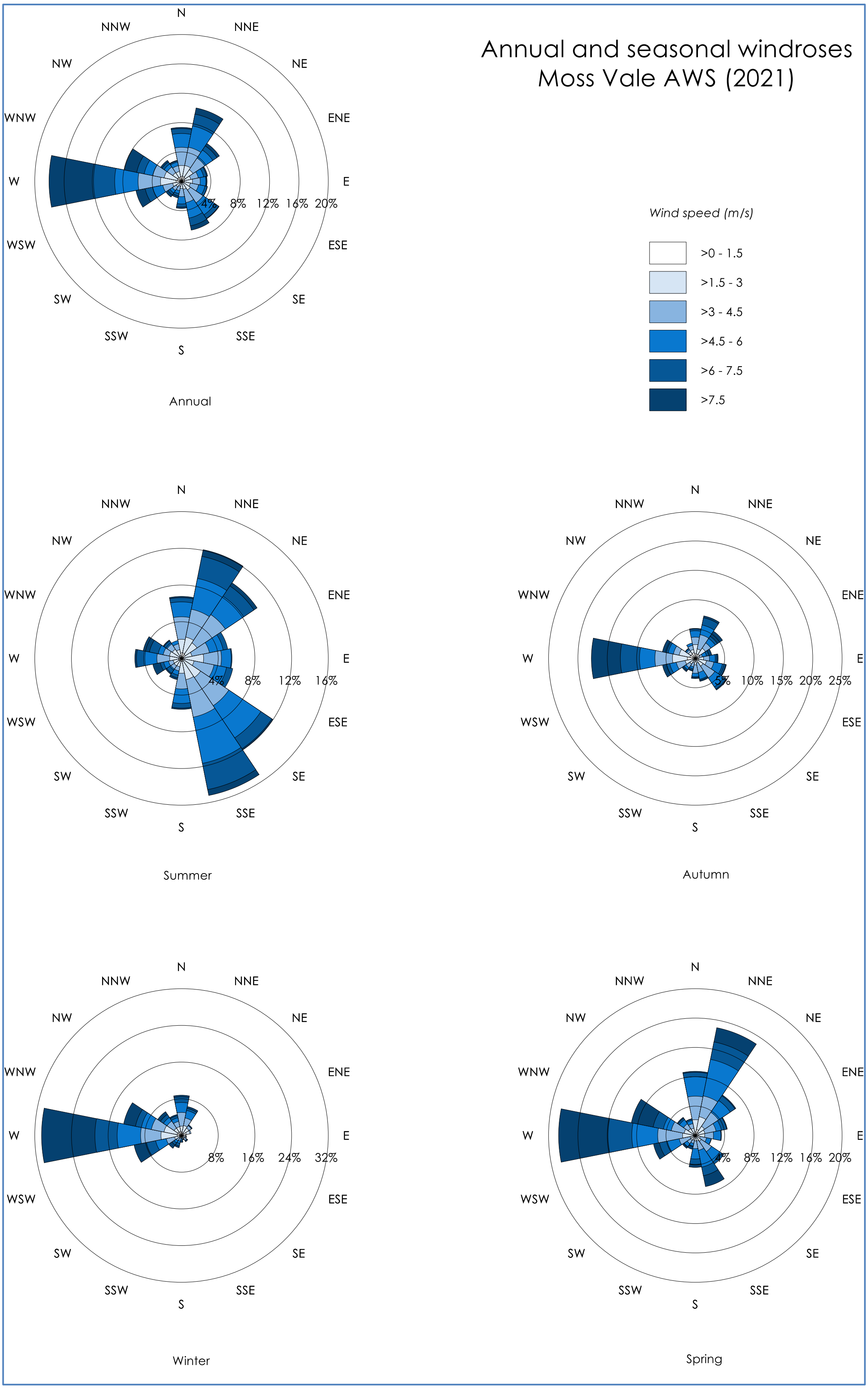

Figure 5-2 : Annual and seasonal windroses – Moss Vale AWS (2021)

5.3 Local air quality monitoring

The main sources of air pollutants in the local area would include emissions from surrounding industrial and commercial operations and from other anthropogenic activities such as wood heaters and motor vehicle exhaust.

Ambient air quality monitoring data from the Project site are not available. However, some local air quality data is available from an air quality monitoring campaign conducted by the NSW Department of Climate Change, the Environment, Energy and Water (DECCW), formally known as the Department of Planning and Environment (DPE) at Bowral (approximately 4.9km northwest of the Project) from December 2021 to March 2022. Ambient air quality data collected during the DPE monitoring campaign was compared with the Bargo and Albion Park South monitoring data for the same period to confirm whether the more distant Bargo and Albion Park South data is suitable for characterising the existing background levels at the site. The results of the comparison are presented in **Section 5.3.5** and indicate that the campaign monitoring data align relatively well with the measured data from Bargo and Albion Park South, indicating these data are reasonably representative of the likely background pollutant concentrations for the Project site.

Hence the available data from the nearest air quality monitors operated by the DCCEEW at Bargo (approximately 30.1km northwest), Albion Park South (approximately 38.4km east-southeast) and Wollongong (approximately 48.7km east-northeast) were used to characterise the background levels for the Project site.

5.3.1 PM_{10} monitoring

A summary of the available PM_{10} monitoring data from 2019 to 2024 for the Bargo, Albion Park South and Wollongong monitoring stations is presented in **Table 5-2** and **Figure 5-3**. These data include levels measured during all extraordinary event days. Extraordinary event days are characterised as those days influenced by exceptional events such as bushfires, dust storms and hazard reduction burns.

A review of **Table 5-2** indicates that the annual average PM_{10} concentrations for the DPE monitoring stations were below the relevant criterion of 25µg/m^3 for all years. The maximum 24-hour average PM_{10} concentrations were found to exceed the relevant criterion of 50µg/m^3 on occasion throughout the review period.

It is noted that there was a significant increase in the frequency of exceedances of the 24-hour average PM_{10} criterion in the 2019/ 2020 summer, predominately due to smoke associated with the widespread bushfires occurring at this time (**NSW DPIE, 2021**) (refer to **Figure 5-3**). Elevated PM_{10} concentrations seen in 2021 can be attributed to hazard reduction burning (**NSW DPE, 2023**).

Table 5-2: Summary of PM_{10} levels from monitoring stations (µg/m³)

Year	Wollongong	Bargo	Albion Park South	Criterion
	Annual Average			
2019	22.6	21.2	19.5	**25**
2020	18.8	15.9	17.1	**25**
2021	15.1	11.8	13.1	**25**
2022	14.3	9.9	10.9	**25**
2023	16.5	15.0	13.4	**25**
2024	18.2	15.4	14.8	**25**
Year	**Maximum 24-hour average**			**Criterion**
2019	**117.6**	**188.9**	**104.3**	**50**
2020	**121.6**	**265.7**	**153.3**	**50**
2021	43.2	**63.9**	39.4	**50**
2022	45.4	25.4	29.9	**50**
2023	**50.8**	**78.9**	36.7	**50**
2024	**54.3**	42.9	41.8	**50**

ND – no data

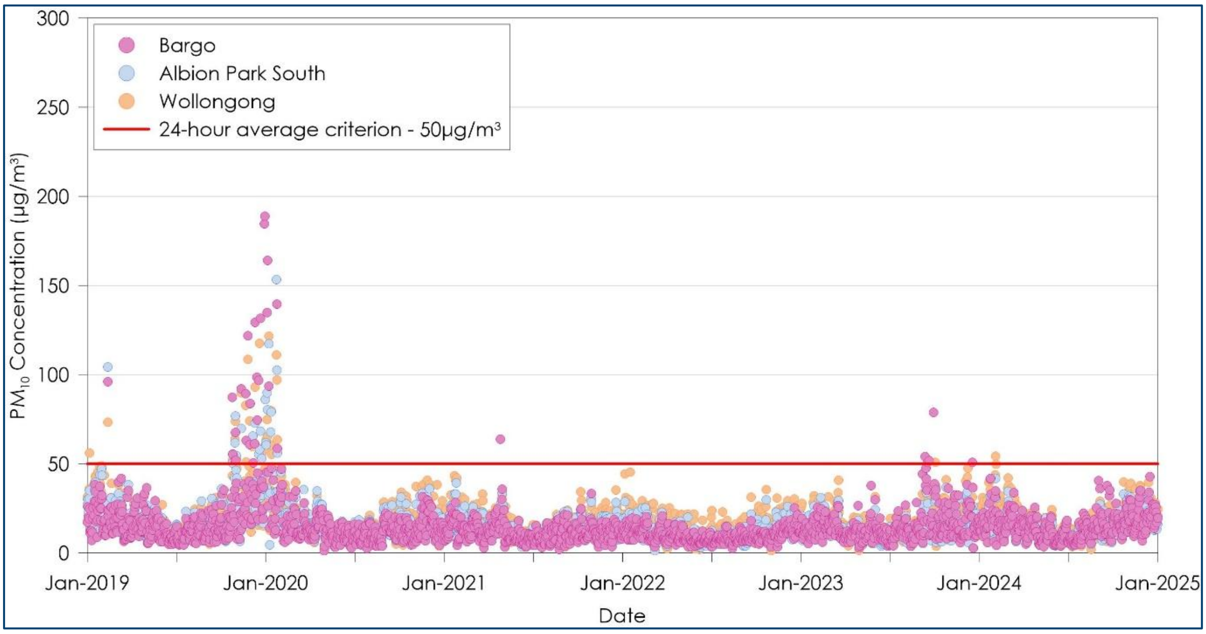

Figure 5-3: 24-hour average PM_{10} concentrations

5.3.2 $PM_{2.5}$ monitoring

A summary of the available $PM_{2.5}$ data for the DCCEEW monitoring stations from 2019 to 2024 is presented in **Table 5-3** and **Figure 5-4**. These data include levels measured during all extraordinary event days. Extraordinary event days are characterised as those days influenced by exceptional events such as bushfires, dust storms and hazard reduction burns.

A review of **Table 5-3** indicates that the annual average $PM_{2.5}$ concentrations at all monitoring stations were below the relevant criterion of 8µg/m³ for all years, except in 2019. The maximum 24-hour average $PM_{2.5}$ concentrations were found to exceed the relevant criterion of 25µg/m³ on occasion.

The significant increase in the frequency of exceedances of the 24-hour average $PM_{2.5}$ criterion in the 2019/ 2020 summer, predominately due to smoke associated with the widespread bushfires occurring at this time (**NSW DPIE, 2021**).

