Western Renewables Link

TECHNICAL REPORT

I Air Quality Impact Assessment

Western Renewables Link
EES Technical Report I

Air Quality Impact Assessment

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AusNet Transmission Group Pty Ltd

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Contents

Tables

Figures

Glossary

Item	Description
Ambient Air Quality	Condition of background air quality
AQMS	Air quality monitoring station
Area of Interest	The Area of Interest is the broad geographical area between Bulgana and Sydenham investigated to understand the constraints and opportunities to identify corridors for further investigation to inform the selection of the single corridor and Proposed Route.
AusNet	AusNet Transmission Group Pty Ltd
AWS	Automatic weather station
BoM	Bureau of Meteorology
CCBD Guide	Civil Construction, Building and Demolition Guide, EPA (2023).
CO	Carbon monoxide
Construction Footprint	The Construction Footprint is indicative and contained within the Project Area and encompasses the land required to facilitate construction of the Project, including the vegetation removal required to achieve the operational safety clearance zone for the transmission line. The construction footprint includes: - Access tracks (both temporary and permanent) - Distribution line crossovers - Stringing pads - Temporary hurdle locations, including the installation of stay blocks, poles, cross beams and protective netting - The existing Bulgana, Sydenham and Elaine terminal station sites - The new 500 kV terminal station near Bulgana - The intermediate laydown areas located near Lexton and Ballan - The laydown areas required at the existing Bulgana and Sydenham Terminal Stations and the new 500kV terminal station near Bulgana - Tower assembly areas - Vegetation clearance required to maintain safe clearances and fuel load requirements around transmission line infrastructure. - Workforce accommodation facilities.
Data Vic	Website for downloading EPA data - https://www.data.vic.gov.au/
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DEECA	Victorian Department of Energy, Environment and Climate Action
DTP	Victorian Department of Transport and Planning
Dust soiling	Deposited dust from activities leading to the soiling of surfaces and associated nuisance effects
EP Act	*Environment Protection Act 2017* as amended by the *Environment Protection Amendment Act 2018*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EES	Environment Effects Statement
EPA	Environment Protection Authority Victoria
EPRs	Environmental Performance Requirements
ERS	Environment Reference Standard (released 14 December 2020).

Item	Description
Exceptional event	NEPM(AAQ) defined as fire or dust occurrence related to bushfire, jurisdiction authorised hazard reduction burning, or continental scale windblown dust
GED	General Environmental Duty
kPa	kiloPascal (unit of pressure)
kV	kilovolt
µg/m^3	Microgram per cubic metre
µm	Micrometre (one millionth of one metre)
NEPC	National Environment Protection Council
NEPM(AAQ)	National Environment Protection Measure for Ambient Air Quality
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
Operational Footprint	The Operational Footprint is indicative and contained within the Project Area and encompasses the land proposed to be used for operational and maintenance purposes for the Project. The Operational Footprint includes: - Indicative location of the transmission line easement, - Any permanent access tracks. - Terminal stations The proposed transmission line easement may be subject to refinement within the Proposed Route based on the findings of the EES, and landholder engagement.
PFAS	Per- and polyFluoroAlkyl Substances
Potential impact	Initial unmitigated and residual potential impacts classified as follows in-line with EPA's 'Publication 1943: Guidance for assessing nuisance dust': - 'Low': Dust impacts are not likely - 'Moderate': Dust impacts only likely to occur on rare occasions - 'Medium': Dust impacts likely - 'High': Dust impacts highly likely to occur - 'Very high': Dust impacts almost certain. Further detail in relation to expected impacts for each relevant classification is provided in **Section 7** to **Section 9** of the report.
Principal Contractor	During the construction stage, there will be multiple principal contractors and sub-contractors involved in the delivery of the different project components. This EES refers to Principal Contractor as a catch all term for the contractor responsible for the works.
Project Area	The Project Area encompasses all areas that would be used to support the construction and operational components of the Project considered in the EES. The Project Area is contained within the Project Land and encompasses the following: ▪ Permanent infrastructure: - Transmission tower structures - Upgrade and connection to the Bulgana Terminal Station - Connection to the Sydenham Terminal Station - An upgrade of Elaine Terminal Station - The new 500kV terminal station near Bulgana

Item	Description
	- Access tracks required for operation ▪ Temporary construction areas and infrastructure: - Distribution line crossovers - Hurdles - Laydown areas - Stringing pads - Access tracks - Tower assembly areas - Workforce accommodation facilities.
Project Land	The Project Land encompasses all land parcels that could be used for the purpose of temporary Project construction and permanent operational components. The Project Land corresponds with the extent of the Specific Controls Overlay proposed in the draft Planning Scheme Amendment for the Project. This generally includes the entire land parcel intersected by a Project component.
Proposed Route	The Proposed Route is approximately 100 to 170m wide and encompasses the nominal future easement for the proposed new transmission line (including a buffer either side), and the terminal station areas. The Proposed Route is located within the Project Area.
PSP	Precinct Structure Plan
$PM_{2.5}$	Particulate matter less than 2.5 micrometres equivalent aerodynamic diameter
$PM_{2.5-10}$	Fraction of PM_{10} that is greater than 2.5 micrometres equivalent aerodynamic diameter (less than 10 micrometres equivalent aerodynamic diameter)
PM_{10}	Particulate matter less than 10 micrometres equivalent aerodynamic diameter
ppm	Parts per million
ppb	Parts per billion
SO_2	Sulfur dioxide
Study area	The 'study area' for this assessment refers to the Project Area with a 500m buffer applied.
TSP	Total suspended particulate
UK IAQM	United Kingdom Institute of Air Quality Management
VLR	Victorian Landfill Register
VOC	Volatile organic compound
500kV	500kV transmission line

Executive summary

The Western Renewables Link (the Project) proposes a new transmission line starting at Bulgana, near Stawell in Victoria's west, and extending approximately 190km to Sydenham in Melbourne's north-west. The Project will enable the connection of new renewable energy generated in western Victoria into the National Electricity Market and increase the Victorian transmission capacity. The Project is being delivered by AusNet Transmission Group Pty Ltd (AusNet).

This Air Quality Impact Assessment forms part of the Environment Effects Statement (EES) prepared for the Project in accordance with the *Environment Effects Act 1978*. This report and the methodology applied in preparing this report, responds to the requirements set out in the EES scoping requirements, with a view to assessing air quality issues, including any potential changes to the existing air quality environment within the 'study area' developed around the Project Area.

The study area for the assessment is the Project Area with a 500m buffer applied. This 500m buffer is consistent with guidance presented in Section 6 of 'Guidance on the assessment of dust from demolition and construction Version 2.2', (UK IAQM, 2024) which identifies that when there are no sensitive receptors within 500m the risk of impacts from construction activities would be 'negligible' and that any effects 'would not be significant'. This guidance is consistent with Section 3.2 of Environment Protection Authority Victoria's (EPA's) 'Publication 1943: Guidance for assessing nuisance dust' from which the primary impact methodology applied in the assessment is adopted.

Overview

The assessment has been based on a review of applicable legislation, policy and guidelines, characterisation of the existing conditions, identification of construction, operation and decommissioning impacts, evaluation of the significance of impacts, and recommendation of Environmental Performance Requirements (EPRs).

The primary legislation underpinning this assessment is the *Environment Protection Act 2017* (Environment Protection Act) and the subordinate legislation established under this Act. The cornerstone of the legislation is the General Environmental Duty (GED). The GED requires anyone conducting an activity that poses risks of harm to human health and the environment from pollution or waste to minimise those risks, so far as reasonably practicable.

'Reasonably practicable' means putting in controls that are proportionate to the risk. If eliminating the risk of harm is not reasonably practicable, then the risk of harm must be reduced so far as reasonably practicable. Recommended mitigation measures and EPRs for the Project presented in this impact assessment have been developed to meet the GED using reasonably practicable avoidance or mitigation measures for air quality effects.

The Environment Reference Standard (ERS) identifies environmental values the Victorian community wants to achieve and maintain. An ERS is not a compliance standard which a duty holder must achieve but is intended to inform planning decisions. The ERS defines the environmental values, indicators and objectives of the ambient air environment.

The EPA 'Publication 1961: Guideline for assessing and minimising air pollution in Victoria' provides a framework to assess and control risks associated with air pollution. This air quality impact assessment has been undertaken in accordance with the guidance and structure established by Publication 1961. The EPA has also released 'Publication 1834.1: the Civil Construction, Building and Demolition Guide' (CCBD Guide) which provides an overview of the new duties under the *Environment Protection Act*, and the controls or mitigation measures that can be implemented to manage risk associated with dust emissions. This has been an important reference in determining the measures required to meet the GED.

The key potential air quality issue for the Project was identified as particulate matter (i.e., dust) with potential emissions arising most significantly during construction and decommissioning works. Other identified and less significant air quality issues included exhaust emissions from combustion of fossil fuels in Project plant and equipment, and odours and other airborne hazards resulting from the handling of potentially contaminated materials and groundwater.

The EPA's 'Publication 1943: Guidance for assessing nuisance dust' method was used to identify the overall unmitigated potential dust impacts of the Project and the corresponding and appropriate management measures. Four steps of assessment were applied with the intended outcome of developing suitable mitigation measures to avoid any potential nuisance and human health impacts from Project emissions. Potential impacts associated with other air quality-related issues including exhaust emissions from plant and equipment, and odours, fumes and airborne hazards resulting from uncovered contaminated materials and groundwater were assessed qualitatively.

Existing conditions

A detailed review of the existing environment was carried out including an analysis of historically measured concentrations of key air quality indicators. There are no specific air quality monitoring stations near or within the Project Area. Existing air quality conditions were therefore characterised using data from EPA monitoring stations located in similar rural environments.

A review of the background air quality conditions showed that:

- There is one limited (compliance) air quality monitoring station (AQMS) near the Project Area at Melton, but background air quality concentrations for around Sydenham can be approximated using observations from the EPA AQMS in Geelong.
- Background air quality over most of the Project Area will be better (i.e., lower pollutant concentrations) than around Sydenham, due to being in rural areas with low population density and low vehicle traffic. However, occasional dust storms and bushfires will still affect background air quality across the 'study area'.

A review of local sources of pollutants showed that:

- The pollutants that would potentially be discharged into air from the Project can also be discharged into air every day from other industrial activities, such as manufacturing sites, energy generation and extractive industries including quarries and mining. The only such sites that have been identified as potentially interacting with the Project are the Boral, Hanson and Barro Group quarries north of Bacchus Marsh and the Rockbank Quarry west of the Sydenham Terminal Station.
- The Project Area contains mostly rural land; some of which is intensively farmed, and some which covers larger and less intensive grazing properties. Local sources of dust emissions therefore may arise from this land, particularly in drier months of the year and when wind speeds are high. The dust erosion potential will vary throughout the year and will depend on the extent of vegetation cover, topsoil moisture content, and the type of farming carried out on the land (for example tilling or harvesting activities).
- Local unsealed roads are also a source of dust emissions, both when vehicles are moving on the roads and when the roads are empty. The dust emission potential again will depend on surface moisture content and compaction, wind speed and direction, and vehicle weights.

Various current and planned future local projects were also identified. The potential for impacts from these projects was also considered as part of the cumulative assessment completed as part of the study.

A review of aerial imagery and land-use information was completed to identify sensitive receptors in and around the 'study area' developed for the assessment. Prevailing local meteorological conditions (and features such as terrain which can influence these conditions) were also reviewed to understand locations that may be at higher risk of exposure to emissions to air arising from Project activities, as well as to help inform environmental management and monitoring recommendations.

The sensitivity of the receiving environment around different portions of the Project was evaluated in-line with Publication 1943. In classifying the sensitivity of the surrounding environment, the methodology considers the nature (type, proximity, orientation and intervening conditions) of surrounding land-use as well as existing conditions. Using this approach, higher levels of sensitivity were identified around the portion of the transmission line east of Allendale to Sydenham Terminal Station. For these locations there was a higher density of and /or

more proximal nearby sensitive receivers, with many located downwind of the Project for the prevailing local winds.

Impact assessment key findings

Potential dust impacts of the Project were assessed using the semi-quantitative method developed by the EPA in Publication 1943. This method assesses the risk posted by nuisance dust by considering three elements:

- The hazard potential of dust sources. This is evaluated based on the size, nature of activities, type of emissions generated and level of control.
- The exposure pathway between the source and receiving environment. The framework considers the separation distance, orientation, and intervening terrain and land uses features between the activity or project and the surrounding receivers.
- The sensitivity of the receiving environment. This aspect considers the historical context of air quality-related issues experienced by people in the receiving environment, as well as the overall land use across this setting.

The following unmitigated dust impacts were initially determined (refer to the Glossary above and further details provided in **Section 5.5** and **Section 7** to **Section 9** in relation to the potential impact terminology listed and used throughout this assessment):

- Unmitigated dust from construction of the Project presenting varying levels of potential impacts from **moderate** to **medium** for different components. The highest rating (**medium**) was determined at receivers around the Allendale to Sydenham portion of the transmission line and associated activities.
- Unmitigated dust from operational inspection and maintenance (including vegetation clearance) activities assessed as presenting **low** to **moderate** levels of potential impacts for different components of the Project. The highest rating (**moderate**) was determined at receivers around the Allendale to Sydenham portion of the transmission line and associated activities.
- **Moderate** unmitigated potential impacts were determined for all components of the Project during decommissioning.

Residual impacts were then evaluated, with the application of recommended mitigation and management controls.

Other potential air quality-related impacts including exhaust emissions from plant and equipment, and odours, fumes and airborne hazards resulting from uncovered contaminated materials and groundwater were assessed qualitatively. Like for dust, potential impacts associated with these aspects were qualitatively considered based on the magnitude of expected emissions, and the likelihood that they would affect surrounding receptors.

With the implementation of the recommended controls and monitoring developed in line with the EPRs (see below) and the conditions of the draft Incorporated Document, and with consideration to the guidance from the EPA's Publication 1943, it was determined that residual dust impacts would be **low** (i.e., dust impacts are very unlikely). It is expected that all impacts could be avoided with pre-emptive and adaptive management.

Low residual potential impacts were also determined from exhaust emissions from plant and equipment during construction and decommissioning stages of the Project. For odours, fumes and airborne hazards resulting from uncovered contaminated materials and groundwater, **low** residual impacts were determined for construction and **negligible** impacts were determined from these emissions during decommissioning.

Although the potential for cumulative air quality effects at surrounding sensitive receptors would depend on the timings and sequencing of the Project and the other identified current or future planned projects, it is unlikely that their contributions would be significant enough to influence the outcomes of the assessment. As such, a **low** potential for residual impacts was determined.

Environmental Performance Requirements

The following Environmental Performance Requirements (EPRs) have been recommended in order to meet the EES evaluation objective:

AQ1 – Develop and implement an Air Quality Management Plan

As part of the Construction Environment Management Plan (CEMP), develop an Air Quality Management Plan and implement measures to minimise the risk of air quality impacts during construction to surrounding sensitive receptors, including monitoring.

AQ2- Implement air quality management and mitigation measures for operations

Implement mitigation measures to effectively manage emissions to air which may arise during specific operational activities (i.e., dust from vehicles, plant and equipment used during schedule maintenance activities or routine vegetation management required within the easement)

EM11 – Develop and implement a Decommissioning Management Plan

The Principal Contractor appointed at the time of decommissioning shall prepare a Decommissioning Management Plan, encompassing management and mitigations measures which seek to minimise the risk of harm to human health, or the environment of all activities associated with decommissioning. Management and mitigation measures shall be consistent with environmental management strategies, practices, and technologies current at the time and shall include, but not be limited to measures for communications and stakeholder engagement, environmental protection measures, waste management and recycling, emergency response and measures to minimise disturbance to agriculture, recreation and other enterprises.

Conclusion

Based on this assessment, the maximum residual potential impact at some nearby receptors was rated as **low** (i.e., impacts very unlikely with occasional short-term and minor exceptions) after controls have been implemented. To meet the GED, mitigation measures consistent with relevant guidance and standard practice were recommended to reduce residual impacts to the extent reasonably practicable. Recommended measures also include inspections and monitoring to review and verify the effectiveness or need for additional controls, primarily during construction.

1. Introduction

1.1 Background

The Western Renewables Link Project (the Project) proposes a new transmission line starting at Bulgana, near Stawell in Victoria's west, and extending approximately 190km to Sydenham in Melbourne's north-west. The Project will enable the connection of new renewable energy generated in western Victoria into the National Electricity Market and increase the Victorian transmission capacity. The Project is being delivered by AusNet Transmission Group Pty Ltd (AusNet).

The Project was originally referred to the former Minister for Planning under the *Environment Effects Act 1978* (Environment Effects Act) on 9 June 2020 by AusNet and it was determined that an Environment Effects Statement (EES) was required. On 22 August 2023, the Minister for Planning determined that the Project has the potential to cause significant environmental effects and that an EES was required to inform decision-makers in the granting of key approvals for the Project. In summary the key changes in the new proposed project scope are:

- The urgent Sydenham Terminal Station Rebuild will be assessed and approved separately. A connection into the Sydenham Terminal Station forms part of Western Renewables Link scope
- The 220kV portion of the transmission line is proposed to be upgraded to 500kV
- The new terminal station north of Ballarat will no longer be required
- A new 500kV terminal station at Bulgana will be required including a new 220kV connection to the existing Bulgana Terminal Station.

The Commonwealth Government's Department of Agriculture, Water and the Environment (DAWE) — now Department of Climate Change, Energy, the Environment and Water (DCCEEW) — has also confirmed that the Project is a 'controlled action' and will require assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Commonwealth has determined that it will use the bilateral assessment agreement and rely on the Victorian Government's assessment process (EES) to inform an approval decision under the EPBC Act.

1.2 Purpose of this report

The purpose of this report is to assess the potential air quality impacts associated with the Project and to define any Environmental Performance Requirements (EPRs) necessary to determine the environmental outcomes that the Project must meet, to be achieved through the implementation of mitigation measures during construction, operation and decommissioning, and address the EES evaluation objectives.

The specific objectives of the impact assessment are to:

- Identify local air quality values and the nature and proximity of potentially sensitive receptors.
- Provide an assessment of the likely impact of the Project on air quality values to inform approvals under relevant policy and legislation.
- Provide recommendations to further avoid or minimise impacts on identified air quality values where appropriate.

1.3 Structure of the report

The report is structured in the following way:

- **Introduction** (this section) which provides background details for the Project and outlines the purpose and structure of the Air Quality Impact Assessment.

- **EES scoping requirements** (**Section 2**) where the EES scoping requirements relevant to air quality are set out, and an indication of where each component of the EES scoping requirements has been considered and addressed in this study.
- **Project description** (**Section 3**), where Project components and activities relevant to the assessment are explained including the locations and activities with the highest associated air quality-related impacts.
- **Legislation, policy and guidelines** (**Section 3.3.4.1**) which lists the Commonwealth, state and other documents relevant to the assessment.
- **Method** (**Section 5**) where the approach applied to assess potential air quality impacts associated with the Project is explained.
- **Existing conditions** (**Section 6**) which identifies background air quality conditions, existing and potential future sources of emissions to air that may lead to cumulative impacts, prevailing local meteorology and details of surrounding sensitive receptors.
- **Impact assessment** (**Section 6.5** to **Section 10**), where initial and residual air quality impacts during the construction, operation and decommissioning of the Project, including potential cumulative impacts from other nearby developments and projects are evaluated. Measures to mitigate or otherwise effectively manage the potential air quality impacts determined are also presented here.
- **Environmental performance requirements** (**Section 11**) which set out the environmental outcomes to be achieved through the implementation of mitigation measures during construction, operation and decommissioning. While some EPRs are performance based to allow flexibility in how they will be achieved, others include more prescriptive measures that must be implemented. Compliance with the EPRs will be required as a condition of the Project's approval.
- **Conclusion** (**Section 12**) where the objectives, methods, outcomes and recommendations of the assessment are presented.

1.4 Related studies

This report should be read in conjunction with the following related technical reports, from which this report draws specific information:

- **Technical Reports Q and R: Geology and Soils Impact Assessment** and **Contaminated Land Impact Assessment**. Details regarding the potential to encounter contaminated materials construction were considered from these assessments to inform the review of related air quality impacts, including odours, fumes and airborne hazards related to contamination.
- **Technical Report S: Groundwater Impact Assessment.** Details regarding the potential to encounter contaminated groundwater during construction were considered from these assessments to inform the review of related air quality impacts, including odours, fumes and airborne hazards related to contamination.
- **Technical Report E: Land Use and Planning Impact Assessment.** The findings of this assessment were used to inform the density, nature and proximity of surrounding land uses around the Project. This information was used to characterise the sensitivity of the receiving environment to the potential emissions to air estimated from the Project.
- **Technical Report P: Transport Impact Assessment.** Project access roads identified in this assessment were used to inform the potential for risks associated with transport-related activities.

2. EES scoping requirements

The Scoping Requirements – Western Renewables Link Environment Effects Statement (DTP, 2023) set out in detail the matters to be investigated, assessed and documented in the EES for the Project and are referred to in this report as the EES scoping requirements.

2.1 EES evaluation objectives

The EES scoping requirements specify evaluation objectives which provide a framework to guide an integrated assessment of environmental effects of the Project, in accordance with the *Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978, Eighth edition, 2023*. The evaluation objectives identify desired outcomes in the context of key legislative and statutory policies, as well as the principles and objectives of ecologically sustainable development and environmental protection, including net community benefit.

The evaluation objective relevant to the air quality assessment is set out in Section 4.5 (Community amenity, safety, roads, and transport) of the EES scoping requirements:

> *Avoid, or minimise where avoidance is not possible, adverse effects for community amenity, health, and safety, with regard to construction noise, vibration, dust, lighting, waste, greenhouse gas emissions, transport network, operational noise, fire risk management and electromagnetic radiation.*

In order to meet the evaluation objective, it is necessary to understand the potential impact of the Project on functions and values of air quality, so that impacts can be appropriately avoided or mitigated. Understanding potential impacts requires an impact assessment, for which the starting point is a clear understanding of the existing conditions. This report details the characterisation of the existing air quality conditions, and the subsequent impact assessment needed to assess the Project against the evaluation objective.

2.2 Assessment of specific environmental effects

The scoping requirements set out the key issues that the Project poses to the achievement of the evaluation objective, together with the features and values of the existing environment that are to be characterised – these are referred to as the 'existing conditions'. The scoping requirements also list potential effects of the Project and identify where mitigation measures may be required.

The scoping requirements pertaining to air quality are reproduced in Table 2-1, together with directions to the reader as to where these items have been addressed in this report (and other reports as applicable).

Table 2-1: Air quality scoping requirements

Aspect	Scoping requirement	Relevant sections
Key issues	Potential for adverse effects to local air quality at sensitive receptors and on other sensitive land uses during construction of the project.	**Section 7** (Construction) See also **Section 8** (Operations), **Section 9** (Decommissioning) and **Section 10** (Cumulative impacts)
Existing environment	Characterise current local conditions in relation to air quality using data collected from existing local monitoring stations.	Existing conditions relevant to air quality are described in **Section 6**. Discussions on the air quality monitoring sites and background air quality data are set out in **Section 6.2**. These data are also presented in **Appendix A**.
	Identify existing land uses in the vicinity of the project which may generate air quality impacts relevant to managing project construction impacts.	Existing land uses and other local air pollutant sources are described in **Section 6.2**.
	Identify sensitive receptors that could be affected by dust from project construction or operation.	Sensitive receptor locations with potential to be impacted in the vicinity of the construction activities are described in **Section 6.3** (Sensitive receptors).

Aspect	Scoping requirement	Relevant sections
Mitigation measures	Describe and propose siting, design, mitigation and management measures to control emissions to air from construction activities.	**Section 7** (Construction) See also **Section 8** (Operations), **Section 9** (Decommissioning), and **Section 10** (Cumulative impacts)
Likely effects	Assess the potential effects of construction activities on air quality.	**Section 7** (Construction) See also **Section 8** (Operations), **Section 9** (Decommissioning), and **Section 10** (Cumulative impacts)
Performance criteria	Describe proposed measures to manage and monitor effects on amenity values and identify likely residual effects, including compliance with standards and proposed trigger levels for initiating contingency measures.	**Section 7** (Construction) See also **Section 8** (Operations), **Section 9** (Decommissioning), **Section 10** (Cumulative impacts), **Section 11** (environmental performance requirements)and **Section 12** (Conclusion)
	Describe contingency measures for responding to unexpected impacts to amenity values resulting from the project during construction and operation of the project.	**Section 7** (Construction) See also **Section 8** (Operations), **Section 9** (Decommissioning), **Section 10** (Cumulative impacts), **Section 11** (Environmental Performance Requirements)and **Section 12** (Conclusion)

3. Project description

3.1 Overview of the Project

The Project aims to address the current constraints of the western Victorian transmission network by providing the additional capacity, reliability and security needed to drive the development of further renewable electricity generation in western Victoria. By doing so, the Project supports the transition from coal-generated electricity to renewables and the efficient connection of renewable electricity into the National Electricity Market.

The Project comprises the construction and operation of a new approximately 190km overhead double circuit 500kV transmission line between Bulgana in Victoria's west and Sydenham in Melbourne's north-west. To support the connection of the new transmission line, the following works are proposed:

- The construction and operation of a new 500kV terminal station near Bulgana and a 220kV transmission line connection to the existing Bulgana Terminal Station
- Expansion of the existing Bulgana Terminal Station
- Connection works at the Sydenham Terminal Station including the modification of a bay and a bay extension with associated infrastructure
- Upgrade of the existing Elaine Terminal Station, through the diversion of an existing line
- Protection system upgrades at connected terminal stations.

The Project's main features are summarised in **Figure 3.1** and the location is shown in Figure 3.2.

