Air Quality Impact Assessment

Morwell Peaking Generation Project

Morwell FlexGen Pty Ltd

Prepared by:

SLR Consulting Australia

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Revision Record

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Basis of Report

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

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Executive Summary

On behalf of Morwell FlexGen Pty Ltd, SLR Consulting Australia Pty Ltd (SLR) has conducted an air quality impact assessment of the Morwell Peaking Generation Facility (MPGF, the Project) to be located at 454 Commercial Road, Morwell in south-east Victoria.

The Project site is approximately 1 km southeast of the Morwell township, covers an area of 27.7 hectares and is located on landed zoned as Industrial Zone 1 (IN1Z).

The Project will include a nominal 20.5 megawatts (MW) total power generation capacity, using reciprocating engine (diesel) technology. The facility will be comprised of ten containerised generation units of approximately 2 MW capacity each, with engine exhausts manifolded and exiting via two 5.5 m high exhaust stacks (each manifold connecting 5 units).

Based on rcent historical market data (2017 to 2025), the MPGF is expected to operate on average 200 hours per annum (approximately 2.3% of the year). However actual year-to-year operation may be markedly higher, and in particularly extreme years operation up to at least 1,200 hours per annum, and it is understood an EPA licence limit is sought on this basis. While the MPGF may be required to operate at any time of the day, it is most likely to be required late afternoon/early evening (typically 4:00 pm to 7:00 pm) during peak summer and winter demand periods

Assessment Methodology

The assessment methodology was based on comparisons of air pollutant dispersion model results with ambient air quality standards. The dispersal of emissions to air from the operation of the Project were modelled using AERMOD in accordance with EPA Victoria guidance.

Potential air pollutants of interest for the operation of the Project are related to emissions associated with the combustion of fuel in emergency generators which include:

- carbon monoxide (CO)
- nitrogen dioxide (NO_2)
- particles with equivalent aerodynamic diameters of less than 10 micron (μm; PM_{10}) and less than 2.5 μm ($PM_{2.5}$)
- sulfur dioxide (SO_2)
- some volatile organic compounds (VOCs)
- polycyclic aromatic hydrocarbons (PAHs).

The dispersed emissions of CO, SO_2, VOC and PAH from the combustion of diesel are low relative to ambient air quality assessment criteria when compared with other products of combustion such as NO_X (as NO_2) and $PM_{2.5}$. Therefore, if no exceedances of NO_2 and $PM_{2.5}$ criteria are predicted, it can be reasonably assumed that CO, SO_2, VOC and PAH emissions from the operation of the Project would also result in no exceedances of their criteria.

The results for predicted maximum cumulative NO_2 and $PM_{2.5}$ pollutant ground level concentrations (GLCs), including existing (background) concentrations were assessed against their air pollution assessment criteria (APACs).

Conclusion

The Project is predicted to meet the relevant APACs at sensitive receptor locations when conservatively assumed to be operating 24 hours per day, 365 days per year, i.e., equivalent to 8,760 hours per year. However, the Project will likely operate for only approximately 200

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hours per year, and most of those hours will correspond to the typical hours of 4:00 pm to 7:00 pm. The predicted GLCs associated with these hours only, assuming 365 days per year operation, are reduced further below the relevant APACs.

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Acronyms and Abbreviations

APAC	Air pollution assessment criterion
AAQMS	Ambient air quality monitoring station
Air NEPM	National Environment Protection (Ambient Air Quality) Measure
AQIA	Air quality impact assessment
AWS	Automatic weather station
BoM	Bureau of Meteorology
CO	Carbon monoxide
EPA	Environment Protection Authority Victoria
GED	General environmental duty
GLC	Ground level concentration
kg	Kilograms
kg/h	Kilograms per hour
km	Kilometre
kW	Kilowatt
m	Metre
mg/m^3	Milligrams per cubic metre
m/s	Metres per second
MW	Megawatt
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measures
NO	Nitrogen oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
PAH	Polycyclic aromatic hydrocarbons
PM_{10}	Particles with equivalent aerodynamic diameters of less than 10 μm
$PM_{2.5}$	Particles with equivalent aerodynamic diameters of less than 2.5 μm
ppm	Parts per million
SO_2	Sulfur dioxide
SRTM DEM	Shuttle Radar Topography Mission derived Digital Elevation Model
$\mu g/m^3$	Micrograms per cubic metre
μm	Micrometre or micron (one thousandth of a millimetre)
VOC	Volatile organic compound

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1.0 Introduction

On behalf of Morwell FlexGen Pty Ltd, SLR Consulting Australia Pty Ltd (SLR) has conducted an air quality impact assessment of the Morwell Peaking Generation Facility (MPGF, the Project) to be located at 454 Commercial Road, Morwell in south-east Victoria.

It is understood that the Project's primary objective is to provide prompt and high-reliability standby generation capacity for limited periods in response to critical wholesale energy market, network and/or adverse weather events to ensure ongoing energy supply continuity, affordability, and stability. Based on recent historical market data (2017 to 2025), the MPGF is expected to operate on average 200 hours per annum (approximately 2.3% of the year). However actual year-to-year operation may be markedly higher, and in particularly extreme years operation up to at least 1,200 hours per annum, and it is understood an EPA licence limit is sought on this basis. While the MPGF may be required to operate at any time of the day, it is most likely to be required late afternoon/early evening (typically 4:00 pm to 7:00 pm) during peak summer and winter demand periods.

2.0 Project Description

2.1 Overview

The Project site is approximately 1 km southeast of the Morwell township, covers an area of 27.7 hectares and is located on landed zoned as Industrial Zone 1 (IN1Z). The surrounding land is generally zoned as IN1Z, except to the west which is zoned as Special Use Zone 1 (SUZ1). Main landmarks surrounding the site are Princes Freeway situated approximately 230 m to the north, the retired Morwell Power Station to the west, industrial facilities to the south and south-east, and a paddock across Monash Way to the east.

The principal Project details include:

- Rolls Royce MTU 20V4000G14F diesel generator set with nominal 20.5 megawatts (MW) total nameplate generation capacity, which is:
  - widely established, reliable with known technical/maintenance characteristics
  - commonly used in sensitive high-density and high-reliability applications including hospitals, data centres, commercial/retail buildings, etc.
  - commonly deployed in the region already with existing local support capability.
- connection to the AusNet Morwell Terminal Station directly south of the site via numerous 66 kV / 22 kV feeders
- approximately 200 hours per annum operation expected, i.e., during peak/extreme wholesale energy events (based on Australian Energy Market Operator (AEMO) Victorian wholesale electricity price data 2000 to 2025), equivalent to approximately 2% of a year only.

The facility will be comprised of ten containerised generation units of approximately 2 MW capacity each, with engine exhausts manifolded and exiting via two 5.5 m high exhaust stacks (each manifold connecting 5 units). The proposed concept layout is presented in **Figure 1**.

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Figure 1 Project Layout



2.2 Pollutants of Concern

The main air pollutants of concern emitted from the combustion of diesel are: oxides of nitrogen (NO_x); comprising primarily nitrogen oxide (NO) and nitrogen dioxide (NO_2), carbon monoxide (CO), sulphur dioxide (SO_2), volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs). Emitted particulate matter is primarily particles with aerodynamic diameters of less than 2.5 microns ($PM_{2.5}$). Unburned hydrocarbon and sulphur compounds from poorly maintained/tuned diesel engines may result in odorous exhaust emissions.

Of these air pollutants from diesel engine use, NO_2 is the key pollutant with respect to its potential for worsening existing air quality impacts. NO_2 has the greatest emission rate relative to its impact assessment criteria (see **Section 3.5**), and with consideration given to existing background levels (**Section 4.4**). NO is a colourless and odourless gas that does not significantly affect human health and commonly estimated as approximately 90% of NO_X at the point of emission. Once in the atmosphere, NO is converted to NO_2 primarily via the reaction of NO and ambient ozone (O_3). NO_2 can have significant health effects including damage to the respiratory tract and increased susceptibility to respiratory infections and asthma. NO will be converted to NO_2 after leaving the combustion source at a rate dependent on atmospheric conditions.

For diesel engines, $PM_{2.5}$ is the second pollutant of concern given it is common for existing levels to exceed criteria, due to, e.g., smoke from bushfires. As such this assessment

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focussed on NO_2 and $PM_{2.5}$ – if these higher risk pollutants meeting their assessment criteria, the lower risk pollutants can be expected to meet theirs also.

With regard to odour emissions, these are generally avoided by designing and maintained the facilities in accordance with OEM equipment provider requirements and generally accepted good industry practice. This includes the advanced integrated monitoring and management systems that are employed in current stationary reciprocating engine generation facilities using a dedicated/single low-sulphur fuel source. Odorous emissions for the Project are therefore expected to be minimised such that adverse amenity impacts will be avoided.

3.0 Legislative Context and Assessment Criteria

3.1 Commonwealth Legislation

The National Environment Protection Council (NEPC) was established under the *National Environment Protection Council Act 1994* (Cth) (Australian Government 2016) with the primary function of:

- developing National Environment Protection Measures (NEPMs)
- assessing and reporting on the implementation and effectiveness of the NEPMs in each State and Territory.

3.1.1 National Environment Protection (Ambient Air Quality) Measure

The "*National Environment Protection (Ambient Air Quality) Measure*" (Air NEPM) (NEPC 2021) developed by the National Environment Protection Council (NEPC) contains standards and goals for key pollutants that are required to be achieved nationwide, with due regard to population exposure. Air NEPM standards apply at performance monitoring locations, with each station located in such a manner that it obtains a representative measure of air quality likely to be experienced by the general population in a region or sub-region of 25,000 people or more.

The desired environmental outcome of the Air NEPM is ambient air quality that allows for the adequate protection of human health and well-being.

The standards are not intended to be applied as modelling criteria for assessing air emissions from individual sources, specific industries or roadside locations and are therefore not strictly appropriate for this AQIA. However, the Victorian Environment Reference Standard which provides assessment criteria relevant to this AQIA (**Section 3.2.2**) adopts (in part) the Air NEPM standards.

The Air NEPM standards for pollutants relevant to the Project are listed in **Table 1**.

Table 1 Relevant Air NEPM Ambient Air Quality Standards

Pollutant	Averaging Period	Air Quality Standard
NO_2	1 hour	0.08 ppm
	Annual	0.015 ppm
$PM_{2.5}$	24 hours	25 µg/m^3
	Annual	8 µg/m^3

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3.2 Victorian Legislation

The *Environment Protection Act 2017* (Victoria State Government 2017) introduces:

- a general environmental duty (GED), which requires everyone, including businesses and individuals, conducting activities that pose a risk to human health or the environment from pollution or waste to understand those risks and take reasonably practicable steps to eliminate or minimise them.
- a duty to notify, which requires a person in management or control of land to notify EPA as soon as practicable if the contamination may pose a significant risk to human health or the environment.

3.2.1 General Environmental Duty

The GED is relevant to the Project requiring emissions to air to be eliminated or minimised as far as practicable.

In determining whether it is reasonably practicable to minimise risks of harm to human health and the environment, the following matters are relevant:

- the likelihood of the risk eventuating
- the degree of harm that would result if the risk eventuated
- what the person knows, or ought reasonably to know about the harm or risks of harm and ways of eliminating or reducing those risks
- the availability and suitability of ways to eliminate or reduce the risk
- the cost of eliminating or reducing the risk.

3.2.2 Environmental Reference Standard

Under the *Environmental Protection Act 2017*, the "*Environment Reference Standard*" (ERS) (Victoria State Government 2022) is to be used to assess and report on environmental conditions in the whole or any part of Victoria. It sets out indicators and objectives for the ambient air environment.

The ERS provides a reference to help make decisions. It does not:

- create specific obligations that must be followed
- set out enforceable compliance limits
- describe levels that it is permitted to pollute up to.

The ERS sets out ambient air quality objectives for criteria pollutants, some of which are relevant to the Project, including NO_2. For the most part, the ERS adopts the Air NEPM standards for these pollutants which aim to provide for the adequate protection of human health and well-being.

3.3 Guideline for Assessing and Minimising Air Pollution in Victoria

EPA Victoria Publication 1961.2 "*Guideline for assessing and minimising air pollution in Victoria*" (EPAV 2025a) provides a framework to assess and control risks associated with air pollution. It is a technical guideline for air quality practitioners and specialists with a role managing pollution discharges to air.

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The air quality assessment criteria in Publication 1961.2 are concentrations of air pollutants that provide a benchmark to understand potential risks. They are risk-based concentrations that help identify when or if an activity is likely to pose an unacceptable risk to human health and the environment. This represents a change in attitude to air quality criteria which were previously concentrations that facilities could effectively 'pollute up to'. There are now no concentrations below which no action, management and/or mitigation of emissions to air is required.

Publication 1961.2 sets out levels of quantitative assessment and air pollution assessment criteria (APACs) that the Project must comply with, noting the requirements of the GED. Publication 1961.2 APACs for criteria pollutants are adopted from the ERS and should be updated to reflect any future update to the ERS.

3.4 Guide to Air Pollution Modelling

EPA Victoria Publication 1957 "*Guide to Air Pollution Modelling*" (EPAV 2025b) provides guidance for Air Pollution Impact Assessments (APIA) required by Victoria's Environment Protection Authority (EPA) for licence approvals and other regulatory purposes within the state. The guidance provides best-practice guidelines for modelling practitioners who are involved in conducting air dispersion modelling of discharges to air in Victoria.

The guidance combines previous EPA Publications 1550 and 1551, provides updated guidance, and clarifies areas of uncertainty for practitioners submitting APIAs to EPA. It should be read in conjunction with the Publication 1961.2.

3.5 Assessment Criteria

Relevant air quality criteria provided in **Table 2** have been sourced from Publication 1961.2 (refer **Section 3.3**).

Table 2 Relevant APACs

Pollutant	Averaging Period	Air Quality Standard
NO_2	1 hour	150 µg/m^3 [a, b]
	Annual	28 µg/m^3 [a, c]
$PM_{2.5}$	24 hours	25 µg/m^3 [a, c]
	Annual	8 µg/m^3 [a, c]

a Cumulative APACs apply to the total concentration (Project plus background).

b 99.9th percentile at any location at or beyond the boundary of the facility, but generally anywhere a person is likely to spend an hour or more.

c At discrete sensitive receptor locations.

In relation to the application of APACs to modelling outputs, Publication 1961.2 advises that APACs with averaging periods of one hour or less apply to the 99.9th percentile predicted concentration at any location at or beyond the boundary of the facility. For all averaging periods greater than one hour, the APACs apply to the 100th percentile predicted concentration at discrete receptor locations. This is because acute exposures can plausibly occur in most locations, e.g., a park, a shopping strip or at a place of work, while longer exposures are more likely at sensitive receptors, such as a nearby residence. In reality, the likelihood of a person spending one hour in one particular location within, e.g., a paddock or a road reserve is low. Instead, it is generally considered reasonable to assess against a 1-hour average APAC only in areas in which a person would likely spend an hour or more, including in parks, a shopping strip or at a place of work.

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The Project is expected to operate for approximately 200 hours or 2.3% of the year. Additional operation, limited to a few hours per month, may be required to maintain the system. It is therefore not strictly relevant to assess annual average concentrations against annual average APACs.

4.0 Existing Environment

4.1 Sensitive Receptors

Publication 1961.2 defines sensitive land uses as land use where is it plausible for humans to be exposed over durations greater than 24 hours, such as residential premises, education and childcare facilities, nursing homes, retirement villages, hospitals. Sensitive land uses identified in the vicinity of the Project comprise suburban residential areas of Morwell to the north and a number of rural residences to the east and southeast, the nearest being approximately 1.4 km northeast of the Project. There are a number of commercial/industrial receptors within a few hundred metres of the Project where the people could reasonably be expected to be for more than an hour. These locations are conservatively included as receptors in the area to distinguish from those areas in which people are unlikely to be for any period of time, e.g., in a paddock. Discrete receptor locations included in the assessment are listed in **Table 3** and presented in **Figure 2** along with the residential areas of Morwell, included as gridded receptors for the purposes of modelling.