Table 5-3: Summary of $PM_{2.5}$ levels from monitoring stations ($\mu g/m^3$)

Year	Wollongong	Bargo	Albion Park South	Criterion
	Annual Average			
2018	7.3	6.8	6.8	**8**
2019	**9.0**	**10.4**	**8.6**	**8**
2020	7.8	7.8	6.8	**8**
2021	5.7	5.3	4.8	**8**
2022	4.7	3.7	3.8	**8**
2023	5.6	5.7	4.9	**8**
2024	6.0	5.4	5.4	**8**
Year	**Maximum 24-hour average**			**Criterion**
2018	**47.6**	**38.1**	**29.4**	25
2019	**81.5**	**170.7**	**49.4**	25
2020	**100.9**	**121.9**	**96.3**	25
2021	23.4	**65.3**	23.3	25
2022	13.2	11.8	13.6	25
2023	**25.4**	**27.5**	22	25
2024	16.2	12.2	15.4	25

ND – no data

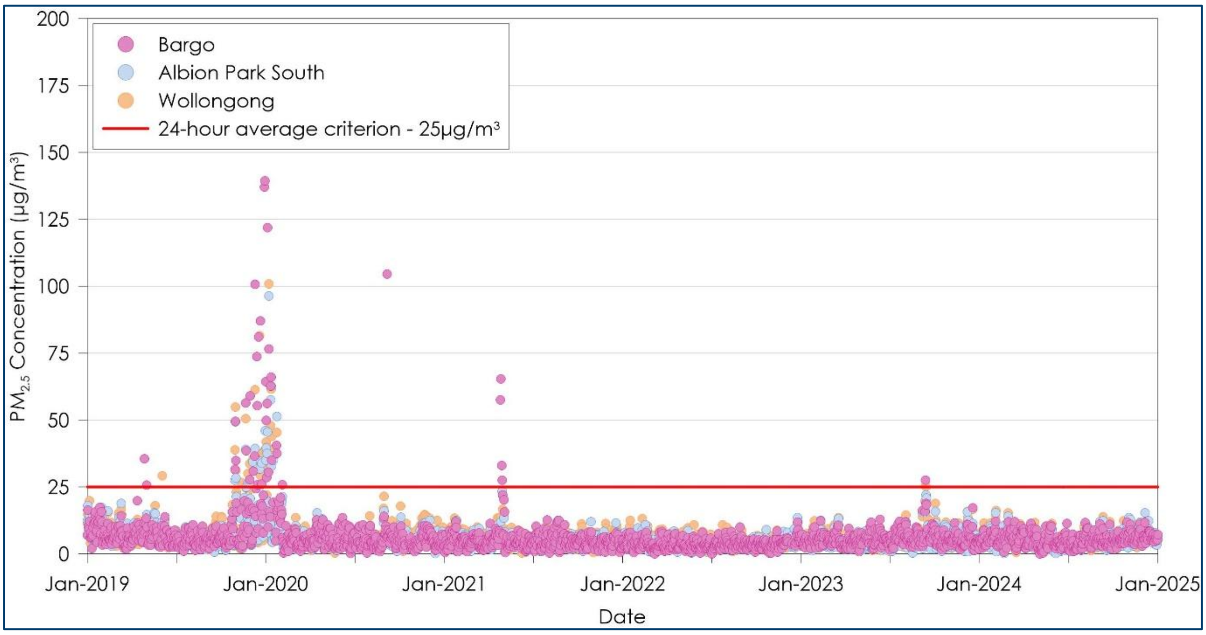

Figure 5-4: 24-hour average $PM_{2.5}$ concentrations

5.3.3 NO_2 monitoring

Figure 5-5 presents the daily maximum 1-hour average NO_2 monitoring data from the Wollongong, Bargo and Albion Park South monitoring sites. The monitoring data recorded are well below the relevant criterion of 146µg/m^3.

A seasonal trend can be seen in the NO_2 monitoring data at the station with elevated NO_2 levels occurring in the cooler months.

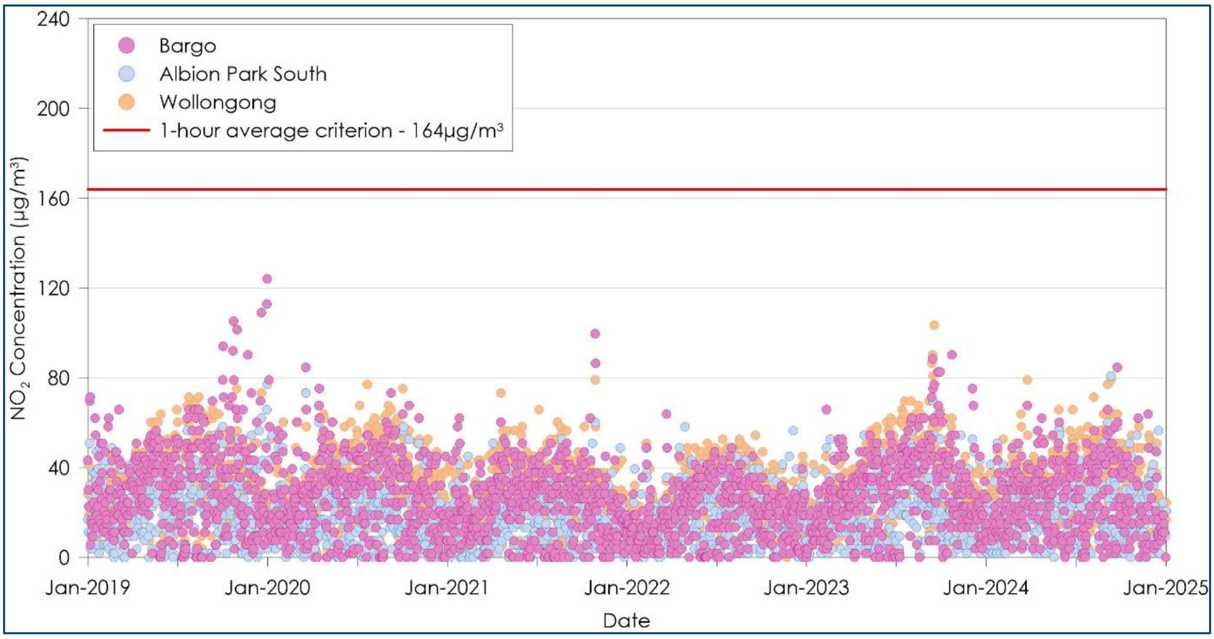

Figure 5-5: Daily maximum 1-hour average NO_2 concentrations

5.3.4 O_3 monitoring

Figure 5-6 presents the rolling 8-hour average O_3 monitoring data from the Wollongong, Bargo and Albion Park South sites. The data show that the levels were mostly below the NSW EPA rolling 8-hour average criterion of 139µg/m^3, with some seasonal exceedances occurring during the warmer months.

A seasonal trend in the ambient O_3 monitoring data can be seen with elevated levels occurring in the warmer months, which is the converse of the trend in the NO_2 monitoring data.

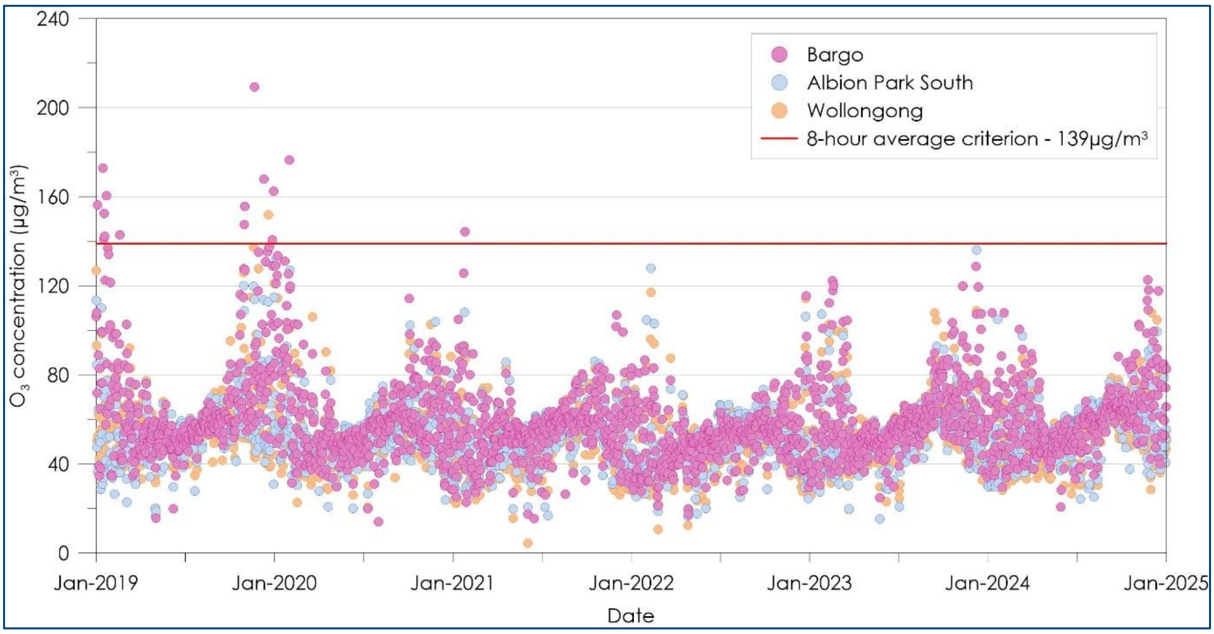

Figure 5-6: Daily maximum rolling 8-hour average O_3 concentrations

5.3.5 DPE monitoring campaign at Bowral

An ambient air quality monitoring campaign was conducted at Bowral by the DPE from December 2021 to March 2022. The campaign included continuous monitoring of $PM_{2.5}$, PM_{10}, NO_2 and O_3 and the measured levels are compared with the nearest DPE air quality monitors at Bargo and Albion Park South for the same period.

The location of the DPE Bowral air monitor approximately 4.9km from the Project site is shown in **Figure 5-7**.

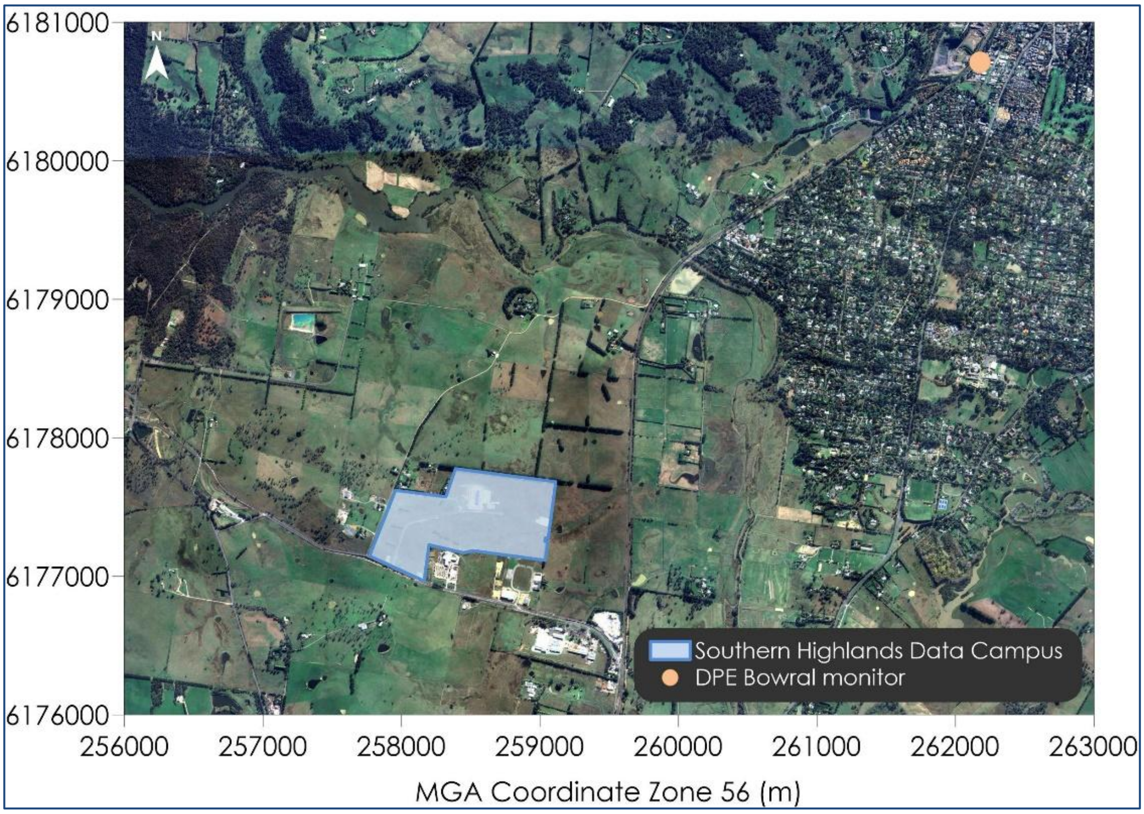

Figure 5-7: Location of DPE Bowral air monitor

Figure 5-8 presents a comparison of the recorded 24-hour average PM_{10} concentrations for the Bowral campaign monitor and the Bargo and Albion Park South DPE monitors. The 24-hour average PM_{10} concentrations recorded at the Bowral monitor were below the relevant NSW EPA criterion of 50µg/m^3 and compare reasonably well with the measured concentrations at the Bargo and Albion Park South monitors.