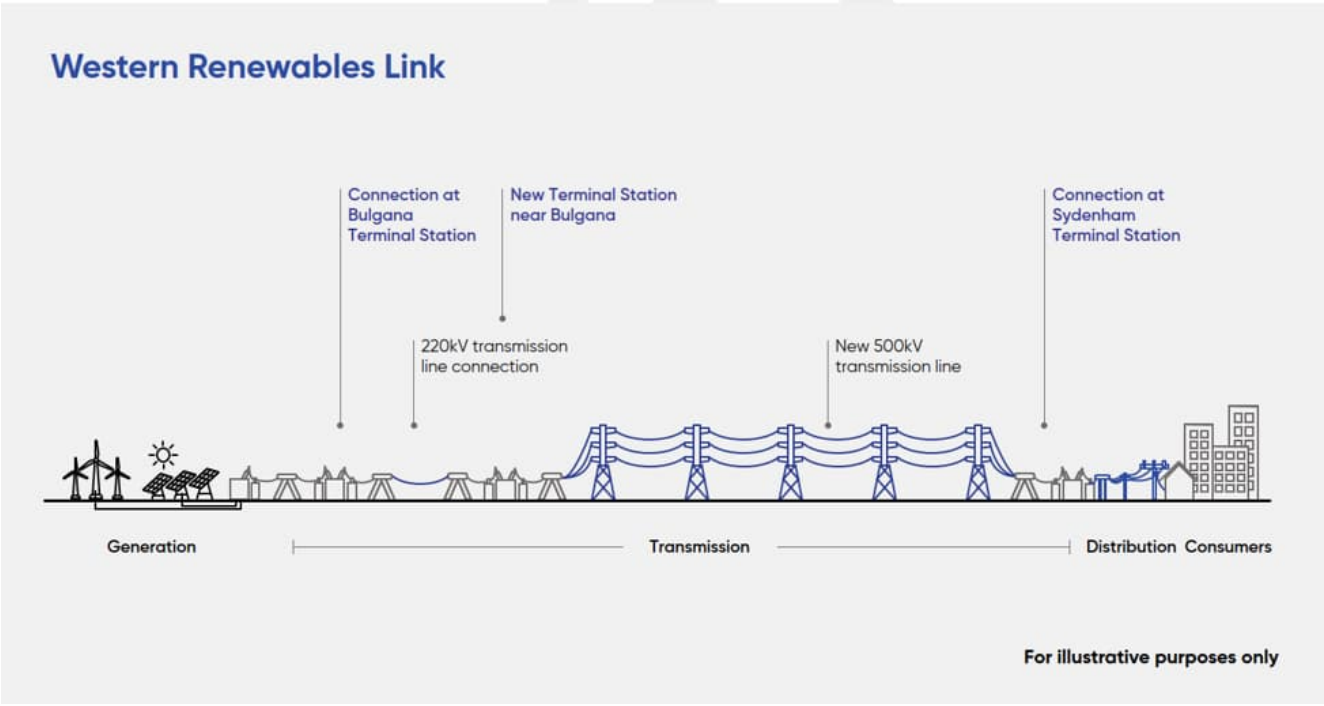

Figure 3.1: Western Renewables Link (Source: AusNet, 2024)

The Project can be described by the following key terms:

- **Project Land**: The Project Land encompasses all land parcels that could be used for the purpose of temporary Project construction and permanent operational components. The Project Land is shown in Figure 3.2.
- **Project Area**: The Project Area is contained within the Project Land and encompasses all areas that would be used to support the construction and operation the Project. The Project Area is shown in Figure 3.2.

- **Proposed Route**: The Proposed Route is approximately 100 to 170m wide and encompasses the nominal future easement for the proposed new transmission line (including a buffer either side), and the terminal station areas. The Proposed Route is located within the Project Area.

The Proposed Route commences at the existing Bulgana Terminal Station with a 220kV transmission line connection to the new 500kV terminal station approximately 2.3km to the northeast. The Proposed Route then runs from the new 500kV terminal station to the north of the existing Ballarat to Horsham transmission line, where it runs parallel to the existing transmission line for approximately 60km. East of Lexton, the Proposed Route deviates from the Ballarat to Horsham transmission line, passing through the northern section of the Waubra Wind Farm between Mount Bolton and Mount Beckworth. Continuing east, the Proposed Route passes south of the Berry Deep Lead gold mining precinct and north of Allendale and Kingston. North of Kingston the Proposed Route turns southeast to Mount Prospect. From Mount Prospect to near Dean, the Proposed Route is adjacent to the existing Ballarat to Bendigo transmission line. Near Dean, the Proposed Route deviates from the existing transmission line to run south, then east through Bolwarrah, Bunding and Myrniong to Darley. The Proposed Route then continues eastward crossing Merrimu Reservoir north of Long Forest and along the northern boundary of MacPherson Park at Melton, connecting to the existing electricity network at the Sydenham Terminal Station.

The Project crosses six local government areas (LGAs), namely:

- Shire of Northern Grampians
- Shire of Pyrenees
- City of Ballarat
- Shire of Hepburn
- Shire of Moorabool
- City of Melton.

For the purposes of this Air Quality Impact Assessment, the 'study area' adopted (described below in Section 5.2) was applied to surrounding sensitive receptors that could be impacted during the Project.

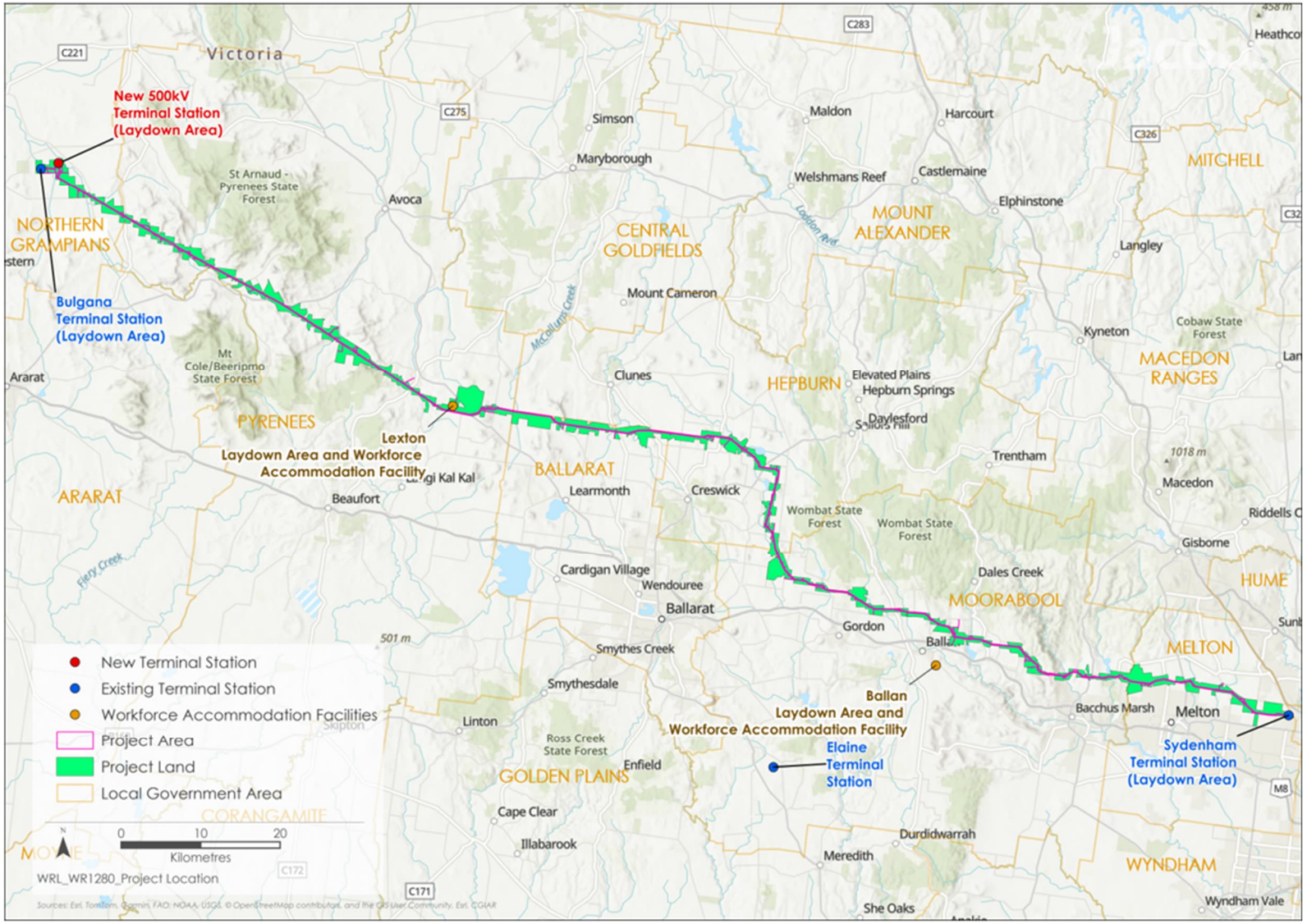

Figure 3.2: Project location (Source: Jacobs 2025)

3.2 Project infrastructure

The Project includes both permanent and temporary infrastructure, as described in Section 3.2.1 and Section 3.2.2. The Project has been progressively refined from an initial broad area of interest as described in **EES Chapter 5: Project development**.

3.2.1 Permanent infrastructure

The proposed Project includes the construction of the infrastructure listed in Table 3-1. Further detail is provided in **EES Chapter 6: Project description**.

Table 3-1: Project infrastructure – key components*

Double circuit lattice towers	418 double circuit towers
Single circuit lattice towers	36 single circuit towers (18 sets of two side-by-side)
Approximate length of 500kV transmission line route	Approximately 190km, between Bulgana in Victoria's west to Sydenham in Melbourne's north-west.
Approximate length of 220kV transmission line route	Approximately 2.5km, between the existing Bulgana Terminal Station to the new terminal station
Terminal Stations	A new 500kV terminal station and associated infrastructure near Bulgana to be connected to the existing Bulgana Terminal Station via a 220kV connection.
	Expansion of the existing Bulgana Terminal Station to support connection of the new 500kV terminal station near Bulgana.
	A connection to the Sydenham Terminal Station, including the modification of a 500kV bay and a new 500kV bay extension with associated infrastructure
	Relocation and diversion of existing 220kV transmission lines at Elaine Terminal Station.

* Note: These figures are approximate and subject to final detailed design, which will consider further landholder consultation and geotechnical, site and other investigations.

For the safe and reliable operation of the transmission line, an easement is needed for the operation of the transmission line, and other related infrastructure to protect public safety and to provide access for maintenance and repair purposes. The transmission line easements will be typically between 70 and 100m wide for the Project.

The transmission line design requirements are specified by the Australian standard AS/NZS 7000:2016 Overhead Line Design and AusNet's Electricity Safety Management Scheme. Key assumptions and considerations of the transmission towers that will form part of the Project and have been used as the basis of this report are described below.

- Transmission towers (towers) support the overhead conductors (wires or lines) at the required height above the ground to meet regulations and safety requirements. The preferred tower configuration will be a galvanised steel lattice structure similar to those found elsewhere across Victoria and within the national network. The typical tower height for the Project is between 60 to 80m.
- Each tower has four footings which will typically be 1.8m in diameter and 9m deep. The four footings base width will be between 10 to 17m wide. During construction, ground disturbance around each tower will typically be no greater than 50 by 70m.
- The spacing or span length between each tower is determined by the height from the ground that the conductors need to be to achieve the required ground clearance in the middle of the span. Typical span length is between 450 to 550m for the transmission line. Longer span lengths are possible over sensitive areas or to avoid impacts, however, longer spans require taller towers to provide safe ground clearances and wider easements to allow for greater sway of the conductors. Similarly, where it is difficult to achieve the

required ground clearance in the middle of the span, due to topography or obstacles, the tower span may be reduced.

- Each span comprises 26 conductors, made up of 12 conductors on each side of the tower cross arms and two ground wires across the top of the tower. Each conductor is approximately 32mm thick and made of aluminium wire strands with a steel core.

As part of the Project, the existing Bulgana Terminal Station will be expanded to support the connection of the new 500kV terminal station into the existing 220kV switchyard. The new 500kV terminal station will support the connection of the Project transmission line and future connections. The new terminal station will require additional land to the northeast of the existing Bulgana Terminal Station.

Upgrades required at Elaine Terminal Station will involve the relocation of existing 220kV transmission lines and diversion of an existing 220kV line into the terminal station. The footprint of the terminal station will not change, and all new equipment will be approximately the same height and scale as existing structures and equipment at the Elaine Terminal Station.

Connection works are proposed at Sydenham Terminal Station. The existing Sydenham Terminal Station will be re-built through the Sydenham Terminal Station Rebuild Project, prior to the Project works. The Project will connect into Sydenham through the modification of a 500kV bay and new 500kV bay extension.

3.2.2 Temporary infrastructure

During construction there will be additional work areas, including vehicle access tracks, temporary tower stringing pads, distribution line crossover points, potential hurdle locations, temporary laydown areas and workforce accommodation facilities.

Temporary laydown areas associated with the terminal stations and the transmission line will be used to sort materials, pre-assemble Project components and store equipment, vehicles and other supplies that support construction activities. Temporary fencing, gates, security systems and lighting will also be installed at the laydown areas. The Project will establish five laydown areas; two of which will be located at existing terminal station sites (Bulgana and Sydenham), one at the new 500kV terminal station near Bulgana, and an additional two sites at intermediate locations between the stations south-east of Lexton and south-east of Ballan. The two intermediate laydown areas are required for the construction of the transmission line. The size of each site (including workforce accommodation facilities) will vary depending on storage requirements. The site south-east of Lexton will be up to approximately 12ha and the site south-east of Ballan will be up to approximately 24ha.

AusNet proposes to utilise temporary workforce accommodation facilities to accommodate construction workforce personnel. Two facilities are proposed; one in each of the western and eastern portions of the Project, co-located with each of the intermediate laydown areas. Each facility will have capacity for up to 350 personnel and will provide individual accommodation units, a communal kitchen and meals area, laundry, gym facilities, mobile and Wi-Fi boosters and serviced cleaning. The layouts of the proposed accommodation facilities will be determined by the Principal Contractor.

3.3 Summary of key project activities

3.3.1 Construction

Construction of the Project will include preparatory activities (e.g., site investigations, establishment of laydown areas and workforce accommodation facilities, etc.), establishment of temporary infrastructure (such as water and wastewater infrastructure and power supplies), construction of towers and transmission line stringing works; construction works at terminal stations; site rehabilitation works; and pre-commissioning activities.

The overall construction duration of the Project is approximately two years. This schedule is dependent on adjustments required to deliver the Project and the granting of approvals within certain timeframes. For tower assembly and transmission line stringing, work will not be constant, with specialist crews following each other along the route doing specific jobs (clearing, site preparation, tower construction, conductor stringing, site rehabilitation, etc). As each work crew leaves a site (or property) there may be days, weeks, or possibly months of

inactivity until the next crew arrives. The cumulative duration of construction work at each tower (i.e., time on each property) will be approximately nine to 22 weeks (over a two-year period). Once construction is complete, site rehabilitation will occur and commissioning activities will include final inspections and other safety and pre-operational checks. Construction of the Project is anticipated to commence in late 2026 and be completed by late 2028.

Key activities associated with the construction of towers include:

- Site preparations, including necessary vegetation clearance
- Construction of vehicle access tracks and minor upgrades to existing roads and tracks
- Tower foundation construction
- Tower structure assembly and erection
- Transmission line stringing works
- Commissioning
- Site rehabilitation.

The works proposed at the new 500kV terminal station near Bulgana, the existing Bulgana Terminal Station and Sydenham Terminal Station will be constructed over a period of approximately 20 months, with key activities including:

- Site preparations, access and necessary vegetation clearance
- Earthworks
- Construction of footings, foundations and drainage systems
- Installation of structures and equipment
- Commissioning
- Landscaping and rehabilitation.

3.3.2 Operations

The operation and maintenance of transmission lines are subject to stringent regulatory controls to ensure public safety and the uninterrupted supply of electricity. All transmission line operators are required to comply with these controls and provide regular reports to the relevant authorities, including Energy Safe Victoria.

The key operation stage activities for the transmission line include:

- Scheduled inspections of the transmission line and easement (either by vehicle patrols or LiDAR/aerial surveys)
- Ongoing vegetation management to maintain safety clearances under the transmission line
- Tower maintenance inspections
- Repairs and maintenance to address issues found in above inspections.

While the terminal stations are operated remotely, staff are present at stations for inspections or maintenance. Routine inspections will occur bi-monthly, with personnel checking the overall condition of the terminal station's assets.

3.3.3 Decommissioning

The Project's transmission line is designed for a service life of 80 years, while the terminal station works have been designed for a minimum life of 45 years. The terminal station works will be maintained and upgraded to enable the terminal stations to remain operational for the service life of the transmission line. At the end of the

service life of the transmission line, the infrastructure will either be decommissioned or upgraded to extend its service life to maintain the security and reliability of the transmission network as determined by the network planner at that time. In the event of decommissioning, the key activities may involve:

- Lowering the overhead transmission lines and ground wires to the ground and cutting them into manageable lengths to roll onto drums or reels for disposal as scrap metal
- Removing insulators and line hardware from structures at the site and disposal at an approved waste facility
- Dismantling towers in manageable sections, removing from the site and selling steel as scrap
- Excavation of footings below finish surface level
- Decommissioning and removal of terminal stations
- Easement restoration and rehabilitation, where required.

3.3.4 Activities relevant to the air quality impact assessment

3.3.4.1 Construction

The following potential air quality-related issues were identified for the Project during construction:

- Dust from construction activities associated with the Project infrastructure, including wind erosion resulting from exposed surfaces, including at laydown areas and workforce accommodation facilities.
- Dust from construction activities associated with associated temporary infrastructure (including concrete batching plants), and upgrades at existing terminal sites including wind erosion resulting from exposed surfaces
- Dust from the construction and use of the temporary construction workforce accommodation facilities at the intermediate laydown areas
- Exhaust emissions from plant and equipment used during construction and activities at temporary construction workforce accommodation facilities
- Odours and airborne hazards from the handling of potentially contaminated materials and groundwater during construction.

Air quality issues can arise when emissions from activities leads to a deterioration in the ambient air quality. During construction, the primary air quality impact would be dust generated from materials excavation, handling, transport and placement, as well as from wind erosion of stored materials and exposed surfaces resulting in impacts at surrounding sensitive receptors. The term dust refers to particulate matter in, most commonly, the form of total suspended particles (TSP), deposited dust, particulate matter with equivalent aerodynamic diameter of 10 microns or less (PM_{10}), and finer particulate matter with equivalent aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$). The intensity of dust-generating activities during construction is expected to be greatest for the construction of the transmission lines and at the new 500kV terminal station near Bulgana.

The transmission line consists of several key components including the towers and conductors. Transmission towers support the overhead conductors whilst preserving ground clearance requirements.

The 500kV tower base footprint is typically 18 by 18m. Tower assembly areas for each tower during construction is typically no greater than 50 by 70m.

From mobilisation to de-mobilisation, construction work at each transmission tower may take approximately nine to 22 weeks (over a two-year period) depending on weather and task scheduling. Plant and equipment required for construction of the transmission towers is anticipated to comprise of mobile cranes, piling rigs, pepper drills, skid steers, bulldozers (if required on access tracks), trucks, light vehicles, generators and semi-trailers (for various deliveries, etc.).

Dust emissions are also expected from upgrade activities at the existing transmission stations, as well as from the temporary construction infrastructure. Relevant temporary project facilities, which may be on, close to, or at some distance from the transmission lines include temporary access tracks, hardstands, water supply, waste handling, storage, and disposal facilities, and power supplies. Details of each of these elements and their potential for dust generation are summarised below:

- Access tracks: Access tracks are required for the transport of plant and equipment to the transmission towers and hardstand areas. Tracks will span an average width of 4 to 6m and may be temporary or permanent. Access tracks are also required at certain intervals from existing roadways to allow for stringing of the transmission lines.

  Existing tracks will be used where practical. This includes those used for farm vehicles or for other projects.

  If upgrades are required to strengthen or widen an existing track, construction would involve laying a road base material (crushed rock) and compacting the material using a roller. Where there are no existing access tracks that can be used, a new all-weather access track would be built.

- Tower assembly sites: Construction works associated with the installation of each transmission tower will require the creation of hardstand areas. These areas will be placed around the tower legs and will be used to support the equipment undertaking the foundation works and as an area from which cranes can operate to assemble and erect the tower. The crane pad will also be used by other equipment during the line stringing phase of the works. These areas will be temporary unless requested to be retained by the landholder.

  These hardstand areas will vary in size, position and ground conditions for each tower but generally will consist of road base gravel style materials, placed and compacted near the base of the tower. The extent of the crane pad area will typically be in the range of 12 by 12m. The pad will align with the access track to the tower. In addition to this hardstand area around each tower site, an area will be cleared to enable pre-assembly of the tower sections. Minor ground improvement works may need to be undertaken in this area to enable safe access for construction workers and their equipment.

  The maximum ground disturbance during construction (the area required to be cleared to install each tower) will typically be no greater than 50 by 70m, with the area being shaped and/or directionally offset as needed to minimise the construction impact. Site-specific conditions, such as the slope of the land or soil conditions, may also influence the size and shape of the cleared area.

- Waste handling, storage and disposal: Wherever possible, all steps will be taken to minimise the levels of wastes generated. Where wastes are produced, consideration will be given to recycling or reuse on site. Where wastes cannot be recycled or reused on site, consideration will be given to opportunities for recycling off site. Refuse generated will be managed as identified in a construction environmental management plan to be developed by the Principal Contractor in collaboration with AusNet.

  Wastewater will be limited to sewage from the construction workforce. Mobile toilets will be provided at the Project's construction sites and will be removed on completion of works. Temporary sewage collection and storage facilities will be installed where required and pumped out for off-site disposal at an appropriate facility to avoid impacts to groundwater.

  Construction waste will mainly comprise cut-off pieces of conductors, small amounts of damaged steel sections, small amounts of concrete waste, packing material, cardboard, plastic, timber etc. Inert wastes (i.e., non-toxic wastes, such as cardboard, glass bottles, timber) will be recycled where practicable. Where recycling is not practicable, construction wastes will be disposed offsite at an approved facility.

- Disposal of excavated material: Material excavated during construction, would be either reused where practicable or removed off site. The transmission route and the terminal station locations have been chosen to minimise the extent of cut and fill required, and to maximise the ability to reuse excavated material for site rehabilitation.

  Opportunities for beneficial reuse of the excavated material for tower footings that is deemed unsuitable for fill will be prioritised, for example for use in landscaping. Where potential for beneficial reuse is not identified the material will be managed in accordance with EPA requirements.

Exhaust emissions from the combustion of fossil fuels in construction plant and equipment represent another air quality impact during construction. The primary pollutants associated with plant exhaust emissions include carbon monoxide (CO), oxides of nitrogen (NO_x) including nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), volatile organic compounds (VOCs) and sulfur dioxide (SO_2) (depending on fuel sulfur content). As outlined in the Geology and Soils Impact Assessment, Contaminated Land Impact Assessment and Groundwater Impact Assessment; odours may be generated from contaminated and hazardous substances encountered where contaminated soils or groundwater is present and disturbed.

3.3.4.2 Operation

Limited emissions to air are expected during operations. The only potential emissions may include dust resulting from inspection and maintenance activities. Dust may also be generated from exposed surfaces resulting from the clearance of vegetation. Limited exhaust emissions would also be generated from associated plant and equipment.

As discussed in **Section 3.3.2**, the key operation stage activities relevant to air quality will include:

- Scheduled inspections of the transmission line and easement (either by vehicle patrols or LiDAR/aerial surveys).
- Vegetation clearance as required.
- Tower maintenance and associated inspections.

Dust generated from these operational maintenance activities and from vehicles, plant and equipment use along access routes during maintenance and inspections were identified as representing the key air quality related impacts.

3.3.4.3 Decommissioning

Activities associated with the decommissioning of transmission lines and terminal stations at the end of their service life are described above in **Section 3.3.3**. Each of these activities have the potential to generate dust impacts.

Exhaust emissions from the combustion of fossil fuels in plant and equipment used during decommissioning also represents a potential impact. Localised contamination resulting from leaks and spills, including from operational maintenance activities incurred over the service life of the assets may also be present.

4. Legislation, policy and guidelines

4.1 Summary of legislation

This section provides an overview of key Commonwealth and state legislation relevant to air quality matters, including identifying primary and likely secondary approval requirements for the Project. Table 4-1 summarises the relevant legislation, policy and guidelines applicable to the air quality impact assessment as well as implications for the Project. The matters to be investigated relevant to air quality include community health and amenity and environmental quality as set out in the scoping requirements.

The legislation relevant to amenity and air quality (a subset of environmental quality) is summarised below. Discussion about the corresponding air quality criteria is included in Section 4.3.

Table 4-1: Relevant legislation, policy and guidelines summary – air quality

Legislation or policy	Key policies and strategies	Implications for the Project
State Legislation		
Environment Effects Act 1978	The *Environment Effects Act 1978* (Environment Effects Act) provides for the assessment of projects that may have a significant effect on the environment by enabling the Minister administering the Act to decide that an EES should be prepared. An EES may be required where: ▪ There is a likelihood of regionally or State significant adverse environmental effects ▪ There is a need for an integrated assessment of social and economic effects of a project or relevant alternatives ▪ Normal statutory processes would not provide a sufficiently comprehensive, integrated, and transparent assessment. The process under the Environment Effects Act is not an approval process in itself; rather it is an assessment process that enables statutory decision-makers to make decisions about whether a project with potentially significant environmental effects should proceed.	On 22 August 2023, the Minister for Planning determined that the Project requires assessment through an EES under the Environment Effects Act, due to matters as set out in the Statement of Decision on Referral No. 2023R-04, and summarised below: ▪ The area of interest for the project supports significant environmental values and other social values, potential aggregate impacts on which are of at least regional significance. ▪ Multiple alignment and design alternatives for the project within the area of interest require rigorous and transparent assessment and refinement. ▪ An EES responds to community interest in project siting, alignment and design alternatives by providing appropriate opportunities for public input. ▪ The Minister for Planning issued the EES scoping requirements in November 2023 (Section 2.2), which have informed this assessment.
Environment Protection Act 2017 (Environment Protection Act)	The *Environment Protection Act 2017* is a risk-based approach to preventing environmental harm and includes a general environmental duty (GED). The GED requires people to take reasonably practicable steps to eliminate, or otherwise reduce risks of harm to human health or the environment from pollution and waste. Doing what is reasonably practicable means putting in proportionate controls to mitigate or minimise the risk of harm. In addition to the GED, duties under the Environment Protection Act relevant to air quality include the duty to respond to harm (s.31) and the duty to notify of an incident (ss. 32- 33).	This legislation provides the framework for the policies, guidelines and objectives which are relevant to all air quality impact assessments in Victoria. The GED requires identification of all risks and implementation of effective control measures so far as reasonably practicable. This guides the approach to managing impacts on air quality and associated environments during the Project. Key subordinate instruments which dictate policies to establish environmental quality objectives associated with air quality are able to be created under this legislation. The GED and duties relating to the reporting of pollution incidents from the Environment Protection Act apply to all activities in Victoria to minimise risks of harm to human health and the environment as relevant for the Project.