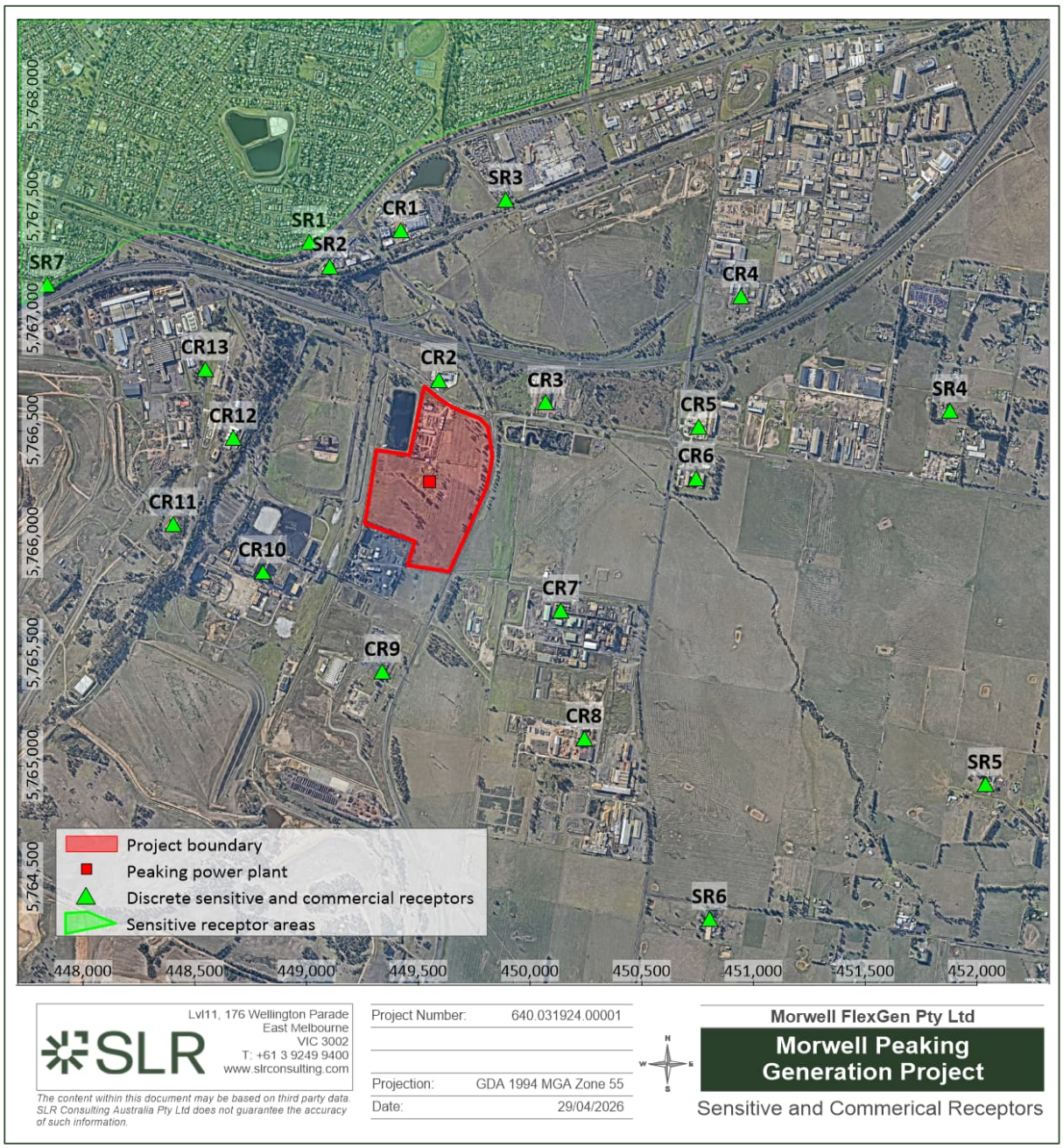
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Table 3 Identified Nearest Sensitive and Commercial/Industrial Receptors

ID	Description	UTM Coordinates (Zone 55)		Distance and Direction from Site
		(m E)	(m S)	
SR1	Residence	449,012	5,767,343	1.2 km NNW
SR2	Residence	449,104	5,767,235	1.0 km NNW
SR3	Residence	449,892	5,767,532	1.3 km N
SR4	Residence	451,878	5,766,589	2.3 km E
SR5	Residence	452,036	5,764,917	2.8 km SE
SR6	Residence	450,802	5,764,317	2.3 km SE
SR7	Residence	447,840	5,767,154	1.9 km WNW
CR1	Commercial/industrial	449,422	5,767,398	1.1 km N
CR2	Commercial/industrial	449,593	5,766,730	0.4 km N
CR3	Commercial/industrial	450,071	5,766,629	0.6 km NE
CR4	Commercial/industrial	450,942	5,767,103	1.6 km ENE
CR5	Commercial/industrial	450,744	5,766,290	1.2 km E
CR6	Commercial/industrial	450,755	5,766,520	1.2 km E
CR7	Commercial/industrial	450,137	5,765,695	0.8 km SE
CR8	Commercial/industrial	450,242	5,765,124	1.4 km SSE
CR9	Commercial/industrial	449,340	5,765,423	0.8 km S
CR10	Commercial/industrial	448,803	5,765,870	0.9 km SW
CR11	Commercial/industrial	448,403	5,766,083	1.2 km W
CR12	Commercial/industrial	448,673	5,766,469	0.9 km W
CR13	Commercial/industrial	448,547	5,766,776	1.1 km WNW

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Figure 2 Identified Nearest Sensitive Receptors

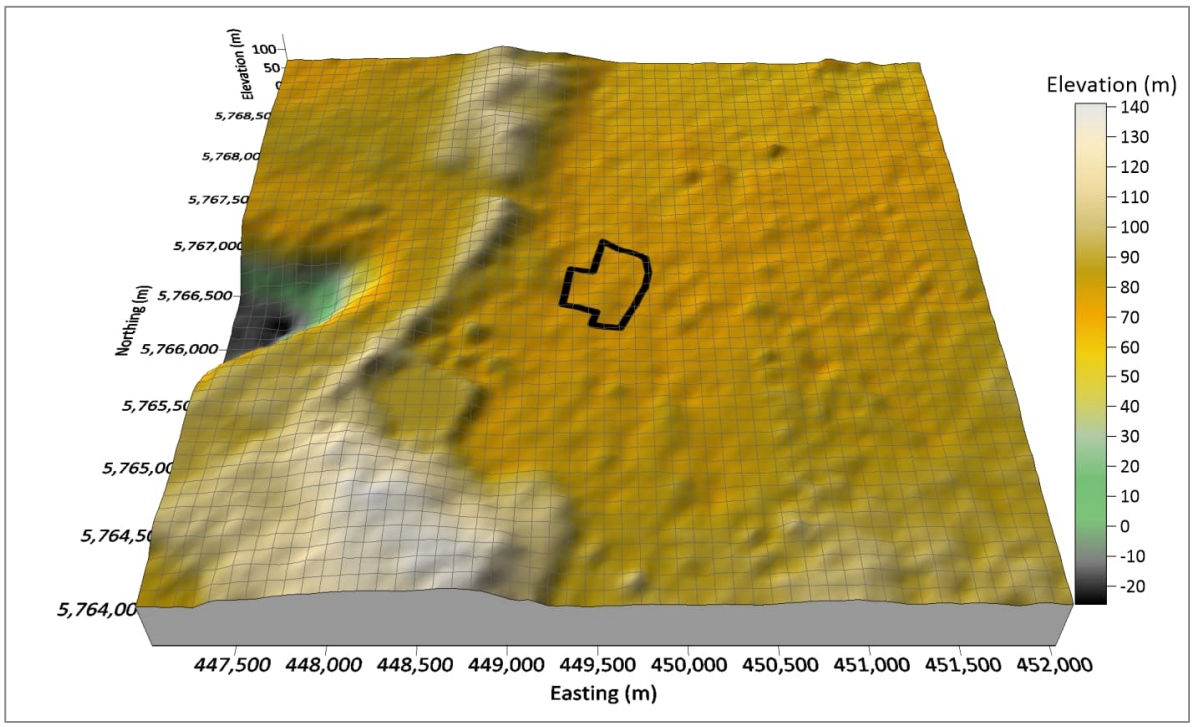


4.2 Topography

The topography immediately surrounding the Project is generally flat or gently undulating, however there is a rise of around 50 m running north-south approximately 500m to the west. Beyond the rise, a coal mine pit drops approximately 100 m below the elevation of the Site. **Figure 3** presents a three-dimensional representation of the topographical features in the area surrounding the Site.

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Figure 3 Project Area and Surrounding Topography



4.3 Meteorology

Local wind speed and direction influence the dispersion of air pollutants. Wind speed determines both the distance of downwind transport and the rate of dilution as a result of plume spreading. Wind direction, and the variability in wind direction, determines the general path pollutants will follow and the extent of crosswind spreading. Surface roughness, which is determined by features such as the topography of the land and the presence of buildings, structures and trees, affects the degree of mechanical turbulence, which influences the rate of dispersion of air pollutants.

The Bureau of Meteorology (BoM) maintains and publishes data from weather stations across Australia. The nearest available BoM automatic weather station (AWS) collecting data suitable for use in a quantitative air dispersion modelling study is located at Morwell (Latrobe Valley Airport), approximately 6 km northwest of the Project and likely experiences similar conditions to the Site.

The Morwell AWS (Station 85280, elevation 56 m), has data available from 1984 to present including for the following parameters:

- temperature (°C)
- rainfall (mm)
- relative humidity (%)
- wind speed (m/s) and wind direction (degrees).

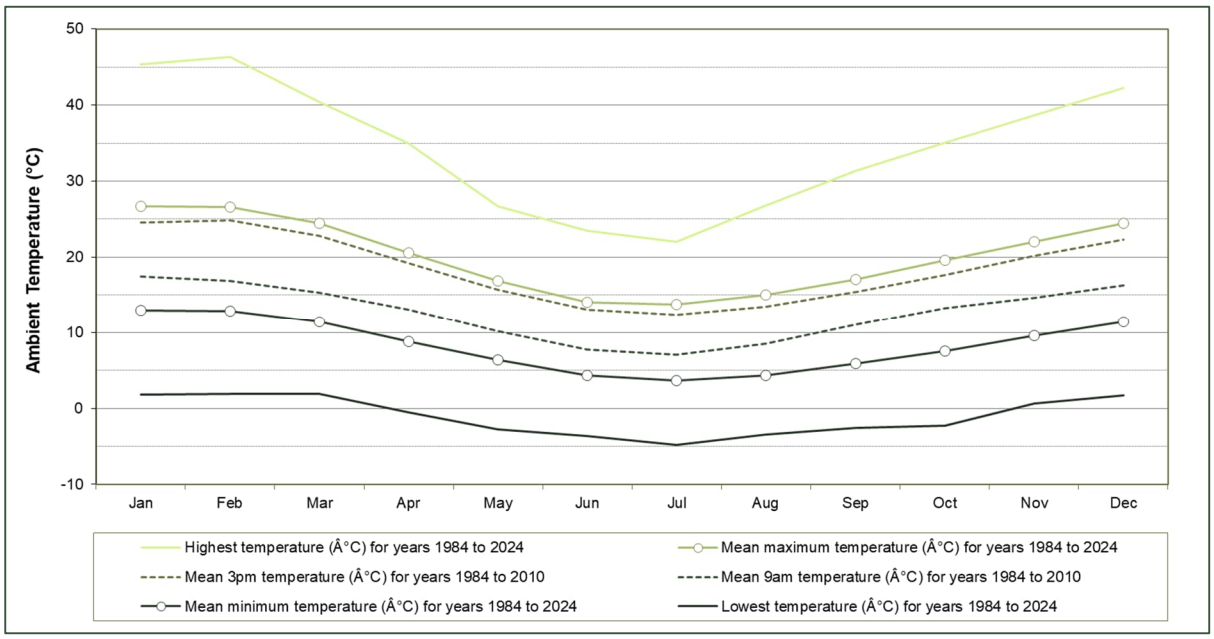
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A review of the long-term data collected by this AWS is provided in the following sections.

4.3.1 Temperature

Temperature statistics for Morwell between 1984 and 2024 are summarised in **Figure 4.** Mean maximum temperatures range from 13.8 °C in winter to 26.6 °C in summer, while mean minimum temperatures range from 3.7 °C in winter to 13.0 °C in summer.

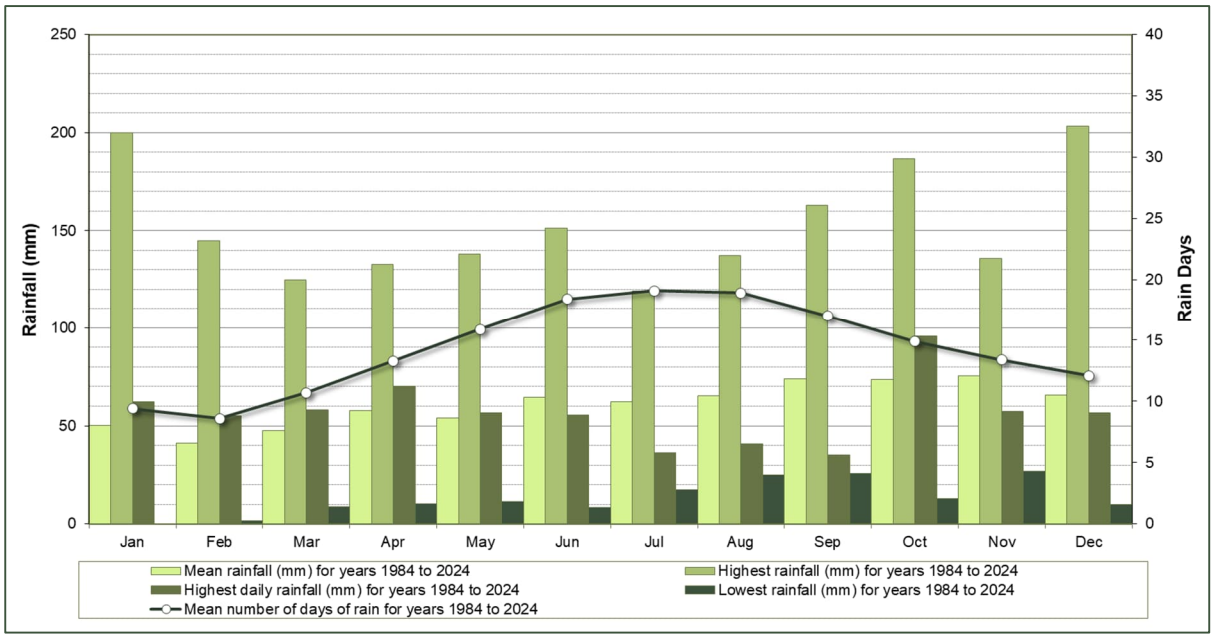
Figure 4 Temperature Trends for Morwell



4.3.2 Rainfall

Rainfall statistics for Morwell for the years 1984 to 2024 are summarised in **Figure 5**. The mean annual rainfall is 731 millimetres (mm). The average monthly rainfall is highest in winter with the highest average monthly rainfall of 65.4 mm/month in August with a maximum average of 19.1 rain days recorded in July. The lowest average of 41.1 mm/month is in February, with a lowest average of 8.6 days of rain occurring in that same month. The highest monthly rainfall recorded is 203.2 mm recorded in December 1985. The maximum daily rainfall of 96 mm was recorded on 4 October 2023.

Figure 5 Long Term Monthly Rainfall Data for Morwell

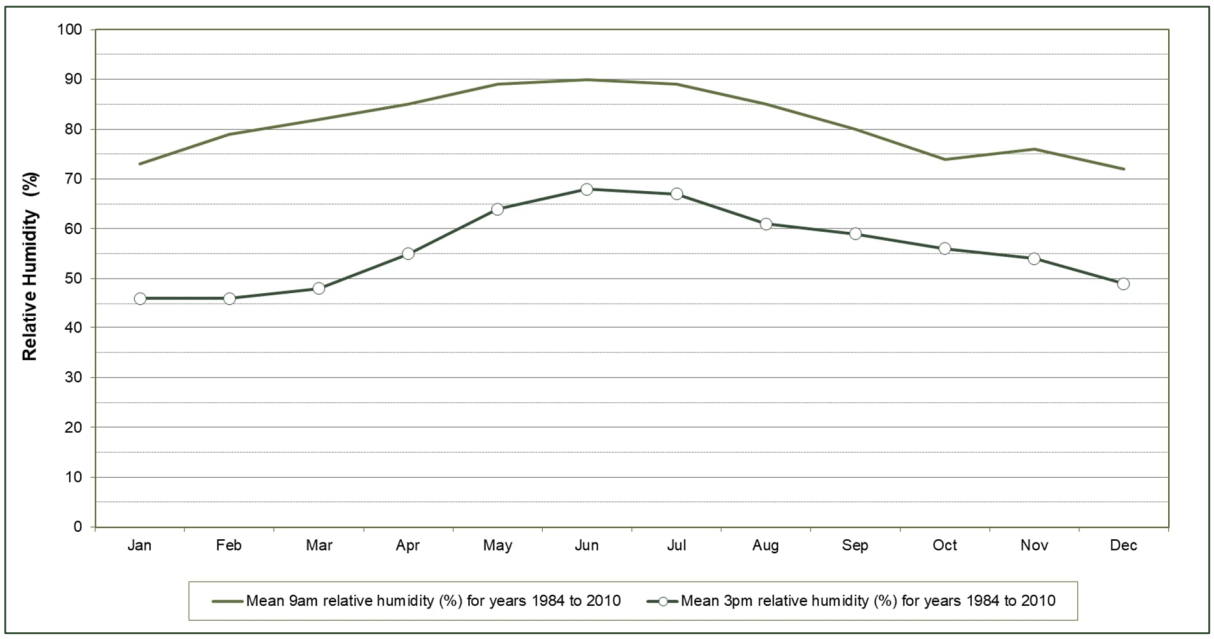


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4.3.3 Relative Humidity

Humidity statistics (9:00 am and 3:00 pm monthly averages) for Morwell for the years 1984 to 2010 are summarised in **Figure 6**. Morning humidity levels range from an average of around 90% in winter to around 73% in summer. Afternoon humidity levels are lower, at around 67% in winter dropping to around 46% in summer.