Figure 5-9 presents a comparison of the recorded 24-hour average $PM_{2.5}$ concentrations for the Bowral campaign monitor and the Bargo and Albion Park South DPE monitors. Similar to the PM_{10} concentrations, the 24-hour average $PM_{2.5}$ concentrations recorded at the Bowral monitor were below the relevant NSW EPA criterion of 25µg/m^3 and compare reasonably well with the measured concentrations at the Bargo and Albion Park South monitors.

Figure 5-10 presents a comparison of the recorded 1-hour average NO_2 concentrations for the Bowral campaign monitor and the Bargo and Albion Park South DPE monitors. The 1-hour average NO_2 concentrations recorded at the Bowral monitor were below the relevant NSW EPA criterion of 164µg/m^3

and recorded generally comparable levels against the measured concentrations at the Bargo and Albion Park South monitors.

Figure 5-11 presents a comparison of the rolling 8-hour average O_3 concentrations for the Bowral campaign monitor and the Bargo and Albion Park South DPE monitors. The 8-hour rolling average O_3 concentrations recorded at the Bowral monitor were below the relevant NSW EPA criterion of 139 µg/m^3 and recorded generally similar trends against the measured concentrations at the Bargo and Albion Park South monitors.

As the prevailing pollutant levels are generally lower at Bowral, using the Bargo and Albion Park data in this assessment is likely to lead to some overestimation of the cumulative pollutant levels.

Overall, the Bowral monitor indicates that the Bargo and Albion Park South sites provide a reasonable indication of the background air quality levels at the Project site.

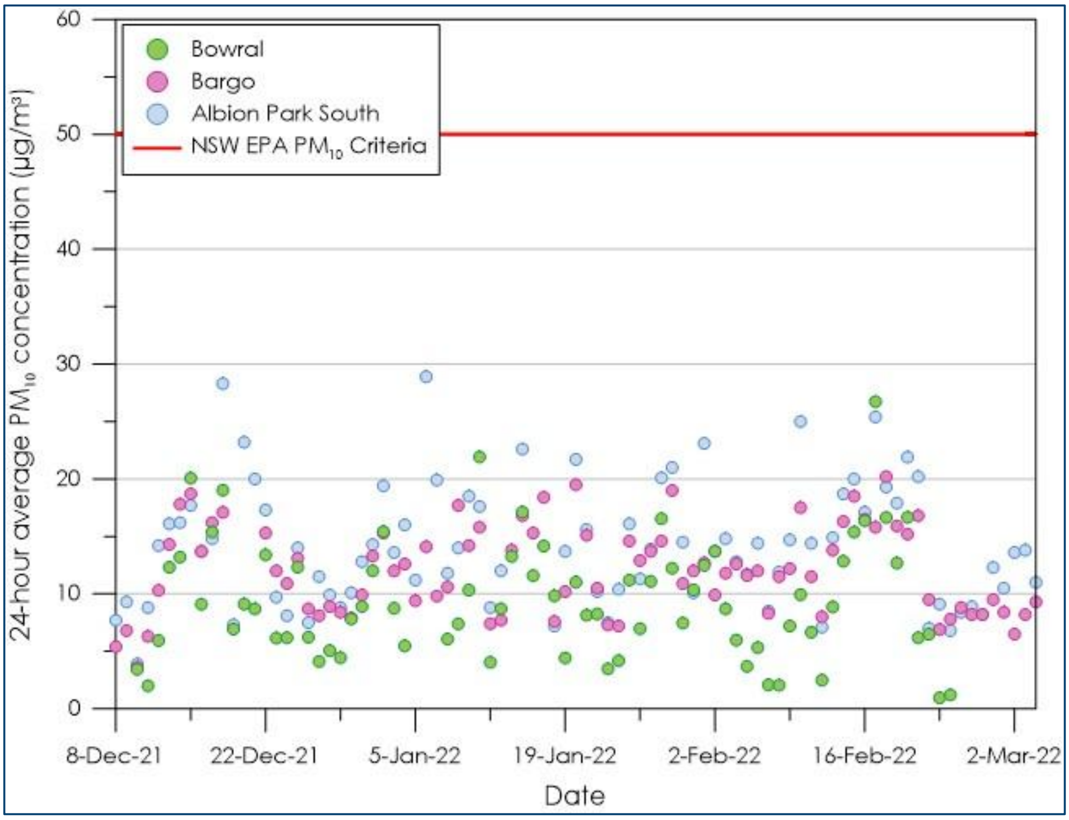

Figure 5-8: Comparison of 24-hour average PM_{10} concentrations during monitoring campaign

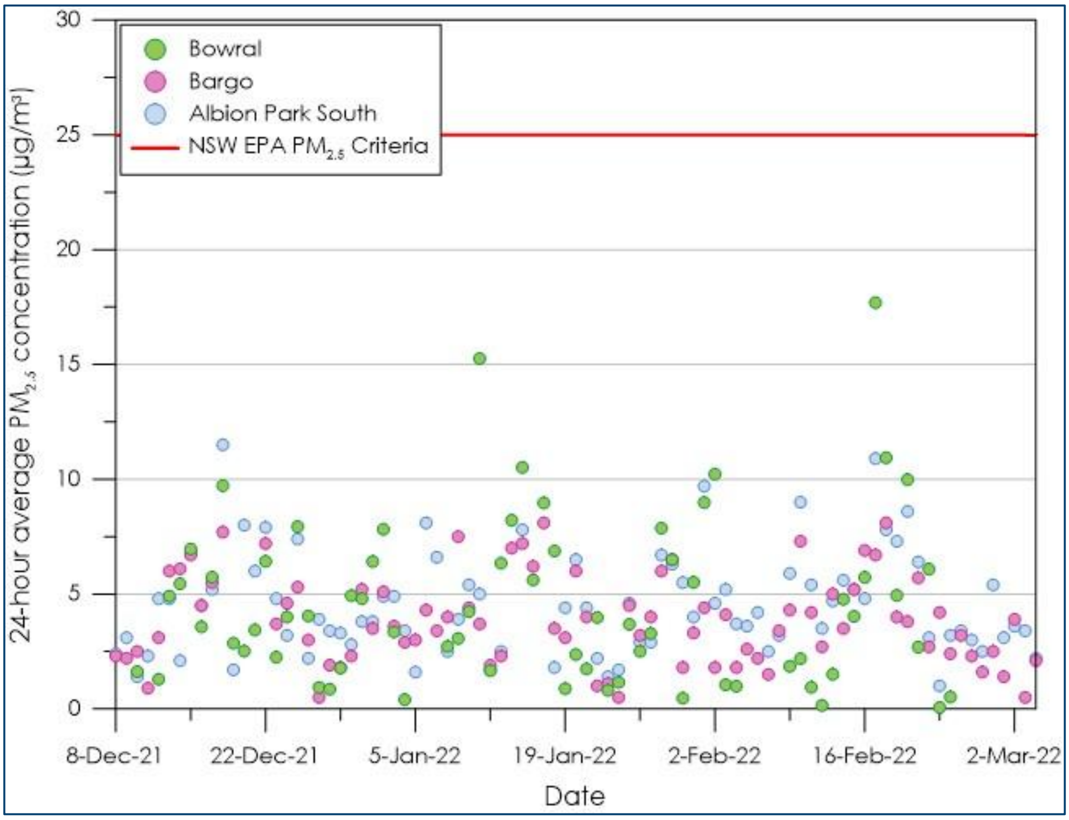

Figure 5-9: Comparison of 24-hour average $PM_{2.5}$ concentrations during monitoring campaign

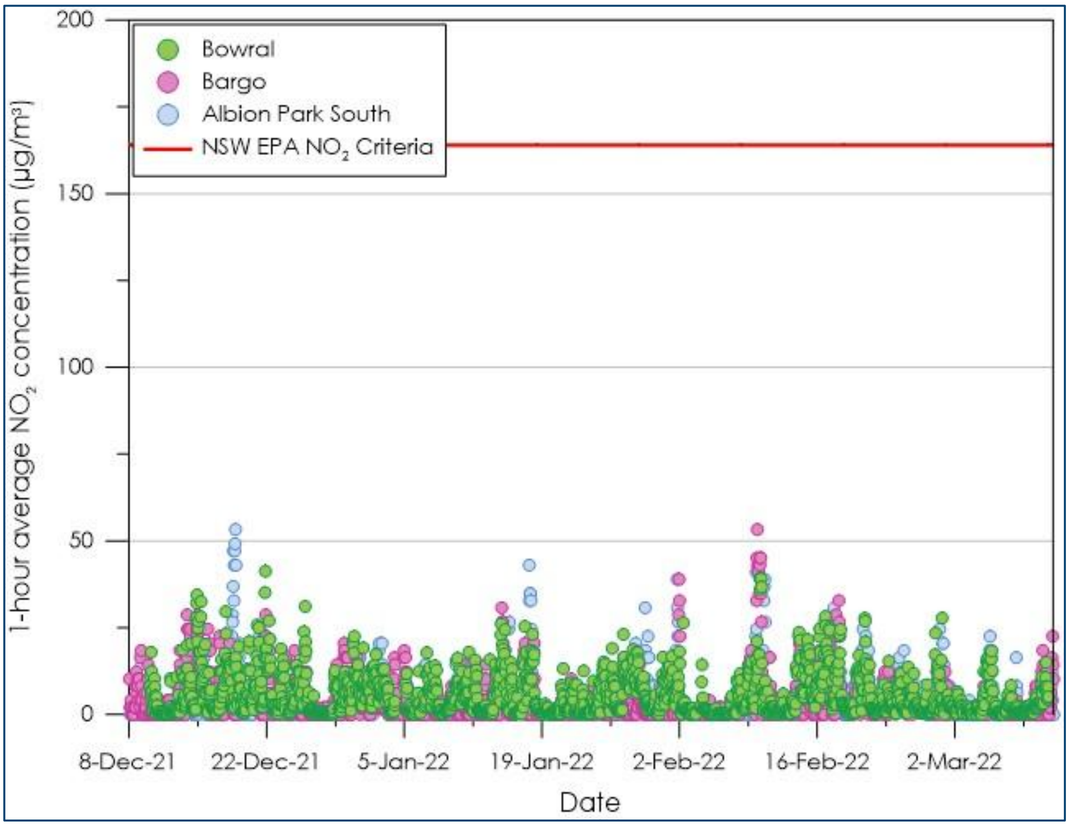

Figure 5-10: Comparison of 1-hour average NO_2 concentrations during monitoring campaign