Legislation or policy	Key policies and strategies	Implications for the Project
Planning and Environment Act 1987 (PE Act 1987)	The *Planning and Environment Act 1987* provides a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians.	Section 12(2)(b) of the Act requires a planning authority when preparing a planning scheme or planning scheme amendment to 'take into account any significant effects which it considers the scheme or amendment might have on the environment or which it considers the environment might have on any use or development envisaged in the scheme or amendment.' Section 60(1)(e) of the Act states that a responsible authority must consider 'any significant effects which the responsible authority considers the use or development may have on the environment or which the responsible authority considers the environment may have on the use or development.
Environment Reference Standard (ERS)	The ERS (Victoria Government 2021) is a subordinate instrument made under the Environment Protection Act. The ERS was gazetted on 26 May 2021. The ERS identifies environmental values for Victoria in the areas of air quality, noise, water and contaminated land; and defines indicators and objectives to measure those values. The ERS supports the protection of the environment from pollution and waste by providing a benchmark to assess and report on environmental conditions in the whole or any part of Victoria. The ERS does not set out enforceable compliance limits; rather, risks of harm to human health and the environment from pollution and waste must be minimised as far as reasonably practicable, in accordance with the GED. The ERS works alongside the GED. Although it is not a compliance standard and does not set compliance limits (EPA, 2021b), the ERS must be considered by responsible authorities when making planning decisions. The ERS includes a qualitative objective for odour, which applies to offensive odours from commercial, industrial, trade and domestic activities. The ERS does not provide an indicator or objective for nuisance dust. The ERS was amended in March 2022, with the objective values updated for NO_2, SO_2 and ozone.	The air quality objectives defined in the ERS informed the objectives for air quality for the Project. Environmental values (air quality) relevant to the Project are assessed in a way that is both appropriate (the methods used match the type of indicators, objectives and the setting) and proportionate (the methods used match the Project's complexity and the extent of potential impacts). The following environmental values (ambient air environment) are relevant to the Project: • Life, health and wellbeing of humans • Life health and well-being of other forms of life including the protection of ecosystems and biodiversity • Local amenity and aesthetic enjoyment • Visibility • The useful life and aesthetic appearance of buildings, structures, property and materials • Climate systems that are consistent with human development, the life, health and well-being of humans and the protection of ecosystems and biodiversity The matters to be considered in the scoping requirements, amenity and environmental quality (in this case, air quality) align with the ERS values. These values have been considered in the development of the Project's air quality objectives, Environmental Performance Requirements and management and mitigation measures.
Environment Protection Regulations	The Environment Protection Regulations (EPA 2021a) are a subordinate instrument of the Environment Protection Act and cover a broad suite of topics including contaminated land, the new framework for permissions, waste management and environmental management (including air and noise) as well as administrative matters relating to offences, fees and transitional arrangements. Part 5 (Environmental Management) of the Regulations addresses matters including air. Part 5.2 – Air (Regulations 103 to 112) specifies	The activities and the nature of the predicted emissions from the Project do not generally fall within the matters regulated under Parts 5.2 and 5.6 (Parts pertaining to the regulation of emissions to air) of the Environment Protection Regulations (EPA 2021a). As such, the Environment Protection Regulations are less directly relevant to the air quality impact assessment for the Project.

Legislation or policy	Key policies and strategies	Implications for the Project
	obligations on manufacturers and suppliers in relation to air pollution, including in relation to the National Pollutant Inventory and specifies obligations in relation to Class 3 substances (listed in Schedule 4). Part 5.6 prescribes standards, limits, testing requirements and offences relating to vehicle noise and air emissions.	
Commonwealth Legislation		
National Environment Protection (Ambient Air Quality) Measure (NEPM(AAQ))	Section 14 of the *National Environment Protection Council Act 1994* and the equivalent provision of the corresponding Act of each participating state and territory provides for the making of measures by the National Environment Protection Council (NEPC) and the matters to which they may relate. This Measure relates to ambient air quality. The desired environmental outcome of the NEPM(AAQ) is ambient air quality that minimises the risk of adverse health impacts from exposure to air pollution. The NEPM(AAQ) requires participating jurisdictions to undertake monitoring, evaluation and reporting activities that allow communities to understand their local air quality and assist the formulation of air quality policies. It provides a focus for air quality issues and drives all jurisdictions to work towards nationally consistent monitoring techniques and reporting. The NEPM(AAQ) does not compel or direct pollution control measures. EPA Victoria is responsible for the regulation, monitoring, assessment and reporting of air pollution in Victoria. Pollutant concentrations measured at EPA's ambient air monitoring stations are compared against the NEPM(AAQ) standards. EPA monitors and assesses a range of indicators including CO, NO_2, SO_2, and particulate matter (PM_{10} and $PM_{2.5}$). In April 2021, the National Environment Protection Council approved a variation to the NEPM(AAQ) standards for O_3, NO_2 and SO_2. A variation to the NEPM(AAQ) was registered on 26 May 2021. The changes reflect the most recent evidence emerging about the health effects of air pollutants. In the 2021 review, Ministers agreed to commence a further review of the O_3, NO_2 and SO_2 standards in 2025; noting reviews of the $PM_{2.5}$ and annual PM_{10} standards are also planned. This includes reduced concentration goals for $PM_{2.5}$ that regulators should seek to achieve by 1 January 2025.	The NEPM(AAQ) is not an active piece of legislation in Victoria, as the Federal Government has no jurisdiction over environmental matters within the States. However, this assessment has anticipated EPA will review the ERS in future to align with NEPM(AAQ) where any standards in the NEPM(AAQ) are more conservative than in the ERS. The regulatory air quality objectives adopted for the Project are informed by the NEPM(AAQ) including the 2025 goals for $PM_{2.5}$, and therefore reflect the most recent evidence emerging about the health effects of air pollutants. EPA monitoring data collected to fulfil the EPA's obligations under the NEPM(AAQ) was used to inform the air quality impact assessment for the Project.

Legislation or policy	Key policies and strategies	Implications for the Project
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides the legal framework to protect and manage matters of national environmental significance (MNES), which include: world heritage properties; national heritage places; wetlands of international importance (Ramsar); listed threatened species and communities; listed migratory species; Commonwealth marine areas; the Great Barrier Reef Marine Park; nuclear actions; and water resources, in relation to coal seam gas and large coal mining development. Any project that is likely to have a significant impact on MNES, must be referred to the Commonwealth Minister for the Environment and Water via the Department of the Climate Change, Energy, the Environment and Water (DCCEEW) for a decision on whether the Project is a 'controlled action' requiring assessment and approval under the EPBC Act.	The Project was referred to the Commonwealth Minister for the Environment, who determined that the Project is a 'controlled action' requiring assessment and approval under the EPBC Act before it can proceed. The Minister's referral decision (EPBC 2020/8741) issued on 2 September 2020 determined that the Project is a 'controlled action' due to its potential to have a significant impact on listed threatened species and communities, and further stipulates that the Project will be assessed under the bilateral (assessment) agreement between the Commonwealth and Victorian Governments. The proposed action referred was varied on 20 November 2024 to reflect the Project description. Under the Victorian *Environment Effects Act 1978*, the EES process is an accredited assessment process under the bilateral (assessment) agreement.
Other Guidelines / policies		
Guideline for assessing and minimising air pollution in Victoria, Publication 1961 (2022a)	In February 2022, EPA Victoria released Publication 1961: Guideline for assessing and minimising air pollution in Victoria; herein referred to as Publication 1961 (EPA 2022a). The guideline provides a framework to assess and control risks associated with air pollution in the form of a technical guideline for air quality practitioners and specialists. The guideline provides a tiered approach to the assessment of risks from air pollution, with three levels of assessment in order of increasing complexity that define the role of atmospheric dispersion modelling and monitoring intended by EPA Victoria within the Environment Protection Act and GED framework. Publication 1961 is discussed further in Section 4.3.	Publication 1961 details air quality assessment criteria for air pollutants for comparison with dispersion modelling results. For pollutants that are listed in the ERS (which includes all the key pollutants relevant to this Project), the air quality assessment criteria in Publication 1961 are cross-referenced to the ERS values. Should the ERS be updated at any point in time, for example to implement a variation to the NEPM(AAQ), then this updated ERS objective will apply as the air quality assessment criteria. Relevant air quality assessment criteria from this Guideline have been adopted for the Project.
Civil Construction, Building and Demolition Guide Publication 1834.1 (2023)	EPA Publication 1834.1: Civil Construction, Building and Demolition Guide (herein referred to as the CCBD Guide) was published in September 2023 (EPA 2023). This guide replaced EPA Publication 480: Best Practice Environmental Guidelines for Major Construction Sites (released February 1996). The CCBD Guide provides an overview of: • duties under the Environment Protection Act, • activities that may lead to erosion and the generation of sediment and dust, • potential impacts of sediment and dust, • factors to consider in understanding erosion, sediment and dust generation,	This CCBD Guide informs current state of knowledge on relevant mitigation measures, likely effects and performance criteria as specified in the scoping requirements. The guidance refers to the obligations and duties under the Environment Protection Act, i.e., GED and associated duties. It forms part of the current state of knowledge and is not intended to be a compliance document. Implications for air quality (dust) are predominantly relevant to projects in delivery and Principal Contractor interpretation; they are also relevant in the formulation of EPRs, particularly those that reference management and monitoring plans.

Legislation or policy	Key policies and strategies	Implications for the Project
	• controls and/or mitigation measures that can be implemented to minimise the generation and transport of dust, and manage risk associated with dust emissions from activities associated with civil construction, building, and demolition. This CCBD Guide is discussed further in Section 4.6.	
Planning Schemes enacted under the *Planning and Environment Act 1987*	Planning Schemes provide state standard provisions selected from the Victoria Planning Provisions, as well as local provisions to provide clear and consistent framework for land use and development decision-making, including responses to climate change.	Clause 13.06-1S (Air Quality Management) which is included across the relevant Planning Schemes covered by the Project Area requires that 'wherever possible, that there is suitable separation between land uses that pose a human health risk or reduce amenity due to air pollutants, and sensitive land uses (residential use, childcare centre, school, education centre, residential aged care centre or hospital)'.

4.2 General Environmental Duty

The cornerstone of the environmental protection legislation is the GED. The GED requires anyone conducting an activity that poses risks of harm to human health and the environment from pollution or waste to minimise those risks, so far as reasonably practicable.

To meet the GED, mitigation measures consistent with relevant guidance and standard practice were recommended to reduce residual impacts to the extent reasonably practicable. Consistent with Chapter 1, Part 6 of the Environment Protection Act, the following matters must be considered in deciding what is reasonably practicable in the circumstances:

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

EPA Publication 1856: Reasonably practicable (EPA Victoria (2020) explains that when dealing with a common risk or harm, demonstrating that the person or business undertaking the activity has done what is reasonably practicable can be achieved if:

- Well-established effective practices or controls have been adopted to eliminate or manage risk; and/or
- Where well-established practices or controls do not exist, it can be shown that effective controls have been assessed and adopted.

The recommended mitigation measures and EPRs for the Project have been assessed as reducing the risk of harm from air emissions so far as reasonably practicable, having regard to the matters listed above.

4.3 Ambient air quality criteria

4.3.1 Key pollutants and associated health effects

The key air pollutants relevant to the Project include:

- Dust (comprising of total suspended particles (TSP), particulate matter with an aerodynamic diameter less than 10 microns (PM_{10}) and particulate matter with an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$))
- Exhaust emissions including carbon monoxide (CO), PM_{10}, $PM_{2.5}$, oxides of nitrogen (NO_x) (including NO_2), SO_2 and VOCs.
- Odours and airborne hazardous substance arising from uncovered contaminated materials and groundwater.

These pollutants are regulated by the ERS and included in the NEPM(AAQ). When not properly managed, these pollutants can lead to a variety of nuisance and amenity and/or adverse health effects. This section provides further background of these effects to contextualise the ERS objectives and NEPM AAQ standards presented in Section 4.3.2 and Section 4.3.3 respectively.

Dust emissions resulting from the excavation of contaminated soil and operation of construction vehicles or equipment over existing contaminated land can give rise to contaminated dust particles, with other potential health effects associated with the specific contaminants. In addition, dust can cause nuisance and amenity issues (EPA Victoria 2020b). PM_{10} and $PM_{2.5}$ are recognised internationally as having the greatest potential to cause health problems due to their inhalation potential and are regulated in the ERS and included in the NEPM(AAQ). PM_{10} particles are small enough to pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. $PM_{2.5}$ particles are so small they can get deep into the lungs and into the bloodstream. The PM_{10} category includes the $PM_{2.5}$ size range.

Nitric oxide (NO) and NO_2 are collectively commonly referred to as NO_x. NO_x emissions are primarily produced by the burning of fuels, and, in the atmosphere, NO may be converted to NO_2 through reaction with ozone (O_3). NO_2 can cause damage to the respiratory tract, increasing susceptibility to infection and respiratory illnesses including asthma. NO_2 is a brown gas and on days of photochemical smog formation, may be visible in the atmosphere. Of the NO_x gases, only NO_2 is regulated in ambient air. However, emissions of NO are still important due to the potential for oxidation to NO_2 in the atmosphere after discharge.

CO is a colourless, odourless gas formed during incomplete combustion of fossil fuels. It is one of the most common industrial hazards, however in urban areas the major source is motor vehicles. Ambient CO concentrations have decreased significantly in recent decades due to technological advances in internal combustion engines. Exposure to elevated CO concentrations can cause various health effects ranging in severity based on the duration of exposure.

Project SO_2 emissions may result from combustion of sulfur-containing compounds in fossil fuels. In significant concentrations, SO_2 can trigger respiratory response in people with existing pulmonary disease (e.g., asthma) who happen to have a susceptibility to SO_2 and may be exercising or otherwise exerting themselves to the point where their respiratory function is elevated.

4.3.2 Environment Reference Standard

The ambient air quality objectives listed in the ERS (March 2022) are provided in Table 4-2. The objectives are concentrations of air quality indicators against which the achievement, maintenance of, or risk to, an environmental value is assessed. The ERS objectives are not compliance standards (EPA, 2021b).

Table 4-2: ERS air quality objectives (March 2022)

Environmental indicator (air pollutant)	Averaging period	ERS maximum concentration objective[3]	ERS permissible exceedances[1]
Particles as PM_{10}	1 day	50 µg/m^3	None
	1 year	20 µg/m^3	None
Particles as $PM_{2.5}$	1 day	25 µg/m^3	None
	1 year	8 µg/m^3	None

Environmental indicator (air pollutant)	Averaging period	ERS maximum concentration objective[3]	ERS permissible exceedances[1]
NO_2	1 hour	80 ppb	1 day/year
	1 year	15 ppb	None
CO	8 hours[2]	9.0 ppm (9000 ppb)	1 day/year
SO_2	1 hour	75 ppb	1 day/year
	1 day	20 ppb	1 day/year
Visibility reducing particles (minimum visual distance)	1 hour	20 Km	3 days/year
Odour (qualitative objective)	Not applicable	An air environment that is free from offensive odours from commercial, industrial, trade and domestic activities	Not applicable

[1] Maximum allowable exceedances of concentration standard in one calendar year.

[2] Rolling 8-hour average based on 1-hour averages.

[3] Mass concentrations for particles in ERS are referenced to gas conditions of 0°C, 101.3 kPa

The objective, averaging period and maximum exceedances for many of the indicators in the ERS are the standards in the NEPM(AAQ), with some modifications. The standard for annual-average PM_{10} is 25 µg/m^3 in NEPM(AAQ), and the objective is 20 µg/m^3 in the ERS.

EPA Victoria is likely to amend the ERS at some stage in regard to the 24-hour average $PM_{2.5}$ goal of 20 µg/m^3 and the annual average $PM_{2.5}$ goal of 7 µg/m^3. The timeframe for when such changes may come into effect is unknown, but it is likely that the change to the $PM_{2.5}$ goals would occur before or during the construction period for the Project.

4.3.3 NEPM(AAQ)

National ambient air quality standards are specified in the current National Environment Protection Measure for Ambient Air Quality, with the latest update gazetted in 2021 (the "NEPM(AAQ)").

The currently gazetted NEPM (AAQ) concentration standards are listed in Table 4-3 for indicators that are potentially relevant to the Project - PM_{10} and $PM_{2.5}$, NO_2, CO, and SO_2.

Table 4-3: NEPM (AAQ) concentration standards – current July 2021

Environmental indicator (air pollutant)	Averaging period	NEPM(AAQ) maximum concentration standard[3]	NEPM(AAQ) permissible exceedances[1]
Particles as PM_{10}	1 day	50 µg/m^3	None[4]
	1 year	25 µg/m^3	None
Particles as $PM_{2.5}$	1 day	25 µg/m^3	None[4]
	1 year	8 µg/m^3	None
NO_2	1 hour	80 ppb	None
	1 year	15 ppb	None
CO	8 hours[2]	9.0 ppm (9000 ppb)	None
SO_2	1 hour	100 ppb 75 ppb (from 2025)	None
	1 day	20 ppb	None

[1] Maximum allowable exceedances of concentration standard in one calendar year.

[2] Rolling 8-hour average based on 1-hour averages.

[3] Mass concentrations for particles in NEPM(AAQ) are referenced to gas conditions of 0°C, 101.3 kPa

[4] Excludes exceptional events which are defined in the NEPM(AAQ) as a fire or dust occurrence directly related to bushfire, jurisdiction authorised hazard reduction burning or continental scale windblown dust.

The NEPM(AAQ) also includes reduced concentration goals for $PM_{2.5}$ that regulators should seek to achieve by 1 January 2025. These reduced concentration goals are provided in Table 4-4. The goals provide a framework for continuous improvement (through policy changes such as emissions from home heating and motor vehicles which take time to implement) and facilitate a review of the $PM_{2.5}$ standard in future. The summary of public submissions report on the 2015 variation of the NEPM(AAQ) when the $PM_{2.5}$ standards and goals were last varied (NEPC, 2015) states that the reduced concentration goals are not standards, but "ambitious 10-year goals" to achieve continued and further reductions in maximum concentrations of $PM_{2.5}$ in ambient air over the 2015 to 2025 period.

Table 4-4: NEPM (AAQ) goal for particles as $PM_{2.5}$ by 2025

Environmental indicator (air pollutant)	Averaging period	NEPM(AAQ) maximum concentration goal[1]
Particles as $PM_{2.5}$ by 2025	1 day	20 µg/m^3
	1 year	7 µg/m^3

[1] Mass concentrations for particles in NEPM(AAQ) are referenced to gas conditions of 0°C, 101.3 kPa

4.3.4 EPA Victoria AirWatch air quality categories

EPA Victoria's AirWatch program on the EPA website uses air quality categories to show the level of air pollutants at monitoring sites across Victoria in real time[1], as shown in Table 4-5. The air quality categories are all based on measurements taken over a period of one hour, even if the NEPM(AAQ) objective for a pollutant is expressed over a longer averaging period – such as for PM_{10} and $PM_{2.5}$.

Table 4-5: Pollutant concentrations used to define air quality categories on EPA Victoria AirWatch website (as updated by EPA, August 2023).

Pollutant	Averaging period	Unit of measurement	Air quality category				
			Good	Fair	Poor	Very poor	Extremely Poor
NO_2	1 hour	ppb	<60	60 to 120	120 to 180	180 to 360	≥360
SO_2	1 hour	ppb	<100	100 to 200	200 to 300	300 to 600	≥600
CO	1 hour	ppb	<30,000	Not applicable	30,000 to 70,000	Not applicable	≥70,000
PM_{10}	1 hour	µg/m^3	<40	40 to 80	80 to 120	120 to 300	≥300
$PM_{2.5}$	1 hour	µg/m^3	<25	25 to 50	50 to 100	100 to 300	≥300

For NO_2, SO_2 and CO, a poor, very poor or extremely poor category indicates that the level of a pollutant is higher than its air quality guideline or standard. However, for PM_{10} and $PM_{2.5}$ there are no regional, national or international guidelines or standards for 1-hour average concentrations. The rationale used by EPA Victoria to select the concentrations that define the category thresholds for PM_{10} and $PM_{2.5}$ has not been published, however EPA Victoria advised Jacobs (pers. comm) that the values were based on experience of typical 1-hour concentrations that may indicate a risk of the 24-hour concentrations being exceeded. Using the shorter averaging period for the air quality categories for fine particulate allows more rapid indication of air quality in

[1] https://www.epa.vic.gov.au/for-community/monitoring-your-environment/about-epa-airwatch/calculate-air-quality-categories, accessed 8 August 2023.

real time, including potential impacts from short term exposure (such as from dust or smoke over a period of several hours) that would not necessarily be reflected in real time using the longer averaging period.

EPA Victoria has published general health advice for each air quality category, including steps recommended to be taken by exposed members of the public to protect themselves from the short-term effects of air pollution. The advice provided on the EPA Victoria website is summarised in Table 4-6.

Table 4-6: General health advice published by EPA Victoria for air quality categories

Air quality category	EPA Victoria general health advice
Good	No change needed to your normal outdoor activities.
Fair	The air quality is okay, but it could change soon. **For the general community:** - No change needed to your normal outdoor activities. **For groups sensitive to air pollution:** - Reduce outdoor physical activity if you develop symptoms like cough or shortness of breath. - Consider closing windows and doors until outdoor air quality is better. - Follow the treatment plan recommended by your doctor.
Poor	The air is probably dusty or smoky. **For the general community:** - Reduce outdoor physical activity if you develop symptoms like cough or shortness of breath. **For groups sensitive to air pollution:** - Avoid outdoor physical activity if you develop symptoms like cough or shortness of breath. - When indoors, close windows and doors until outdoor air quality is better. - Follow the treatment plan recommended by your doctor.
Very Poor	The air is probably very dusty or smoky. **For the general community:** - Avoid outdoor physical activity if you develop symptoms like cough or shortness of breath. - When indoors, close windows and doors until outdoor air quality is better. **For groups sensitive to air pollution:** - Stay indoors as much as possible with windows and doors closed until outdoor air quality is better. - If you feel that the air in your home is uncomfortable, consider going to a place with cleaner air (such as an air-conditioned building like a library or shopping centre) if it is safe to do so. - Actively monitor symptoms and follow any treatment plan recommended by your doctor.
Extremely Poor	The air is probably extremely dusty or smoky. **For the general community:** - Stay indoors as much as possible with windows and doors closed until outdoor air quality is better. - If you feel that the air in your home is uncomfortable, consider going to a place with cleaner air (such as an air-conditioned building like a library or shopping centre) if it is safe to do so. **For groups sensitive to air pollution:** - Stay indoors with windows and doors closed until outdoor air quality is better and reduce indoor activity. - If you feel that the air in your home is uncomfortable, consider going to a place with cleaner air (such as an air-conditioned building like a library or shopping centre) if it is safe to do so. - Actively monitor symptoms and follow the treatment plan recommended by your doctor.

(Source: https://www.epa.vic.gov.au/for-community/monitoring-your-environment/about-epa-airwatch/air-quality-categories, accessed 8 August 2023)

4.4 Proposed Project air quality criteria

The air quality criteria proposed to be adopted for the Project are the most conservative concentrations from both the ERS and the NEPM(AAQ), including the 2025 goals for $PM_{2.5}$. These adopted air quality criteria for the Project are listed in Table 4-7.

Table 4-7: Air quality criteria adopted for the Project

Environmental indicator (air pollutant)	Averaging period	Maximum concentration[2], or criteria
Particles as PM_{10}	1 day	50 µg/m^3
	1 year	20 µg/m^3
Particles as $PM_{2.5}$	1 day	25 µg/m^3 (current ERS/NEPM(AAQ)) 20 µg/m^3 (future 2025 goal)
	1 year	8 µg/m^3 (current ERS/NEPM(AAQ)) 7 µg/m^3 (future 2025 goal)
Respirable crystalline silica	1 year	3 µg/m^3
NO_2	1 hour	80 ppb
	1 year	15 ppb
CO	8 hours[1]	9.0 ppm (9000 ppb)
SO_2	1 hour	75 ppb
	1 day	20 ppb
Odour (qualitative objective)	Not applicable	An air environment that is free from offensive odours from commercial, industrial, trade and domestic activities

[1] Rolling 8-hour average based on 1-hour averages.

[2] Mass concentrations for particles in NEPM(AAQ) and ERS are referenced to gas conditions of 0°C, 101.3 kPa

4.5 Publication 1961 (EPA Guideline)

In February 2022, EPA Victoria released Publication 1961 (EPA 2022a). The guideline provides a framework to assess and control risks associated with air pollution in the form of a technical guideline for air quality practitioners and specialists. The guideline provides a tiered approach to the assessment of risks from air pollution, with three levels of assessment in order of increasing complexity that define the role of atmospheric dispersion modelling and monitoring intended by EPA Victoria within the Environment Protection Act and GED framework. Air quality assessment criteria are defined in the guideline for air pollutants for comparison with dispersion modelling results. For the Project, the relevant air quality criteria adopted are from the relevant objectives specified in the ERS. Should the ERS be updated at any point in time (for example to implement a variation to the NEPM AAQ), then this updated ERS objective would apply as the air quality criteria. Key elements of the guideline have been incorporated into this impact assessment, where relevant.

Publication 1961 does not provide methodologies for conducting atmospheric dispersion modelling, nor for assessment of odour or nuisance dust; although Publication 1961 does refer to other guidelines that cover these issues, including:

- Guidance for assessing nuisance dust (Publication 1943) published June 2022 (EPA, 2022b)
- Ambient air quality monitoring (Publication 1955) (under development)
- Guide to indicative air pollution monitoring (Publication 1956) (under development)
- Guide to air pollution modelling (Publication 1957) (under development)
- Guidance for assessing odour (Publication 1883) published June 2022 (EPA, 2022c).

This assessment was undertaken in general accordance with the methods outlined in these publications as well as the outcomes of stakeholder engagement (discussed further below in Section 5.5). This approach is recognised in EPA Victoria (2021c).

4.6 Guidelines for dust from construction sites

In November 2020, EPA Victoria published the CCBD Guide. This guide replaced EPA *Publication 480: Best Practice Environmental Guidelines for Major Construction Sites* (EPA Victoria, 1996). The CCBD Guide provides an overview of:

- Duties under the Environment Protection Act
- Activities that may lead to erosion and the generation of sediment and dust
- Potential impacts of sediment and dust
- Factors to consider in understanding erosion, sediment and dust generation
- Controls and/or mitigation measures that can be implemented to minimise the generation and transport of dust, and manage risk associated with dust emissions from activities associated with civil construction, building, and demolition.

Controls and mitigation measures from the CCBD Guide and other relevant guidelines suitable for addressing the risks determined in the impact assessment (see Section 7 to Section 10 below) were also incorporated.

4.7 Clause 13.06-1S (Air Quality Management) Planning Schemes

As outlined in Table 4-1, the standard Victoria Planning Provisions for air quality management are listed in the Planning Schemes applying to the Project Area. With reference to the standard requirement that 'wherever possible, that there is suitable separation between land uses that pose a human health risk or reduce amenity due to air pollutants, and sensitive land uses (residential use, childcare centre, school, education centre, residential aged care centre or hospital)', guidance is drawn from Publication 1518: Recommended Separation Distances for Industrial Residual Air Emissions – Guideline, (EPA, 2013) regarding 'suitable separation'. Power transmission is not an 'industry requiring separation' listed in Section 7 of the guideline. As such, clause 13.06-1S Planning Scheme requirements for the Project is not considered relevant.