Figure 6 Humidity Data for Morwell



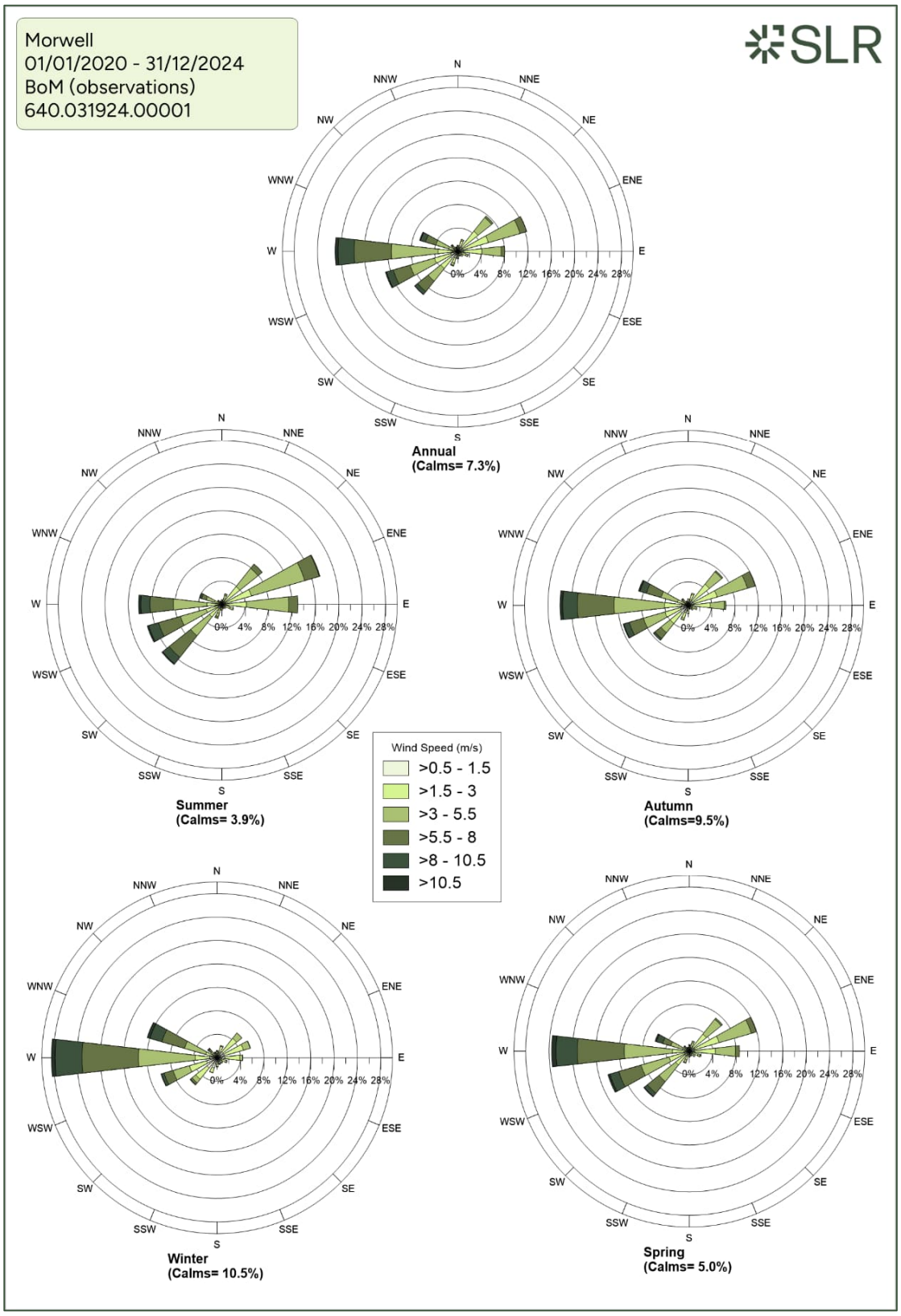
4.3.4 Wind

Annual and seasonal wind roses for Morwell Airport for the years 2020 to 2024 are presented in **Figure 7**. The wind roses show that overall, winds from the west

are predominant, with all seasons having similar distributions. Morwell reports calm (less than 0.5 m/s) conditions on average 7.3% of the time.

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Figure 7 Annual and Seasonal Wind Roses for Morwell (2020 – 2024)



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4.4 Air Quality

In general, Victoria's air quality is good, although there are periods of poor air quality due mostly to smoke, occasional dust storms and urban pollution (EPAV 2018, 2020, 2021, 2022b).

In the Latrobe Valley, there is a history of air quality impacts occurring on the valley floor e.g. in the large rural towns of Morwell, Moe and Traralgon, due to emissions from the open cut brown coal mines, the occasional mine fire, coal-fired and natural gas-fired power stations, and the Maryvale Paper Mill. Non-industrial sources of air pollutants include: domestic wood burning, road traffic emissions (Melbourne Airshed pollution also spilling into Latrobe Valley sometimes), and smoke from bushfires and controlled burns. These sources have combined to cause, occasionally, elevated levels of sulfur dioxide (SO_2), particulate matter measured as PM_{10} and $PM_{2.5}$, and odour impacts. In general, nitrogen dioxide (NO_2) levels are low, although ozone (O_3), which is formed partly from local emissions of NO_x, can be high. A concise summary of air quality impacts and issues for the region is provided by (Parliament of Victoria, Legislative Council Environment and Planning Committee November 2021). Also, 'plume strikes' from coal-fired power stations have been detected on higher elevations in the Strzelecki Ranges to the south (Jacobs 11 Dec 2020).

The closest air quality monitoring stations (AAQMSs) to the Project, operated by EPA Victoria, are located at Hourigan Road, Morwell East, approximately 2.3 km north of the Project, and at Maryvale Crescent, Morwell South, approximately 3.3 km west-northwest of the Project. Given their proximity to the Project, these AAQMS can be considered generally representative of the Project area, noting Morwell South AAQMS is approximately 170 m from the M1 and may be impacted by exhaust emissions during periods of particularly heavy traffic. Both AAQMS monitor CO, $PM_{2.5}$ (until end of 2022) and SO_2, but Morwell South also monitors NO_2 and O_3, necessary for this AQIA, therefore the data from Morwell South is used to represent background conditions in the Project area. A more complete $PM_{2.5}$ dataset for the period 2020-2024 is available from Traralgon AAQMS, approximately 11 km east of the Project. This data is used to represent background $PM_{2.5}$ at the Project area for 2023 and 2024 in the absence of data from Morwell South for these years.

4.4.1 NO_2 and O_3

The 1-hour NO_2 concentrations reported for Morwell South for 2020-2024 along with the 1-hour average NO_2 ERS are provided in **Figure 8**.

As discussed in **Section 2.2**, NO_X emitted from combustion processes mainly consist of NO with a smaller portion of NO_2. In the atmosphere NO emitted from the source oxidises to NO_2 in the presence of ozone (O_3) as it travels further from the source and mixes with the ambient air. The rate of oxidation depends on a number of parameters including the ambient O_3 concentration and can vary from a few minutes to many hours. The daily 8-hour maximum O_3 concentrations reported for Morwell South for 2020-2024 along with the O_3 8-hour average ERS are provided in **Figure 9.**

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Figure 8 Morwell South 1-Hour Average NO_2 Concentrations 2020-2024

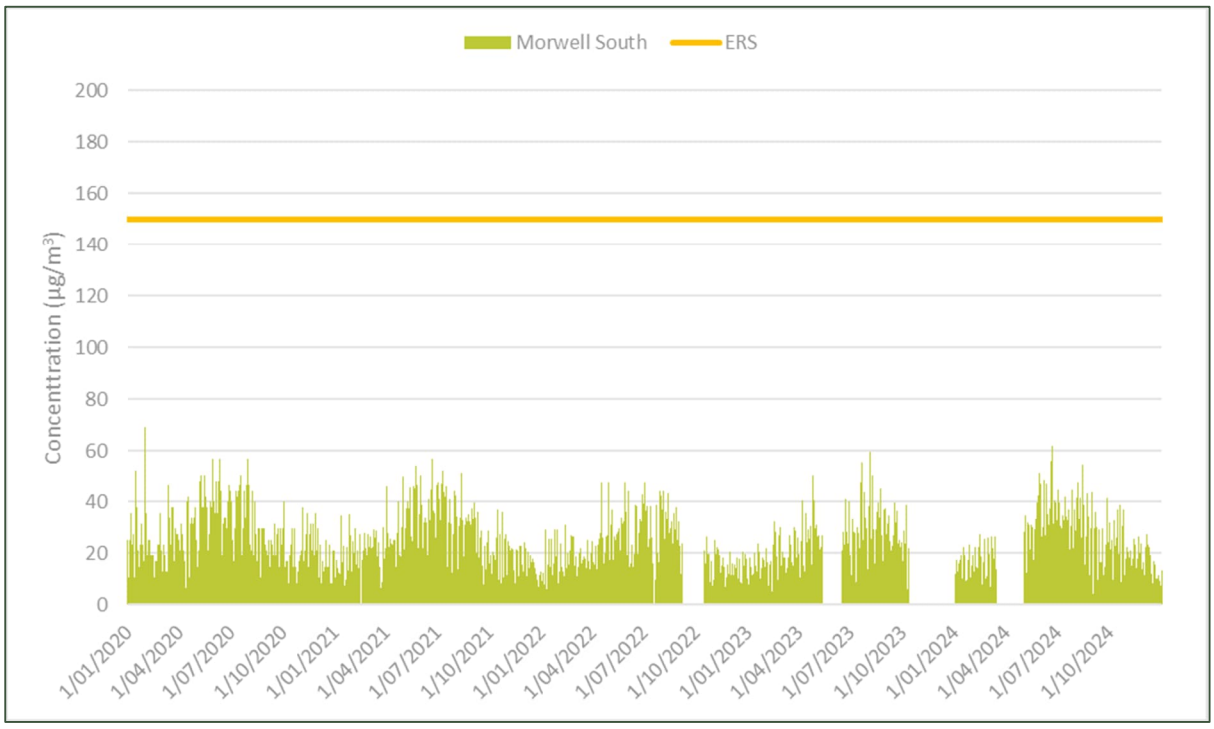
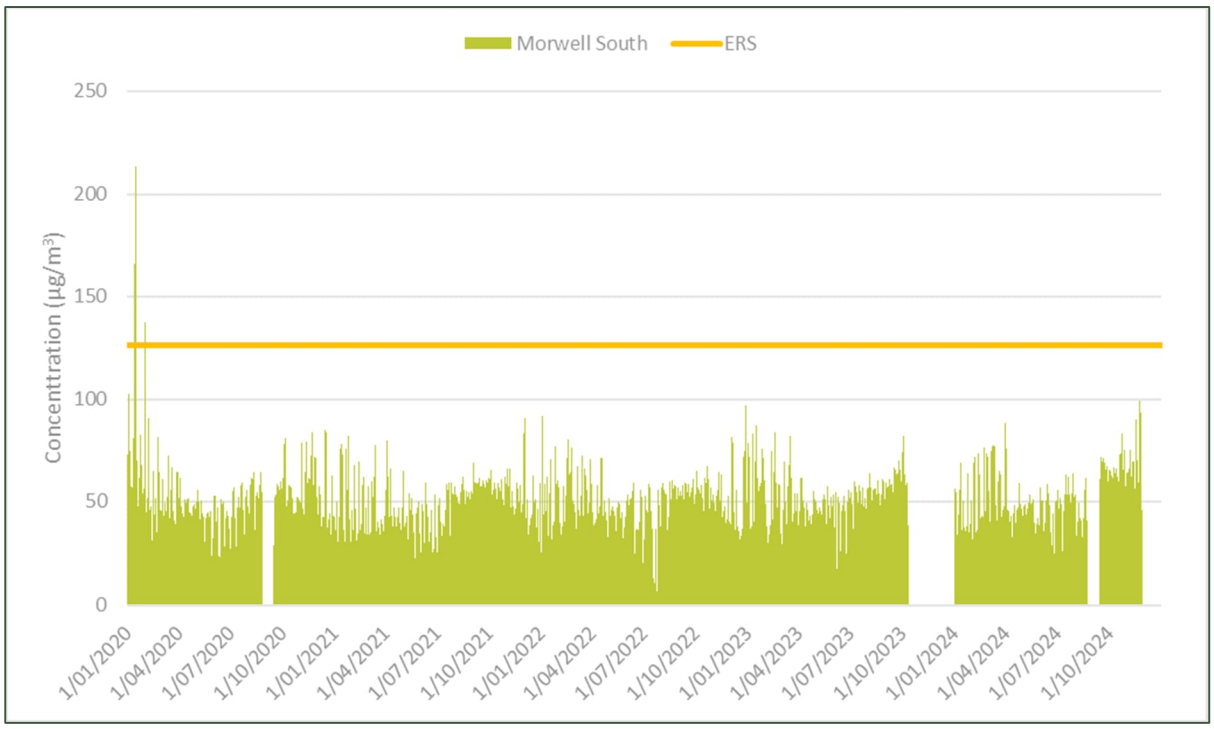


Figure 9 Morwell South 8-Hour Average O_3 Concentrations 2020-2024

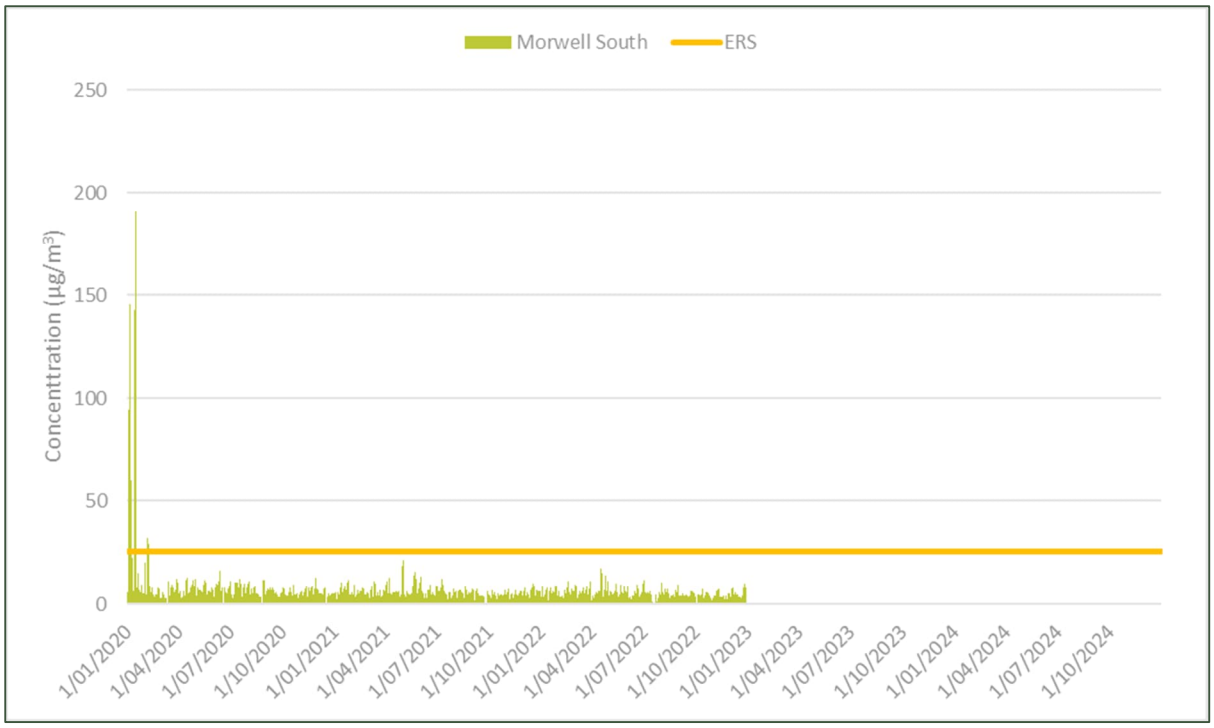


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4.4.2 $PM_{2.5}$

$PM_{2.5}$ data for Morwell South is available for 2020-2022, which is sufficient for the purposes of this assessment. The 24-hour average $PM_{2.5}$ concentrations reported for Morwell South along with the 24-hour average $PM_{2.5}$ ERS are provided in **Figure 10**. Significantly elevated $PM_{2.5}$ concentrations recorded during individual days during January and February 2020 are indicative of regional air quality impacts from bushfire events that occurred throughout Victoria during this period. There were no exceedances of the ERS for the remaining period.