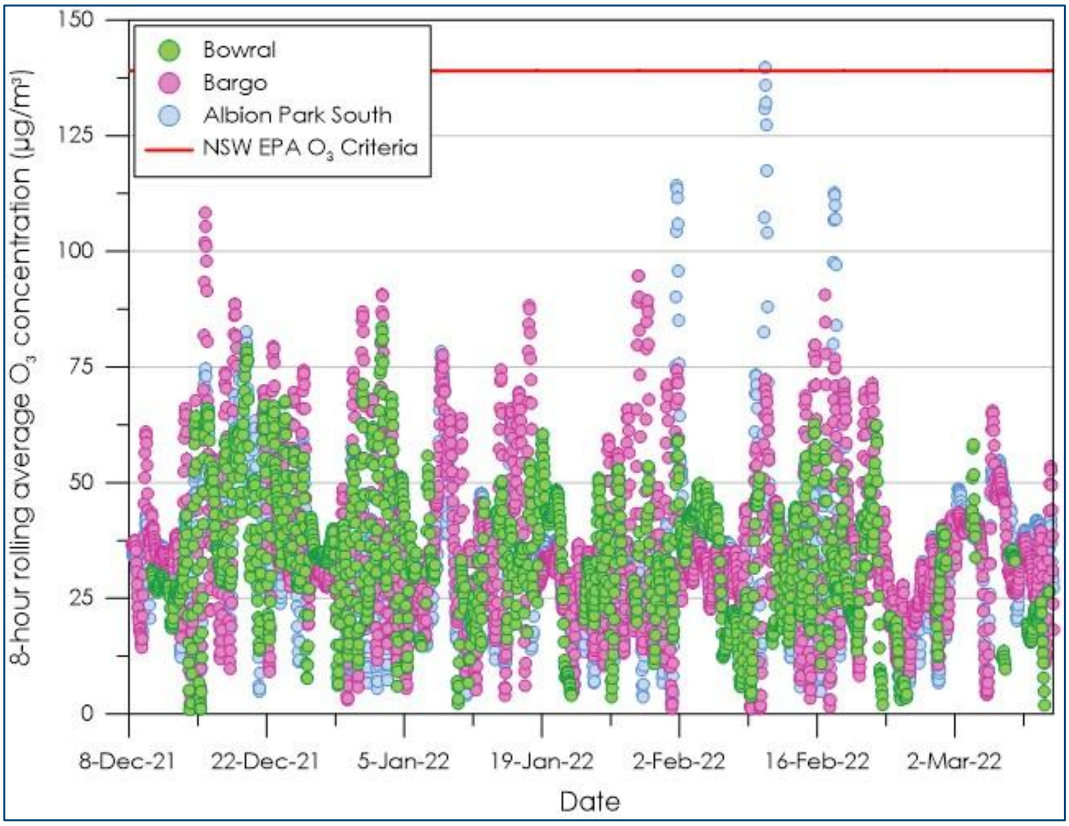

Figure 5-11: Comparison of rolling 8-hour average O_3 concentrations during monitoring campaign

5.3.6 Estimated background levels

As outlined above, there are no readily available site-specific monitoring data, and therefore the background air quality levels from the closest DCCEEW monitoring station at Bargo for the 2021 calendar year were used to represent background levels for the Project. The maximum 24-hour average PM_{10} and $PM_{2.5}$ levels recorded at Bargo in 2021 which were not classified as extraordinary event days, were used to represent background.

For the conversion of NO_X to NO_2, the Ozone Limiting Method (OLM) has been adopted as per the NSW EPA *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA, 2022**). This method assumes all available ozone in the atmosphere will react with NO in the plume until either all the O_3 or all the NO is used up. The OLM applies hourly varying background levels of O_3 and NO_2 recorded at the Bargo monitoring station during 2021 to determine the predicted cumulative NO_2 level.

The background air quality levels applied in this assessment are summarised in **Table 5-4**.

Table 5-4: Summary of background levels

Pollutant	Background level	Units
24-hour average PM_{10}	35.7	µg/m³
Annual average PM_{10}	11.8	µg/m³
24-hour average $PM_{2.5}$	22.0	µg/m³
Annual average $PM_{2.5}$	5.3	µg/m³
1-hour average NO_2	Hourly varying	µg/m³
Annual average NO_2	7.5	µg/m³

6 DISPERSION MODELLING APPROACH

6.1 Introduction

The following sections are included to provide the reader with an understanding of the model and modelling approach applied for the assessment. The CALPUFF is an advanced air dispersion model which can deal with the effects of complex local terrain on the dispersion meteorology over the modelling domain in a three-dimensional, hourly varying time step.

The model was setup in general accord with the methods provided in the NSW EPA document *Generic Guidance and Optimum Model Setting for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia'* (**TRC**, **2011**).

6.2 Modelling methodology

Modelling was undertaken using a combination of the CALPUFF Modelling System and The Air Pollution Model (TAPM). The CALPUFF Modelling System includes three main components: CALMET, CALPUFF and CALPOST and a large set of pre-processing programs designed to interface the model to standard, routinely available meteorological and geophysical datasets.

6.2.1 Meteorological modelling

The WRF model was applied to the available data to generate a three-dimensional upper air data file for use in CALMET. The centre of analysis for the WRF modelling used is 258492 metres (m) east and 6177387m north. The simulation involved an outer grid of 306km with 9km grid spacing, with two nested grids with 3km and 1km grid spacing.

The CALMET domain was run on a domain of 10 x 10km with a 0.1km grid resolution. The available meteorological data from the Moss Vale AWS (BoM) were included in the simulation.

6.2.2 Meteorological modelling evaluation

The outputs of the CALMET modelling are evaluated using visual analysis of the wind fields and extract data. **Figure 6-1** presents a visualisation of the wind field generated by CALMET for a single hour of the modelling period (i.e., example only). The wind fields follow the terrain well and indicate the simulation produces realistic fine scale flow fields (such as terrain forced flows) in surrounding areas.

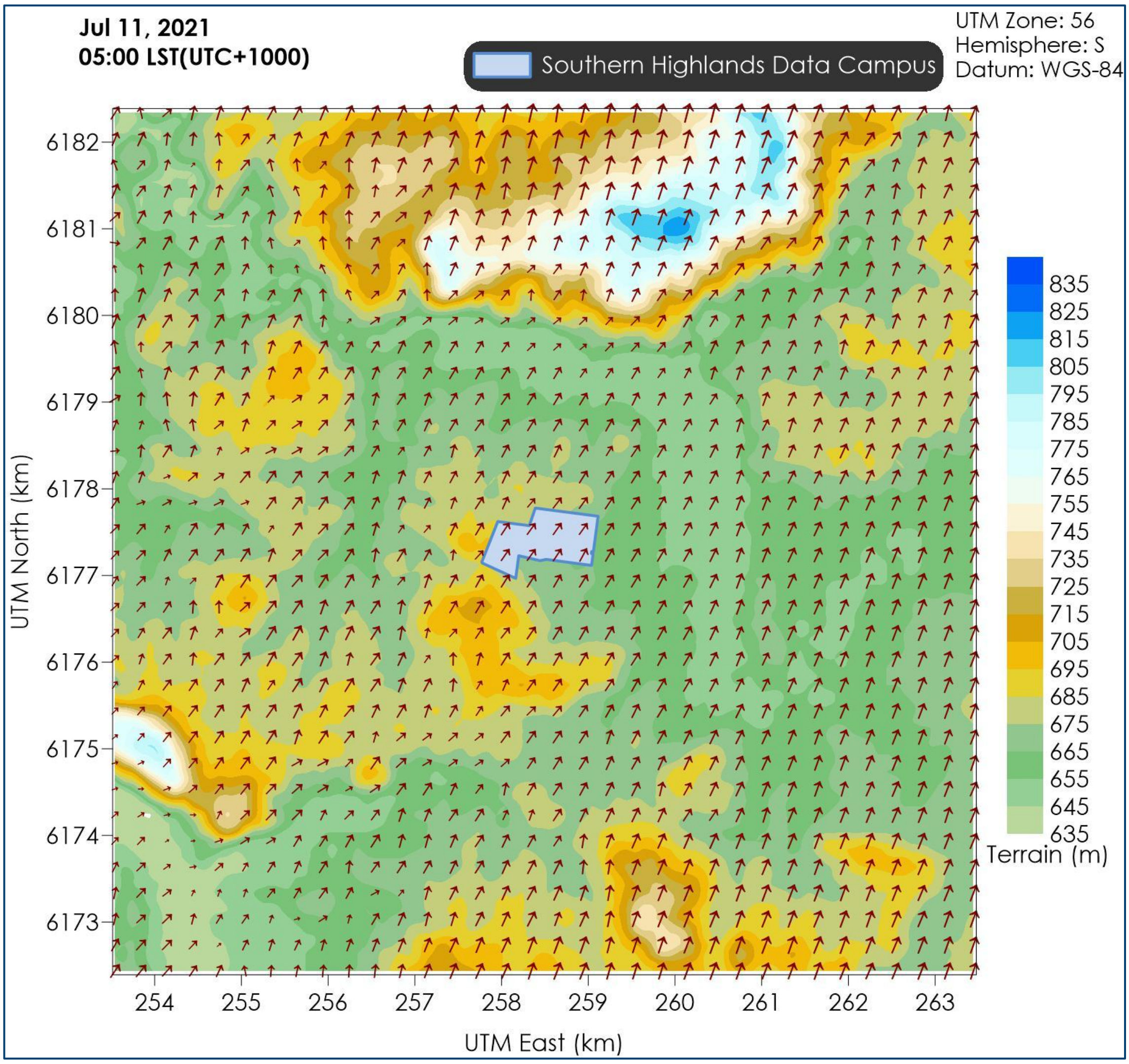

Figure 6-1: Representative 1-hour average snapshot of wind field for the Project

CALMET generated meteorological data were extracted from a point within the CALMET domain and are graphically represented in **Figure 6-2** and **Figure 6-3**.

Figure 6-2 presents the annual and seasonal windroses from the CALMET data. Overall, the windroses generated in the CALMET modelling reflect the expected wind distribution patterns of the area as determined based on the available measured data and the expected terrain effects on the prevailing winds as discussed in **Section 5.2**.

Figure 6-3 includes graphs of the temperature, wind speed, mixing height and stability classification over the modelling period and shows sensible trends considered to be representative of the area.

In conclusion, the CALMET generated meteorological data area considered suitable for use in the air dispersion modelling for the Project.