5. Method

5.1 Overview

This section of the report describes the method that was used to assess the potential impacts of the Project. Risk screening was applied to prioritise the key issues for impact assessment. Measures to avoid, minimise and manage potential effects have then been developed to address these impacts. This section also outlines the key steps undertaken in completing this assessment.

5.2 Study area

The study area for the air quality impact assessment is the Project Area with a 500m buffer applied. This 500m buffer is consistent with guidance presented in Section 6 of 'Guidance on the assessment of dust from demolition and construction Version 2.2', (UK IAQM, 2024) which identifies that when there are no sensitive receptors within 500m the risk of impacts from construction activities would be 'negligible' and that any effects 'would not be significant'. The air quality study area is also generally consistent with the guidance presented in Section 3.2 of Publication 1943 (EPA, 2022b). The study area for the assessment is displayed below in Figure 5.1.

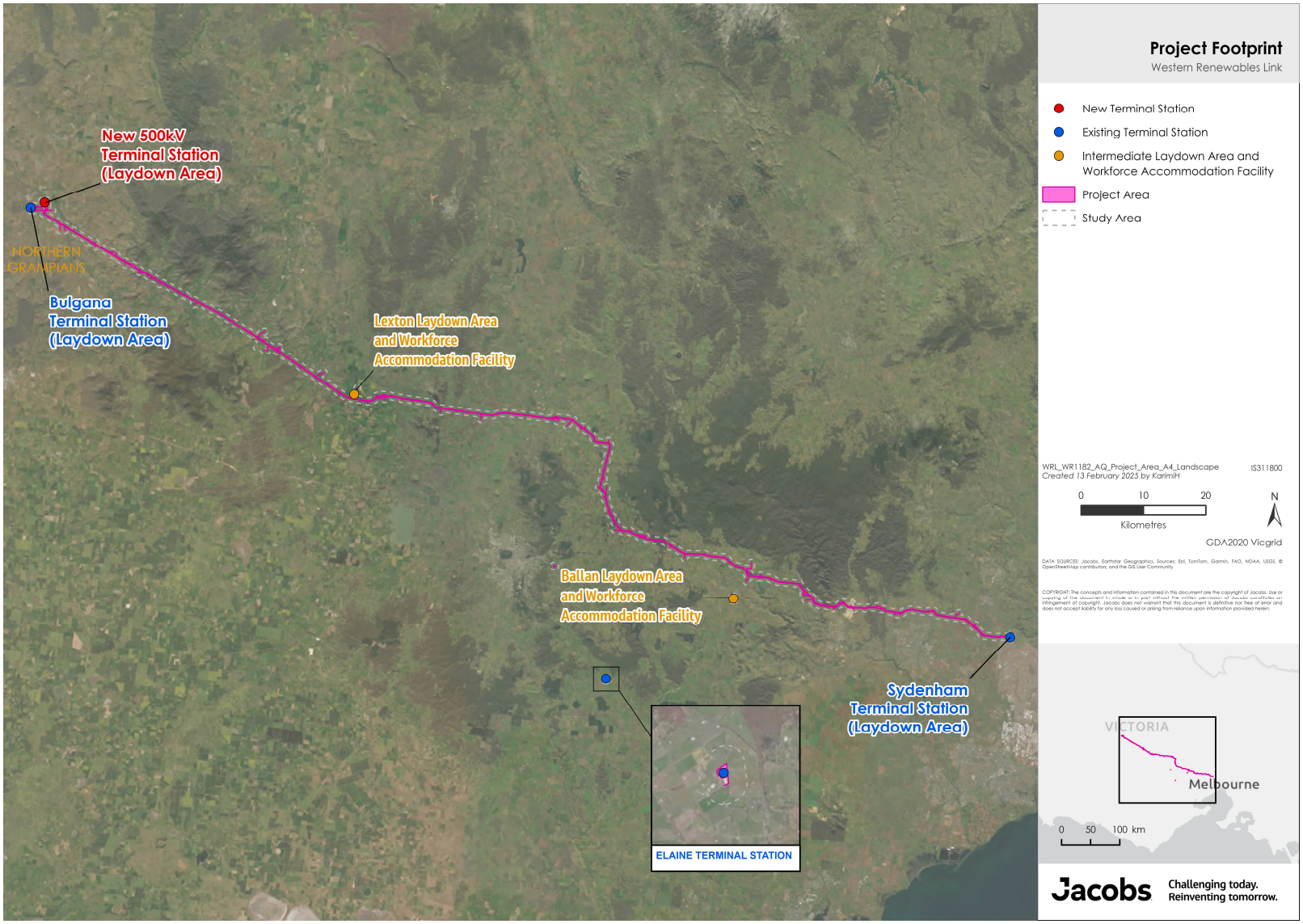

Figure 5.1: Air quality study area (Source: AusNet, 2025)

5.3 Existing conditions

The existing conditions assessment was used to characterise the current condition and values of the physical, biological, and social environment. The approach comprised desktop research and data analysis. Consistent with the EES scoping requirements, the purpose of the existing conditions assessment was to characterise background air quality, identify other local potential sources of relevant air pollutants and identify surrounding sensitive receptors. A review of prevailing local meteorological conditions was also completed noting that meteorological conditions are important for determining the direction and rate at which emissions from a source would disperse. Key features of local terrain were also reviewed, noting that terrain can influence meteorology at a local scale.

The data sources used for the existing conditions assessment are provided in Table 5-1.

Table 5-1: Data sources for existing conditions

Data	Source
Background air quality	▪ EPA annual datasets for Geelong and Melton, downloaded from Data Vic (https://www.data.vic.gov.au/)
Other local potential sources of relevant air quality pollutants	▪ EPA licenced sites, priority sites, environmental audit reports and landfills identified using spatial information from Victoria Unearthed (available at https://mapshare.vic.gov.au/victoriaunearthed/) and permissioning decisions register (available at https://www.epa.vic.gov.au/about-epa/public-registers/permissions) , accessed 17 February 2025 ▪ National Pollutant Inventory Facilities Dataset for 2022-23 reporting year, downloaded as .kmz file format (https://data.gov.au/dataset/ds-dga-043f58e0-a188-4458-b61c-04e5b540aea4/details) and imported into Google Earth ▪ Google Earth aerial imagery
Receptor locations	▪ Google Earth aerial imagery and from Ferguson Perry on behalf of AusNet via Aerometrex (dated September 2022 [Hepburn to Sydenham] and June 2023 [Bulgana to Hepburn]) ▪ Planning and Land Use Maps from VicPlan (https://mapshare.vic.gov.au/vicplan/), accessed 8 August 2023. ▪ Dwelling locations from Ferguson Perry on behalf of AusNet provided December 2022
Local topography and meteorology	▪ Ferguson Perry on behalf of AusNet via Aerometrex (Dated August 2021) ▪ Hourly wind speed and direction recorded collected from 2011 to 2022 from the Commonwealth Bureau of Meteorology's (BoM's) stations operated at Stawell, Pyrenees, Ballarat, and Melbourne Airport.

These features of the existing environment are presented and discussed below in Section 6.

5.4 Risk screening

A risk screening process was undertaken to identify the air quality related risks associated with the design, construction, operation and decommissioning of the Project and to provide for the appropriate level of investigation. The outcomes of the risk assessment identified the key issues that were taken forward into the impact assessment phase (see Section 7.1, Section 8.1 and Section 9.1) .

5.5 Impact assessment method

The method for the air quality impact assessment included:

- Identifying key issues (as described in Section 5.4) to be addressed in the impact assessment
- Identifying potential impacts of Project construction, operation, and decommissioning including the likely extent, magnitude and duration of changes to air quality according to the impact ratings developed for the study summarised below in Table 5-2 and Table 5-3.

- Potential impacts of the Project were measured against the existing conditions by assessing the significance of the impacts, taking into consideration mitigation measures. Mitigation measures to reduce the potential impacts have been recommended in accordance with the mitigation hierarchy (avoid, minimise, manage, rehabilitate and offset) and these have then informed the development of Environmental Performance Requirements (EPRs).
- Identifying any other potential developments that could lead to cumulative impacts when considered together with the Project.
- Prepare EPRs to define the environmental outcomes to be achieved through the implementation of mitigation measures during construction, operation and decommissioning. While some EPRs are performance based to allow flexibility in how they will be achieved, others include more prescriptive measures that must be implemented. Compliance with the EPRs will be required as a condition of the Project's approval.
- Apply the relevant workforce accommodation facilities conditions from the draft Incorporated Document, to avoid, minimise and manage impacts associated with these sites
- Determining the residual impacts associated with the construction, operation, and decommissioning of the Project, and evaluating their significance in accordance with the criteria described above.

Dust generated during construction and decommissioning activities was identified as the air quality issue with the highest potential for impacts. In June 2022 the EPA released Publication 1943 which provides a framework for assessing nuisance dust impacts. This framework is consistent with the overarching provisions of the GED to 'eliminate or minimise the risks posed by hazards to prevent harm'. The framework assesses the risk posted by nuisance dust by considering three elements:

- Step 1: The hazard potential of dust sources. This is evaluated based on the size, nature of activities, type of emissions generated and level of control.
- Step 2: The exposure pathway between the source and receiving environment. The framework considers the separation distance, orientation, and intervening terrain and land uses features between the activity or project and the surrounding receivers.
- Step 3: The sensitivity of the receiving environment. This aspect considers the historical context of air quality-related issues experienced by people in the receiving environment, as well as the overall land use across this setting.

As displayed below in Figure 5.2 these elements are combined to determine the overall risk of dust impacts from an activity or project (Step 4), with the final outcome being any residual risks once planned mitigation and management measures are applied.

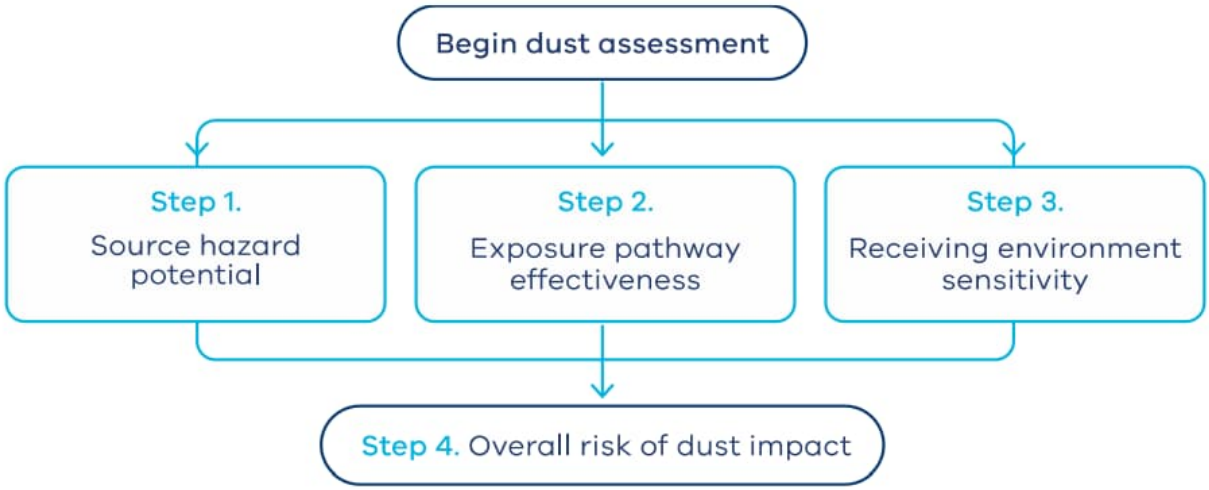

Figure 5.2: Nuisance dust risk assessment framework (Source: EPA, 2022a)

The assessment methodology is intrinsically linked to the process and full details of how the assessment was completed and its outcomes are presented in Section 7 to Section 9. The dust impact ratings applied are listed below in Table 5-2. The 'score' in column one refers to sum of outcomes from steps 1, 2 and 3. Further guidance of this (and associated potential consequences) are provided below in Section 7 to Section 9 noting that the assessment methodology is intrinsically linked to the impact rating process.

Table 5-2: Dust impact ratings (Source; EPA, 2022a)

Score	Impact rating	Comment
32-36	Very high	Dust impact almost certain. Nuisance dust impacts will occur. Any interventions to reduce impacts in either the source, pathway or receiving environment are unlikely to be practical so effective mitigation is doubtful.
27-31	High	Dust impacts highly likely to occur. Significant nuisance dust to occur, and impacts are highly likely. There may be some interventions that can be applied to reduce the impacts, but it is likely that significant re-engineering or redesign will be required.
22-26	Medium	Dust impacts likely. Some nuisance dust impacts to occur and without careful and considered application of mitigation measures it is likely to cause impacts. The focus should be what can be done to break the source-pathway-receiving environment chain.
17-21	Moderate	Dust impacts only likely to occur on rare occasions. Although there may be some residual nuisance dust impacts, it is possible it can be practically and effectively managed.
12-16	Low	Dust impacts are not likely and are expected to be minimal.
-	Negligible*	Any dust impacts are extremely unlikely to occur.

* Note: additional category added to Publication 1943 categories to account for circumstances where dust impacts would not occur

As noted in Section 4.3.1, there are other potential air quality impacts associated with the Project. These included exhaust emissions from plant and equipment and odours/airborne hazardous materials in the event that uncovered contaminated materials and groundwater is encountered. Additionally, there is also the potential for cumulative impacts from surrounding developments and land uses, as well as nearby projects. Potential impacts associated with these matters have been assessed qualitatively with impacts characterised based on the ratings below in Table 5-3.

Table 5-3: Exhaust emissions and/or odours/airborne hazards impact assessment ratings

Impact rating	Comment
Very high	Exhaust emissions and/or odours/airborne hazard impacts almost certain. Interventions to reduce impacts in either the source, pathway or receiving environment are unlikely to be practical so effective mitigation is doubtful.
High	Exhaust emissions and/or odours/airborne hazard impacts highly likely to occur. Significant impacts to occur, and impacts are highly likely. There may be some interventions that can be applied to reduce the impacts, but it is likely that significant re-engineering or redesign will be required.
Medium	Exhaust emissions and/or odours/airborne hazard impacts likely. Some impacts to occur and without careful and considered application of mitigation measures it is likely to cause impacts. The focus should be what can be done to break the source-pathway-receiving environment chain.
Moderate	Exhaust emissions and/or odours/airborne hazard impacts only likely to occur on rare occasions. Although there may be some residual impacts, it is possible it can be practically and effectively managed.
Low	Exhaust emissions and/or odours/airborne hazard impacts are not likely and are expected to be minimal.
Negligible	Exhaust emissions and/or odours/airborne hazard impacts are extremely unlikely to occur.

Potential impacts were initially assessed in the absence of any standard or specific practice control measures. Specific measures, monitoring and EPRs were recommended based on the outcomes of the assessment, and residual risks were determined. The EPRs are presented in Section 11.

5.6 Stakeholder engagement

Stakeholders and the community were consulted to support the preparation of this report and to inform the development of the Project and understanding of its potential impacts.

Table 5-4 lists specific engagement activities and matters discussed and raised that occurred in relation to air quality, with more general engagement activities occurring at all stages of the Project.

Table 5-4: Stakeholder engagement undertaken for Air Quality Impact Assessment

Engagement Activity	Date	Matters discussed/raised
Consultation with EPA	11 May 2021	▪ Update on WRL air quality existing conditions report. ▪ Dust identified as the key air emission with exhaust gases from vehicle emission sources considered minor. ▪ Focus of assessment on terminal stations where more intensive activities likely to occur due to construction cut and fill, concrete foundations and footings. ▪ Access roads to terminal stations in comparison will be a focus of activity and may be in use for many months. ▪ Terrain influencing access track construction for the transmission line and use of the access track, for example vehicle speeds – watering for dust suppression and speed controls seen as key controls on these transmission line access tracks. ▪ Targeting of controls around sensitive receptors/houses as needed – planned management measures to be designed with respect to any nearby sensitive receptors. Adaptive management approach recommended (for inclusion in assessment). ▪ Nearby extractive industries as a potential cumulative impact risk. ▪ Representative 'background' (existing) air quality data obtained for assessment (Geelong data).

Engagement Activity	Date	Matters discussed/raised
		▪ Dust modelling considered but agreed impractical across Project Area given the size of the study area – alternative is a "work safe" approach to dust, where issues are identified, and controls are put in place to mitigate at local sites. ▪ Alignment of EPA's air quality standards with national (NEPM) standards for nitrogen dioxide and sulfur dioxide. ▪ Potential community benefits of Project.
	Subsequent engagement through 2021, 2022 and 2023 through Technical Reference Group	▪ Endorsement of the risk-based assessment methodology, with some detail to be included explaining the basis and suitability of the approach for the Project (included in Section 5.5) ▪ Include reference to the 2025 objective values listed in the ERS (included in Section 4.3.2) ▪ Provide context around the potential effectiveness of different control measures being recommended (included in Section 7.2.4)
'Social Pinpoint' data (Project website data entries) received from the public	2021-22	▪ Corridors for further investigation - Southern 500kV option; excavation of potential PFAS in soil at/near Fiskville fire training facility.
		▪ No Social Pinpoint (comments from community interactions with the Project website were identified that related to air quality

5.7 Community feedback

In addition to consultation undertaken with specific stakeholders, consultation has been ongoing with the community throughout the design development and the EES process. Through this process, air quality has not been identified as a key area of concern. This has also been the case throughout the consultation period through 2020 to present (December 2024). A review of the AusNet consultation database shows that no specific concerns related to air quality have been raised.

5.8 Assumptions, limitations and uncertainties

The following assumptions, limitations and uncertainties apply to this impact assessment:

- Consideration of planning schemes, planning scheme amendments and development applications has been undertaken using publicly accessible sources of information and information provided by Councils and the Department of Transport and Planning (DTP).
- The report has been written at a point in time and is based on information provided by AusNet on the Project (Project components and location of components) and information on current and future land use and planning matters available through public sources and in consultation with key stakeholders of the EES process. Much of the information and data used within this report is dynamic and is constantly evolving, including planning schemes. The information is presumed as accurate at the time of writing.
- The assessment of land use is based on the identification of reasonably foreseeable land uses identified in future land use strategic plans and policies and is not representative of the operational life span of the transmission lines and terminal stations.
- Typology mapping was restricted to include only land parcels within the route and 100m either side of the Proposed Route.

6. Existing conditions

6.1 Overview

Aspects of the receiving environment are described in this Section. Details of existing background air quality conditions, sources of existing and potential future emissions to air, land uses, and sensitive receivers, topography and prevailing meteorology are provided. The significance of these features in the context of the assessment (forming the basis for steps 2 and 3 of the Publication 1943 nuisance dust assessment methodology) are also described in this Section.

6.2 Background air quality, pollutant sources, land uses and projects

6.2.1 Background air quality, Northern Grampians, Pyrenees, Ballarat, Hepburn, and Moorabool LGAs

There are no ambient air quality monitoring stations in these local government areas, so EPA Victoria measurements at the (standard) monitoring station in Geelong were used as a surrogate for Ballarat for PM_{10}, $PM_{2.5}$, NO_2, SO_2 and CO for 50th percentile statistical observations. Maximum background air quality in Ballarat was also inferred from the maximum observations at Geelong for NO_2 and CO. Though using the Geelong data for maximum PM_{10} and $PM_{2.5}$ would overestimate the Ballarat upper percentile PM_{10} concentrations (noting the greater density of transport, industry and population, as well as sea salt influences compared to the subject inland locations), the Geelong AQMS is the best currently available source of background air quality data for the Project.

Air quality outside of Ballarat is likely to be better (i.e., have lower pollutant concentrations) than in Ballarat township itself, except during bushfires or dust storms. The Northern Grampians, Pyrenees, Ballarat, Hepburn, and Moorabool LGAs cover rural areas outside of Ballarat with smaller towns and with low population density and low vehicle density, and therefore lower density of emission sources for PM_{10}, CO and NO_2. Some background concentrations of pollutants will be present due to long-distance transport of pollutants from the Melbourne airshed, and from dust storms and bushfires. However, with the low numbers of local emission sources, the average air quality concentrations are expected to be lower than in Ballarat.

Background air quality in Bacchus Marsh, at the eastern end of the Moorabool LGA, is likely to be similar to Ballarat or Melton given its proximity, and the similar density of air emitting industries and activities (see further information below in Section 6.2.2).

Statistical summaries of the data records for the Geelong AQMS for 2014 to 2022 are provided Appendix A. The data that represents ambient air quality in Ballarat is taken from Appendix A and is summarised in Table 6-1. For each pollutant, a range of percentiles and the maximum measured concentrations are shown.

<u>PM_{10} and $PM_{2.5}$</u>

For PM_{10} and $PM_{2.5}$, only the 50th percentile is representative of ambient quality in the Northern Grampians, Pyrenees, Ballarat, Hepburn, and Moorabool LGAs. The higher percentiles and the maxima for 24-hour PM_{10} and $PM_{2.5}$ at Geelong, and the annual average, are likely to overstate the actual concentrations in these LGAs. However, if the region is affected by bushfire smoke or large dust storms, the maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations in these LGAs could be similar to the maxima shown in Table 6-1.

The reported PM_{10}, $PM_{2.5}$, NO_2, SO_2, and CO results are taken from the annual monitoring reports published by EPA Victoria (EPA Victoria 2015, 2016, 2017, 2018, 2019,2020, 2021 and 2022).

The ambient air quality concentrations reported in **Appendix A** and summarised in Table 6-1 show the following:

- 50th percentile concentrations for 24-hour average PM_{10} and $PM_{2.5}$ are well below the ERS objectives.
- Maximum 24-hour average concentrations for PM_{10} and $PM_{2.5}$ at Geelong exceed the ERS objectives, however the maxima at Geelong may not be representative of the maxima at Ballarat. It is assumed however

that there may be occasions where the PM_{10} and $PM_{2.5}$ criteria are approached or exceeded in Ballarat, especially during exceptional events such as a large-scale dust storm or bushfires (e.g., 2020).

- Annual average PM_{10} and $PM_{2.5}$ are close to the ERS objectives, however annual average concentrations of PM_{10} and $PM_{2.5}$ in Geelong are not representative of the Ballarat area and would overstate the likely background air quality in the Northern Grampians, Pyrenees, Ballarat, Hepburn, and Moorabool LGAs.

NO_2, SO_2 and CO

Maximum concentrations of NO_2, SO_2 and CO occurring in Geelong (and representative of the Northern Grampians, Pyrenees, Ballarat, Hepburn, and Moorabool LGAs) are below the applicable ERS objectives and the NEPM(AAQ) standards (see Table 4-3).

Table 6-1: Summary of ambient air quality concentrations at Geelong AQMS (2014–2022) (see Appendix A for further data).

Pollutant	Averaging period	ERS objective	Maximum concentration (24-hour average for PM_{10} and $PM_{2.5}$, 1-hour average for NO_2 and SO_2 and 8-hour rolling average for CO as aligned to applicable ERS objective values)[1]	Average 50th percentile concentration[3]	Range of annual average concentrations
PM_{10}	24h	50 µg/m³	Lowest – 38 µg/m³ (2022) Highest – 286 µg/m³ (2015)	16 µg/m³	-
	Annual	20 µg/m³	-	18.7 µg/m³	17.1 – 20.9 µg/m³
$PM_{2.5}$[2]	24h	25 µg/m³	Lowest – 23 µg/m³ (2021) Highest – 155 µg/m³ (2020)	5.7 µg/m³	-
	Annual	8 µg/m³ decreasing to 7µg/m³ in 2025	-	6.7 µg/m³	6.4 – 7.8 µg/m³
NO_2	1h	120 ppb	Lowest – 33 ppb (2022) Highest – 51 ppb (2018)	4 ppb	-
	Annual	30 ppb	-	5.8 ppb	5.5 – 6.3 ppb
SO_2	1h	200 ppb	Lowest – 10 ppb (2016) Highest – 47 ppb (2019)	0.1 ppb	-
	Annual	20 ppb	-	0.5 ppb	0.3 – 0.7 ppb
CO	8h	9 ppm	Lowest – 1.0 ppm (2017) Highest – 2.9 ppm (2020)	0.1 ppm	-

[1] Data shown is the year with the highest maximum 24-hour / 1-hour / 8-hour average concentration, and the year with the lowest maximum 24-hour / 1-hour / 8-hour average concentration.

[2] Only data for 2017 to 2021 available as monitoring for $PM_{2.5}$ commenced in August 2016, with insufficient data noted as having been captured in 2022.

[3] Average from each annual 50th percentile data result.

Source: (EPA, 2023)

6.2.2 Background air quality, Melton LGA

The Melton LGA is located in the northwest of the Melbourne Metropolitan area and was the third fastest growing LGA in Victoria with an estimated resident population of 173,072 people in June 2020. AQMS sites used by EPA to represent air quality in Greater Melbourne, such as Alphington, Footscray, and Dandenong, are likely

to overstate background ambient air quality at receptors around the eastern end of the Project Area towards the Sydenham Terminal Station. A new air quality monitoring station was installed at Melton for continuous measurement of $PM_{2.5}$ in August 2020. Data from this station are summarised in Table 6-2, with further detail provided in Appendix A.

Table 6-2: Summary of ambient air quality concentrations at Melton AQMS (2021–2022) (see Appendix A for further data).

Pollutant	Averaging period	ERS objective	Maximum concentration (24-hour average)[1]	Average 50th percentile concentration[3]	Range of annual average concentrations
$PM_{2.5}$[2]	24h	25 µg/m^3	Lowest – 15 µg/m^3 (2022) Highest – 22 µg/m^3 (2021)	4.9 µg/m^3	-
	Annual	8 µg/m^3 decreasing to 7µg/m^3 in 2025	-	6.1 µg/m^3	5.9 – 6.2 µg/m^3

[1] Data shown is the year with the highest maximum 24-hour average concentration, and the year with the lowest maximum 24-hour average concentration.

[2] Only data for 2021 and 2022 available as monitoring at Melton commenced in August 2020.

[3] Average from each annual 50th percentile data result.

Source: (EPA, 2023)

As Table 6-2 shows, measured $PM_{2.5}$ concentration at Melton were better than those adopted from the data collected at Geelong. The average annual concentration was around 0.6 µg/m^3 lower, with the maximum and 50th percentile 24-hour averaged $PM_{2.5}$ concentrations also considerably lower. Noting that the other key pollutants are not monitored at Melton, these limited data from the Melton AQMS indicate that air quality conditions around Melton LGA may be less affected, and that the adoption of representative background concentrations from Geelong for receptors around this location is conservative.

6.2.3 Pollutant sources, land uses and projects, Project-wide

With a small number of exceptions identified in Section 6.2.4, there are no industrial sources of air emissions that could result in a cumulative impact on air quality for the Project in the study area.

Most of the study area and surrounding land contain predominantly rural land uses; some which is intensively farmed, and some which covers larger and less intensive grazing properties. Local sources of dust emissions therefore may arise from this land, particularly in drier months of the year and when wind speeds are high. The dust erosion potential will vary throughout the year and will depend on the extent of vegetation cover, topsoil moisture content, and the type of farming carried out on the land (for example tilling or harvesting activities).