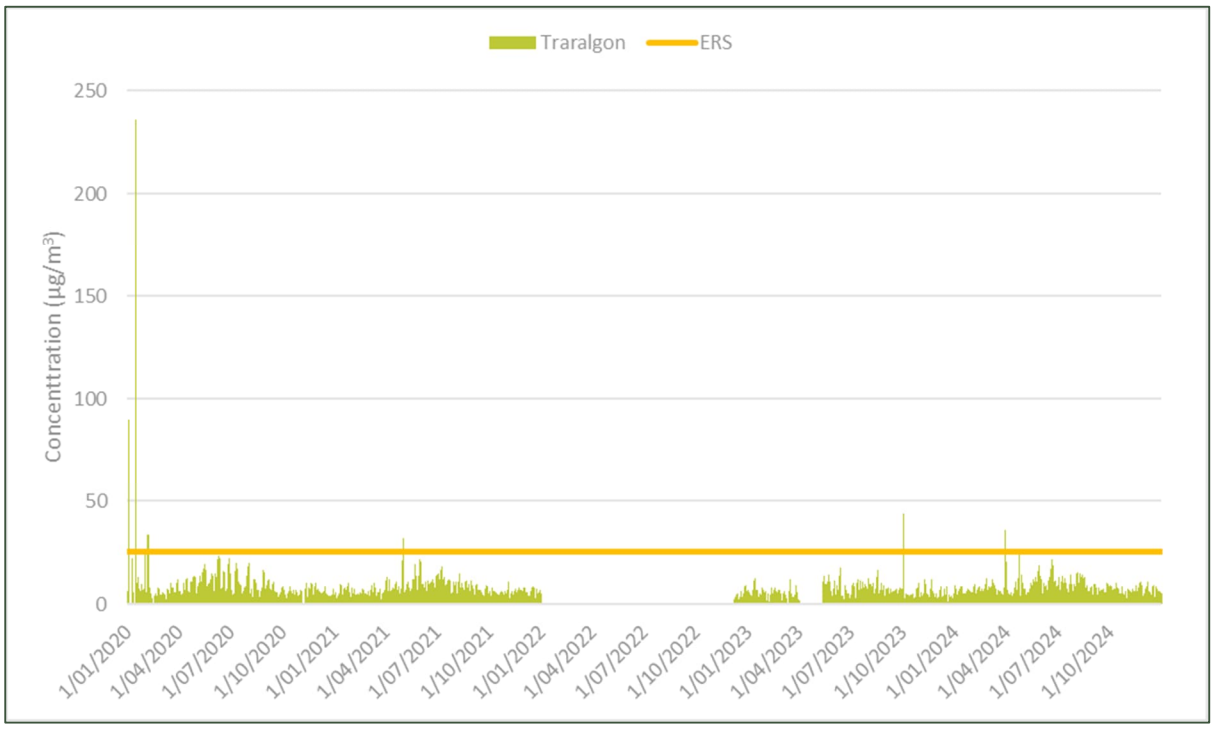
Figure 10 Morwell South 24-Hour Average $PM_{2.5}$ Concentration 2020-2024



A more complete $PM_{2.5}$ dataset for the period 2020-2024 is available from Traralgon AAQMS, approximately 11 km east of the Project is presented in **Figure 11**. Comparing the plots, indicates that the $PM_{2.5}$ concentrations monitored at Traralgon are generally greater than those monitored at Morwell South.

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Figure 11 Traralgon 24-Hour Average $PM_{2.5}$ Concentration 2020-2024



5.0 Impact Assessment Methodology

In accordance with Publication 1961.2, the dispersal of emissions to air from the Project were modelled using AERMOD. The American Meteorological Society (AMS)/USEPA Regulatory Model (AERMOD) was specifically designed to support the USEPA's regulatory programs, however it is also the Victorian regulatory model. AERMOD is a steady-state plume modelling system with three components: AERMOD (dispersion model), AERMAP (terrain data pre-processor) and AERMET (meteorological data pre-processor).

AERMOD was used to predict maximum cumulative pollutant ground level concentrations (GLCs) resulting from the Project emissions to air and existing background concentrations.

5.1 Environmental Inputs

AERMOD requires a range of inputs to describe the Project environment:

- topographical data
- meteorological data
- background pollutant concentrations.

The sources of the required data are summarised in **Table 4** and these inputs are discussed in the following sections.

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Table 4 Air Dispersion Model Input Data

Item	Source	Description
Topographical data	Shuttle Radar Topography Mission (SRTM) Derived Digital Elevation Model (DEM)	1 second (~30m) resolution
Meteorological data	TAPM and AERMET pre-processor.	A site specific synthetic meteorological dataset representative of the Project location provides input to AERMOD's meteorological pre-processor, AERMET.
Background pollutant concentrations	Morwell South AAQMS.	NO_2, O_3 and $PM_{2.5}$ (2020-2022) concentrations considered to be representative of the Project area.
	Traralgon AAQMS.	$PM_{2.5}$ (2023-2024) concentrations considered to be conservatively representative of the Project area.

5.1.1 Topography

The Shuttle Radar Topography Mission (SRTM) global digital surface model data, with resolution one arc-second (approximately 30 metres), can be used as an input for plume dispersion modelling. The raw SRTM data cannot distinguish between ground surface topography and other elevated features such as tree canopies and buildings. However, due there being few trees and few buildings in the Project area, the dataset was considered to be satisfactory as in input for this assessment. Data was processed with AERMAP for use in AERMOD.

5.1.2 Meteorology

Meteorological mechanisms govern the dispersion, transformation and eventual removal of pollutants from the atmosphere. The extent to which pollution will accumulate or disperse in the atmosphere is dependent on the degree of thermal and mechanical turbulence within the earth's boundary layer. Dispersion comprises vertical and horizontal components of motion. The stability of the atmosphere and the depth of the surface-mixing layer define the vertical component. The horizontal dispersion of pollution in the boundary layer is primarily a function of the wind field. The wind speed determines both the distance of downwind transport and the rate of dilution as a result of plume spreading. The generation of mechanical turbulence is similarly a function of the wind speed, in combination with the surface roughness. The wind direction, and the variability in wind direction, determines the general path pollutants will follow, and the extent of crosswind spreading. Pollution concentration levels therefore fluctuate in response to changes in atmospheric stability, to concurrent variations in the mixing depth, and to shifts in the wind field (Oke 2002).

For this study, a site-representative three-dimensional meteorological dataset was compiled using TAPM before extracting the necessary on-site and upper air input files for the AERMOD meteorological pre-cursor model, AERMET. Details of the TAPM modelling are provided in **Appendix A**.

In accordance with EPA guidance (EPAV 2025b) five years of meteorological data (2020 to 2024) were modelled for this assessment with surface characteristics (albedo, Bowen ratio and surface roughness) of the assessment location informed from publicly available on-line aerial imagery. A summary of the AERMET modelling options and parameters used for the assessment is provided in **Table 5**. A summary of the resulting AERMOD meteorological files is provided in **Table 6.**

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Table 5 AERMET Model Parameters

Parameter	Option / Source			
Adjusted U* (surface friction velocity)	Yes			
Threshold wind speed (m/s)	0.28			
Wind speed and direction	TAPM (see **Appendix A** for details)			
Temperature	TAPM (see **Appendix A** for details)			
Upper air data	TAPM			
Scalar Parameters [a]	**Summer**	**Autumn**	**Winter**	**Spring**
Albedo	0.18	0.18	0.20	0.18
Bowen ratio	0.80	1.00	1.00	0.50
Surface roughness 1° – 30° (m)	0.22	0.05	0.01	0.14
Surface roughness 31° – 60° (m)	0.15	0.02	0.004	0.08
Surface roughness 61° – 90° (m)	0.10	0.01	0.001	0.05
Surface roughness 91° – 120° (m)	0.15	0.02	0.004	0.08
Surface roughness 121° – 150° (m)	0.15	0.02	0.004	0.08
Surface roughness 151° – 180° (m)	0.15	0.02	0.004	0.08
Surface roughness 181° – 210° (m)	0.22	0.05	0.01	0.14
Surface roughness 211° – 240° (m)	0.32	0.13	0.05	0.24
Surface roughness 241° – 270° (m)	0.22	0.05	0.01	0.14
Surface roughness 271° – 300° (m)	0.15	0.02	0.0001	0.08
Surface roughness 301° – 330° (m)	0.12	0.02	0.0001	0.07
Surface roughness 331° – 360° (m)	0.10	0.01	0.0001	0.05
a Albedo and Bowen ratio assessed as a simple arithmetic average of land cover based on 10 km x 10 km domain centred on Project. Surface roughness assessed as the geometric mean of land cover of a 1 km radius circle centred on Project by sector arc (12 sectors of 30°).				

Table 6 AERMOD Meteorological Input Data

Meteorological Year	Available Hours	Calms [a] and Missing Data	Valid Hours [b]
2020	8,784	65	8,719
2021	8,760	102	8,658
2022	8,760	89	8,671
2023	8,760	114	8,646
2024	8,784	90	8,694
a <0.28 m/s b AERMOD does not predict GLCs during calms			

5.1.3 Background Pollutant Concentrations

Existing air quality in the area surrounding the Project will be affected by a combination of emissions from sources in the local area, as well as emissions that flow into the area from the wider region.

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Data from Morwell South AAQMS, and Traralgon AAQMS for $PM_{2.5}$ for 2023 and 2024, refer **Section 4.4**, is used to represent the background air quality in the Project area for 2020 to 2024. Predicted GLCs arising from the Project are added to the background concentrations to provide the predicted cumulative GLCs.

5.2 Project Emissions

Emissions to air from the Project resulting from the combustion of diesel will be discharged to air through two stacks servicing five manifolded engine exhausts each. The configuration of the Project stacks, their emission characteristics and estimated emissions rates, derived from engine emission specification sheets (provided in **Appendix B**) are provided in **Table 7**.

Table 7 Project Stack Emissions

Source	Easting (m)	Northing (m)	Release Height (m)	Stack Tip Diameter (m)	Exit Velocity (m/s) [a]	Exit Temp. (°C) [b]	Emission Rate (g/s)	
							NO_X	$PM_{2.5}$
Stack 1	449,524	5,766,293	5.5	1.44	25.0	420	19.2	0.18
Stack 2	449,521	5,766,288	5.5	1.44	25.0	420	19.2	0.18
						Total	**36.4**	**0.36**

a Exit velocity based on individual engine specification flow rate (m^3/s) and stack diameter.

b Supplier estimate based on engine exhaust temperature of 471ºC cooled through manifolding and 5.5 m stack.

5.3 Model Parameters and Options

AERMOD model parameters and options were selected in accordance with EPAV guidance (EPAV 2025b). A summary of additional AERMOD modelling options and parameters used for the assessment is provided **Table 8.**

Table 8 Model Parameters

Parameter	Option
Adjusted U* (friction velocity)	Yes
Output type	Concentration (µg/m^3)
Depletion options	None
Dispersion coefficient	Rural
Building downwash	Prime
Gridded receptors	Multi-tier Cartesian Grid: 5 km x 5 km, 50 m spacing.
Discrete receptors	Sensitive receptor locations (Refer **Section 4.1**) 0 m (AGL)

AGL Above ground level

5.4 Building Downwash

Building downwash is a phenomenon caused by structures near to pollutant emission sources influencing atmospheric turbulence. Airflow is rapidly mixed to the ground as frictional forces and pressure gradients cause stagnations and eddies to develop in the wake of buildings downwind of elevated sources.

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A stack is considered to be wake-affected when the stack and building are located less than five times the lesser of the building height or project building width apart.

The USEPA has established a Good Engineering Practice (GEP) stack height which is defined as the 'height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutants in the immediate vicinity of the source as a result of atmospheric downwash, eddies or wakes which may be created by the source itself, nearby structures or nearby terrain obstacles' (USEPA, 1985). The definition of GEP stack height is the building height plus 1.5 times the lesser of the building height or projected building width.

AERMOD contains the Prime algorithm, which was used to predict building downwash effects. Influencing building dimensions were calculated using the USEPA's Building Profile Input Program (BPIP).

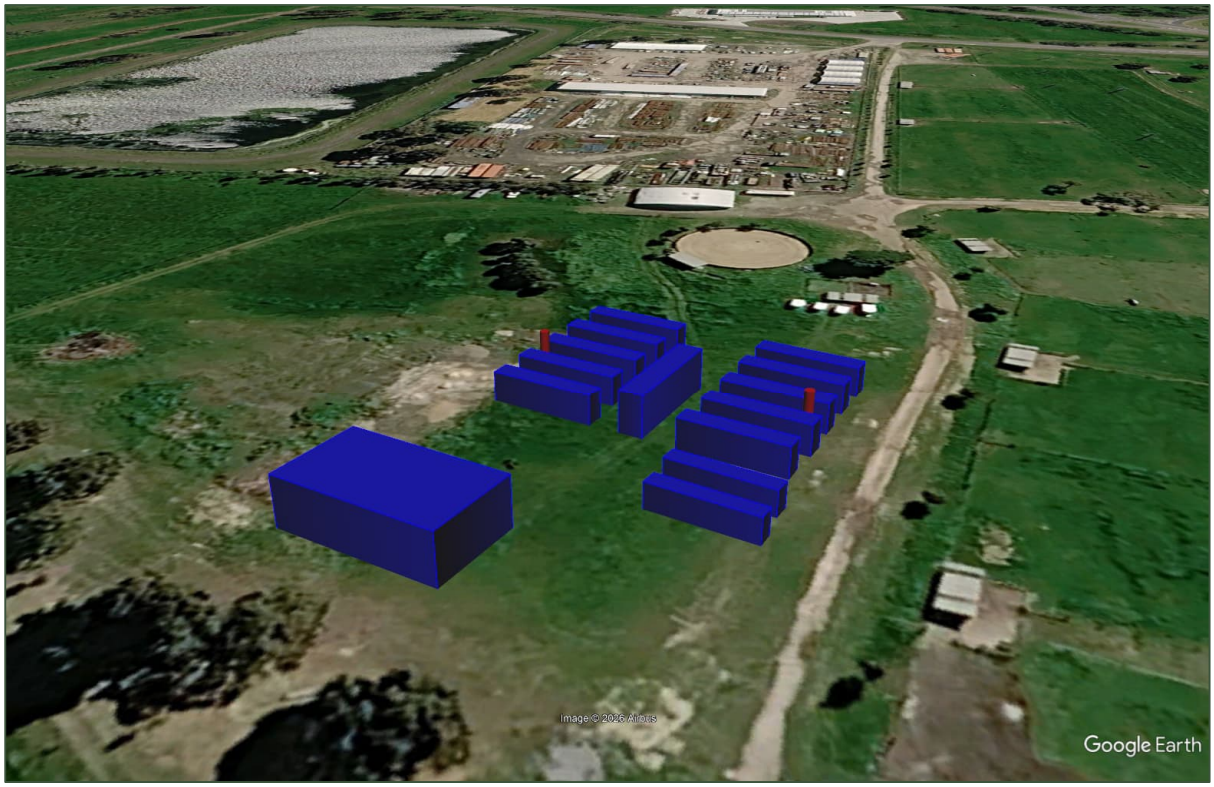
Buildings were included in the model as follows (L x W x H; m):

- containerised generators:14 x 3.7 x 3.6
- bulk fuel storage tanks: 12.2 x 2.5 x 2.9
- switch room: 17.5 x 4.0 x 5.0
- maintenance store: 20 x 8.0 x 5.5

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Figure 12 illustrate the sources and buildings as represented for the purposes of modelling the Project configuration.

Figure 12 Project Modelled Point Sources and Buildings



5.5 NO_X to NO_2 Conversion

The rate of NO oxidation to NO_2 depends on a number of parameters including the ambient O_3 concentration and can vary from a few minutes to many hours. The following methods

can be applied to take account the oxidation of NO to NO_2 in estimating downwind NO_2 concentrations.

Method 1 – 100% Conversion

This method is usually used as a screening level assessment and assumes 100% conversion of NO to NO_2 before the plume arrives at a receptor location. Use of this method can significantly over-predict NO_2 concentrations in the nearfield and is therefore not considered further in this assessment.

Method 2 – Partial Conversion

This method assumes some fraction of NO converts to NO_2 before the plume arrives at a receptor location. The distance from the source at which maximum GLCs of NOx occur may be only a few minutes after emissions such that only some small fraction of the NO would have likely oxidised to NO_2. Analysis of NO_2/NO_X ratios in the Latrobe Valley, Victoria (LVAMN 2017, 2018, 2019) indicates that as NO concentrations increase, the NO_2/NO_X ratios decrease, as expected for areas impacted by emissions from the combustion of fossil fuels. NO_2/NO_X ratios generally range from 12% to 25% for higher NO_X concentrations. Use of a fixed partial conversion may over-predict NO_2 concentrations in the nearfield and underpredict them in the far field. This method is not considered further in this other than to generate reasonably representative isopleths of predicted maximum 1-hour average NO_2 concentrations across the model domain. A conservative NO_2/NO_X ratio of 30% is assumed for this (**Section 6.0**).

Method 3 – Ambient Ozone Limiting Method (OLM)

This method assumes that all the 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. NO_2 concentrations can be estimated by this method using the following equation (Cole and Summeryhays 1979):

$$[NO_2]_{total} = \{0.1 \times [NO_x]_{predicted}\} + MIN\{(0.9) \times [NO_x]_{predicted} \text{ or } (46/48) \times [O3]_{background}\} + [NO_2]_{background}$$

This modelling approach is deemed conservative as it assumes that the atmospheric reaction is instantaneous and ignores photolysis. In reality, the reaction might take place over a number of hours such that at the distances from the source at which maximum GLCs of NOx occur, the period of time following emission may not be sufficient for this reaction to occur fully. While the method is generally accepted to overestimate NO_2 formation, EPA Publication 1957 cautions that the OLM method will not be accepted by EPA unless with prior approval for specific circumstances. Publication 1957 provides no alternative method for estimating NO_2 concentrations from the NO_X concentrations, however.

Summary

This assessment employs the OLM with hourly varying NO_2 and O_3 concentration data from Morwell South AAQMS which at only approximately 3.3 km from the Project can be considered representative of the Project area.

5.6 Limitation, Uncertainties and Assumptions

The following limitations, uncertainties and assumptions apply to this assessment.

All atmospheric dispersion models, including AERMOD, represent a simplification of the many complex processes involved in the dispersion of pollutants in the atmosphere. To obtain quality results it is important that the most appropriate model is used and the quality of the input data (meteorological, terrain, source characteristics) is high.