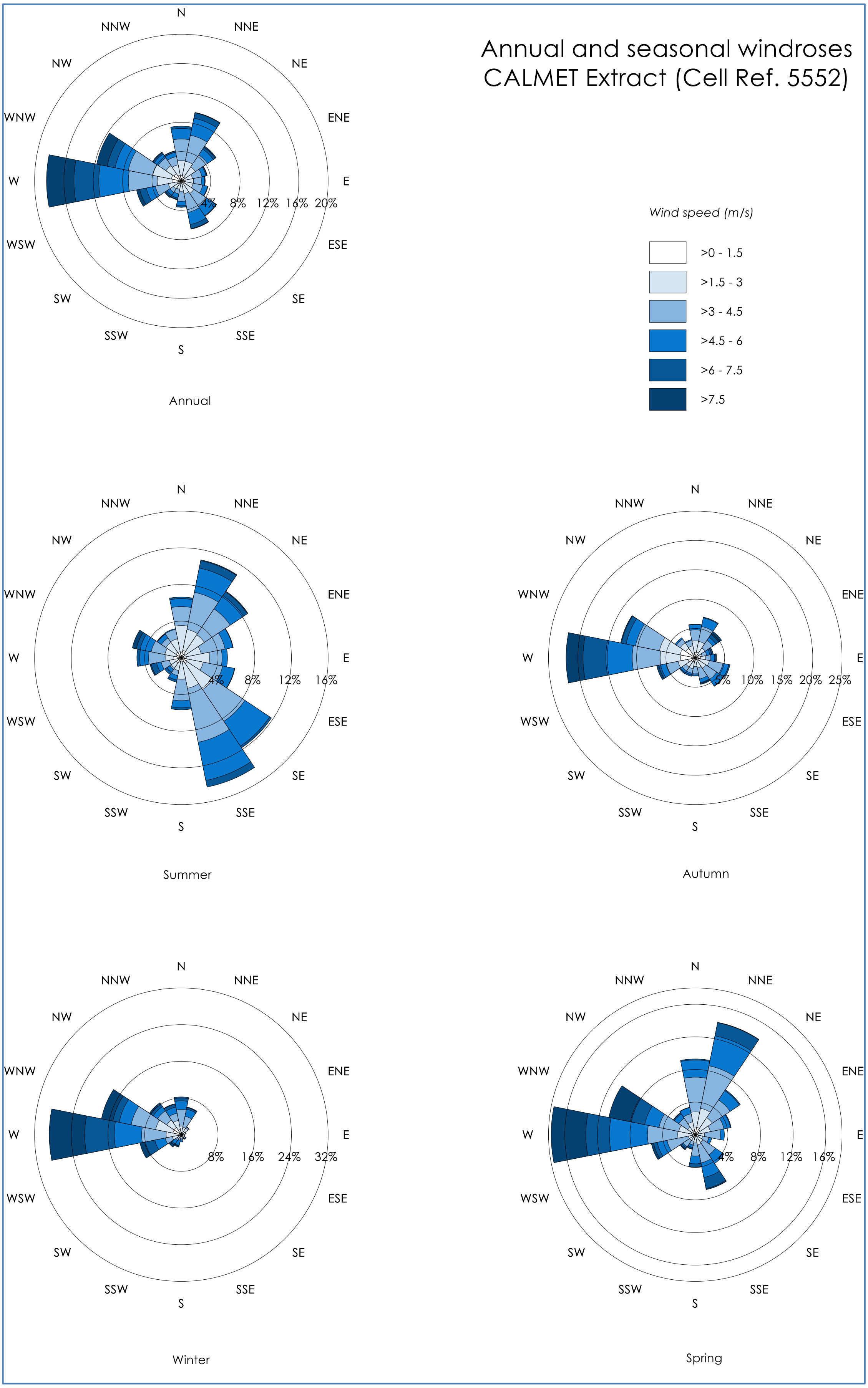

Figure 6-2: Annual and seasonal windroses from CALMET (Cell ref 5552)

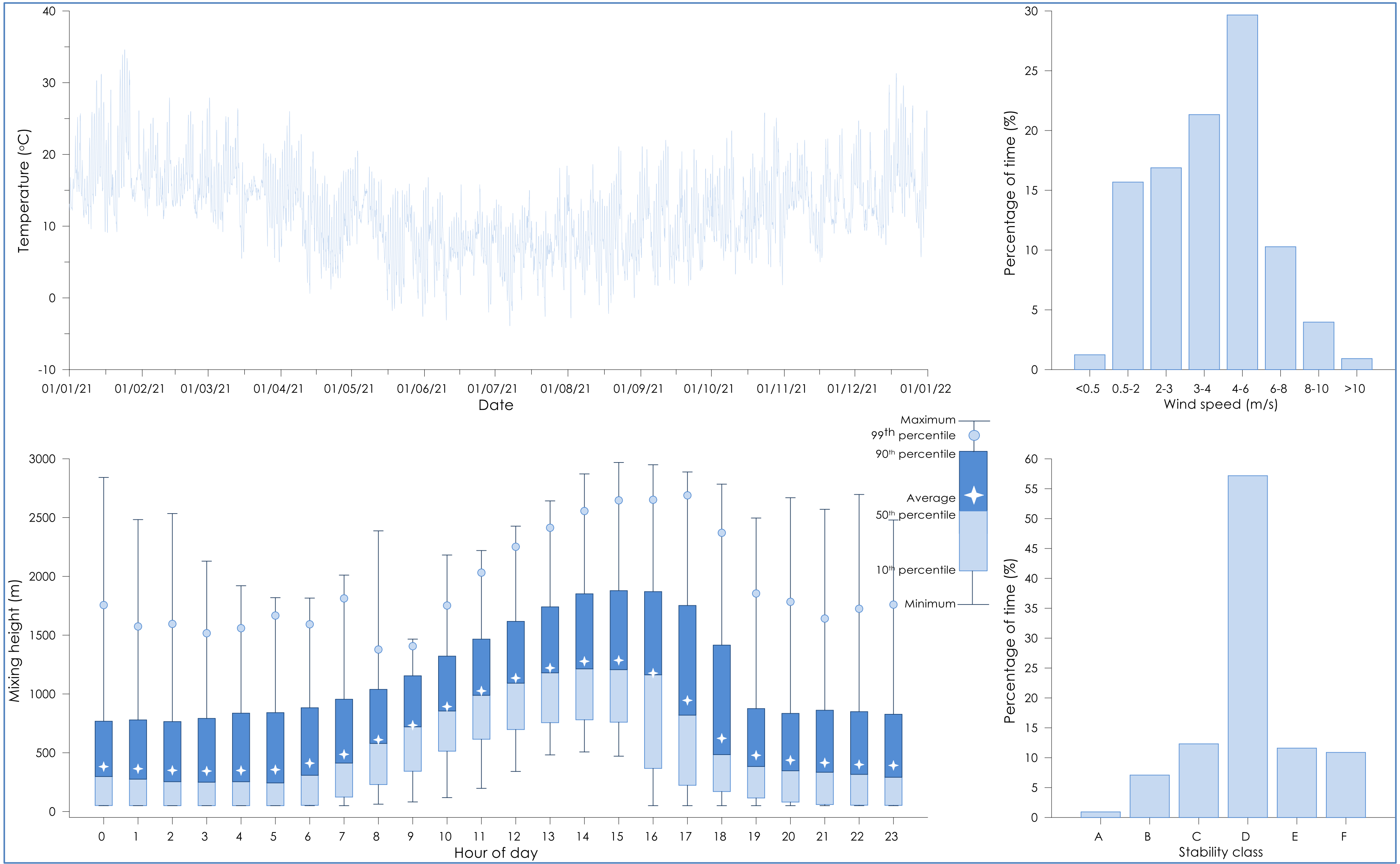

Figure 6-3: Meteorological analysis of CALMET (Cell Ref 5552)

6.3 Dispersion modelling

Air dispersion modelling using the CALPUFF model of the Project air emissions sources was conducted to predict the potential air quality impacts in the surrounding environment.

The Project generator hall includes capacity for seven generators producing approximately 3.3MW. The generators would operate with two redundant/ backup gas generators and up to five continuously operating generators to power the data centre. The five concurrently operating Project generators would therefore have a maximum operational capacity of approximately 16MW. The generators would be routinely cycled through continuous operation and redundancy (offline) phases to maintain service reliability and longevity.

For the purpose of the assessing the maximum impacts, it has been assumed in the model that five generators operate continuously at 100% load every hour of the year. In reality, the generators would be brought online as needed to meet energy demands and are not expected to operate at maximum capacity at all times.

Exhaust outlets for the generators would be assembled in groups of up to four (see **Figure 3-2**). Each group of four exhaust outlets was included as a point source in the model.

The parameters for the modelled points sources for the Project are outlined in **Table 6-1**.

Table 6-1: Modelled parameters for the Project

Site	Stack height (m)	Stack diameter (m)	Exit temperature (K)	Exit velocity (m/s)
Project (SQE2)	23.5	0.5	579.2	29.2

Figure 6-4 presents the modelled point source locations for the Project.

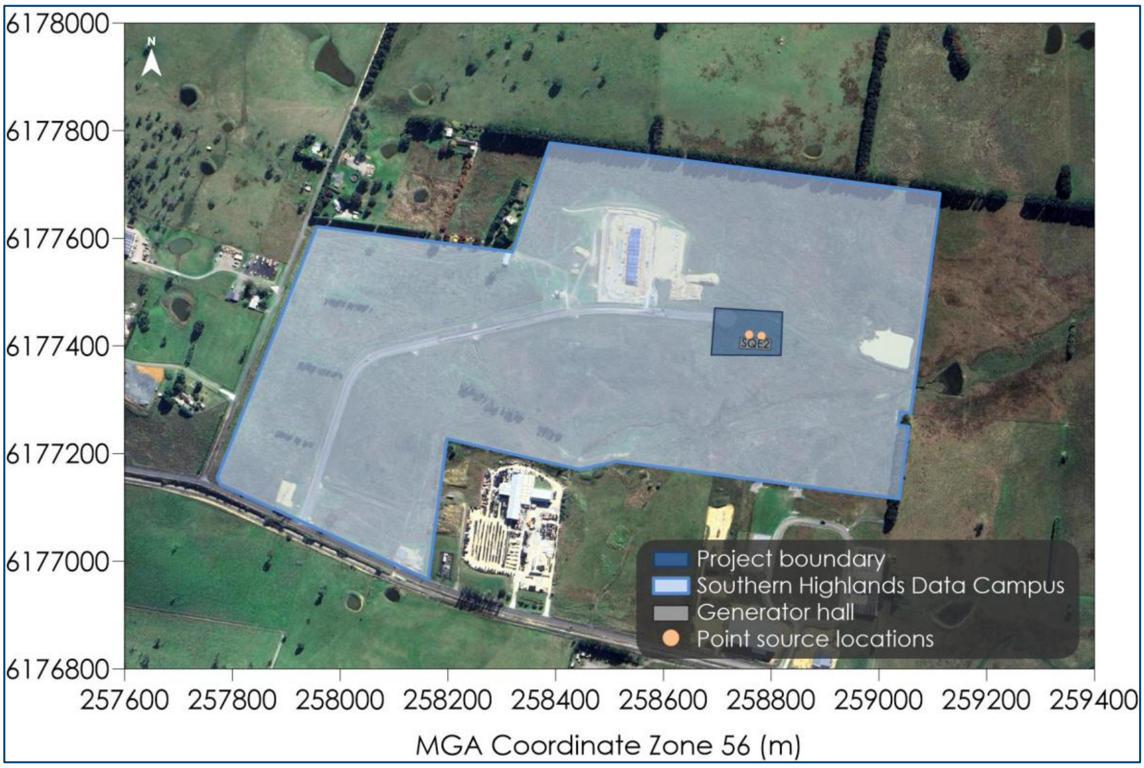

Figure 6-4: Modelled point source locations for the Project

In addition to the emissions from the Project, emissions from nearby approved operations were also modelled, to assess potential cumulative air quality impacts with a focus on NO_2 emissions.

Consideration of the existing approved generator facility SQE1 has been included in the model per the *Air Quality Impact Assessment Continuous Gas-Fired Power Generation at 30 Douglas Road, Moss Vale* (**Todoroski Air Sciences, 2023**).

Other operations include the Boral Berrima Cement Works, the Austral Masonry Plant and the new Bowral Bricks brick manufacturing facility. Key NO_2 emission sources from these facilities have been explicitly included in the modelling

The parameters for the modelled points sources for the nearby operations are outlined in **Table 6-2**.