Local unsealed roads are also a source of dust emissions, both when vehicles are moving on the roads and when the roads are empty. The dust emission potential again will depend on surface moisture content and compaction, wind speed and direction and vehicle weights.

6.2.4 Pollutant sources, land uses and projects, Location-specific sources

6.2.4.1 Moorabool LGA

As displayed in Figure 6.1 three large quarries (gravel and sand) (Boral, Hanson, and Barro Group quarries) are located within and around the Project Area just to the north of Bacchus Marsh. These quarries operate crushing and excavation activities that generate dust. It is also understood that part of the Hanson Quarry is used for placement of clean fill in the quarry void for rehabilitation purposes, a further potential source of dust. Additionally, blasting is also completed at Hanson Quarry which can generate dust and NO_x. If not properly managed, blasting can lead to localised amenity and visibility impacts.

These quarries have the potential to emit particulate emissions beyond the site boundaries which influence background air and to act cumulatively with dust emissions from other dust sources resulting in increased adverse effects for nearby sensitive receptors. These facilities may privately conduct boundary monitoring for dust; however, no monitoring data is publicly available. Jacobs was not made aware of the presence of any relevant monitoring data during consultation held with Hanson. The quarries identified above have Work Authorities issued by Department of Jobs, Precincts and Regions (DJPR) to enable quarry activities including operation of crushing equipment.

The potential for cumulative air quality impacts from other projects in and around the Project Area within the Moorabool LGA is reviewed below in Section 10.

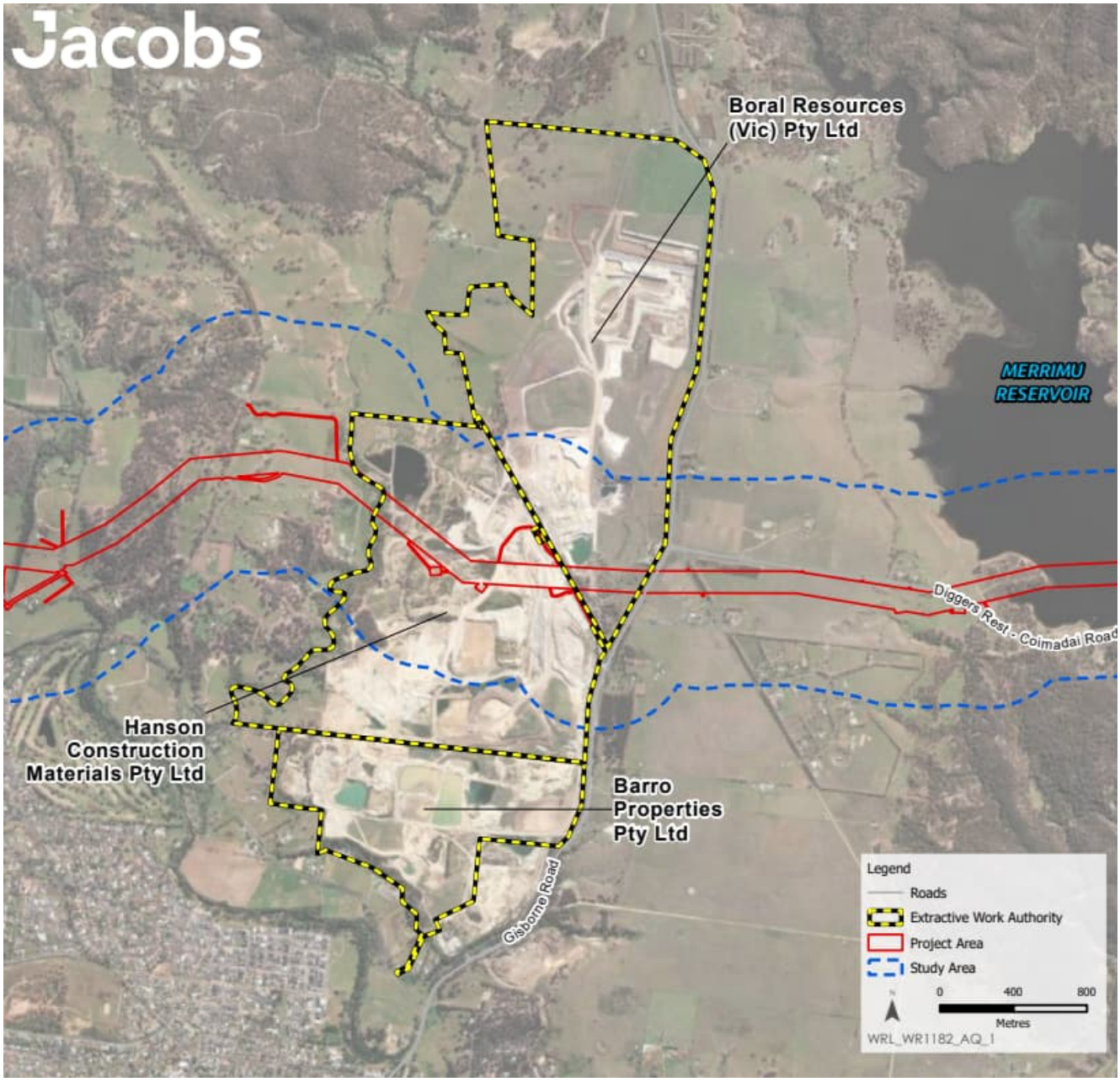

Figure 6.1: Location of Boral, Hanson and Barro Group quarries, north of Bacchus Marsh. (Source: Jacobs, 2024)

6.2.4.2 Melton LGA

Two quarries operated by Central Pre-Mix Concrete Pty Ltd, and Keilor-Melton Quarry, are located on Leakes Road, around 1,300m to the southwest of the Project Area towards the eastern end of the Project approaching the existing Sydenham Terminal Station (Figure 6.2). These quarries are also a potential source of dust in the same context as discussed above for the quarries in the Moorabool LGA (Section 6.2.4.1).

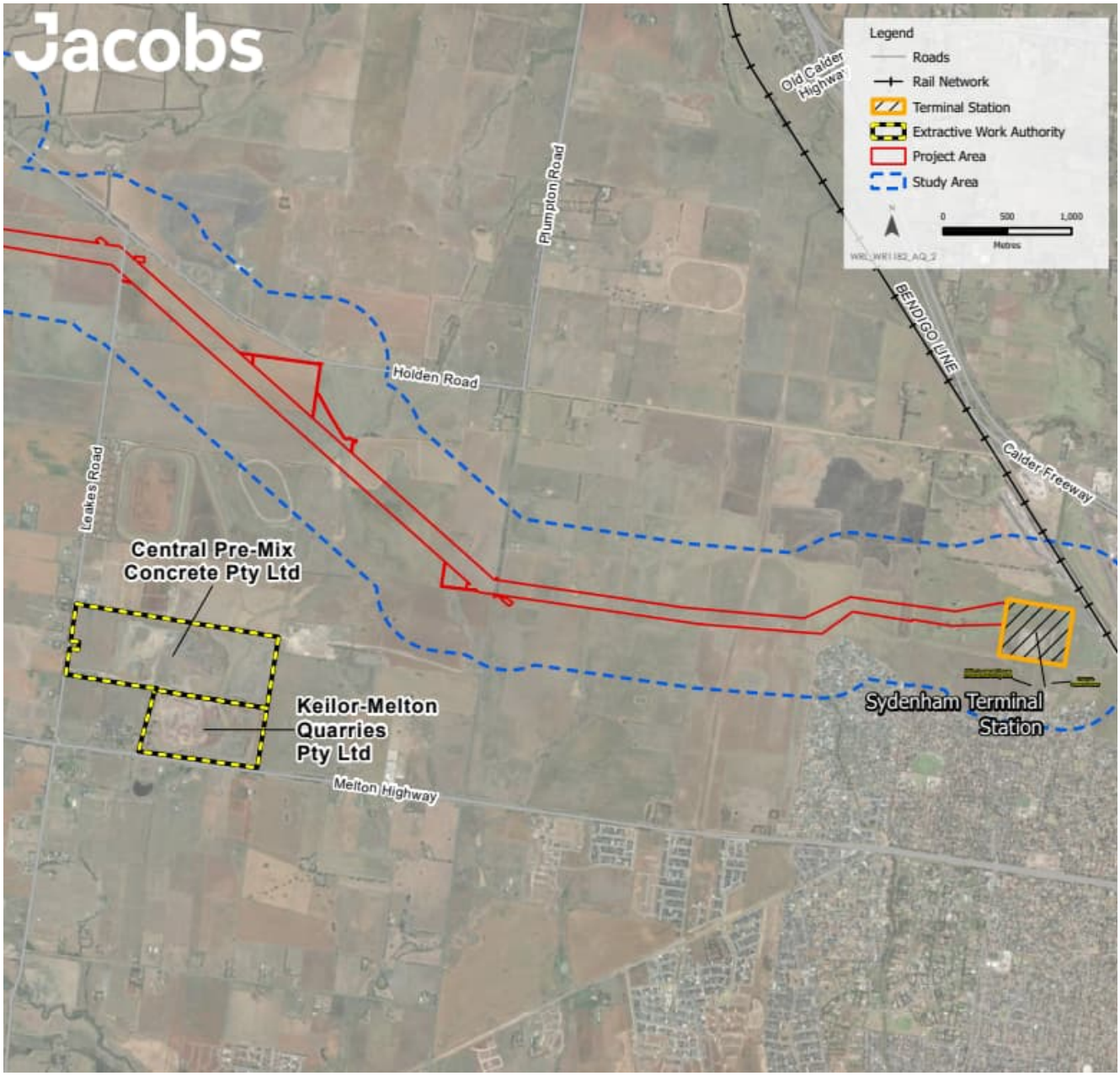

Figure 6.2: Location of nearby quarries, west of the proposed Sydenham Terminal Station. (Source: Jacobs, 2024)

The potential for cumulative air quality impacts from other projects in and around the Project Area within the Melton LGA is reviewed below in Section 10.

6.3 Sensitive receptors

Based on review of the data sources (Section 5.3), the following land uses are considered relevant to the identification of sensitive receptors for the air quality assessment for the Project:

- Between the existing Bulgana Terminal Station and Allendale, there is a large proportion of farming-zoned land, in particular cropping (oilseeds and cereal), grazing, perennial horticulture and plantation forests.
- Closer to Ballarat there is also some urban and rural residential land as well as vineyards and intensive horticulture, trees of special significance, and other ecologically valued sites.

- There are a small number of residences and businesses in the study area, excluding the rural towns of Elmhurst, Lexton, Waubra and Learmonth, which have typical rural town residential areas and businesses such as retail, mechanics, schools and hospitality.
- In Mount Rowan, Federation University has an equestrian centre and Ballarat Grammar has a farming campus.

Cross-referencing the Project Area against aerial imagery, land use information and dwelling data confirmed by AusNet, nearby sensitive receptors were determined. The nearest sensitive receptors in relation to each element of the Project are summarised below in Table 6-3. Additionally, a breakdown of the setback distance to residential receptors from the different components of the Project are listed below in Table 6-4. It is noted that the density and proximity of receptors along the transmission lines, temporary construction infrastructure, and ancillary works components of the Project have been described by way of Bulgana to Allendale and Allendale to Sydenham. As displayed below in Table 6-4 the proximity and density of receivers to the west of the township of Allendale is much lower than to the east. The location also roughly corresponds with the mid-point along the route.

Table 6-3: Nearest sensitive receptors

Project element	Approximate distance to nearest residential sensitive receptor
Transmission lines, temporary construction infrastructure, and ancillary works (including access tracks)	Generally, 50 to 100m consistent with minimum easement requirements
Powercor distribution line crossovers	
Existing Bulgana Terminal Station	Approximately 2,000m
New 500kV terminal station at Bulgana	Approximately 1,100m
Elaine Terminal Station	Approximately 1,300m
Ballan intermediate laydown area and workforce accommodation facility	Approximately 700m
Lexton intermediate laydown area and workforce accommodation facility	Approximately 1,450m

Table 6-4: Overview of location of residential receptors in relation to different components of the Project

Project element	Number of residential receptors within different setbacks from the Project			
	0 to 100m	100 to 200m	200 to 500m	500 to 1000m
Transmission lines, temporary construction infrastructure, and ancillary works (Bulgana to Allendale)	2	8	43	89
Transmission lines, temporary construction infrastructure, and ancillary works (Allendale to Sydenham, including Sydenham connection works)	20	30	255	1,430
Powercor distribution line crossovers (Bulgana to Allendale)	1	3	23	27
Powercor distribution line crossovers (Allendale to Sydenham)	7	16	78	318
Existing Bulgana Terminal Station	0	0	0	0

Project element	Number of residential receptors within different setbacks from the Project			
	0 to 100m	100 to 200m	200 to 500m	500 to 1000m
New 500kV terminal station at Bulgana	0	0	0	0
Elaine Terminal Station	0	0	0	0
Ballan intermediate laydown area and workforce accommodation	0	0	0	14
Lexton intermediate laydown area and workforce accommodation	0	0	0	0

The location of surrounding sensitive receptors in relation to the Project Area are displayed in Figure 6.3. Further detail are shown from west to east along the Project Area in

Figure 6.4, Figure 6.5, Figure 6.6 and Figure 6.7.

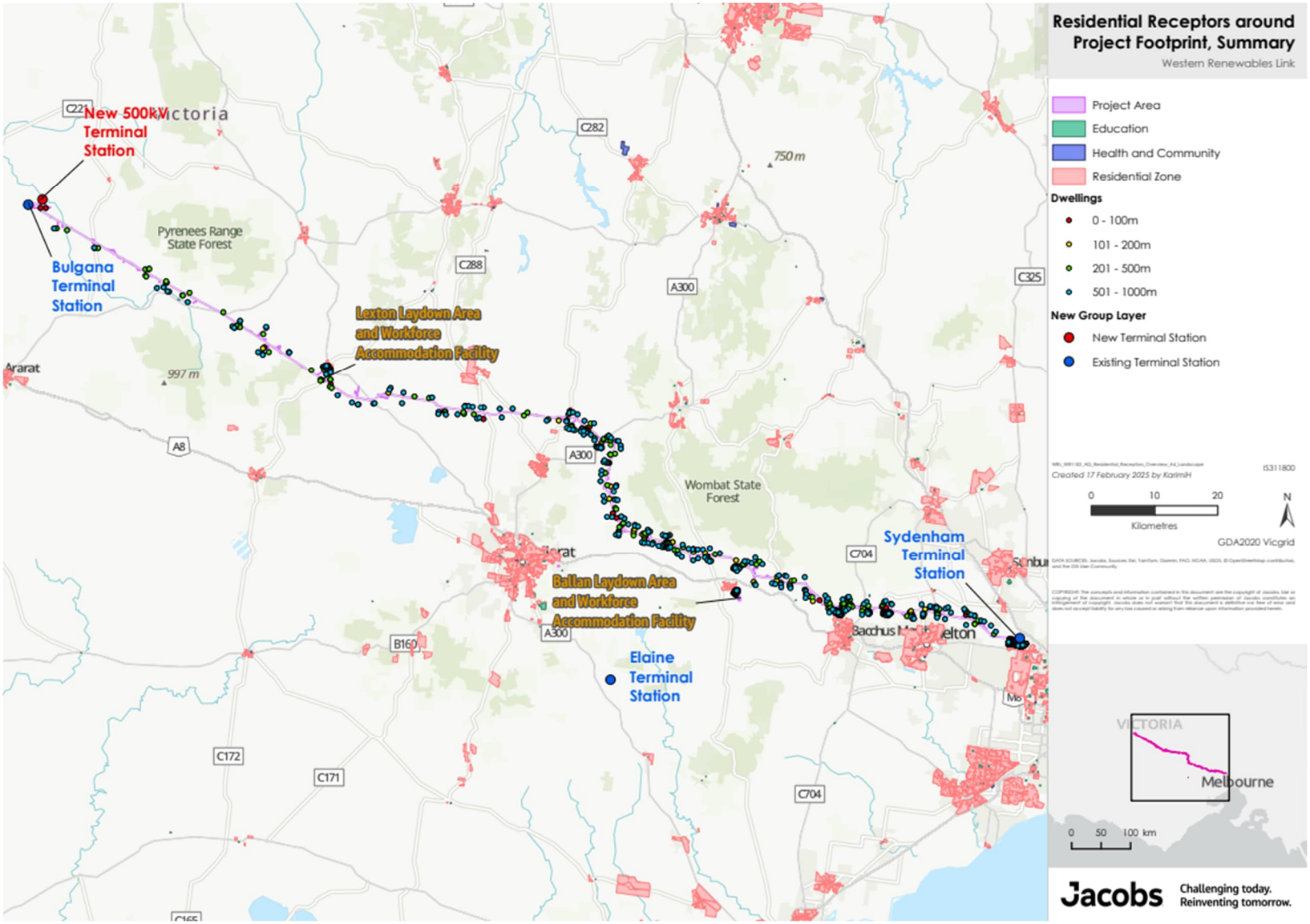

Figure 6.3: Nearest sensitive receptors (Source: Jacobs, 2024)

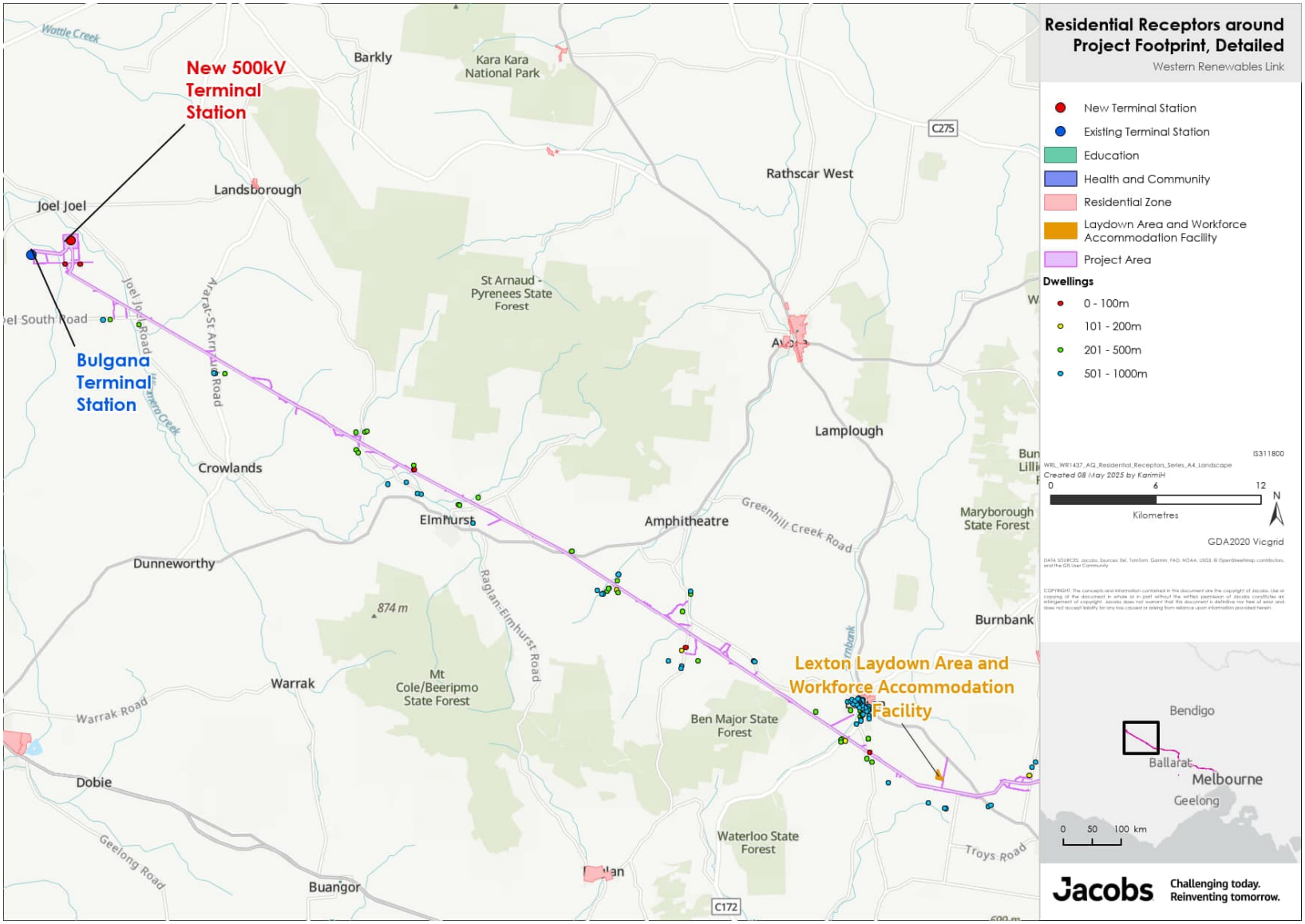

Figure 6.4: Nearest sensitive receptors, Bulgana to Waubra (Source: Jacobs, 2024)

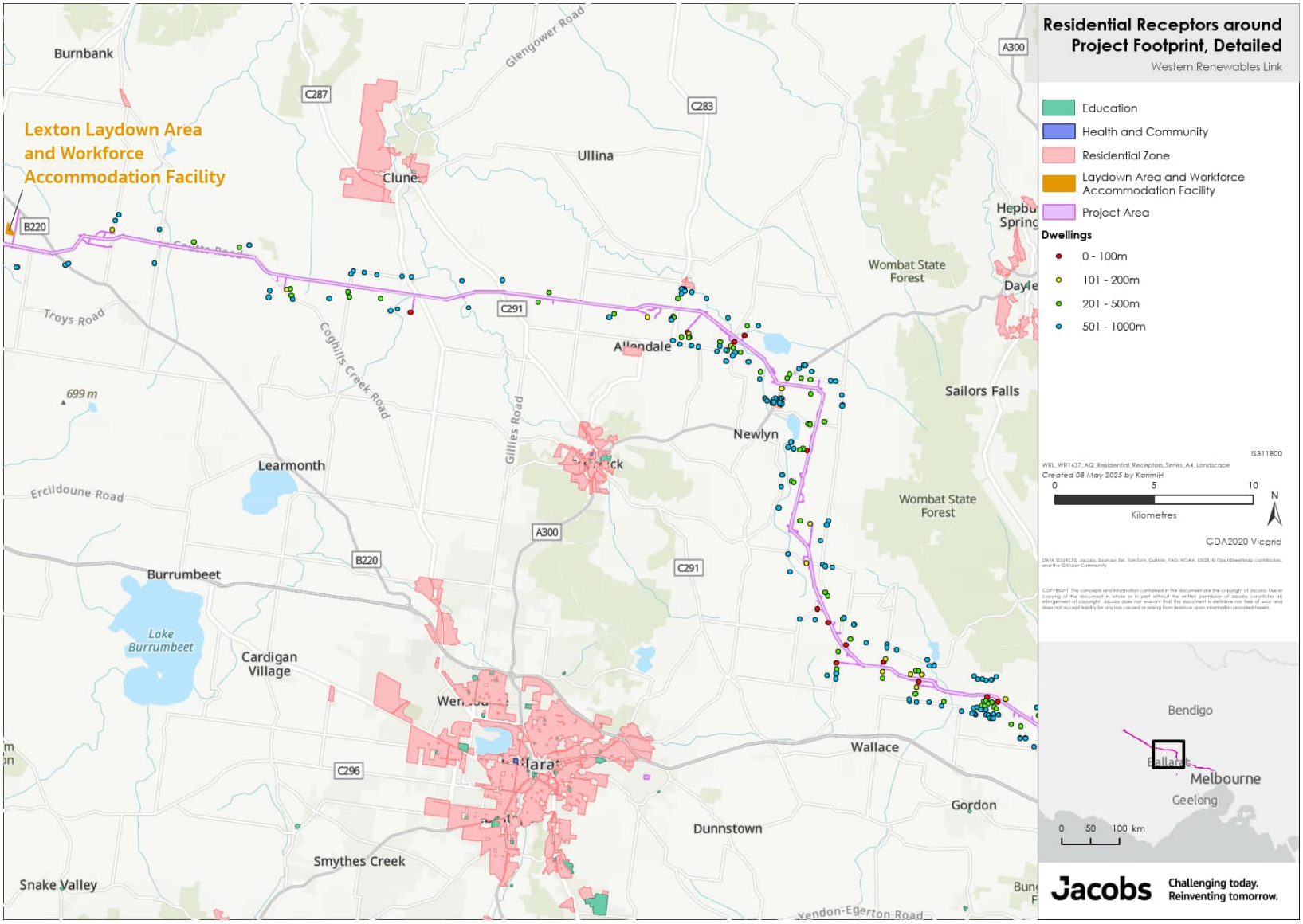

Figure 6.5: Nearest sensitive receptors, Waubra to Gordon (Source: Jacobs, 2024)

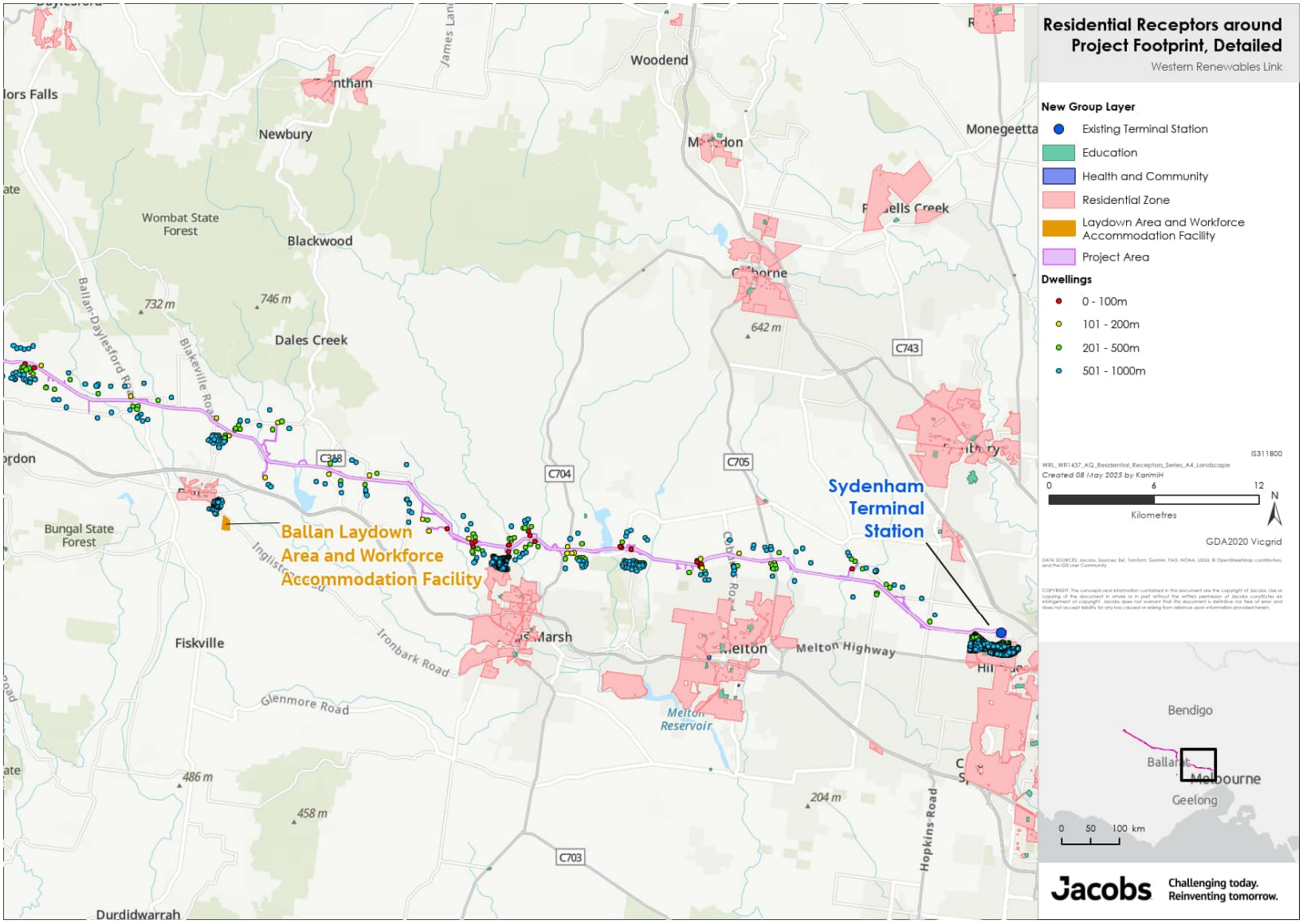

Figure 6.6: Nearest sensitive receptors, Gordon to Sydenham Terminal Station (Source: Jacobs, 2024)