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The main sources of uncertainty in dispersion models, and their effects, are discussed below:

- **Oversimplification of physics:** This can lead to both under-prediction and over-prediction of ground level pollutant concentrations. Uncertainties are greater in Gaussian plume models as they do not include the effects of non-steady-state meteorology (i.e., spatially- and temporally-varying meteorology).
- **Uncertainties in emission rates:** GLCs are proportional to the pollutant emission rate (excluding the effects of background air pollutant concentrations). In addition, most modelling studies assume constant worst-case emission levels or are based on the results of a small number of stack tests, however operations (and thus emissions) are often quite variable. Accurate measurement of emission rates and source parameters requires continuous monitoring.
- **Uncertainties in wind direction and wind speed:** Wind direction affects the direction of plume travel, while wind speed affects plume rise and dilution of plume. Uncertainties in these parameters can result in errors in the predicted distance from the source of the plume impact, and magnitude of that impact. In addition, aloft wind directions commonly differ from surface wind directions. The preference to use rugged meteorological instruments to reduce maintenance requirements also means that light winds are often not well characterised.
- **Uncertainties in mixing height:** If the plume elevation reaches 80% or more of the mixing height, more interaction will occur, and it becomes increasingly important to properly characterise the depth of the mixed layer as well as the strength of the upper air inversion.
- **Uncertainties in temperature:** Ambient temperature affects plume buoyancy, so inaccuracies in the temperature data can result in potential errors in the predicted distance from the source of the plume impact, and magnitude of that impact.
- **Uncertainties in stability estimates:** Gaussian plume models use estimates of stability class, and 3D models use explicit vertical profiles of temperature and wind (which are used directly or indirectly to estimate stability class for Gaussian models). In either case, uncertainties in these parameters can cause either under-prediction or over-prediction of GLCs. For example, if an error is made of one stability class, then the computed concentrations can be off by 50% or more.

The USEPA makes the following statement in its Modelling Guideline (US EPA 2005) on the relative accuracy of models:

Models are more reliable for estimating longer time-averaged concentrations than for estimating short-term concentrations at specific locations; and the models are reasonably reliable in estimating the magnitude of highest concentrations occurring sometime, somewhere within an area. For example, errors in highest estimated concentrations of ±10 to 40% are found to be typical, i.e., certainly well within the often-quoted factor-of-two accuracy that has long been recognised for these models. However, estimates of concentrations that occur at a specific time and site are poorly correlated with actually observed concentrations and are much less reliable."

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6.0 Impact Assessment Results

6.1 NO_2

The 99.9th percentile predicted 1-hour average NO_2 GLCs for the Project for between 4:00 pm and 7:00 pm, representing the typical expected times of facility operation on average, and worst-case 24-hour operation (every day of the year), at the most impacted sensitive receptor and commercial receptors are summarised in **Table 9**. The NO_2 GLCs are presented using method 3 (OLM), as discussed in **Section 5.5**. The APAC is predicted to be met at all sensitive and commercial receptor locations.

Table 9 Maximum Predicted 1-Hour Average OLM NO_2 GLCs at Sensitive and Commercial Receptors

Operation Scenario	GLC (µg/m³)				
	Project	Background		Project (OLM)	Cumulative [a]
	NO_X	NO_2	O_3	NO_2	NO_2
4:00 pm to 7:00 pm	230	30	40	61	91
Worst case 24-hour operation	789	11	44	122	133
				APAC	**150**

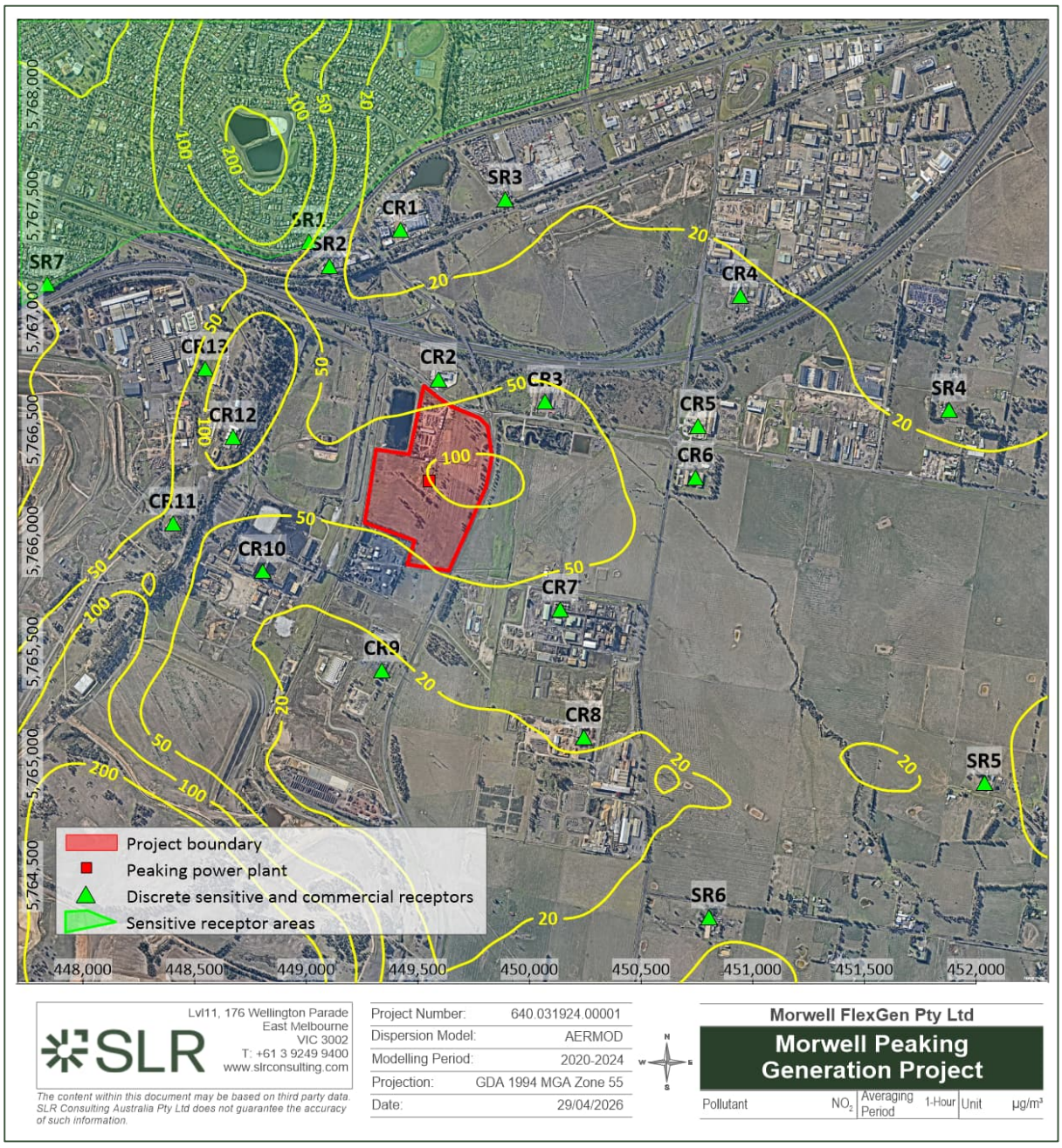
a 99.9th percentile

It is impractical to generate isopleths of the incremental maximum one-hour average NO_2 GLCs over the modelling domain using the method 3 (OLM) conversion. Instead, these are provided for the worst-case 24-hour operation in **Figure 13** using a NO_2/NO_x ratio of 30%. It is noted that these isopleths were calculated using the 100th percentile GLCs not 99.9th percentiles as presented in **Table 9**, which are assessable against the APAC.

For completeness, the corresponding predicted annual average GLCs are provided in **Figure 14** and indicate compliance with the annual average APAC of 28 µg/m³ across the domain.

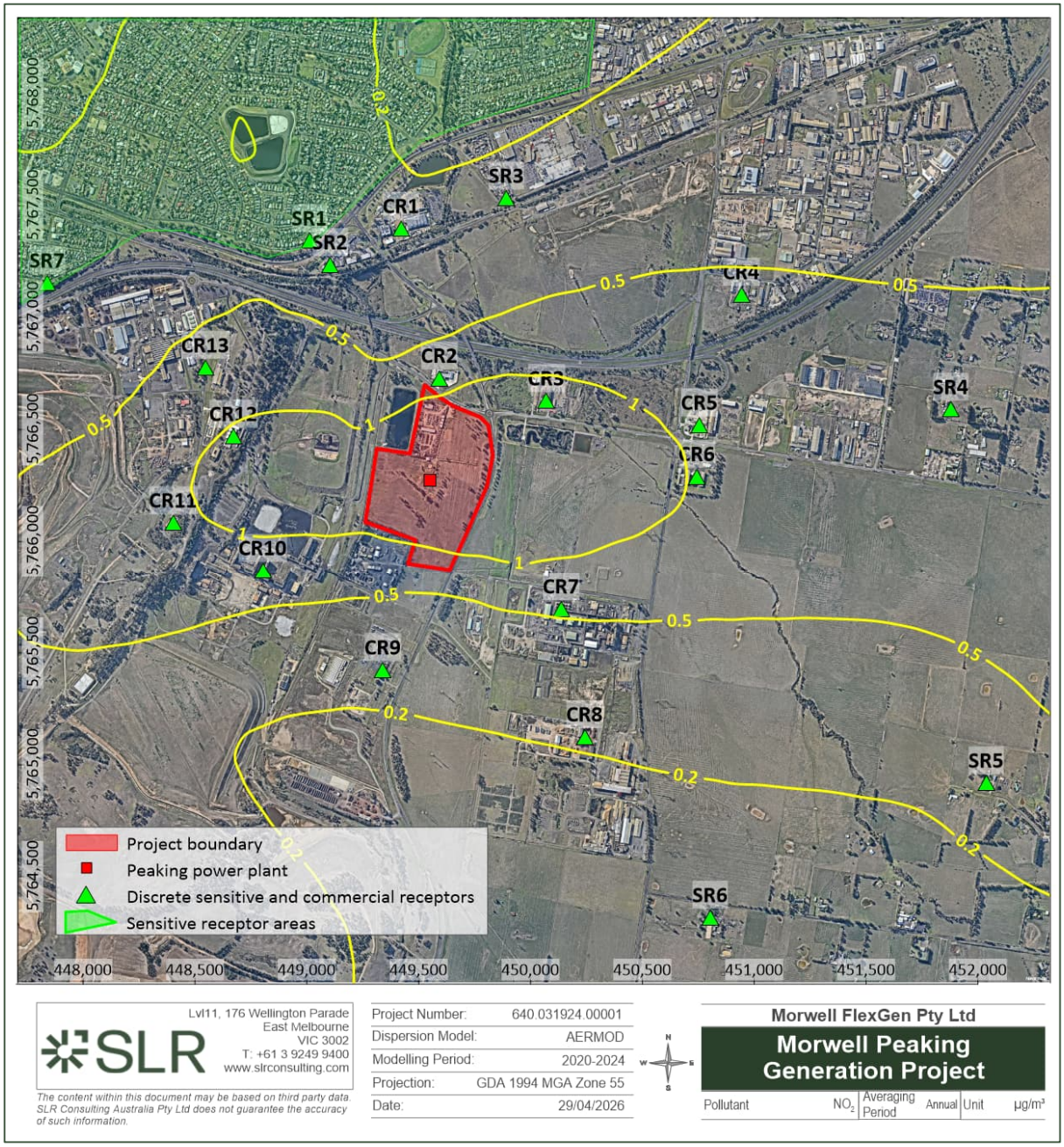
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Figure 13 Maximum Predicted 1-Hour Average NO_2 GLCs (24-Hour Operation; 30% NO_2:NO_X Ratio)



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Figure 14 Maximum Predicted Annual Average NO_2 GLCs (24-Hour Operation; 30% NO_2:NO_X Ratio)



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6.2 $PM_{2.5}$

The predicted 24-hour average $PM_{2.5}$ GLCs at a location representative of a sensitive receptor or commercial receptor resulting from the maximum predicted Project contribution to the GLCs are summarised in **Table 10**. The APAC is predicted to be met for the Project at locations representative of sensitive receptors for operation between 4:00 pm and 7:00 pm, representing the typical expected times of facility operation on average, and worst-case 24-hour operation (every day of the year).

Table 10 Maximum Predicted 24-Hour Average $PM_{2.5}$ GLCs at Sensitive Receptors

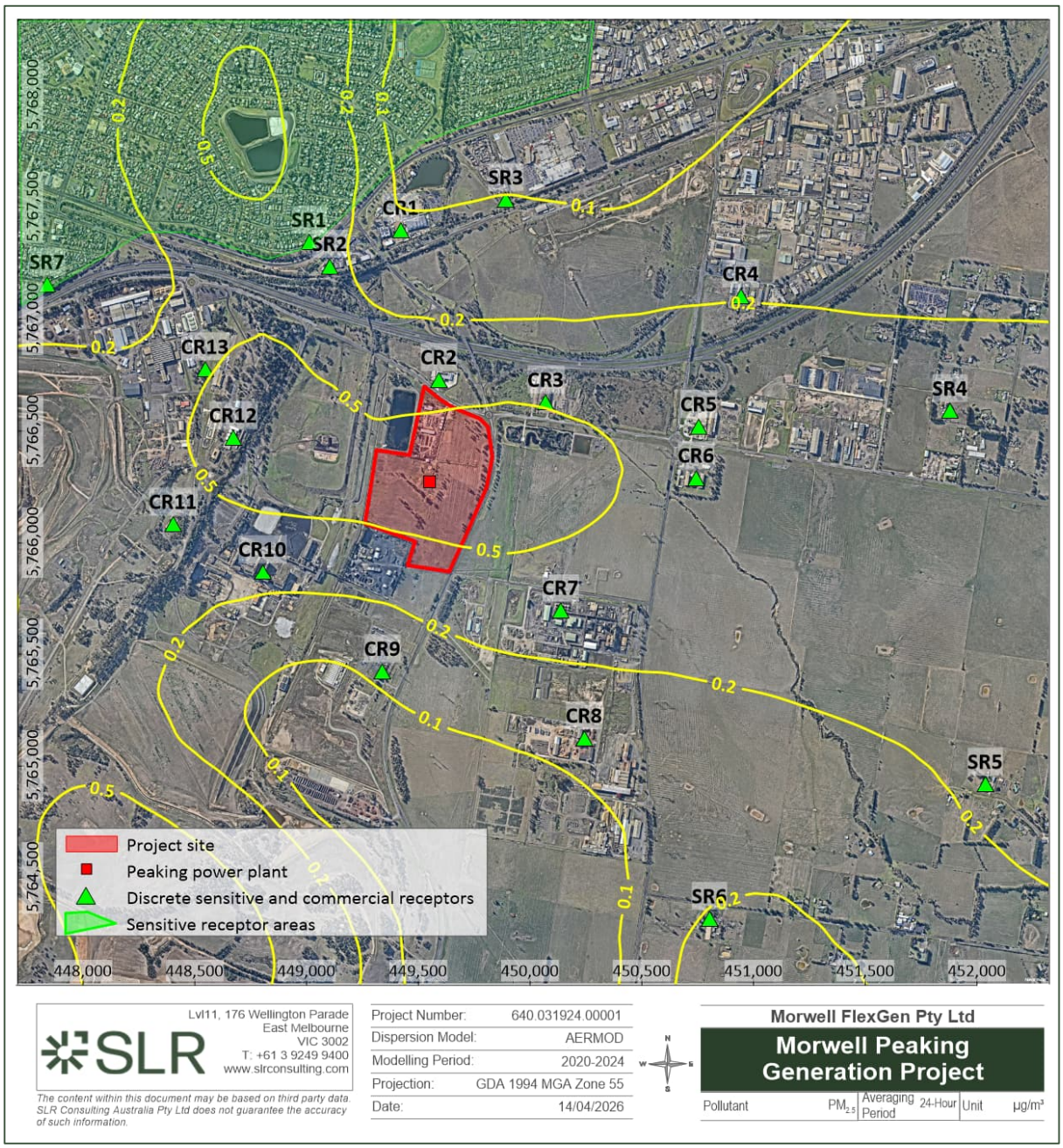
Operation Scenario	GLC (µg/m^3)		
	Project	Background	Cumulative
4:00 pm to 7:00 pm	0.4	14	14
Worst-case 24-hour operation	1.6	6.2	7.8
APAC			**25**

Isopleths of the incremental, maximum predicted 24-hour average $PM_{2.5}$ GLCs are provided in **Figure 15**, for the worst-case 24-hour operation.

For completeness, the corresponding predicted annual average GLCs are provided in **Figure 16** and indicate compliance with the annual average APAC of 8 µg/m^3 across the domain.