The model includes consideration of potential "building" wake effects on air dispersion that arise due to the effect of winds passing over the buildings at the Project and the adjacent structures.

Table 6-2: Modelled stack parameters for the surrounding operations

Site	Number of stacks	Stack height (m)	Stack diameter (m)	Exit temperature (K)	Exit velocity (m/s)
SQE1 +	7	18	0.5	681	23.1
Boral Berrima Cement Works^	1	84	3	386.4	29.1
Austral Masonry Plant*	1	20	0.25	415.7	2.78
Bowral Bricks brick manufacturing facility (new)*	1	35	2	453	13.74

Source: + **Todoroski Air Sciences (2025)** ^**Boral (2023)** ***Airlabs Environmental (2020)**

Figure 6-4 presents the modelled point source locations for the Project.

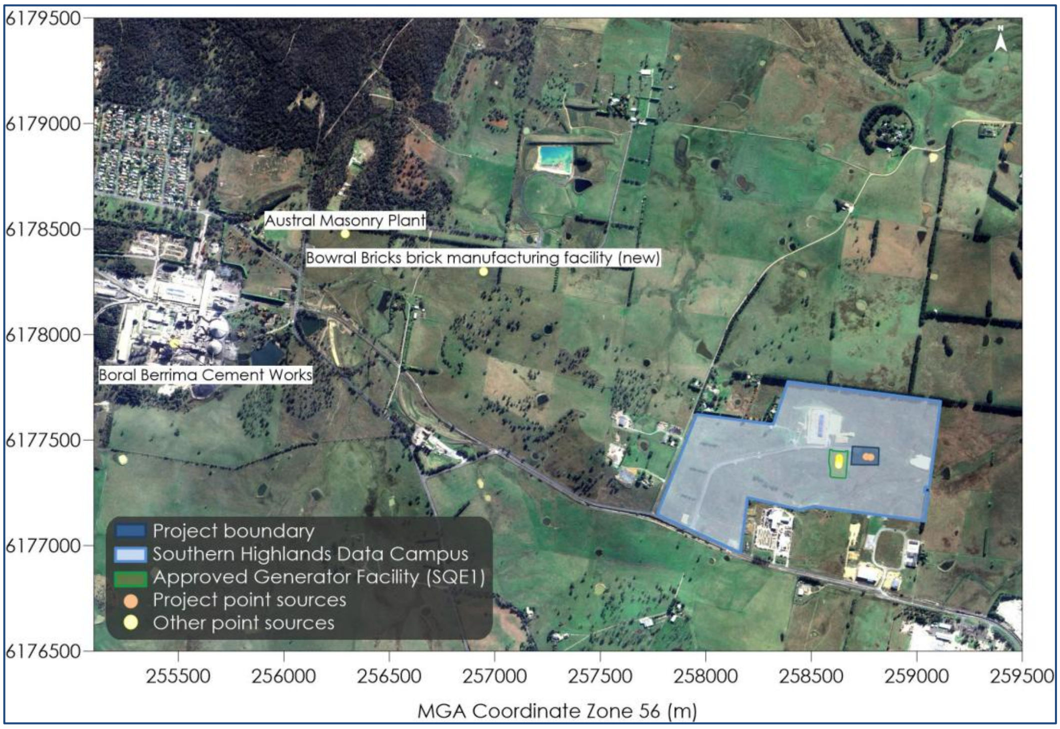

Figure 6-5: Other modelled point sources for nearby operations

6.4 Emission estimation

The assessment considers a single worst-case operational scenario to represent the operation of the Project. The modelled emissions are assumed to emit continuously over the modelling period.

The emissions for the Project are based on using engines fitted with add-on selective catalytic reduction (SCR) controls in order to reduce NOx concentration emission down to 50mg/m^3. Engine flow rate data were obtained from engines which meet NSW NO_X emission performance specifications, e.g. JenBacher Genset, as presented in **Appendix B**.

Gas engines have inherently low particulate emissions when run in a steady state for power generation. For this assessment, it has been assumed that all $PM_{2.5}$ and PM_{10} is equivalent to the total TSP in the emissions. The modelled emissions concentration is set out in **Table 6-3**. Actual particulate emissions rates are likely to be lower due to the add-on SCR controls.

Table 6-3: Modelled emission concentrations for gas generation engines with SCR

Pollutant	Concentration (mg/m^3)
NOx	50
TSP/ PM_{10} / $PM_{2.5}$	5

A summary of the emission rates for the Project and nearby operations applied in the dispersion modelling is presented in **Table 6-4**. The emission rates for the Project in the table below are calculated using the flow rate in **Table 6-1** multiplied by the concentration in **Table 6-3.** The emission rates for other sources are taken directly from publicly available monitoring report data, as set out below.

Table 6-4: Summary of modelled Project and other source emission rates (g/s)

Source	NO_X	PM_{10}	$PM_{2.5}$
Project – SQE2 (per engine)	0.19	0.02	0.02
SQE1 (per engine) +	0.46	0.01	0.01
Boral Berrima Cement Works^	192.9	2.7	1.1
Austral Masonry Plant*	0.005	-	-
Bowral Bricks brick manufacturing facility (new)*	10.54	0.87	0.53

Sources: + **Todoroski Air Sciences (2025)** ^**Boral (2023)** ***Airlabs Environmental (2020)**

6.5 Greenhouse gas emissions

Greenhouse gas emissions have been estimated for the direct sources from the Project (i.e. Scope 1), namely the on-site combustion of gaseous fuel (i.e. natural gas) and oils used in the power generators.

The maximum total annual power generated for the site is estimated based on five generators operating at any one time, each producing a maximum of approximately 3.3MW and operating for all 8,760 hours per year, resulting in 140,160 MWh per annum. Based on an electrical/ thermal efficiency of approximately 43% the annual requirement for natural gas is estimated at 1,162,160 GJ.

Based on the manufacturer's specifications (see Appendix B), the power generators are assumed to consume oil during operation at a rate of approximately 0.6 litres (L) of oil per hour per engine which is 32kL in total (i.e. 5*8,760*0.6 = 26,280 L). Based on each engine also being serviced every 3,000 hours which requires an oil change of 765 L, this would result in 11.2kL per annum (i.e. (5*8,760)/3,000 * 765 = 11,169L). The total oil consumed is calculated as 37.4kL per annum for five generators.

Table 6-5 presents a summary of the greenhouse gas emissions calculations.

Table 6-5: Summary of greenhouse gas emissions calculations

Operation	Variable	Natural gas usage	Units	Oil usage	Units
Project	Annual quantity	1,162,160	GJ	37.4	kL
Approved SQE1	Annual quantity	1,016,890	GJ	16.8	kL
Combined Project + Approved SQE1	Annual quantity	2,179,050	GJ	54.2	kL
Energy content factor *		0.00393	GJ/m³	38.8	GJ/kL
Emission factors combined (i.e. $CO_2 + CH_4 + N_2O$) *		51.53	kg CO_2-e/GJ	13.9	kg CO_2-e/GJ
Combined Project + Approved SQE1 Scope 1 greenhouse gas emissions		112,286	t CO_2-e	29	t CO_2-e

* **DCCEEW (2024)**

In comparison to the GHG emission from the Project and Approved SQE1 combined, the GHG emissions for the same amount of electricity from the grid are calculated using the latest emission factor (**DCCEEW, 2024**). Specifically For the Project (SQE2) and Approved SQE1, the maximum total electricity use would be approximately 16MW plus 14MW = 30MWh. The GHG emissions would be 30MWh x 0.66[1] tonnes of CO_2-e per MWh x 365 days x 24 hours equals 173,448 t CO_2-e. We note that the Department of Climate Change, Energy the Environment and Water (DCCEEW) does not assume 100%

[1] From Table 1: Indirect (Scope 2 and Scope 3) emission factors from consumption or purchase of acquired electricity, Australian National Greenhouse Accounts Factors, (**DCCEEW, 2024**).

coal-fired grid electricity and the emission factor is based on the mix of energy sources supplying electricity to the grid.

6.5.1 Greenhouse gas emissions – large emitters

Projects that generate more than 25,000 t CO_2-e are considered large emitters, and it is necessary to ensure that GHG emissions are minimised. In terms of avoiding GHG emissions, based on current emission factors, significantly less GHG emissions would be generated by the Project and Approved SQE1 than using grid electricity, specifically the Project and Approved SQE1 would generate approximately 112,286 t CO_2-e vs. approximately 173,448 t CO_2-e that would arise from grid electricity. The project would generate approximately 35% less GHG than using grid electricity at present. Other air quality and GHG mitigation measures are set out in **Section 8**.

The Project represents the least GHG and air pollutant emitting option available at present. It is projected that GHG emissions from grid electricity will reduce over time and at some future time will be lower than GHG emissions from using gas engines.

It is important to note that in this case using grid electricity is commercially desirable as it is cheaper than operating gas engines. However, using engines is necessary for this Project due to a lack of grid electricity, which we understand is likely to be the case for many years according to the regional energy supplier.

In terms of achieving net zero by 2050, the plan would be simple, and involves not operating on gas and connecting to the electricity grid. The plan would achieve the required target assuming that the federal and state government projections for a net zero grid are correct and that it is possible to connect the site to the grid. The government projections assume net zero would be achieved by investment in electricity infrastructure and clean technology as part of the transition to net zero emissions by 2050.

7 DISPERSION MODELLING RESULTS

This section presents the predicted air quality levels which may arise from air emissions generated by the Project. The dispersion model predictions presented in this section include those for the operation of the Project in isolation (incremental impact) and the operation of the Project with consideration of other sources (total cumulative impact) for $PM_{2.5}$, PM_{10} and NO_2.

It is important to note that when assessing impacts per the maximum 24-hour average levels, these predictions are based on the highest predicted 24-hour average concentrations which were modelled at each point within the modelling domain for the worst day (i.e. a 24-hour period) at that point during the one year long modelling period. For the next point/ location the maximum impact may arise on a different day, thus the isopleth diagrams in the figures do not show a snap-shot of impact on just one day, but show every maximum impact at every point at any time.

Associated isopleth diagrams of the dispersion modelling predictions are presented in **Figure 7-1** to **Figure 7-12**.

Table 7-1 presents the predicted incremental and cumulative particulate dispersion modelling results at each of the assessed receptor locations.

The predicted incremental results show that minimal incremental effects would arise at the receptor locations due to the Project. The predicted cumulative results indicate that the receptor locations are predicted to experience levels below the relevant criteria for each of the assessed metrics.

The maximum cumulative 1-hour average NO_2 results are generally limited by the existing maximum background level of 94 µg/m^3, indicating that the project does not tangibly add to maximum cumulative 1-hour average NO_2 concentrations in the surrounding area.