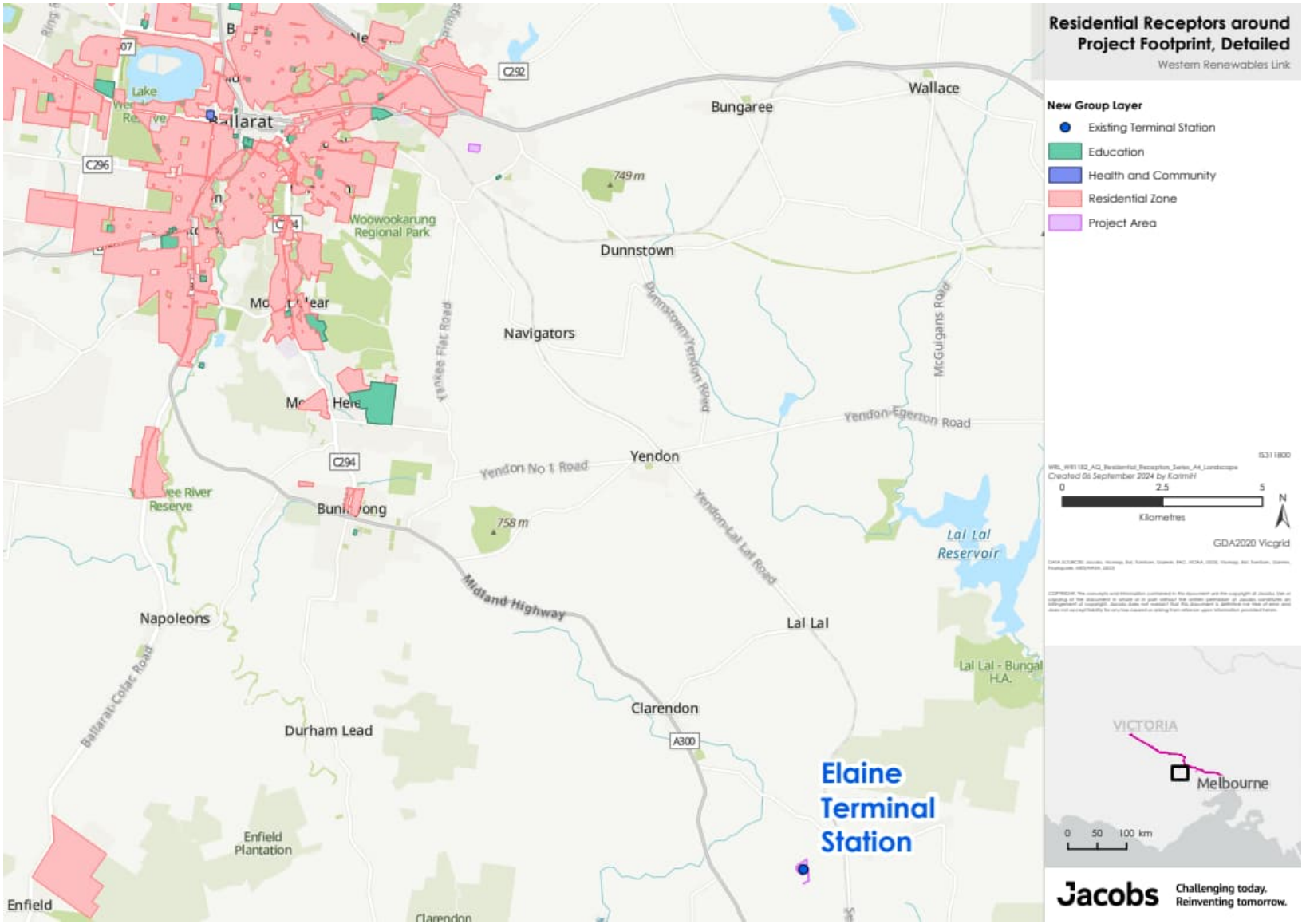

Figure 6.7: Nearest sensitive receptors, Elaine Terminal Stations (Source: Jacobs, 2024)

The nature and proximity of sensitive receptors to the Project was used to characterise the sensitivity of the receptors to human health and nuisance (i.e., dust soiling[2]) air quality impacts with reference to step 2B of the assessment methodology outlined above in Section 5.5.

6.4 Topography and meteorology

6.4.1 Overview

This section describes the topography and meteorology of the Project Area relevant to air quality assessment. An understanding of prevailing local meteorological conditions (and features such as terrain which can influence these conditions) around the Project is critical to the effective management of air quality-related issues.

There are several Bureau of Meteorology (BoM) weather stations operating around the Project Area (Table 6-5) and data from these stations allow local meteorology and climatological statistics to be determined for each Project location. Topographical and meteorological summaries for each of these locations are provided in the following sub-sections.

Table 6-5: Nearby automatic weather stations

Location	Automatic Weather Stations
From existing Bulgana Terminal Station to Allendale	Grampians (BoM), Stawell (BoM), Pyrenees (BoM), and Ballarat (BoM)
Elaine Terminal Station	Ballarat (BoM)
Allendale to existing Sydenham Terminal Station	Ballarat (BoM), Melton (EPA) and Melbourne Airport (BoM)

6.4.2 Existing Bulgana Terminal Station to Allendale

The western extent of the transmission line at Bulgana is at an elevation of approximately 220m, and the transmission line climbs gradually over undulating terrain to an elevation of about 500 near Allendale.

The four meteorological monitoring sites near this section of the Project are Grampians, Stawell, Pyrenees, and Ballarat Automatic Weather Stations (AWS). The Grampians AWS is located at the peak of Mount William at a significantly higher elevation than the terrain around the Project Area and therefore is considered unsuitable for use for this assessment. The Stawell, Pyrenees and Ballarat AWS meteorological data were used for the assessment of Project activities from Bulgana to Allendale. The representativeness of these AWS data to any location along the transmission line route depend on the local elevation and nearby topography i.e., whether the given location is more sheltered or exposed than the AWS sites.

Wind roses

Data records covering a 12-year period (2011 to 2022) of wind speed and wind direction expressed as one-hour averages at hourly intervals were obtained from BoM for Stawell (Figure 6.8), Pyrenees (Figure 6.9) and Ballarat (Figure 6.10). The wind speed categories used in the wind roses show critical wind speeds for dust pickup. The figures also show wind roses for the driest months of the 12-year period (January, February, and March); i.e., a focus for dust emission mitigation.

The following observations relevant for Project activities from Bulgana to Allendale are noted from the wind roses:

- The wind roses for each AWS for “all months” each show a dominance of winds from the north and/or the south directions. The frequency of winds from easterly and westerly directions is low.

[2] Dust soiling refers to deposited dust from activities leading to the soiling of surfaces and associated nuisance effects.

- The wind rose for Stawell shows a much lower frequency of northerly winds than the Pyrenees and Ballarat locations.
- The wind roses for the three AWS for "all months" show different distribution of directions for the highest two wind speed categories (18 to 36Km/h, and >36Km/h).
- Wind speed distributions for each AWS are listed in Table 6-6. The distribution of wind speeds is not markedly different over the summer period compared to the full year period for Pyrenees and Ballarat, however higher wind speeds are more frequent at Stawell in the summer months.
- The frequency of occurrence of various wind directions can be quite different in the January to March period compared to the full year average, but the amount of seasonal variation differs between AWS sites. For example, at Stawell the winds are more strongly dominated by high wind speeds from the south during the summer than over the full year. At the Pyrenees AWS location this trend is much less noticeable.
- At the Ballarat AWS location, wind directions are also more dominant from the south during the summer than over the full year, but the dominant wind direction is more south easterly than at Stawell.

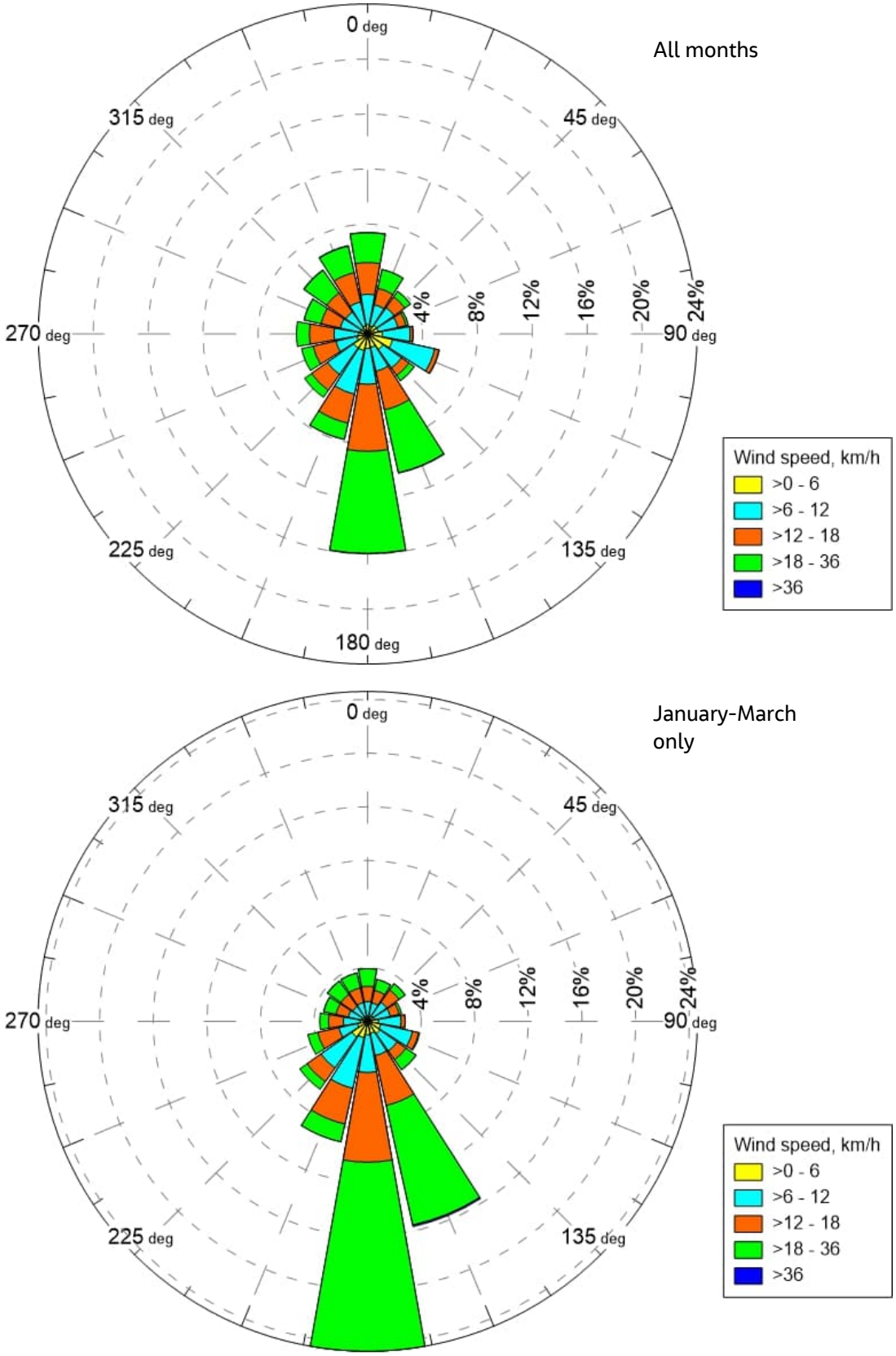

Figure 6.8: Windrose for Stawell AWS showing hourly-average wind speed and direction for all hours, 2011-2022. Upper wind rose – all months of the year. Lower wind rose – driest months only (January, February, March). (Source: BoM, 2023)

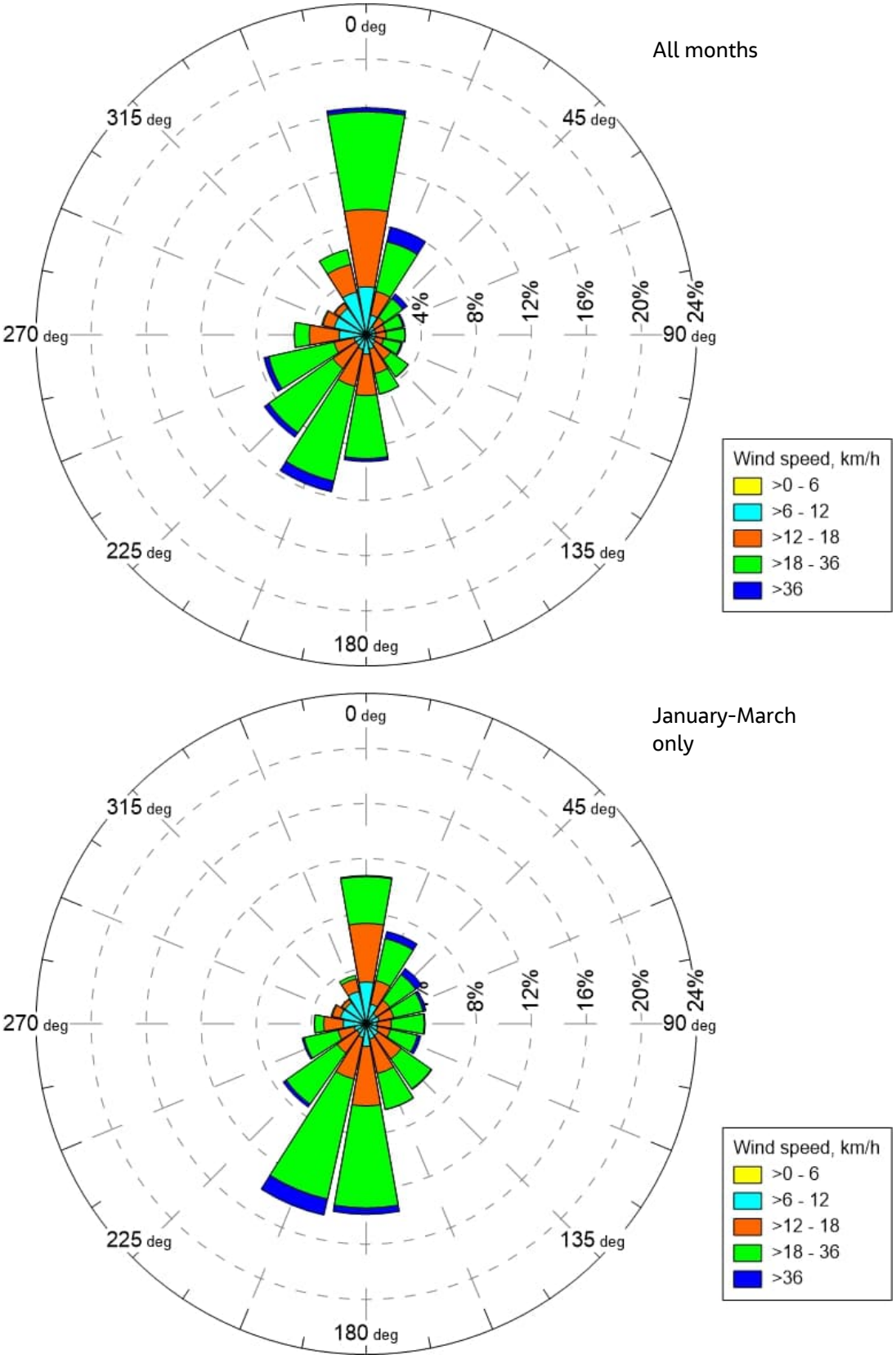

Figure 6.9: Windrose for Pyrenees AWS showing hourly-average wind speed and direction for all hours, 2011-2022. Upper wind rose – all months of the year. Lower wind rose – driest months only (January, February, March). (Source: BoM, 2023)

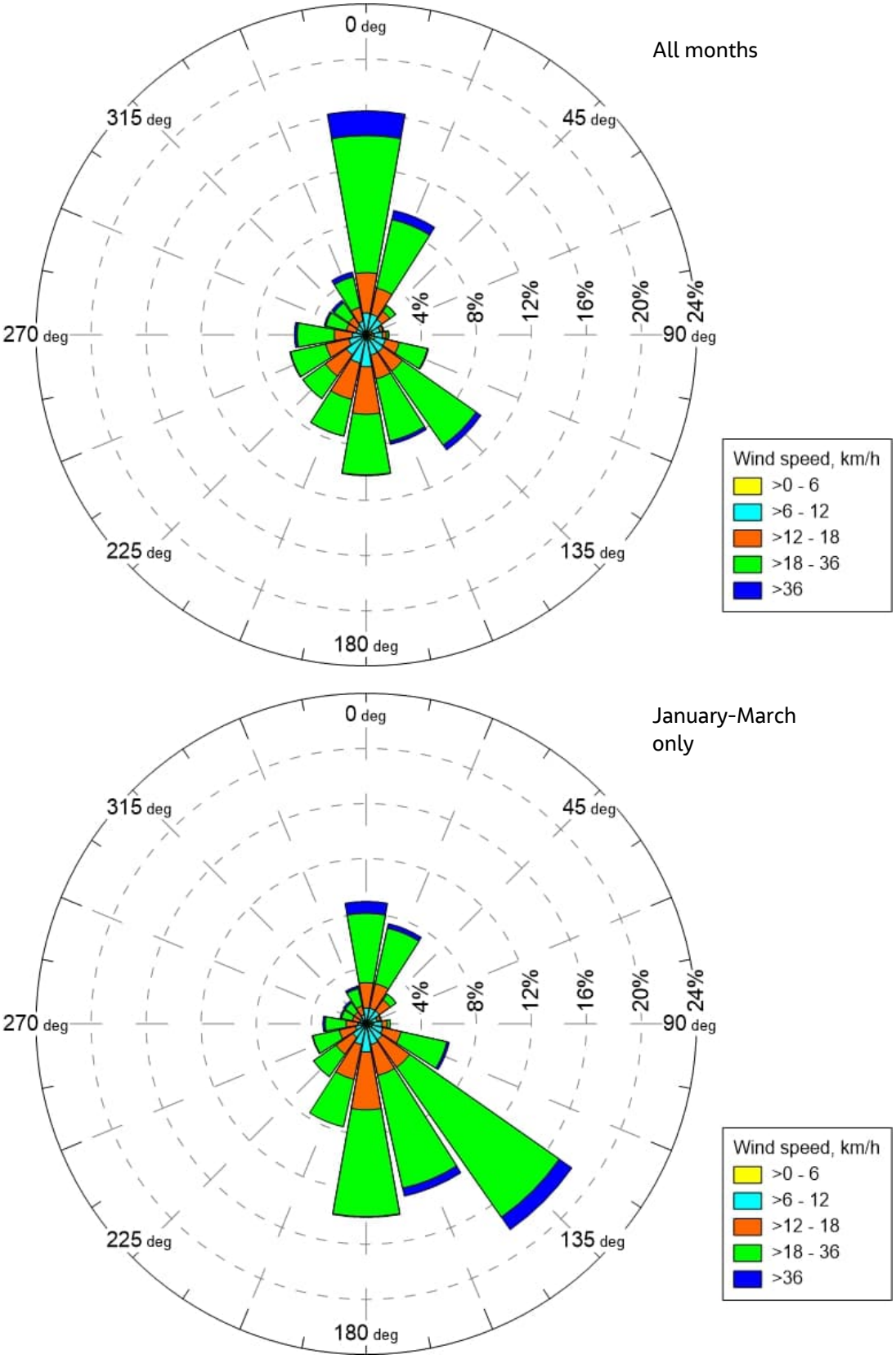

Figure 6.10: Windrose for Ballarat AWS showing hourly-average wind speed and direction for all hours, 2011-2022. Upper wind rose – all months of the year. Lower wind rose – driest months only (January, February, March). (Source: BoM, 2023)

Table 6-6: Bulgana to Allendale wind speed distributions – hourly-average records for 2011 to 2022

Wind speed category	Frequency distribution over all months of the year, 2011 to 2022			Frequency distribution for January, February, and March only, 2011 to 2022		
	Stawell	Pyrenees	Ballarat	Stawell	Pyrenees	Ballarat
Percentage of Hourly-Average Records Within Category						
0 - 3.6km/hr (0 - 1m/s)	7.9%	0.6%	3.4%	6.0%	0.4%	2.3%
3.6 - 10.8km/hr (1 - 3m/s)	33.1%	17.1%	15.1%	27.6%	16.2%	11.7%
10.8 – 18km/hr (3 - 5m/s)	32.6%	34.2%	28.3%	31.6%	33.8%	27.0%
18 - 28.8km/hr (5 - 8m/s)	23.8%	35.0%	37.8%	31.0%	36.8%	42.7%
28.8 – 36km/hr (8 - 10m/s)	2.3%	9.2%	11.1%	3.5%	8.9%	12.4%
Percentage of Hourly-Average Records Greater Than Category						
≥18km/hr (≥5m/s)	26.4%	48.1%	53.2%	34.7%	49.6%	59.0%
≥28.8km/hr (≥8m/s)	2.5%	13.1%	15.4%	3.8%	12.8%	16.3%
≥36km/hr (≥10m/s)	0.2%	3.9%	4.3%	0.3%	3.9%	3.9%

(Source: BoM, 2023)

High speed wind gust analysis

Detailed analysis of the frequency and direction distribution of high wind speed gusts was conducted using the data supplied by BoM. The wind gust data was reported by BoM as wind gusts at 60-minute intervals, with a wind gust defined as the highest 3-second mean wind speed (sampled every second) over the last 60 minutes.

Figure 6.11 shows bar charts of frequency of occurrence of gust wind speeds for the Stawell, Pyrenees and Ballarat AWS as a function of wind direction for all days of the year. The wind speed categories show critical wind speeds for dust pickup and highlight the wind directions under which these high wind speeds are most frequent.

The frequencies shown in the bar charts in Figure 6.11 are not comparable to the frequencies shown in the wind roses in Figure 6.8 to Figure 6.10 because the data in the wind roses and the table are based on hourly average data, rather than the highest wind speed within the hour which is used to build the bar charts. However, the data in the bar charts based on wind gusts supports the trends seen in the hourly-average data analysis; that is, high wind speeds with the potential to escalate dust erosion and pick-up are predominantly from the north and south directions – although the "south" direction can be due south, southeast or southwest depending on measurement location (and likely influenced by nearby terrain).

The data shows a pronounced trend of the highest percentage of high wind gust speeds coming from a southerly direction at all AWS locations, with another peak in high wind gust speeds from the north also present at the Pyrenees location. High wind speed gusts are much less frequent from the east and west directions at all AWS locations.

Figure 6.12 shows the comparative bar charts of frequency of occurrence of gust wind speeds for the January to March period. The bar charts illustrate the southerly dominance of high wind speeds in these summer months.