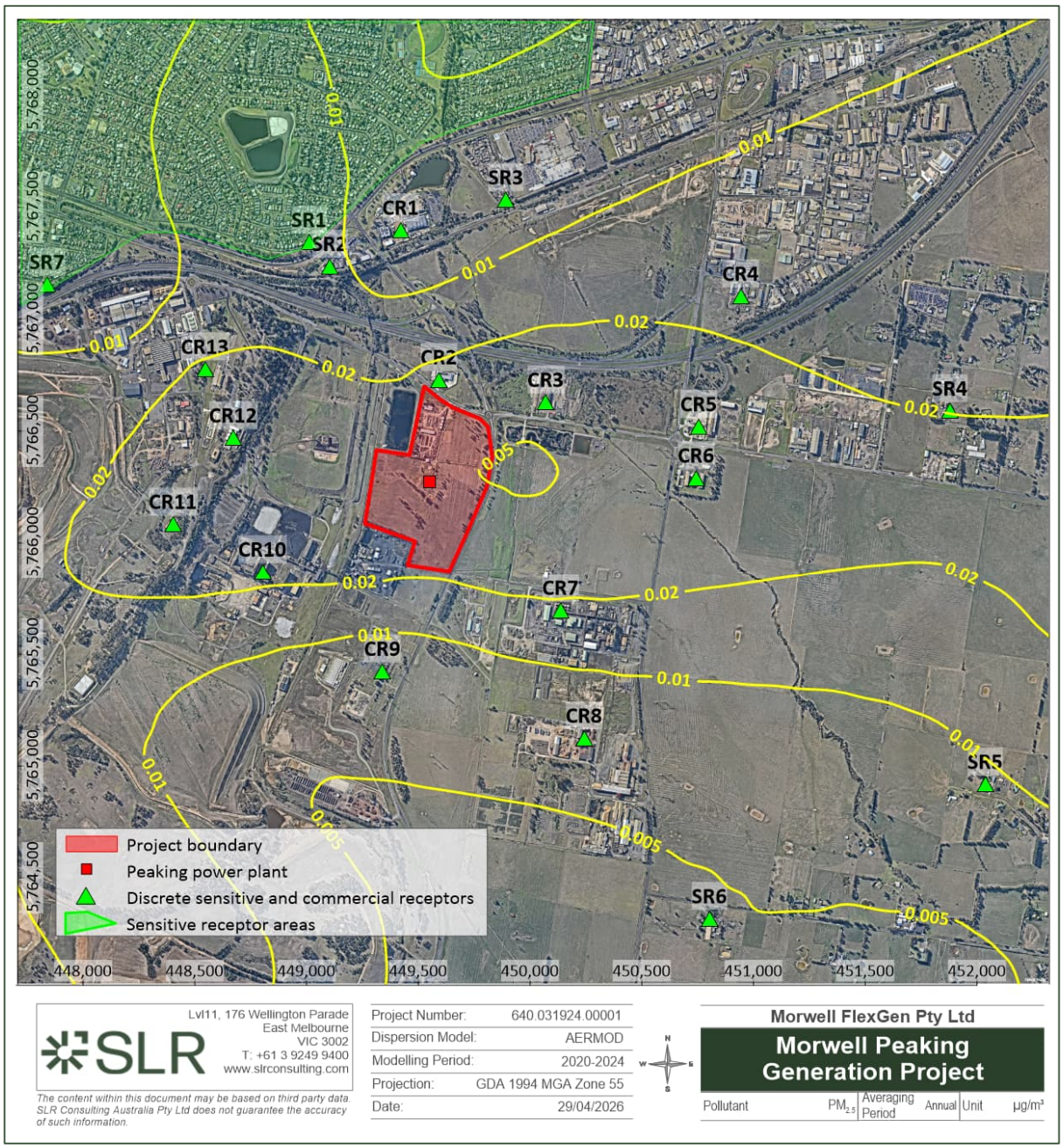
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Figure 15 Maximum Predicted 24-Hour Average $PM_{2.5}$ GLCs (24-Hour Operation)



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Figure 16 Maximum Predicted Annual Average $PM_{2.5}$ GLCs (24-Hour Operation)



7.0 Conclusions

The Project is predicted to meet the relevant APACs at sensitive receptor locations when conservatively assumed to be operating 24 hours per day, 365 days per year; i.e., equivalent to 8,760 hours per year. However, the Project will likely operate for only approximately 200 hours per year, and most of those hours will correspond to the period 4:00 pm to 7:00 pm. The predicted GLCs associated with these hours only, assuming 365 days per year operation, are reduced further below the relevant APACs.

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9.0 Feedback

At SLR, we are committed to delivering professional quality service to our clients. We are constantly looking for ways to improve the quality of our deliverables and our service to our clients. Client feedback is a valuable tool in helping us prioritise services and resources according to our client needs.

To achieve this, your feedback on the team’s performance, deliverables and service are valuable and SLR welcome all feedback via https://www.slrconsulting.com/en/feedback. We recognise the value of your time and we will make a $10 donation to our Charity Partner - Lifeline, for every completed form.

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Appendix A Meteorological Modelling

Air Quality Impact Assessment

Morwell Peaking Generation Project

Morwell FlexGen Pty Ltd

SLR Project No.: 640.031924.00001

19 August 2026

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TAPM

Prognostic models, such as The Air Pollution Model (TAPM), solve the equations of atmospheric dynamics to produce physically realistic three-dimensional meteorological fields, such as wind, temperature, humidity, surface fluxes and boundary-layer structure. They are the models used in weather forecasting and climate research, and as a basis for dispersion modelling. Data from local climate stations are optional and local flows arise through the dynamic forcing simulated by the computational model. Larger-scale fields (up to global scale) are required for their initialization and ongoing boundary updates.

TAPM (Version 4.0) was used to generate synthetic meteorological data sets, which were then processed in AERMET to create the surface and profile meteorology data sets used by AERMOD. TAPM is a model developed at Commonwealth Scientific and Industrial Research Organisation (CSIRO) Marine and Atmospheric Research which is widely used throughout Australia for this purpose and is recognised by state regulatory authorities.

TAPM was run for the years 2020-2024 without using observational data to nudge the model.

TAPM was initially configured with a nested model grid coverage designed to capture, broad scale synoptic flows, regional and broader scale sea breezes and land breezes, regional and broader wind channelling around terrain features and influence of land use.

The parameters used for the model runs are provided in **Table A1**, and apply to the meteorological component of TAPM. The parameters are in accordance with EPAV (2025b). The pollution dispersion components of TAPM have not been used. For all other input parameters default values were used.

Table A1 TAPM Configuration Parameters

Parameter	Value
Start and end dates	31 December 2019 – 31 December 2024
Grid Centre (Lat/Long, WGS84)	38°15'S, 146°25.5'E
Grid Centre (UTM Co-ordinates [m])	(449,688; 5,766,290) UTM zone 55
No. of grids	4
No. of horizontal grid points	41 x 41
Horizontal grid spacing	10 km, 3 km, 1 km, 0.3 km
No. of vertical levels	25 (up to 8,000 m)
Monthly deep-soil moisture content (12 values)	0.15 m^3/m^3 (model default)
Topography	TAPM datasets
Vegetation and land use	TAPM datasets
Surface vegetation and precipitation processes	Included
Snow processes and non-hydrostatic processes	Excluded
Data assimilation	None

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A1.1 Model Data Validation – Morwell AWS

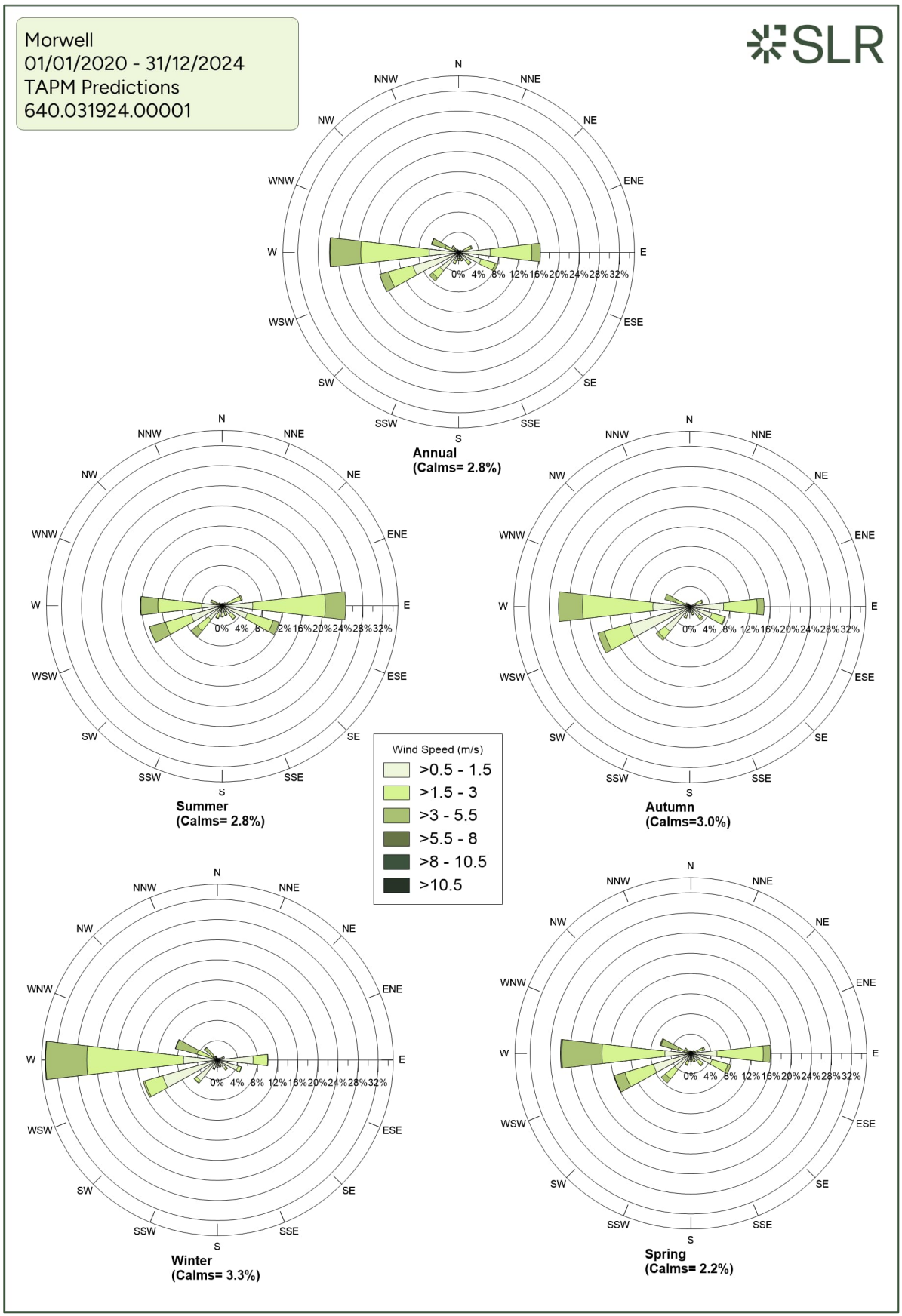
Wind Speed and Wind Direction

To provide confidence in the site representative meteorological dataset generated using TAPM, meteorological data representative of the location of Morwell AWS, approximately 6 km northwest of the Project, was generated then compared with the observational data recorded at Morwell AWS for validation purposes.

Modelled and observed wind data at the Morwell for the years 2020-2024 are presented as annual and seasonal wind roses in **Figure A1** and **Figure A2**, respectively. The wind roses suggest that the TAPM-predicted wind directions match the observed data reasonably well, with both indicating that winds from the west are predominant, with all seasons having similar distributions. The predicted windspeeds appear to be significantly lower than those observed, however, and TAPM tends to underpredict the observed southwesterly winds.

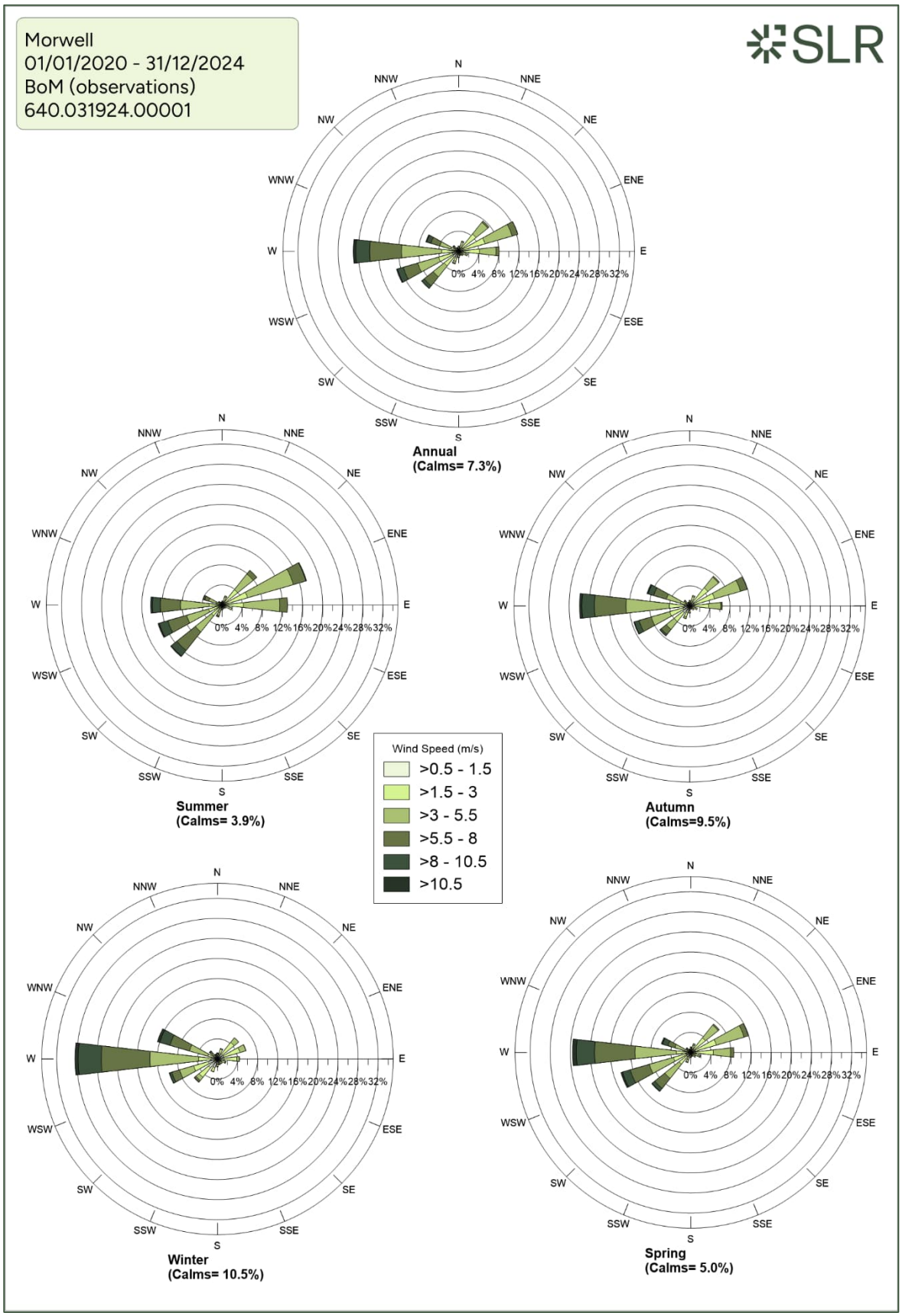
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Figure A1 Modelled Wind Data – Morwell AWS 2020-2024



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Figure A2 Observed Wind Data – Morwell AWS 2020-2024



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Table A2 provides a summary of the model performance statistics, while **Figure A3** and **Figure A4** present the observed and predicted wind speed and wind direction frequencies, respectively. The TAPM predictions generally under-predict the wind speeds and could therefore be considered conservative for modelling purposes.

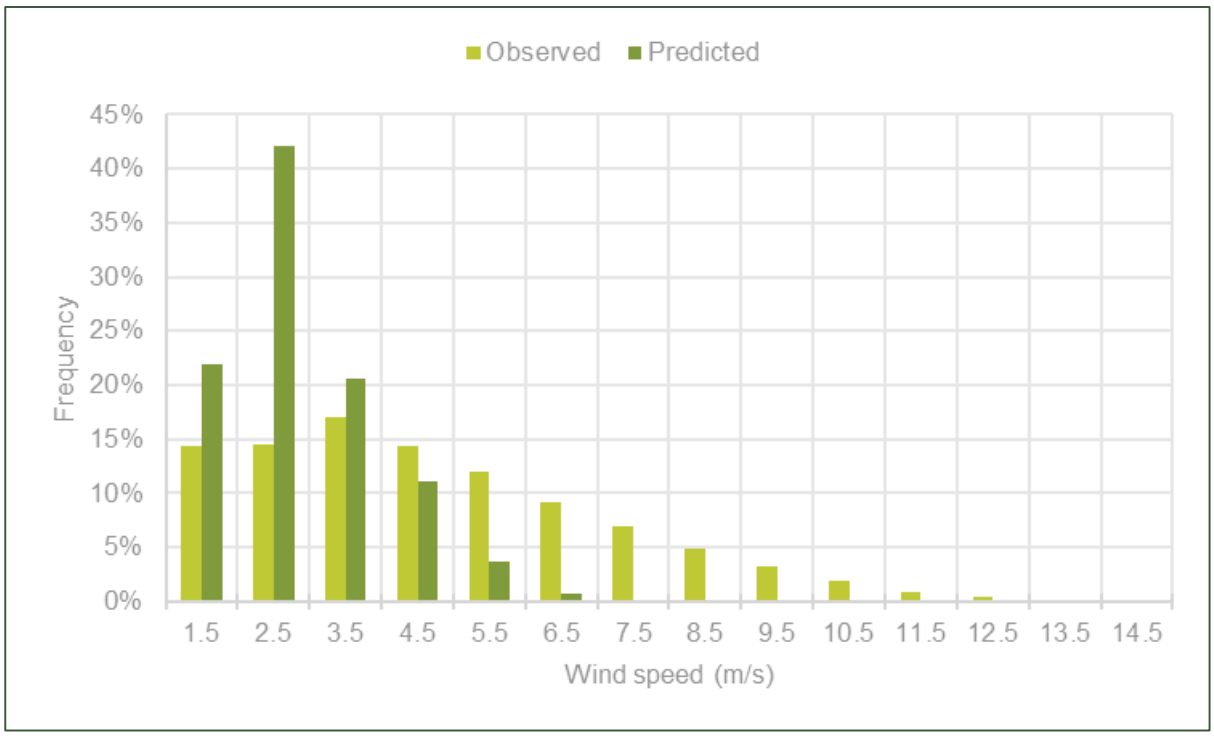
Table A2 Model Performance Statistics

Parameter	Statistic	Observed	Predicted
Windspeed	Mean	3.7	1.9
	Standard deviation	2.5	1.1
	Index of agreement [a]	0.63	
Wind direction	Index of agreement [a]	0.79	

a The index of agreement (IOA) is a measure of the overall agreement between modelled and observed time series. It ranges between zero for no agreement and 1 if the two time series are identical. The IOA shows no agreement if the time series are different by orders of magnitude, even if they happen to be correlated, and hence is a more stringent measure of performance than the correlation coefficient. IOAs of 0.7 - 0.8 are considered to indicate good dispersion model performance.