Table 7-1: Dispersion modelling results for assessment locations

Receptor ID	$PM_{2.5}$ (µg/m³)				PM_{10} (µg/m³)				NO_2 (µg/m³)			
	24-hr ave.		Ann. ave.		24-hr ave.		Ann. ave.		1-hr ave.		Ann. ave.	
	Inc.	Cum.	Inc.	Cum.	Inc.	Cum.	Inc.	Cum.	Inc.	Cum.	Inc.	Cum.
	Air quality impact criteria											
	-	25	-	8	-	50	-	25	-	164	-	32
1	0.4	22.9	<0.1	5.4	0.4	36.6	<0.1	12.0	11.9	94.0	0.1	8.2
2	0.7	23.1	<0.1	5.5	0.7	36.8	<0.1	12.0	13.3	97.5	0.3	9.5
3	0.6	23.8	<0.1	5.5	0.6	37.5	<0.1	12.0	18.2	94.0	0.3	10.0
4	0.2	22.7	<0.1	5.4	0.2	36.5	<0.1	12.0	10.3	94.0	0.1	8.3
5	0.3	22.7	<0.1	5.4	0.3	36.4	<0.1	11.9	12.1	94.0	0.1	7.8
6	0.3	22.7	<0.1	5.4	0.3	36.4	<0.1	11.9	12.1	94.0	0.1	7.6
7	0.1	22.5	<0.1	5.3	0.1	36.5	<0.1	11.9	5.2	94.0	0.1	7.4
8	0.1	22.5	<0.1	5.4	0.1	36.5	<0.1	11.9	5.4	94.0	0.1	7.5
9	0.2	22.4	<0.1	5.4	0.2	36.4	<0.1	11.9	5.6	94.0	<0.1	7.1
10	0.1	22.4	<0.1	5.3	0.1	36.5	<0.1	11.9	4.2	94.0	<0.1	7.0
11	0.1	22.4	<0.1	5.4	0.1	36.5	<0.1	11.9	5.4	94.0	<0.1	7.1
12	0.0	22.3	<0.1	5.3	0.0	36.4	<0.1	11.9	4.7	94.0	<0.1	7.0
13	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	5.8	94.0	<0.1	7.0
14	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	5.4	94.0	<0.1	6.9
15	0.1	22.3	<0.1	5.3	0.1	36.3	<0.1	11.9	5.9	94.0	<0.1	7.1
16	0.1	22.4	<0.1	5.3	0.1	36.4	<0.1	11.9	4.4	94.0	<0.1	7.0
17	0.1	22.3	<0.1	5.4	0.1	36.3	<0.1	11.9	10.4	94.0	0.1	7.6

Receptor ID	PM2.5 (µg/m³)				PM10 (µg/m³)				NO2 (µg/m³)			
	24-hr ave.		Ann. ave.		24-hr ave.		Ann. ave.		1-hr ave.		Ann. ave.	
	Inc.	Cum.	Inc.	Cum.	Inc.	Cum.	Inc.	Cum.	Inc.	Cum.	Inc.	Cum.
	Air quality impact criteria											
	-	25	-	8	-	50	-	25	-	164	-	32
18	0.1	22.4	<0.1	5.3	0.1	36.2	<0.1	11.9	8.3	94.0	0.1	7.5
19	0.1	22.2	<0.1	5.3	0.1	36.0	<0.1	11.8	7.2	94.0	<0.1	7.0
20	0.1	22.3	<0.1	5.3	0.1	36.1	<0.1	11.8	6.3	94.0	0.1	7.1
21	0.1	22.3	<0.1	5.3	0.1	36.1	<0.1	11.8	5.7	94.0	0.1	7.1
22	0.1	22.3	<0.1	5.3	0.1	36.1	<0.1	11.8	5.5	94.0	0.1	7.2
23	0.1	22.3	<0.1	5.3	0.1	36.1	<0.1	11.8	5.2	94.0	0.1	7.2
24	0.1	22.3	<0.1	5.3	0.1	36.1	<0.1	11.8	4.6	94.0	0.1	7.2
25	0.1	22.4	<0.1	5.3	0.1	36.2	<0.1	11.8	5.9	94.0	0.1	7.3
26	0.1	22.4	<0.1	5.3	0.1	36.2	<0.1	11.9	7.1	94.0	0.1	7.4
27	0.2	22.5	<0.1	5.3	0.2	36.3	<0.1	11.9	9.5	94.0	0.1	7.5
28	0.1	22.5	<0.1	5.3	0.1	36.3	<0.1	11.9	9.3	94.0	0.1	7.6
29	0.1	22.5	<0.1	5.4	0.1	36.3	<0.1	11.9	8.8	94.0	0.1	7.6
30	0.1	22.4	<0.1	5.4	0.1	36.3	<0.1	11.9	7.6	94.0	0.1	7.7
31	0.1	22.3	<0.1	5.4	0.1	36.2	<0.1	11.9	6.2	94.0	0.2	7.7
32	0.1	22.3	<0.1	5.3	0.1	36.1	<0.1	11.9	4.1	94.0	0.1	7.4
33	0.1	22.3	<0.1	5.4	0.1	36.2	<0.1	11.9	6.5	94.0	0.2	7.6
34	0.1	22.3	<0.1	5.4	0.1	36.2	<0.1	11.9	6.2	94.0	0.2	7.6
35	0.1	22.3	<0.1	5.4	0.1	36.2	<0.1	11.9	6.1	94.0	0.1	7.5
36	0.1	22.2	<0.1	5.4	0.1	36.2	<0.1	11.9	6.1	94.0	0.1	7.5
37	0.1	22.3	<0.1	5.4	0.1	36.2	<0.1	11.9	6.9	94.0	0.1	7.4
38	0.1	22.3	<0.1	5.3	0.1	36.2	<0.1	11.9	6.7	94.0	0.1	7.4
39	0.1	22.3	<0.1	5.3	0.1	36.2	<0.1	11.9	7.1	94.0	0.1	7.3
40	0.1	22.3	<0.1	5.3	0.1	36.2	<0.1	11.9	7.2	94.0	0.1	7.3
41	0.1	22.2	<0.1	5.3	0.1	36.2	<0.1	11.9	6.9	94.0	0.1	7.3
42	0.1	22.2	<0.1	5.3	0.1	36.2	<0.1	11.9	7.2	94.0	0.1	7.3
43	0.1	22.2	<0.1	5.3	0.1	36.2	<0.1	11.9	7.2	94.0	0.1	7.3
44	0.1	22.2	<0.1	5.3	0.1	36.2	<0.1	11.9	6.3	94.0	0.1	7.3
45	0.1	22.2	<0.1	5.3	0.1	36.2	<0.1	11.9	6.3	94.0	0.1	7.3
46	0.1	22.2	<0.1	5.3	0.1	36.2	<0.1	11.9	6.2	94.0	0.1	7.2
47	0.1	22.3	<0.1	5.3	0.1	36.2	<0.1	11.9	6.0	94.0	0.1	7.2
48	0.1	22.3	<0.1	5.3	0.1	36.2	<0.1	11.9	5.2	94.0	0.1	7.1
49	0.1	22.3	<0.1	5.3	0.1	36.1	<0.1	11.8	6.2	94.0	<0.1	7.0
50	0.1	22.3	<0.1	5.3	0.1	36.1	<0.1	11.8	4.8	94.0	<0.1	7.0
51	0.1	22.3	<0.1	5.3	0.1	36.1	<0.1	11.8	3.6	94.0	<0.1	7.0
52	0.2	22.3	<0.1	5.3	0.2	36.1	<0.1	11.9	10.0	96.9	0.1	7.4
53	0.2	22.4	<0.1	5.4	0.2	36.2	<0.1	11.9	9.0	96.3	0.2	7.6
54	0.2	22.4	<0.1	5.4	0.2	36.2	<0.1	11.9	8.3	99.0	0.1	7.4
55	0.1	22.4	<0.1	5.4	0.1	36.2	<0.1	11.9	8.2	94.0	0.1	7.6
56	0.2	22.4	<0.1	5.4	0.2	36.5	<0.1	11.9	12.1	94.0	0.1	7.5
57	0.1	22.3	<0.1	5.3	0.1	36.2	<0.1	11.9	8.1	94.0	0.1	7.3
58	0.1	22.3	<0.1	5.3	0.1	36.2	<0.1	11.9	7.1	94.0	<0.1	7.2
59	0.1	22.3	<0.1	5.3	0.1	36.2	<0.1	11.9	7.0	94.0	<0.1	7.2
60	0.1	22.3	<0.1	5.3	0.1	36.2	<0.1	11.9	5.0	94.0	0.1	7.1
61	0.1	22.3	<0.1	5.3	0.1	36.2	<0.1	11.9	5.0	94.0	0.1	7.1
62	0.1	22.3	<0.1	5.3	0.1	36.2	<0.1	11.9	5.0	94.0	<0.1	7.1
63	0.1	22.3	<0.1	5.3	0.1	36.3	<0.1	11.9	4.9	94.0	<0.1	7.0
64	0.1	22.3	<0.1	5.3	0.1	36.3	<0.1	11.9	4.8	94.0	<0.1	7.0
65	0.1	22.3	<0.1	5.3	0.1	36.3	<0.1	11.9	4.7	94.0	<0.1	7.0
66	0.1	22.3	<0.1	5.3	0.1	36.2	<0.1	11.9	4.6	94.0	<0.1	7.0
67	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	4.4	94.0	<0.1	7.0

Receptor ID	$PM_{2.5}$ (µg/m³)				PM_{10} (µg/m³)				NO_2 (µg/m³)			
	24-hr ave.		Ann. ave.		24-hr ave.		Ann. ave.		1-hr ave.		Ann. ave.	
	Inc.	Cum.	Inc.	Cum.	Inc.	Cum.	Inc.	Cum.	Inc.	Cum.	Inc.	Cum.
	Air quality impact criteria											
	-	25	-	8	-	50	-	25	-	164	-	32
68	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	4.2	94.0	<0.1	7.0
69	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	4.0	94.0	<0.1	7.0
70	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	4.0	94.0	<0.1	6.9
71	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	4.7	94.0	<0.1	6.9
72	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	5.0	94.0	<0.1	6.9
73	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	5.1	94.0	<0.1	6.9
74	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	4.9	94.0	<0.1	6.9
75	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	4.6	94.0	<0.1	6.9
76	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	4.5	94.0	<0.1	6.9
77	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	3.8	94.0	<0.1	6.9
78	0.0	22.3	<0.1	5.3	0.0	36.3	<0.1	11.9	3.0	94.0	<0.1	6.9
79	0.1	22.3	<0.1	5.3	0.1	36.1	<0.1	11.8	5.7	94.0	<0.1	6.9

Figure 7-1: Predicted incremental (Project only) 24-hour average $PM_{2.5}$ concentrations (µg/m³)

Figure 7-2: Predicted cumulative 24-hour average $PM_{2.5}$ concentrations (µg/m³)

Figure 7-3: Predicted incremental (Project only) annual average $PM_{2.5}$ concentrations (µg/m³)

Figure 7-4: Predicted cumulative annual average $PM_{2.5}$ concentrations (µg/m³)

Figure 7-5: Predicted incremental (Project only) 24-hour average PM_{10} concentrations (µg/m³)

Figure 7-6: Predicted cumulative 24-hour average PM_{10} concentrations (µg/m³)

Figure 7-7: Predicted incremental (Project only) annual average PM_{10} concentrations (µg/m³)

Figure 7-8: Predicted cumulative annual average PM_{10} concentrations (µg/m³)

Figure 7-9:Predicted incremental (Project only) maximum 1-hour average NO_2 concentrations (µg/m³)

Figure 7-10: Predicted cumulative maximum 1-hour average NO_2 concentrations (µg/m³)

Figure 7-11: Predicted incremental (Project only) annual average NO_2 concentrations (µg/m³)

Figure 7-12: Predicted cumulative annual average NO_2 concentrations (µg/m³)

8 MITIGATION AND MANAGEMENT

It's noted that whilst many alternative means of reducing potential impacts were considered, such as renewable energy and hydrogen, these are not presently viable for delivering the necessary steady continuous power required day and night for the data centre. Solar, wind or other such technology that can be installed at this location cannot presently deliver the continuous energy required at all times. Battery technology sufficient to store the amount of power needed to accommodate the downtime that occurs with renewable technology is simply too large and is not economically viable.