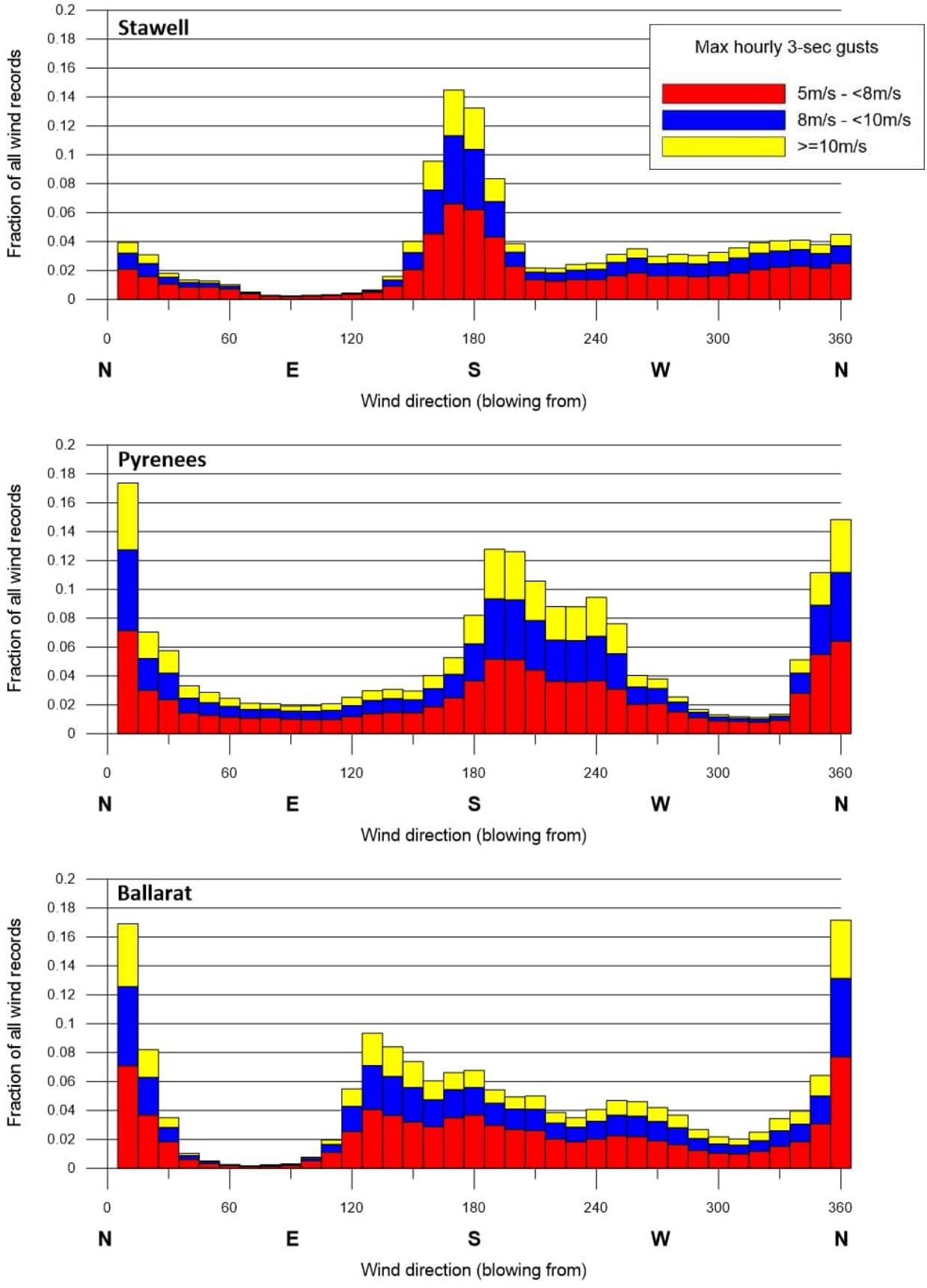

Figure 6.11: Bulgana to Allendale Gust wind speeds as a function of wind direction, all hours 2011-2022 (Source: BoM, 2023)

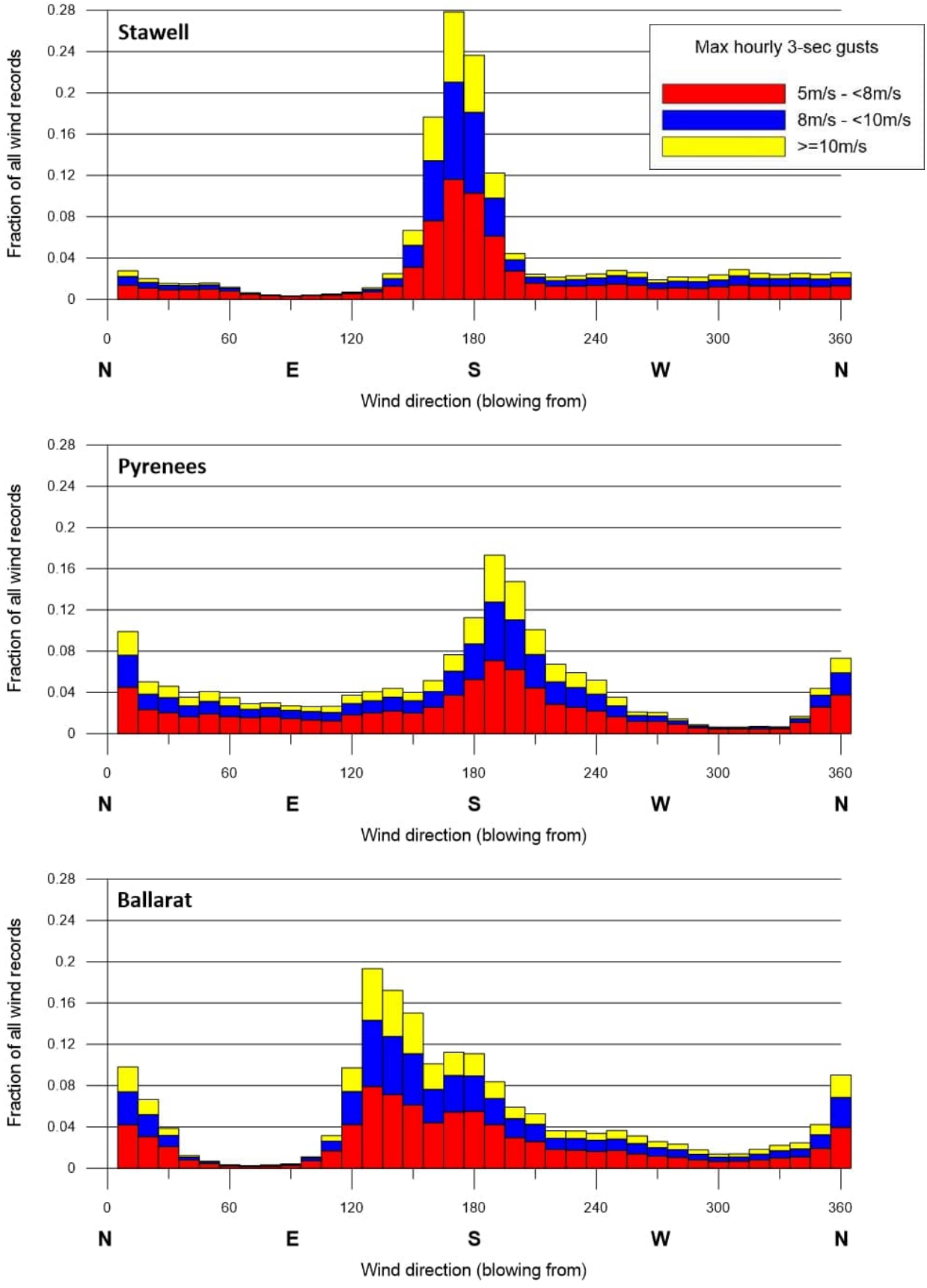

Figure 6.12: Bulgana to Allendale Gust wind speeds as a function of wind direction, summer 2011-2022 (Source: BoM, 2023)

6.4.3 Allendale to existing Sydenham Terminal Station

The western portion of the Project Area around Allendale is at an elevation of about 500m. Ground levels climb gradually over undulating terrain as it heads southeast to an elevation of about 700m before reducing to an elevation of about 160m near the existing Sydenham Terminal Station.

The Ballarat, Melton and Melbourne Airport AWS sites may all be relevant to meteorological characteristics for this portion of the Project Area. The Pyrenees AWS may also be relevant for the highest elevations of the route.

The relevance of these AWS sites to any location along the transmission line route will depend on the local elevation and nearby topography – i.e., whether the given location is more sheltered or exposed than the AWS sites.

Wind roses

Data records covering a 12-year period of wind speed and wind direction expressed as one-hour averages at hourly intervals were obtained from BoM for the Melbourne Airport AWS and from EPA for the Melton AWS and are summarised as wind roses in Figure 6.13 and Figure 6.14. Wind roses for the Ballarat and Pyrenees AWS were shown in Figure 6.9 and Figure 6.10.

The following observations relevant to the section of the Project from Allendale to the existing Sydenham Terminal Station are noted from the wind roses:

- The wind roses for each AWS for "all months" each show a dominance of winds from the north and/or the south directions. The frequency of winds from east is low. The frequency of winds from the west is higher at Melton and Melbourne Airport than at the other AWS sites.
- The wind roses for the three AWS for "all months" show different distribution of directions for the highest two wind speed categories (18 to 36km/h, and >36km/h).
- Wind speed distributions for each AWS are shown in Table 6-7. At all AWS locations, the distribution of wind speeds is not markedly different over the summer period compared to the full year period.
- The Melton site displays much lower wind speeds overall, compared to the BoM sites.
- The frequency of occurrence of various wind directions can be quite different in the January-March period compared to the full year average, but the amount of seasonal variation differs between AWS sites.

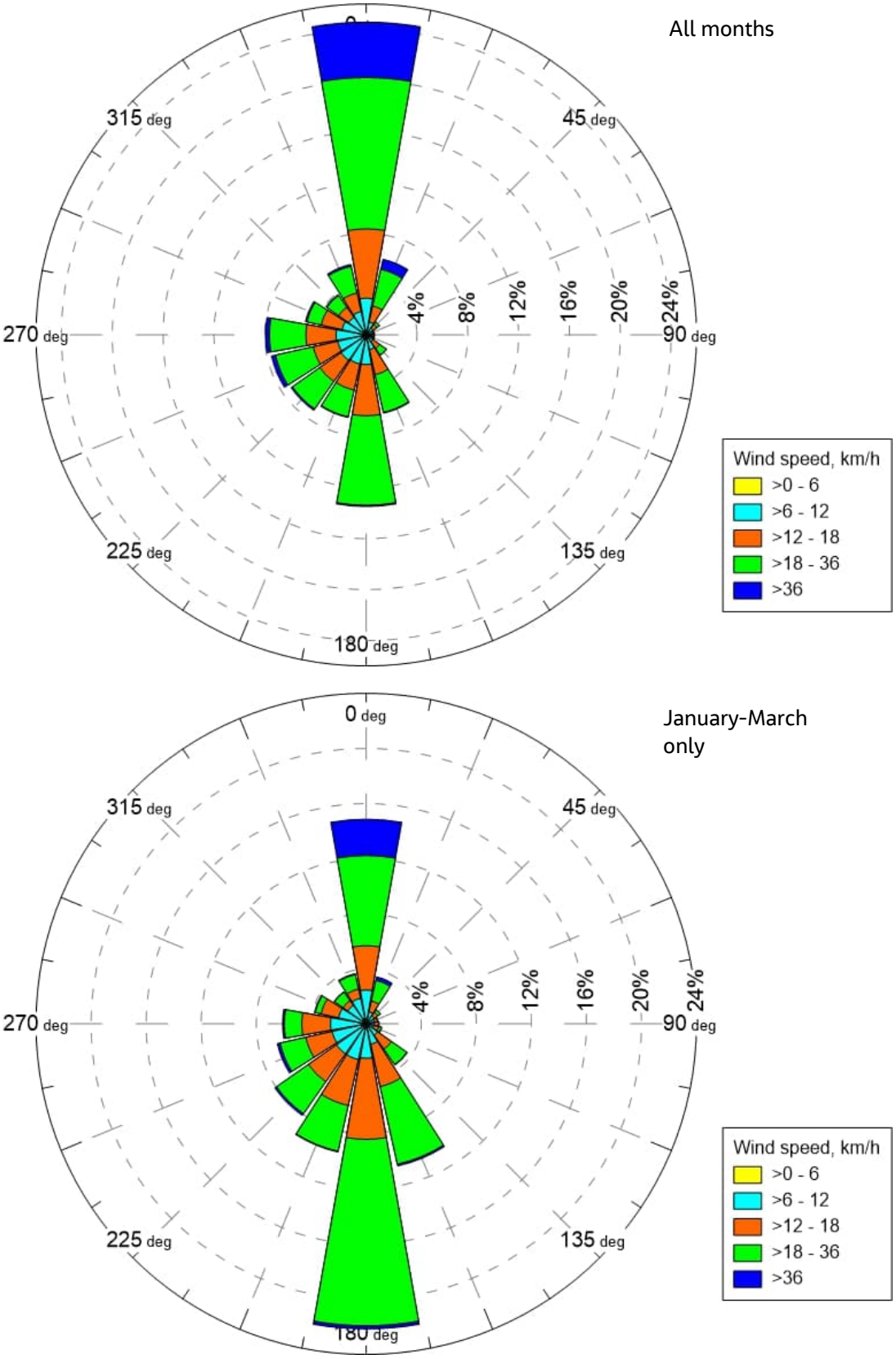

Figure 6.13: Windrose for Melbourne Airport AWS showing hourly-average wind speed and direction for all hours, 2011-2022. Upper wind rose – all months of the year. Lower wind rose – driest months only (January, February, March) (Source: BoM, 2023)

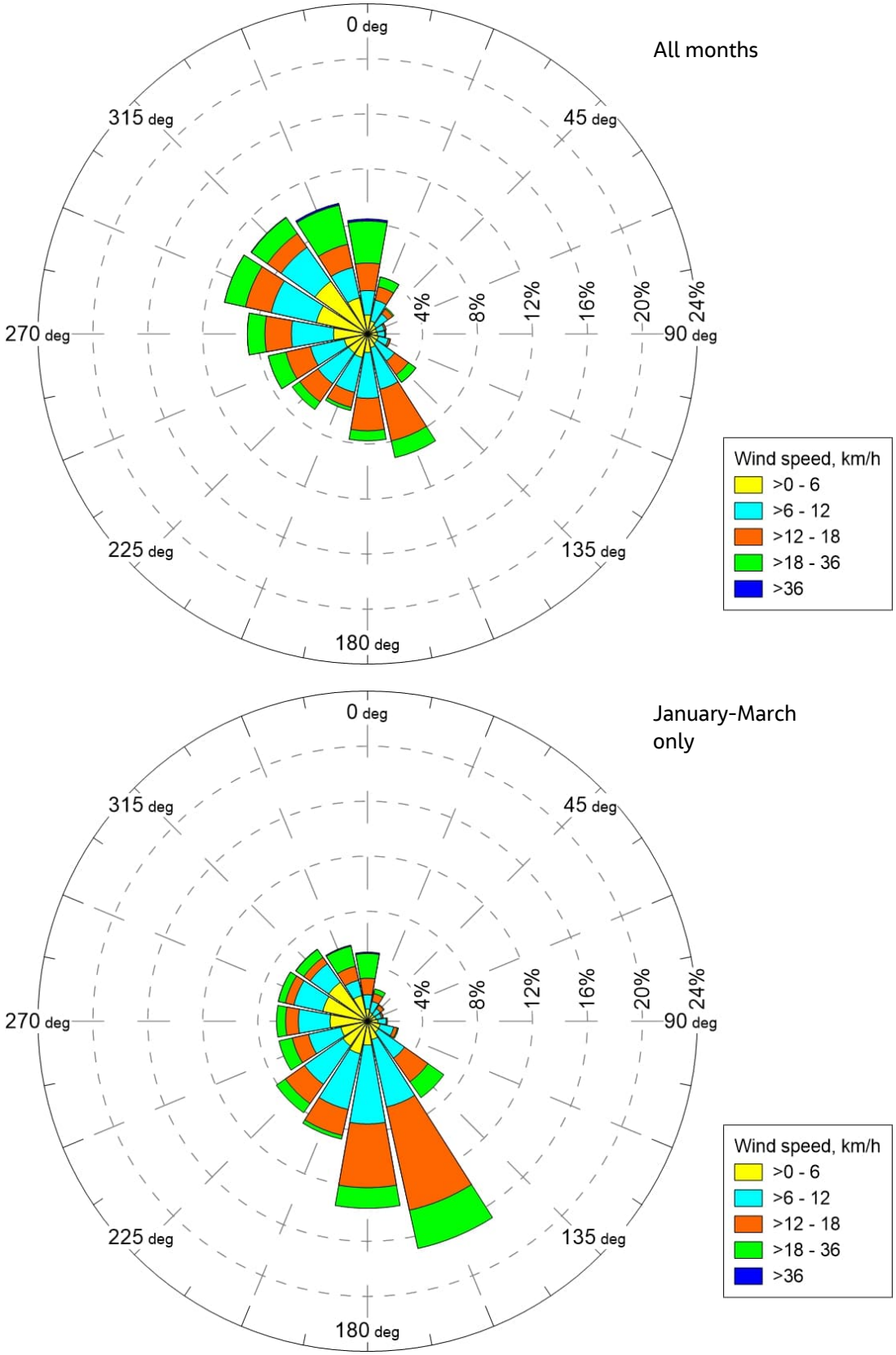

Figure 6.14: Windrose for Melton AWS showing hourly-average wind speed and direction for all hours, 2011-2022. Upper wind rose – all months of the year. Lower wind rose – driest months only (January, February, March). (Source: EPA, 2023)

Table 6-7: Allendale to existing Sydenham Terminal Station Wind speed distributions – hourly-average records for 2011 to 2022.

Wind speed category	Frequency distribution over all months of the year, 2011 to 2022				Frequency distribution for January, February, and March only, 2011 to 2022			
	Pyrenees	Ballarat	Melbourne Airport	Melton	Pyrenees	Ballarat	Melbourne Airport	Melton
Percentage of Hourly-Average Records Less Than Category								
0 - 3.6km/hr (0 - 1m/s)	0.6%	3.4%	1.9%	7.5%	0.4%	2.3%	1.4%	6.6%
3.6 - 10.8km/hr (1 - 3m/s)	17.1%	15.1%	17.9%	47.2%	16.2%	11.7%	19.4%	48.8%
10.8 – 18km/hr (3 - 5m/s)	34.2%	28.3%	32.7%	28.2%	33.8%	27.0%	33.8%	31.3%
18 - 28.8km/hr (5 - 8m/s)	35.0%	37.8%	31.7%	14.9%	36.8%	42.7%	32.3%	12.2%
28.8 - 36km/hr (8 - 10m/s)	9.2%	11.1%	10.1%	1.9%	8.9%	12.4%	9.0%	0.9%
Percentage of Hourly-Average Records Greater Than Category								
⩾18km/hr (⩾ 5m/s)	48.1%	53.2%	47.4%	17.2%	49.6%	59.0%	45.4%	13.3%
⩾28.8km/hr (⩾ 8m/s)	13.1%	15.4%	15.8%	2.3%	12.8%	16.3%	13.1%	1.0%
⩾36km/hr (⩾ 10m/s)	3.9%	4.3%	5.7%	0.4%	3.9%	3.9%	4.1%	0.2%

(Source: BoM, 2022 and EPA, 2023)

High speed wind gust analysis

Detailed analysis of the frequency and direction distribution of high wind speed gusts was conducted using the data supplied by BoM for the Melbourne Airport AWS but could not be completed for the Melton site due to lack of wind gust data recorded by the EPA.

Figure 6.15 shows bar charts of frequency of occurrence of gust wind speeds for the Melbourne Airport AWS as a function of wind direction for all days of the year, and for the summer months only.

However, the data in the bar charts based on wind gusts supports the trends seen in the hourly-average data analysis; that is, high wind speeds with the potential to escalate dust erosion and pick-up are predominantly from the north and south directions – although the "south" direction can be due south, southeast or southwest depending on measurement location (and likely influenced by nearby terrain).

The data shows a pronounced trend of the highest percentage of high wind gust speeds coming from a southerly direction at all AWS locations, with another peak in high wind gust speeds from the north also present at the Pyrenees and Melbourne Airport locations. High wind speed gusts are much less frequent from the east and west directions at all AWS locations.

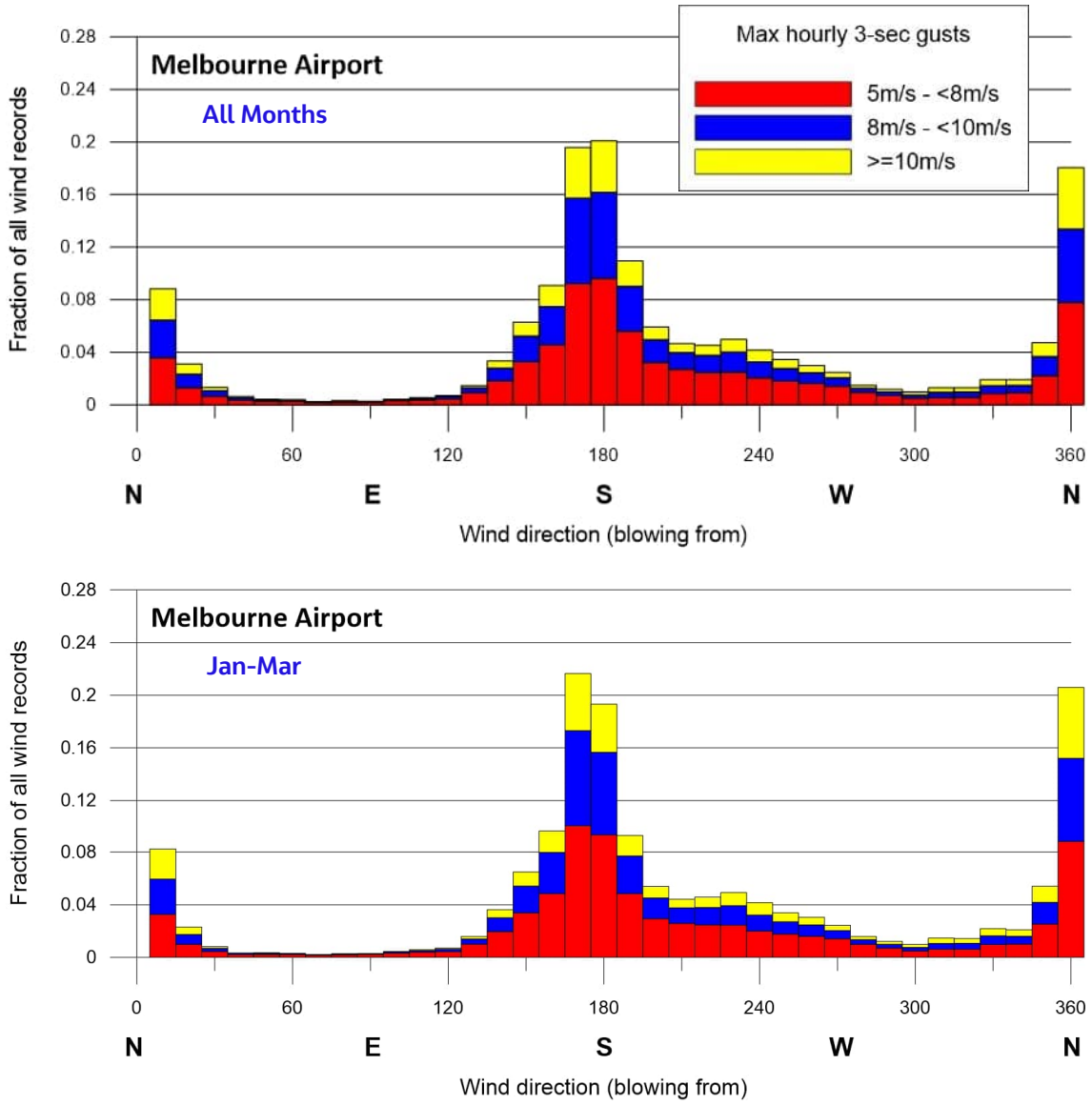

Figure 6.15: Frequency of occurrence of gust wind speeds (maximum gust per hour) for the Melbourne Airport AWS as a function of wind direction, 2011 to 2022 (Source: BoM, 2023)

6.5 Significance for the assessment

Section 3.3 (Step 3) the EPA's nuisance dust assessment framework considers the context (historical and land use) within which an activity or project is to be completed. Guidance for characterising these aspects for an assessment has been reproduced below in Table 6-8.

Table 6-8: Receiving environment sensitivity rating (Source: EPA, 2022a)

Score	Historical Context	Land use
2	No previous history No incidents or non-compliance. Only single isolated reports. Generally, the public is unconcerned.	Low general expectation of amenity • Exposure can be easily avoided. • Dust doesn't have an impact in any lasting way on. appearance, aesthetics or value of property by soiling or, locations where human exposure is transient or, areas of low ecological value. • e.g., footpaths, walking or bike trails, farmland (unless sensitive horticultural land,) short term car parks, roads, no nearby waterways, dry arid areas, or waste land (abandoned paddocks etc.).

Score	Historical Context	Land use
4	Some history Occasional complaints, history of industry causing problems elsewhere. Some concern in immediate area but not widespread.	Moderate general expectation of amenity • People can move on, can potentially avoid exposure. • Dust could impact on appearance, aesthetics or value of property, locations where people are occupationally exposed over a full working day but not in a home setting or, areas of moderate ecological value. • E.g., enjoyment of the outdoors, recreational activities, playing sport, offices, warehouses and industrial units, playgrounds, shopping areas, longer term vehicle storage, peri-urban or outer suburban nature areas, somewhat modified water ways.
6	Significant history Community has had regular impacts of dust and is highly sensitised. Regular or repeated non-compliance, past enforcement activity	High general expectation of amenity • Exposure cannot be avoided. • Dust is likely to impact on damage to property, clothes, vehicles, affects food preparation, etc. or, individuals may be exposed for over eight hours or more in a day, areas of high ecological value. • e.g., residential properties with backyards and open living areas, rural living zones, hospitals, schools, prisons, accommodation, residential care homes, car parks associated with workplace or residential parking

Note: In the context of Publication 1943, 'industry' refers to any land uses that can lead to the deterioration of amenity at more sensitive surrounding receptors.

The data presented in Table 6-1 and described in Section 6.2 above, outline how the adopted background conditions are generally below ERS objective values with the exception of 24-hour averaged $PM_{2.5}$ and PM_{10}. On this basis, the 'historical context' risk score of '2' was applied.

Section 6.2.3, Section 6.2.4 and Section 6.3 describe how land uses and thus the potential for exposure and associated expectations for amenity vary across the Project Area. Considering this information, the 'land use' receiving environment sensitivity weightings below in Table 6-9 were applied. The 'land use' risk score was set to '2' around the transmission lines, temporary construction infrastructure, and ancillary works and Powercor distribution line crossovers (Bulgana to Allendale), new 500kV terminal station at Bulgana, existing Elaine and Bulgana Terminal Stations and at the intermediate laydown areas (including workforce accommodation facilities). This was determined on the basis of rural farmland being the predominant land use surrounding these locations. A score of '4' was applied for the 'transmission lines, temporary construction infrastructure, and ancillary works and Powercor distribution line crossovers (Allendale to Sydenham). Again, rural farmland was identified as the predominant land use around these locations, albeit with more proximal and / or higher densities of rural residential receptors.

Table 6-9: Project receiving environment sensitivity weightings

Project element	Score		
Score	**Historical Context**	**Land use**	**Total**
Transmission lines, temporary construction infrastructure, and ancillary works (Bulgana to Allendale)	2	2	4
Transmission lines, temporary construction infrastructure, and ancillary works (Allendale to Sydenham)	2	4	6

Project element	Score		
Score	**Historical Context**	**Land use**	**Total**
Powercor distribution line crossovers (Bulgana to Allendale)	2	2	4
Powercor distribution line crossovers (Allendale to Sydenham)	2	4	6
Existing Bulgana Terminal Station	2	2	4
New 500kV terminal station near Bulgana	2	2	4
Existing Elaine Terminal Station	2	2	4
Ballan intermediate laydown area and workforce accommodation facility	2	2	4
Lexton intermediate laydown area and workforce accommodation facility	2	2	4

The information presented in this section also forms the basis for Step 2 of the Publication 1943 nuisance dust assessment methodology. In this step, the effectiveness of the dust transmission pathway from the source to the receiving environment is considered. The factors evaluated in determining the dust transmission pathway effectiveness are listed below in Table 6-10.