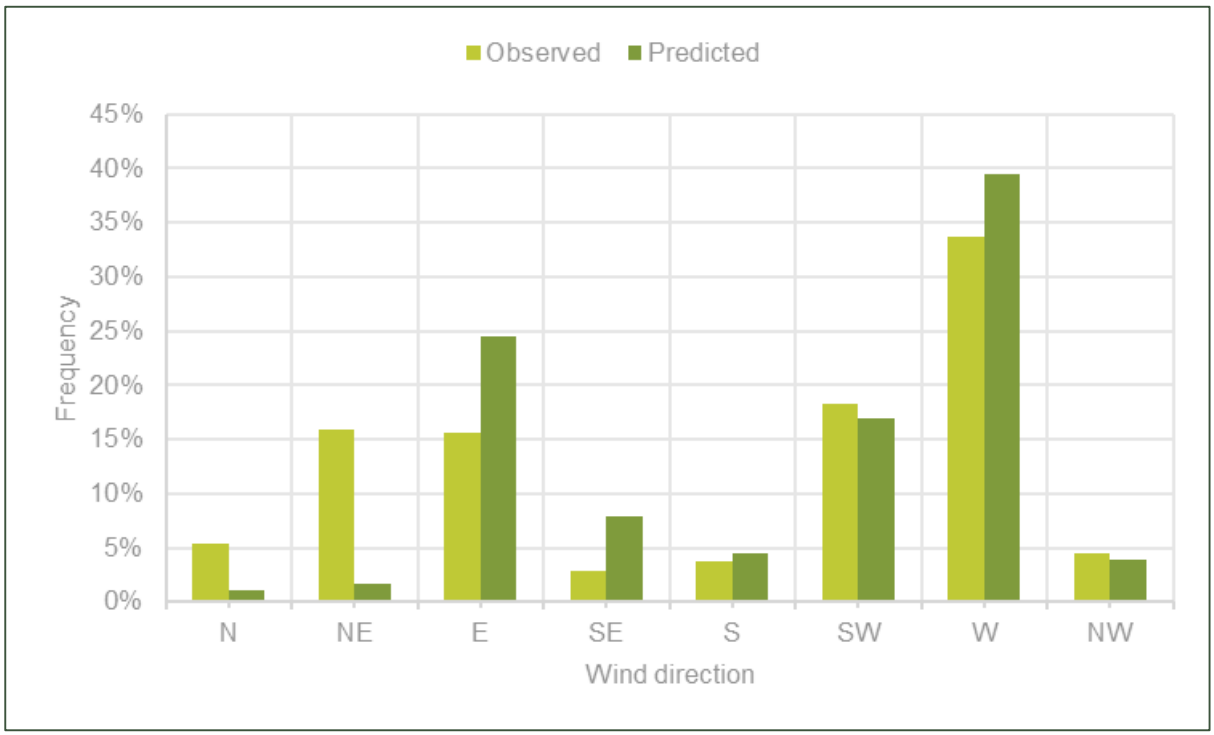
b Scalar mean.

Figure A3 Wind Speed Frequency Comparison



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Figure A4 Wind Direction Frequency Comparison



Overall, the TAPM predictions are concluded to adequately represent the observed wind directions recorded by the Morwell AWS, but underpredict the windspeeds. Airport BoM AWS generally have elevated windspeeds being usually being clear of dense buildings and trees found in more residential areas, which TAPM has not successfully replicated here.

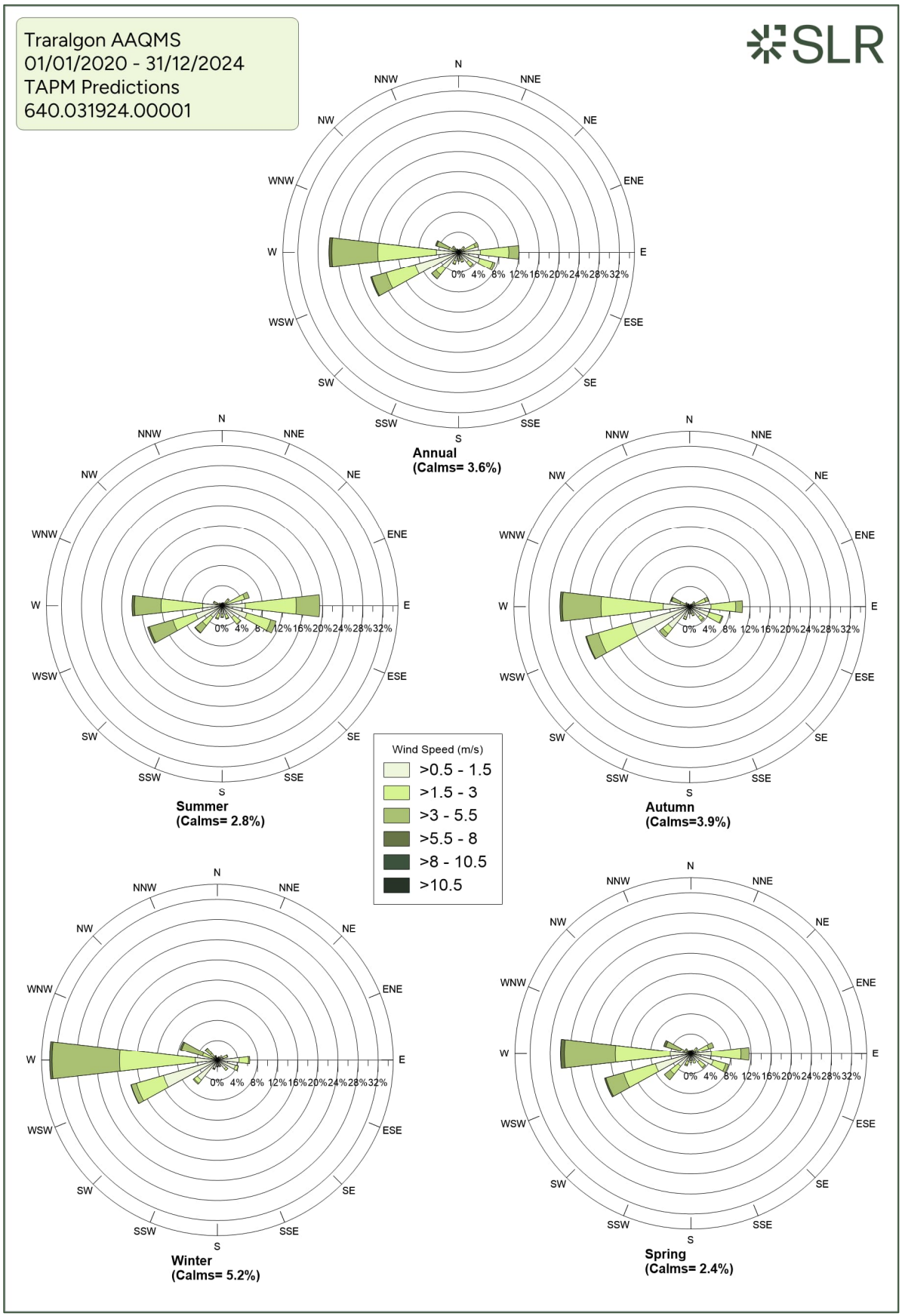
A1.2 Model Data Validation – Morwell AWS

Given the apparent inconsistency between the predicted and observed windspeeds at Morwell AWS, the comparison is repeated for Traralgon AAQMS, approximately 11 km northeast of the Project.

Modelled and observed wind data at the Traralgon AAQMS for the years 2020-2024 are presented as annual and seasonal wind roses in **Figure A5** and **Figure A6**, respectively. The wind roses suggest that the TAPM solution wind directions match the observed data reasonably well, with both indicating that winds from the west are predominant, with all seasons having similar distributions. As with the Morwell AWS predictions, TAPM again tends to underpredict the observed southwesterly winds.

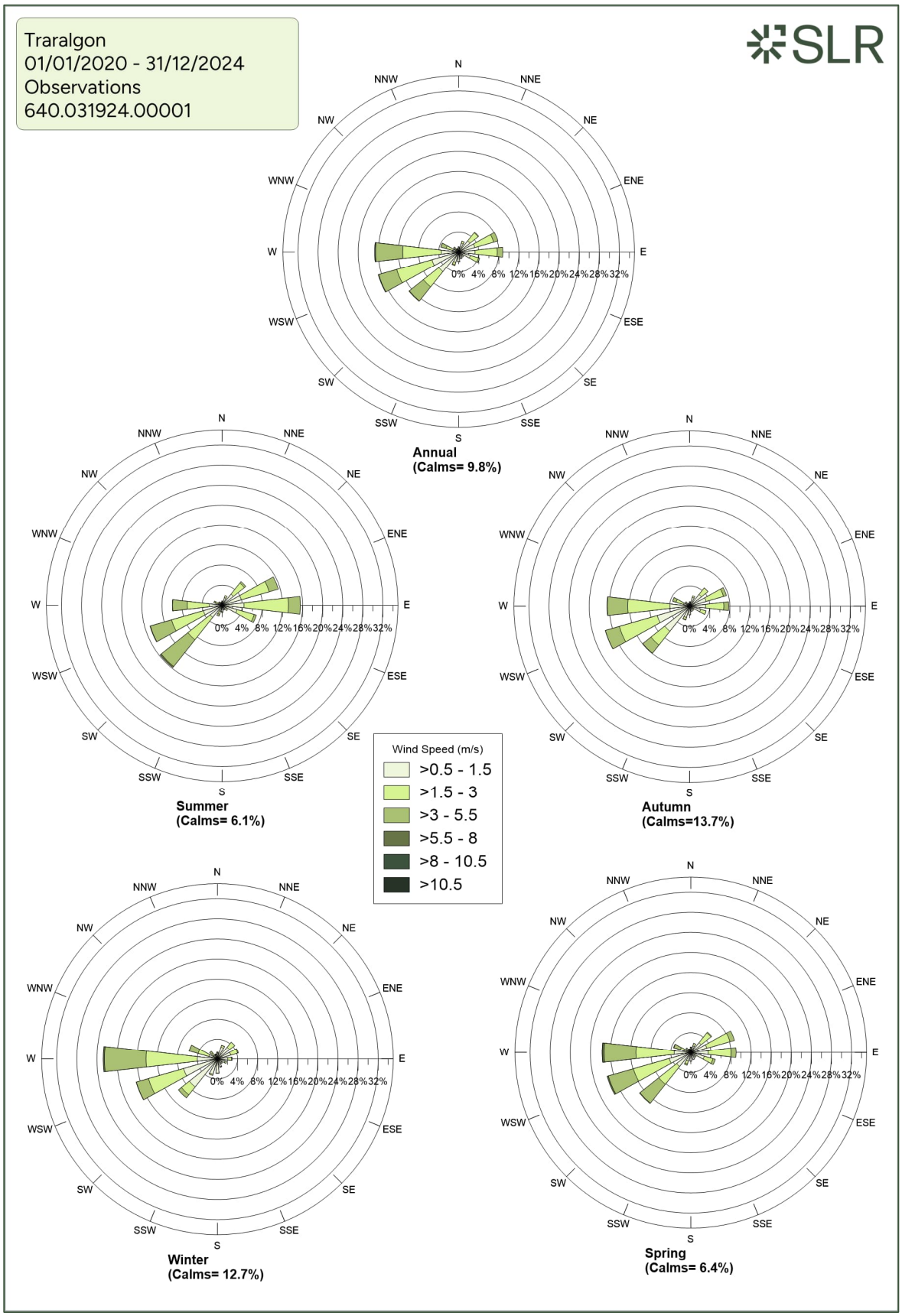
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Figure A5 Modelled Wind Data – Traralgon AAQMS 2020-2024



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Figure A6 Observed Wind Data – Traralgon AAQMS 2020-2024



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Table A2 provides a summary of the model performance statistics, while **Figure A3** and **Figure A4** present the observed and predicted wind speed and wind direction frequencies, respectively. The TAPM predictions generally under-predict the wind speeds and could therefore be considered conservative for modelling purposes.

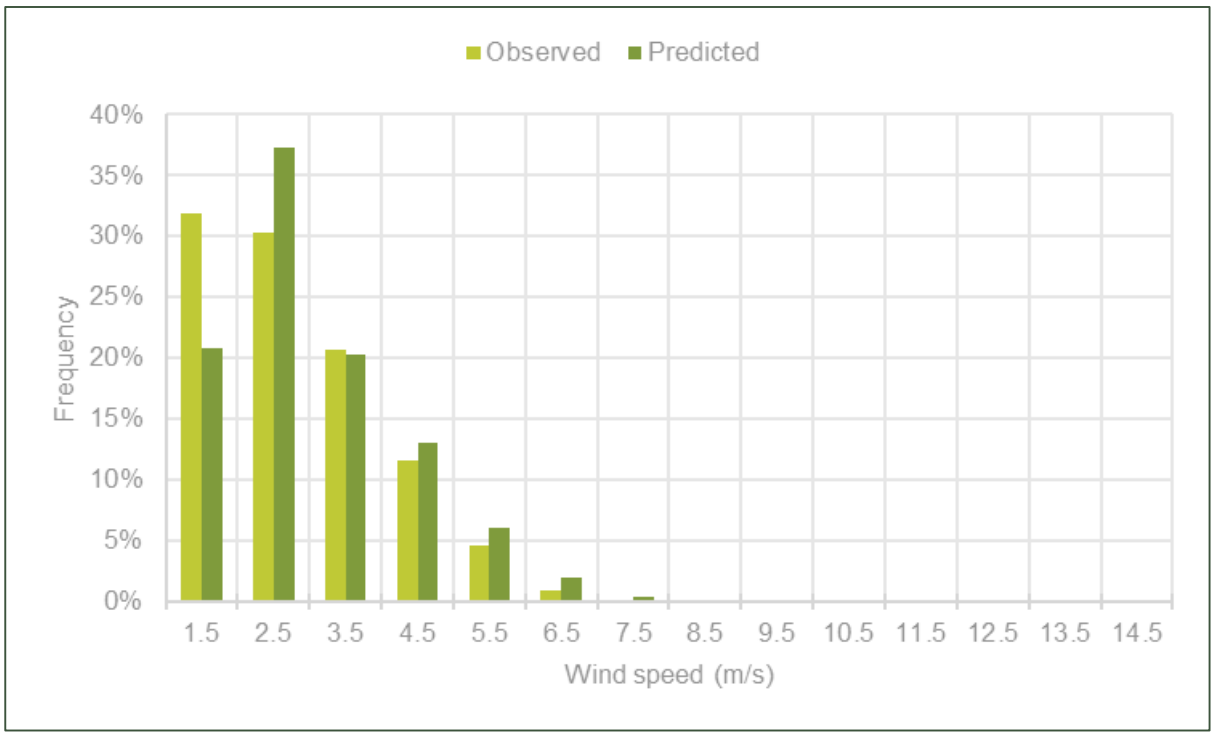
Table A3 Model Performance Statistics

Parameter	Statistic	Observed	Predicted
Windspeed	Mean	1.8	2.1
	Standard deviation	1.2	1.2
	Index of agreement [a]	0.86	
Wind direction	Index of agreement [a]	0.80	

a The index of agreement (IOA) is a measure of the overall agreement between modelled and observed time series. It ranges between zero for no agreement and 1 if the two time series are identical. The IOA shows no agreement if the time series are different by orders of magnitude, even if they happen to be correlated, and hence is a more stringent measure of performance than the correlation coefficient. IOAs of 0.7 - 0.8 are considered to indicate good dispersion model performance.