In relation to air and GHG emissions:

- The new gas-fired engines will be fitted with Selective Catalytic Reductions (SCR) technology to abate NOx emissions down to approximately only 10% the emissions from standard low NO_X engines operating on gas.
- Diesel fuelled reciprocating engines generate far more emissions, generally 20 to 80 times more air emissions, depending on the type of engine use and add-on abatement controls that are applied. Diesel engines are more GHG intensive than gas engines and thus are more typically used for short term backup or standby power, or for continuous power at remote sites where gas is not available.
- Gas turbines can achieve similar air emissions to gas engines, however they are less fuel efficient and lead to larger GHG impacts. Such turbines are generally used at energy producing sites such a gas fields where there may be ample gas but limited other energy sources available, at coal fired power stations due to their compact size and ability to re-start a power station, or for occasional use to stabilise, monetise or restart the electricity grid (e.g. after a black out due to their rapid start up capacity). These technologies can be ruled out due to their inferior emissions performance.
- Other technology (solar, wind, battery, hydrogen, battery storage, or other renewable energy sources) is not appropriate on the site for the reasons set out above.

The chosen technology represents the only suitable option which provides the lowest technically feasible air and GHG emissions technology which is a commercially ready and viable technology option for this Project at present.

Please note that the very low NO_X emissions performance specified for the proposed engines is achieved with additional add-on SCR treatment. The emissions performance for this project (50 mg/m^3 for NO_X) is approximately 10% of the level required by the NSW EPA.

The performance differences between manufacturers for such engines is not significant, e.g. the variation between two identical engines from the same maker would be similar, especially considering that the SCR system reduces engine emissions by approximately 90%.

In terms of management methods for maintaining low emissions performance, all engines will be subject to regular maintenance testing, including periodic testing of emissions performance per manufacturer's specifications and schedules to ensure the low emissions performance levels of the engines are maintained. Further details are available in the Operational Environmental Management Plan.

The Project would also utilise various mitigation measures to minimise the overall generation of GHG emissions. Some examples of GHG mitigation and management practices that would be applied during construction and operation of the Project include:

- Investigating ways to reduce energy consumption throughout the life of the project and reviewing energy efficient alternatives;
- Regular maintenance of equipment and plant per manufacturer's specifications;
- Ensure plant and equipment are fitted with appropriate controls;
- Ensure plant and equipment are switched off when not in use;
- Monitoring the consumption of fuel and regularly maintaining equipment to ensure operational efficiency;
- Monitoring the total site natural gas consumption and investigating avenues to minimise consumption;
- If and when feasible switch to renewable lower GHG intensity fuels such as hydrogen or biogas;
- If and when feasible, switch to lower GHG intensity grid electricity; and,
- Source consumable materials from environmentally sustainable sources.

9 SUMMARY AND CONCLUSIONS

This report has assessed the potential air quality impacts associated with the proposed operation of an additional continuous gas-fired power generation facility located at Moss Vale, NSW.

Air dispersion modelling was used to predict the potential for off-site NO_2, PM_{10} and $PM_{2.5}$ impacts in the surrounding area due to the operation of the Project, and all other surrounding sources of emissions, using with generally conservative assumptions that would predict the likely impacts.

It is predicted that all the assessed air pollutants generated by the operation of the Project would comply with the applicable assessment criteria at the assessed receptors and therefore would not lead to any unacceptable level of environmental harm or impact in the surrounding area.

The Project is predicted to result in relatively low emissions and would not result in any significant air pollution that may adversely impact residential land uses.

Nevertheless, the site would utilise technology that low NO_X emission mitigation controls and would perform all periodic testing and maintenance as per the manufacturer's specifications and schedule to maintain low pollutant emissions from the site.

Overall, the assessment demonstrates the Project can operate without causing any significant air quality impact at receptors in the surrounding environment and would be maintained per manufacturer's specifications to ensure continued low emissions performance.

10 REFERENCES

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Appendix A
Selection of Meteorological Year

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Selection of meteorological year

A statistical analysis of the latest six contiguous years of meteorological data from the nearest BoM weather station with suitable available data, Moss Vale AWS weather station, is presented in **Table A-1**.

The standard deviation of the latest six years of meteorological data spanning 2019 to 2024 was analysed against the available measured wind speed, wind direction, temperature and relative humidity. The analysis indicates that the 2021 dataset is closest to the mean for wind speed, wind direction, temperature and relative humidity. On the basis of a score weighting analysis, 2021 was found to be most representative.

Table A-1: Statistical analysis results for Moss Vale AWS

Year	Wind speed	Wind direction	Temperature	Relative humidity	Score
2019	1.0	0.3	0.3	1.0	2.5
2020	0.5	0.1	0.1	0.5	1.2
2021	0.1	0.2	0.3	0.2	0.8
2022	0.7	0.3	0.3	0.7	1.9
2023	0.4	0.2	0.1	0.2	1.0
2024	0.7	0.2	0.2	0.5	1.7

Figure A-1 shows the frequency distributions for wind speed, wind direction, temperature and relative humidity for the 2021 year compared with the mean of the 2019 to 2024 data set. The 2021-year data appear to be reasonably well aligned with the mean data.

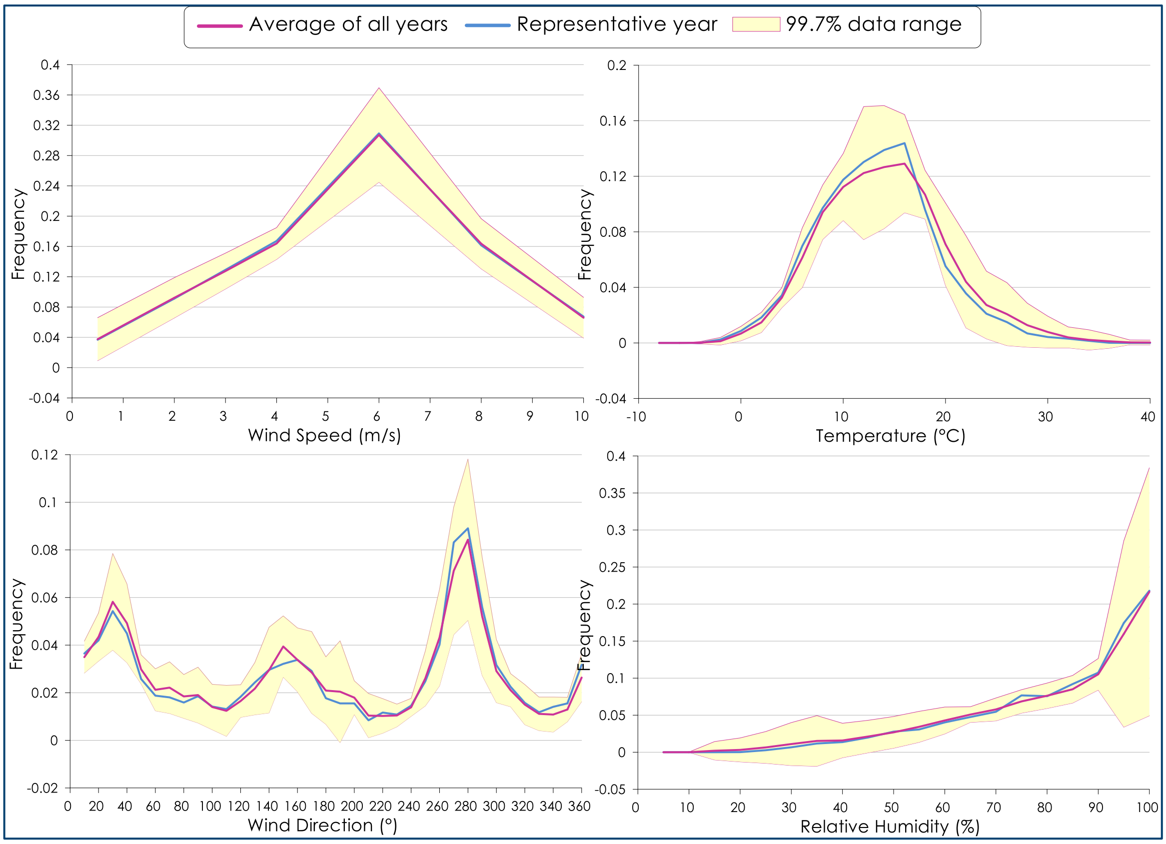

Figure A-1: Frequency distributions for wind speed, wind direction, temperature and relative humidity

Appendix B

Manufacturer technical data sheets

0.01 Technical Data (at genset)

			100%	75%	50%
Power input	[2]	kW	7,324	5,617	3,910
Gas volume	*)	Nm³/h	771	591	412
Mechanical output	[1]	kW	3,431	2,573	1,715
Electrical output	[4]	kW el.	3,354	2,516	1,667
Heat to be dissipated (calculated with Glycol 37%)	**[5]**				
~ Intercooler 1st stage (Engine jacket water cooling circuit)	[9]	kW	1,091		
~ Intercooler 2nd stage (Low temperature circuit)		kW	173		
~ Lube oil (Engine jacket water cooling circuit)		kW	353		
~ Jacket water		kW	533		
~ Surface heat	ca. [7]	kW	234		
Spec. fuel consumption of engine electric	[2]	kWh/kWel.h	2.18	2.23	2.35
Spec. fuel consumption of engine	[2]	kWh/kWh	2.14	2.18	2.28
Lube oil consumption	ca. [3]	kg/h	0.69	~	~
Electrical efficiency			45.8%	44.8%	42.6%
Fuel gas LHV		kWh/Nm³	9.5		

*) approximate value for pipework dimensioning
[_] Explanations: see 0.10 - Technical parameters

All heat data is based on standard conditions according to attachment 0.10. Deviations from the standard conditions can result in a change of values within the heat balance and must be taken into consideration in the layout of the cooling circuit/equipment (intercooler; emergency cooling; ...).

Figure B-1: Jenbacher technical data sheet

0.02 Technical data of engine

Manufacturer		JENBACHER
Engine type		J 620 GS-J09
Working principle		4-Stroke
Configuration		V 60°
No. of cylinders		20
Bore	mm	190
Stroke	mm	220
Piston displacement	lit	124.75
Nominal speed	rpm	1,500
Mean piston speed	m/s	11.00
Length	mm	5,542
Width	mm	1,900
Height	mm	2,540
Weight dry	kg	15,000
Weight filled	kg	16,000
Moment of inertia	kgm²	69.21
Direction of rotation (from flywheel view)		left
Radio interference level to VDE 0875		N
Starter motor output	kW	20
Starter motor voltage	V	24

Thermal energy balance

Power input	kW	7,324
Intercooler	kW	1,264
Lube oil	kW	353
Jacket water	kW	533
exhaust when cooling down 180 °C	kW	832
exhaust when cooling down 100 °C	kW	1,276
Surface heat	kW	135

Exhaust gas data

Exhaust gas temperature at full load	[8]	°C	326
Exhaust gas temperature at bmep= 16.5 [bar]	[8]	°C	~ 381
Exhaust gas temperature at bmep= 11 [bar]	[8]	°C	~ 444
Exhaust gas mass flow rate, wet		kg/h	18,645
Exhaust gas mass flow rate, dry		kg/h	17,505
Exhaust gas volume, wet		Nm³/h	14,744
Exhaust gas volume, dry		Nm³/h	13,326
Max.admissible exhaust back pressure after y-pipe		mbar	50

Figure B-2: Jenbacher technical data sheet