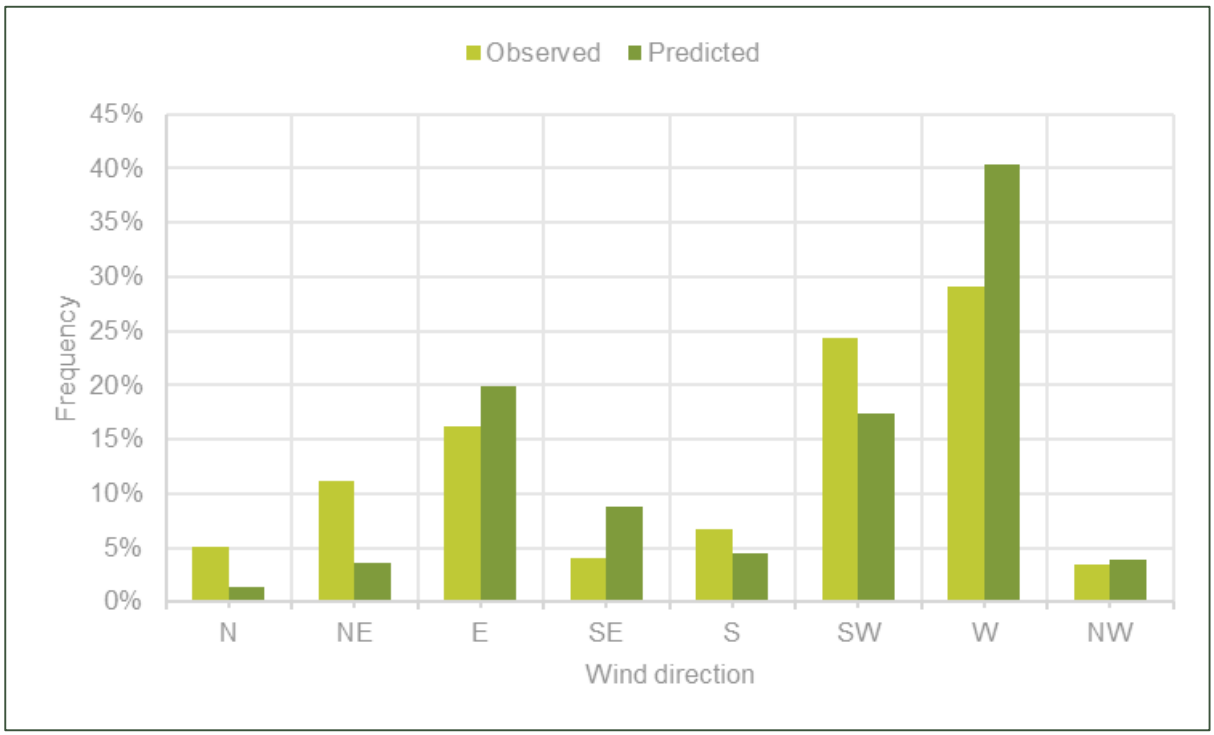
b Scalar mean.

Figure A7 Wind Speed Frequency Comparison



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Figure A8 Wind Direction Frequency Comparison



Overall, the TAPM predictions are concluded to represent the observed wind directions and wind speeds recorded by the Traralgon AAQMS.

A.1.3 Summary

Given the performance demonstrated at Morwell AWS and Traralgon AAQMS, it is expected that the TAPM solutions extracted at the Project are likely to be a reasonable representation of the conditions experienced at that location, perhaps with lower windspeeds predicted, which would generally lead to a more conservative modelling assessment (reduced dispersion).

A.2 Project Site Representative Meteorological Data

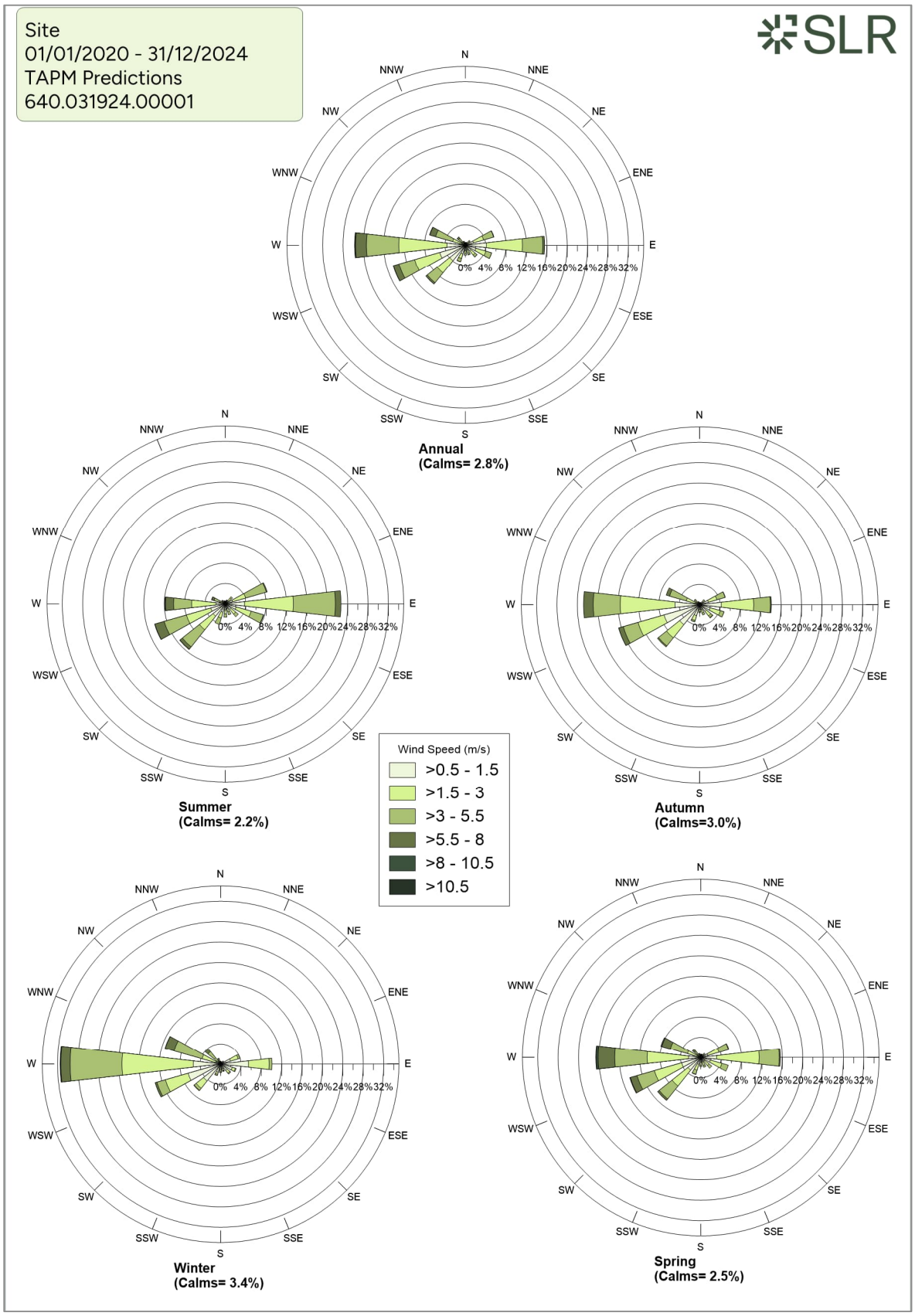
This section presents a summary of the key meteorological conditions predicted by TAPM and AERMET at the Project site.

A.2.1 Wind Speed and Direction

A summary of the annual wind behaviour predicted by TAPM for the Project site is presented in **Figure A9.** Based on the model predictions, the site experiences predominantly from the west, with all seasons having similar distributions. Calm (less than 0.5 m/s) conditions are predicted average 2.1% of the time.

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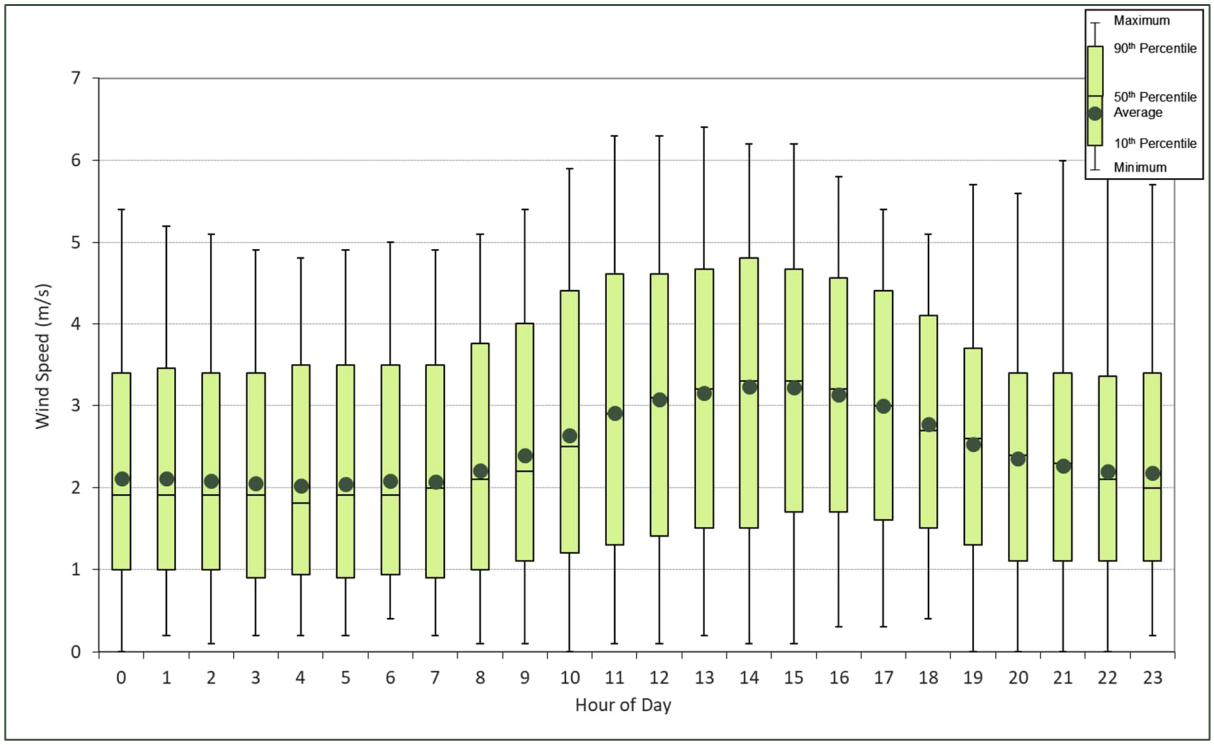
Figure A9 Wind Roses for the Project Site, as Predicted by TAPM



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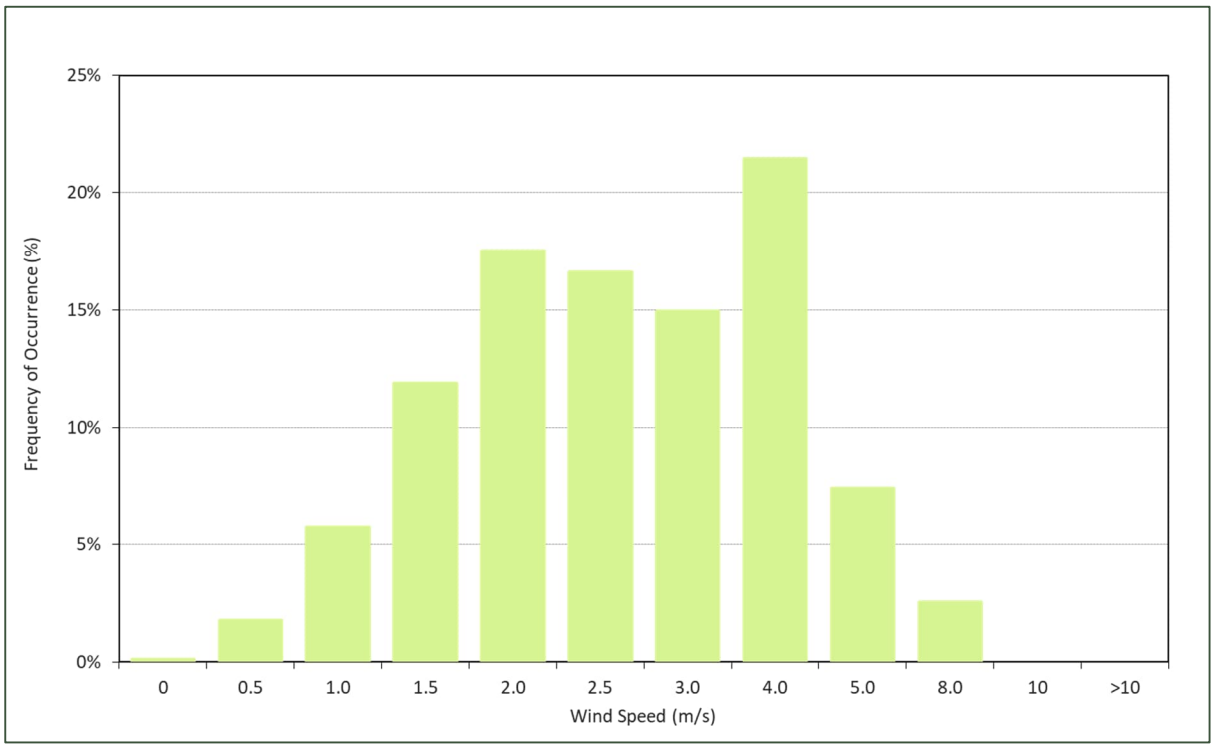
The diurnal variations in maximum and average wind speed predicted by TAPM at the Project are illustrated in **Figure A10.** Wind speeds during the day are greater due to convective forcing. The frequency of wind speeds predicted by TAPM at the Project are illustrated in **Figure A11**. Wind speed determines both the distance of downwind transport and the rate of dilution as a result of 'plume' stretching. In general, higher wind speeds promote dispersion and result in lower pollutant GLCs.

Figure A10 Predicted Diurnal Variation in Wind Speed for the Project (2020-2024)



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Figure A11 **Predicted Wind Speed Frequency for the Project (2024-2024)**

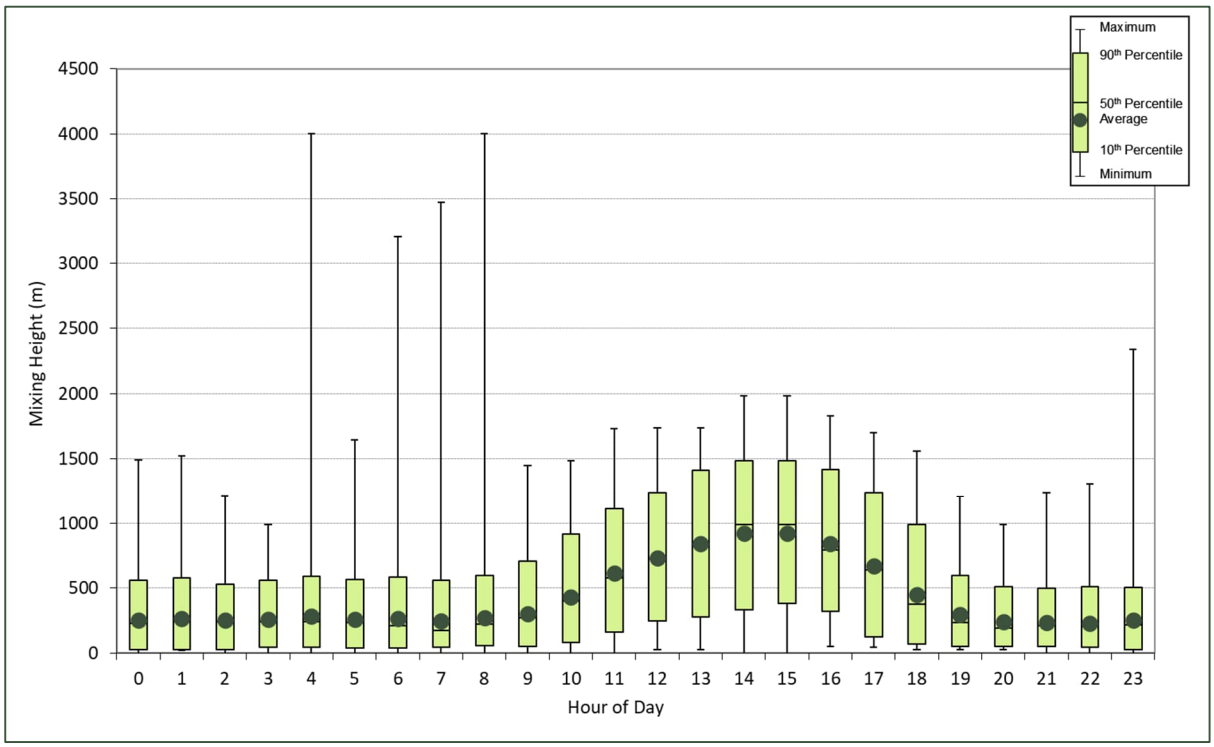


A.2.2 Mixing Height

The diurnal variations in maximum and average mixing depths predicted by AERMET at the Project are illustrated in **Figure A12.** An increase in the mixing depth during the morning is apparent, arising due to the onset of vertical mixing following sunrise. The maximum average mixing heights occur in the early to mid-afternoon, then begin to decrease due to the dissipation of ground-based temperature inversions and the growth of the convective mixing layer.

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Figure A12 AERMET Predicted Diurnal Variation in Mixing Height for the Project (2020-2024)



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Appendix B Engine Emission Data Sheets

Air Quality Impact Assessment

Morwell Peaking Generation Project

Morwell FlexGen Pty Ltd

SLR Project No.: 640.031924.00001

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