Table 6-10: Dust exposure pathway effectiveness sensitivity rating (Source: EPA, 2022a)

Score	Distance	Orientation of receivers relative to prevailing wind direction	Terrain	Intervening land use
1	• Receptors are hundreds of metres or kilometres from source or • Separation distance has been met easily.	• Winds rarely (<10%) blow from source to receptor or • Source is upwind, winds are of low speed	• Source located in a valley or quarry hole, downslope from receptor or highly undulating terrain between source and receptor	• High vegetation, i.e., densely forested or • Highly built-up or intervening zone with multiple non-sensitive uses that have no dust emissions of their own
2	• Receptors are tens or hundreds of metres from source or • Separation distance has not been met or met but only just at the threshold distances	• Even distribution of winds (10-20%) from source to receptor or source is upwind, winds are of moderate speed • High frequency (>10%) of stable weather conditions with low dispersion.	• Source is on same altitude as receiving environment, generally flat land.	• Moderate vegetation and/or • Intervening land use zone contains other non-sensitive industry or smaller businesses.
3	• Receptors are adjacent to the source/site or • Distance well below (less than half) separation distances.	• High frequency (>20%) of winds from source to receptor or • Source is upwind, winds are of high speed	• Source is upslope of receiving environment and/or located in the same valley	• Open land and cleared of obstacles and/or • Isolated dwellings or structures in pathway

Using the guidance above in Table 6-10, the pathway dust transmission effectiveness weightings were determined for the Project below in Table 6-11.

Table 6-11: Project pathway transmission effectiveness weightings

Project element	Score				
	Distance	Orientation of receivers relative to prevailing wind direction	Terrain	Intervening land use	Total
Transmission lines, temporary construction infrastructure, and ancillary works (Bulgana to Allendale)	2	2	2	2	8
Transmission lines, temporary construction infrastructure, and ancillary works (Allendale to Sydenham)	2	2	2	2	8
Powercor distribution line crossovers (Bulgana to Allendale)	2	2	2	2	8
Powercor distribution line crossovers (Allendale to Sydenham)	2	2	2	2	8
Existing Bulgana Terminal Station	1	2	2	2	7
New 500kV terminal station near Bulgana	1	2	2	2	7
Existing Elaine Terminal Station	1	1	2	2	6
Ballan intermediate laydown area and workforce accommodation facility	1	2	2	2	7
Lexton intermediate laydown area and workforce accommodation facility	2	1	2	2	7

The scores presented in Table 6-11 were made on the following basis:

- Transmission lines, temporary construction infrastructure, and ancillary works, Powercor distribution line crossovers (Bulgana to Allendale): Distance rating of '2' based on the location of the nearest surrounding receivers (refer to Section 6.3) being 10 to 100m or further away. Orientation rating of '2' on the basis of the moderate frequency of winds (10 to 20%) blowing in the direction from the site towards the various nearby sensitive receivers. Terrain and land use ratings of '2' and '2' respectively based on the nearest receivers generally being at or around the same elevation as the transmission line, with the intervening land mostly being open with moderate vegetation.
- Transmission lines, temporary construction infrastructure, and ancillary works, Powercor distribution line crossovers (Allendale to Sydenham): Distance rating of '2' based on the location of the nearest surrounding receivers (refer to Section 6.3) being 10 to 100m or further away. Orientation rating of '2' on the basis of the moderate frequency of winds (10 to 20%) blowing in the direction from the site towards the various nearby sensitive receivers. Terrain and land use ratings of '2' and '2' respectively based on the nearest receivers generally being at or around the same elevation as the transmission line, with the intervening land mostly being open with moderate vegetation.
- Existing Bulgana Terminal Station: Distance rating of '1' based on the location of the nearest surrounding receivers (refer to Section 6.3) being more than 2,000m away. Orientation rating of '2' on the basis of the moderate frequency of winds (10 to 20%) blowing in the direction from the site towards the nearest sensitive receivers. Terrain and land use ratings of '2' and '2' respectively based on the generally flat, mostly open but partially developed intervening land between the site and the surrounding receivers.
- New 500kV terminal station at Bulgana: Distance rating of '1' based on the location of the nearest surrounding receivers (refer to Section 6.3) being more than 1,100m away. Orientation rating of '2' on the basis of the moderate frequency of winds (10 to 20%) blowing in the direction from the site towards the nearest sensitive receivers. Terrain and land use ratings of '2' and '2' respectively based on the generally flat, mostly open but partially developed intervening land between the site and the surrounding receivers.
- Existing Terminal Station (Elaine): Distance rating of '1' based on the location of the nearest surrounding receivers (refer to Section 6.3) being more than 1km away. Orientation rating of '1' on the basis of the low frequency of winds (less than10%) blowing in the direction from the site towards the nearest sensitive receivers. Terrain and land use ratings of '2' and '2' respectively based on the generally flat, mostly open land with moderate vegetation coverage between the site and the surrounding receivers.
- Ballan intermediate laydown area and workforce accommodation facility: Distance rating of '1' based on the location of the nearest surrounding receivers (refer to Section 6.3) being around 700m away. Orientation rating of '2' on the basis of the moderate frequency of winds (10 to 20%) blowing in the direction from the site towards the nearest sensitive receivers. Terrain and land use ratings of '2' and '2' respectively based on the generally flat, mostly open land with moderate vegetation coverage between the site and the surrounding receivers.
- Lexton intermediate laydown area and workforce accommodation facility: Distance rating of '2' based on the location of the nearest surrounding receivers (refer to Section 6.3) being around 200m away. Orientation rating of '1' on the basis of the low frequency of winds (less than10%) blowing in the direction from the site towards the nearest sensitive receivers. Terrain and land use ratings of '2' and '2' respectively based on the generally flat, mostly open land with moderate vegetation coverage between the site and the surrounding receivers.

7. Construction impact assessment

7.1 Key issues

This section provides a discussion on the potential air quality impacts from the Project during construction. Consistent with the approach outlined above in Section 5.5, potential dust impacts were assessed using the EPA's methodology presented in Publication 1943. This assessment is presented in Section 7.2.

Other potential air quality-related issues during construction including exhaust emissions from construction plant and equipment, and odours and airborne hazards resulting from the handling of potentially contaminated materials and groundwater were also identified. Impacts associated with these issues were assessed qualitatively below in Section 7.3.

7.2 Impact assessment - dust

As identified in Section 3.3.4, there is the potential for dust impacts from construction activities associated with the following works:

- Transmission line (including the towers and lines), including the 220kV connection at Bulgana
- Existing terminal station upgrades (Bulgana and Elaine) and the new 500kV terminal station near Bulgana (including temporary laydown areas)
- Ancillary works areas including the construction and use of access tracks within the Project Area
- Laydown areas, including workforce accommodation facilities
- Powercor distribution line crossovers.

The process and results for each stage of application of the Publication 1943 nuisance dust assessment methodology for the issues above is presented in the following sections.

7.2.1 Step 1: Hazard potential of dust sources

Step 1 of the Publication 1943 nuisance dust assessment method involves evaluating the potential for an activity or source to generate nuisance dust emissions, as well as the characteristics of the dust emissions. As listed below in Table 7-1, the method considers the size of the potential dust emission sources, nature of activities to be undertaken, the type of dust emissions (relating to the material type), and the ease of control of emissions.

Table 7-1: Hazard potential effectiveness rating (Source: EPA, 2022a)

Score	Size of dust emitting source	Activities being undertaken	Type of dust emission	Level of control
1	Small: materials usage in the order of hundreds of tonnes/m^3 per year; area sources of tens m^2	Low potential for dust emissions: Dust not generated by activity per-se (car yards, auto recyclers, washing and cleaning leads to sediments. Sites with exposed areas without activity (typically vacant yards, lots etc).	Coarse: only larger stony materials on site, very coarse sand, blue metal	Full control or containment: Fully sealed areas and/or highly effective, tangible measures in place leading to little or no residual dust. Releases only due to plant failure. Good housekeeping, enclosed operation with extraction and treatment equipment
2	Medium: materials usage in the order of thousands of tonnes/m^3 per year; area sources of hundreds of m^2.	Moderate potential for dust emissions: activities on unsealed sites, i.e., container parks, or other access roads, leading to track-out onto external roads. Cement and	Intermediate: crushed rock, beach and builders' sands, or fine stone, aggregates.	Partial Control or containment: Some areas of the site may be controlled or sealed but there are areas not addressed (e.g., haul roads or car parks). Reliance on management and

Score	Size of dust emitting source	Activities being undertaken	Type of dust emission	Level of control
		building products manufacturing.		housekeeping (i.e., water carts, keeping tip-faces small, wheel washes etc.).
3	Large: Materials usage in the order of hundreds of thousands of tonnes/m^3 per year; area sources of thousands of m^2.	High potential for dust emissions: grinding, blasting, material handling in open air, crushing, screening, haul roads for heavy vehicles, agricultural activities (ploughing fields)	Fine: Very fine dusts that can readily become airborne (i.e., silt clay, coal dust, dried tracked out mud, gypsum, cement etc.)	No effective control or containment: Large exposed stockpiles or unsealed areas, specifically dry conditions, open air operation with no containment, management controls not maintained.

Using this guidance and the Project details, the Project hazard potential ratings below in Table 7-2 were determined.

Table 7-2: Project hazard potential effectiveness weightings, construction

Project element	Score				
	Size of dust emitting source	Activities being undertaken	Type of dust emission	Level of control	Total
Transmission lines, temporary construction infrastructure, and ancillary works (Bulgana to Allendale)	2	2	2	2	8
Transmission lines, temporary construction infrastructure, and ancillary works (Allendale to Sydenham)	2	2	2	2	8
Powercor distribution line crossovers (Bulgana to Allendale)	1	1	2	2	6
Powercor distribution line crossovers (Allendale to Sydenham)	1	1	2	2	6
Existing Bulgana Terminal Station	1	1	2	2	6
New 500kV terminal station near Bulgana	3	2	2	2	9
Existing Elaine Terminal Station	2	2	2	2	8

Project element	Score				
	Size of dust emitting source	Activities being undertaken	Type of dust emission	Level of control	Total
Ballan intermediate laydown area and workforce accommodation facility	1	1	2	2	6
Lexton intermediate laydown area and workforce accommodation facility	1	1	2	2	6

The hazard potential score of '9' determined for the portions of the transmission line and the new 500kV terminal station at Bulgana above in Table 7-2 is based on the extent of disturbance expected (understanding that this would be temporal), the nature of activities being completed (i.e., earthworks) that have the potential to generate some finer dust, and their ease of control. Hazard potential scores of '6' were determined for the existing Bulgana terminal station, intermediate laydown areas and for the Powercor distribution line crossovers based on the smaller extent of disturbance, nature of activities (i.e., less potential for extensive earthworks) and associated emissions. Finally, a rating of '8' was determined for Elaine Terminal Station based the extent of works planned at this location.

7.2.2 Steps 2 and 3: Pathway effectiveness and receiving environment sensitivity

These aspects of the assessment method relate to features of the existing environment. As such, these ratings are described above in Section 6.5, with the pathway effectiveness (Step 2) and receiving environment sensitivity (Step 3) scoring determined for the Project listed in Table 6-11 and Table 6-9 respectively.

7.2.3 Step 4: Unmitigated impact assessment

Consistent with Figure 5.2, Step 4 involves the combination of the values for hazard potential (Step 1), pathway effectiveness (Step 2) and receiving environment sensitivity (Step 3) to determine the overall potential for impacts (in the absence of mitigation). Guidance from Publication 1943 for Step 4 is reproduced below in Table 7-3, with the additional category added as detailed in Section 5.5.

Table 7-3: Overall dust impact review (Source: EPA, 2022a)

Score	Descriptor	Comment
32-36	Very high	Dust impact almost certain. Nuisance dust impacts will occur. Any interventions to reduce impacts in either the source, pathway or receiving environment are unlikely to be practical so effective mitigation is doubtful.
27-31	High	Dust impacts highly likely to occur. Significant nuisance dust to occur, and impacts are highly likely. There may be some interventions that can be applied to reduce the impacts, but it is likely that significant re-engineering or redesign will be required.
22-26	Medium	Dust impacts likely. Some nuisance dust impacts to occur and without careful and considered application of mitigation measures it is likely to cause impacts. The focus should be what can be done to break the source-pathway-receiving environment chain.
17-21	Moderate	Dust impacts only likely to occur on rare occasions. Although there may be some residual nuisance dust impacts, it is possible it can be practically and effectively managed.
12-16	Low	Dust impacts are not likely and are expected to be minimal.
-	Negligible	Any dust impacts are extremely unlikely to occur.

Based on the hazard potential (Step 1), pathway effectiveness (Step 2) and receiving environment sensitivity (Step 3) scoring listed in Table 7-1, Table 6-11 and Table 6-9 respectively, the overall potential unmitigated construction dust impacts listed in Table 7-4 were determined.

Table 7-4: Unmitigated dust impacts, construction

Project element	Score				Unmitigated impact rating
	Receiving environment sensitivity	Pathway effectiveness	Hazard potential	Total and rating	
Transmission lines, temporary construction infrastructure, and ancillary works (Bulgana to Allendale)	4	8	8	20	Moderate, without effective management impacts may only occur rarely
Transmission lines, temporary construction infrastructure, and ancillary works (Allendale to Sydenham)	6	8	8	22	Medium, dust impacts likely if not properly managed
Powercor distribution line crossovers (Bulgana to Allendale)	4	8	6	18	Moderate, without effective management impacts may only occur rarely
Powercor distribution line crossovers (Allendale to Sydenham)	6	8	6	20	Moderate, without effective management impacts may only occur rarely

Project element	Score				Unmitigated impact rating
	Receiving environment sensitivity	Pathway effectiveness	Hazard potential	Total and rating	
Existing Bulgana Terminal Station	4	7	6	19	Moderate, without effective management impacts may only occur rarely
New 500kV terminal station near Bulgana	4	7	9	20	Moderate, without effective management impacts may only occur rarely
Existing Elaine Terminal Station	4	6	8	18	Moderate, without effective management impacts may only occur rarely
Ballan intermediate laydown area and workforce accommodation facility	4	7	6	17	Moderate, without effective management impacts may only occur rarely
Lexton intermediate laydown area and workforce accommodation facility	4	7	6	17	Moderate, without effective management impacts may only occur rarely

As Table 7-4 shows, a 'medium' risk of potential dust impacts was determined during construction for receivers along the transmission line and around the temporary construction infrastructure, and ancillary works between Allendale and Sydenham. For receivers along this portion of the transmission line and around the temporary construction infrastructure and ancillary works, this outcome was primarily driven by the hazard potential of the emissions expected to be generated. 'Moderate' potential unmitigated impacts were determined for the remaining components of the Project.

Powercor distribution line crossovers

As listed in Table 7-4, a 'moderate' unmitigated risk of dust impacts during construction was determined for the Powercor distribution line crossovers. This is primarily driven by the proximity and sensitivity of nearby receptors, rather than the dust-generating potential of the expected construction activities.

Intermediate laydown areas and workforce accommodation facilities

Potential unmitigated dust impacts associated with the laydown areas and workforce accommodation facilities are also presented in Table 7-4. As shown, 'moderate' risks were determined for the Ballan and Lexton locations.

7.2.4 Mitigation and management

Design impact avoidance measures

Section 2 of the EES scoping requirements outlines the need to identify avoidance and mitigation measures. The primary approach to avoidance of air quality impacts was through the route selection for the Project. As discussed in Chapter 5 of the EES, route selection sought to maximise the separation to nearby receptors while balancing the need to manage other social, cultural, environmental and engineering constraints. Additionally,

there will be opportunities to avoid impacts at some sensitive receptors through the micro-siting of Project features during detailed design.

In instances where air quality impacts to sensitive receptors cannot be avoided, EPRs and mitigation measures to minimise dust generation have been adopted and are outlined below.

Management measures during construction

Consistent with the CCBD Guide, GED and other relevant guidance, the following measures are to be included in the Construction Environmental Management Plan (CEMP) for the Project:

- Watering of access tracks and exposed and disturbed areas. This will minimise the level of dust generated from Project traffic along unsealed roads and from wind erosion from exposed and disturbed areas, such that associated residual impacts would be minimised.
- Modifying the intensity of activities based on observed dust levels and local meteorological conditions. This would identify adverse ambient air quality and meteorological conditions so that activities can be scaled back or suspended accordingly (i.e., avoid or minimise). This would reduce the potential for any residual impacts when ambient conditions are already degraded.
- Avoiding the burning of trimmed and cleared vegetation. This will prevent associated emissions to air, which include particulate matter associated with these types of activities.
- Covering of loads and removing loose materials/debris before vehicles exit the site. This would minimise dust associated with the transport of construction materials.
- Minimising the extent of disturbed and exposed areas and stockpiles. This would limit dust arising from wind erosion.
- Covering or stabilising long-term stockpiles. Again, this would limit the extent of dust resulting from wind erosion effects at these areas.
- Positioning any dusty activities such as concrete batching and materials stockpiles as far as practicable from surrounding receptors to minimise the potential for impacts.
- Identifying appropriate site speed limits. Dust generated from traffic traveling along unsealed roads is less at lower speeds, minimising the potential for impacts.
- Revegetating or sealing finished areas as soon as possible. Revegetated and sealed areas are less susceptible to wind erosion, minimising the potential for impacts.
- Maintain minimum setback distances of at least 100m to sensitive receptors from temporary concrete batch plants consistent with guidance presented in EPA's 'Publication 1949: Separation distance guidelines' (EPA, 2024). This will minimise the potential for impacts from emissions to air arising from concrete batching activities
- Ongoing consultation with surrounding sensitive receptors, in-line with the EES. Mitigation and management controls will be regularly discussed and reviewed so that they remain suitable.

The CEMP should be reviewed and updated annually, as well as in response to Project changes, changes to conditions, monitoring results or enquiries/complaints.

It is noted that the EPRs do not apply to establishment of the laydown areas, or the development of the workforce accommodation facilities. Rather, the conditions of the draft Incorporated Document will apply for these activities. The conditions include the requirement for the workforce accommodation facilities to develop and implement a Construction Environmental Management Plan (CEMP) that includes consideration of air quality impacts. The EPRs apply to the use of the laydown areas and the workforce accommodation facilities.

Guidance regarding the potential effectiveness of different control options for reducing generated dust emissions is provided in the National Pollution Inventory 'Emission Estimation Technique Manual for Mining Version 3.1', (Commonwealth Department of Sustainability, Environment Water, Population and Communities

[now DAWE], 2012). This is reproduced below in Table 7-5. This guidance highlights how residual dust impacts from key construction activities would be reduced by way of the nominated controls significantly reducing the extent of dust generated through suppression and avoidance.

Table 7-5: Indicative effectiveness of recommended dust controls (Source: former Department of Sustainability, Environment, Water, Population and Communities [DSEWPC], 2012)

Source/activity	Control method and estimated emission reduction	Reference
Dust		
Transport along unsealed roads	Watering, able to achieve a 50 (watering rate 2 litres per minute) to 75 (watering rate greater than 2 litres per minute) percent reduction in emissions generated.	DSEWPC, 2012
Unloading soil material from trucks	Water sprays able to achieve approximately 70% reduction. Dust emissions would be negligible during the unloading of other materials (e.g., steel).	DSEWPC, 2012
Loading, unloading and management of stockpiles	Water sprays able to achieve approximately 50% reduction. Reductions of approximately 30 percent can be achieved using wind breaks.	DSEWPC, 2012
Wind erosion from disturbed and exposed surfaces	Reduction of approximately 30 percent through primary rehabilitation, up to 90 percent for mostly re-established vegetation/ground cover and 100 percent for fully rehabilitated vegetation/groundcover.	DSEWPC, 2012

Contingency measures

Measures to review and verify the effectiveness of prescribed controls, or the need for additional controls have also been developed as part of the EPRs below in Section 11, and the conditions in the draft Incorporated Document. With the implementation of these measures, it is expected that emissions to air would be minimised to the extent that is reasonably practicable, in line with the requirements of the GED.

7.2.5 Residual dust impacts

Measures commensurate to the levels of unmitigated impact assessed were developed in-line with the GED and other relevant guidelines as listed above. Through the application of these measures either via the EPRs or the conditions within the draft Incorporated Document, residual impacts during construction would be reduced to the extent reasonably practicable whereby impacts could be effectively managed. In the context of the ratings from Publication 1943 reproduced in Table 7-3, with these controls, it is expected that residual impacts could be reduced to 'low' (i.e., Dust impacts are very unlikely and may only occur on rare occasions during exceptional circumstances; i.e., existing elevated background conditions and/or inclement weather). These rare instances may be occasional short-term (i.e., hours) occurrences where there may be elevated dust levels that could lead to minor nuisance dust soiling but remain non-harmful to human health. These may be highest when winds are blowing in the direction from the Project towards sensitive receptors, and when works are taking place in proximity to these locations. There is a higher potential for these minor effects in locations where there is a higher density of nearby sensitive receptors. Resulting dust concentrations at surrounding receptors are expected to remain within the range of values already experienced during natural fluctuations and variations in existing background conditions (i.e., imperceptible from existing conditions). It is expected that impacts could be avoided through adaptive management measures outlined above.

Unmitigated and residual construction dust impact ratings are summarised below in Table 7-6.

Table 7-6: Summary of unmitigated and residual construction dust impact ratings

Project element	Unmitigated impact rating	Residual impact rating
Transmission lines, temporary construction infrastructure, and ancillary works (Bulgana to Allendale)	Moderate, without effective management impacts may only occur rarely	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
Transmission lines, temporary construction infrastructure, and ancillary works (Allendale to Sydenham)	Medium, dust impacts likely if not properly managed	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
Powercor distribution line crossovers (Bulgana to Allendale)	Moderate, without effective management impacts may only occur rarely	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
Powercor distribution line crossovers (Allendale to Sydenham)	Moderate, without effective management impacts may only occur rarely	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
Existing Bulgana Terminal Station	Moderate, without effective management impacts may only occur rarely	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
New 500kV terminal station near Bulgana	Moderate, without effective management impacts may only occur rarely	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
Existing Elaine Terminal Station	Moderate, without effective management impacts may only occur rarely	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
Ballan intermediate laydown area	Moderate, without effective management impacts may only occur rarely	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
Lexton intermediate laydown area	Moderate, without effective management impacts may only occur rarely	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances

7.3 Impact assessment - other air quality impacts during construction

7.3.1 Exhaust emissions

The trucks and heavy machinery used during construction, as well as the mobile generators for power supply, where needed, may discharge products of fuel combustion into the air including nitrogen oxides, carbon monoxide, sulfur dioxide, and fine particulates. Plant and equipment required for Project construction are likely to include:

- Mobile cranes
- Mobile concrete batching plants
- Piling rigs
- Rock drill (as required)
- Skid steer loader
- Bulldozers
- Excavators

- Road roller (compactor)
- Front end loader backhoe
- Light vehicles
- Trucks for delivery of plant and materials
- Semi-trailers
- Concrete trucks
- Elevated work platforms
- Forklifts and scissor lifts.

A generator and self-bunded fuel tank will be required to power site facilities; smaller generators will be used in various construction activities around the sites. Generators will be fuelled by diesel or unleaded fuel.

All vehicles in the field are anticipated to be diesel fuelled although personal vehicles travelling to and from site may use diesel.

There are no confined spaces where this machinery will operate over the Project Area and, for vehicles and mobile plant operating at the surface, any engine exhaust emissions will disperse rapidly once discharged into the air. In addition, the Project-related emissions of these contaminants, from a regional context, are negligible compared with the day-to-day Victoria vehicle fleet using roads around the Project Area.

Products of combustion from construction vehicles can also give rise to odour, if not well maintained. However, given the setback distances this is not expected to impact on surrounding sensitive receptors.

Based on the relatively minor nature of potential exhaust emissions from construction plant and equipment, and the separation distances to sensitive receptors, in the context of Table 5-3 unmitigated impacts from these emissions are expected to be low.

Despite this outcome, the following measures are to be implemented in line with the GED:

- Conducting routine servicing and maintenance of equipment. This will make sure that they continue operating in a proper and efficient manner. This is expected to reduce (i.e., minimise) emissions from abnormal operations.
- Switching off all vehicles, plant and equipment when not in-use for extended periods. This avoids unnecessary exhaust-related emissions by removing the emissions source.

With the implementation of these measures, there are not expected to be any residual air quality impacts associated with exhaust emissions from construction plant and equipment. As such, impacts are expected to remain low.

7.3.2 Odours and airborne hazards

During construction activities, contaminated soil, rock, and groundwater may be encountered, giving rise to odour, fumes and airborne hazards which may affect amenity. Odour can also be emitted from soils containing naturally occurring chemicals such as sulphides that when exposed to the air produce an unpleasant gas (hydrogen sulphide).

The Project may involve earthworks and excavation activities in potentially contaminated sites. Consistent with the Geology and Soils Impact Assessment and Contaminated Land Impact Assessment any odours, fumes or airborne hazards resulting from uncovered contaminated materials or groundwater will be carefully managed to minimise, so far as reasonably practicable, impacts on amenity and human health. No significant sources of contamination that would be disturbed as part of the Project have been identified, and therefore the associated potential impacts are anticipated to be low.

Recommended controls to address these matters include:

- Applying odour supressing agents to materials as necessary should any contaminated or hazardous materials be uncovered during the works, to mitigated and associated effects.
- Adhering to relevant requirements for removal and disposal of contaminated and hazardous materials listed in the applicable health and safety legislature and regulations so that any emissions are avoided or otherwise minimised, and effects are effectively mitigated.

With the application of these measures as well as the relevant recommendations from the Geology and Soils Impact Assessment and Contaminated Land Impact Assessment, residual impacts associated with odours and airborne hazards are not expected and would remain low in the content of Table 5-3.

7.3.3 Dust from transport activities outside the Project Area

While potential dust impacts from construction traffic along unsealed roads within the Project Area is assessed above in Section 7.2.3, there is also the potential for dust to be generated along the wider transport route. This risk of wheel-borne dust generation is greatest along unsealed roads with higher speed limits, and the potential for impacts is highest along these portions of the transport route that pass closest to sensitive receptors. Without mitigation, potential impacts associated with this matter are considered to be moderate.

With the application of the following measures, residual impacts associated with off-site transport dust related emissions are expected to be low:

- Covering of loads and removing loose materials/debris before vehicles exit the site. This would minimise dust associated with the transport of construction materials.
- Regularly inspecting unsealed roads to be used by the Project with speed limits of 60km/hr or more that pass within 100m of a sensitive receptor, and applying watering as required to minimise dust generation.

8. Operations impact assessment

8.1 Key issues

This section provides a discussion on the potential air quality impacts from the Project during operations. As was applied above for construction in Section 6.5, potential dust impacts resulting from operational inspection and maintenance activities was assessed using the methodology presented in Publication 1943. The process and results of this assessment are presented below in Section 8.2. Other potential air quality-related impacts during operations were qualitatively assessed with the outcomes discussed in Section 8.3.

8.2 Impact assessment - dust

Limited emissions to air are expected during operations. The only potential emissions may include dust resulting from inspection and maintenance activities. Dust may also be generated from exposed surfaces resulting from the clearance of vegetation. Limited exhaust emissions would also be generated from associated plant and equipment.

As discussed in Section 3.3.4.2, dust generated from operational maintenance activities (including vegetation clearing) and from vehicles, plant and equipment use along access routes during maintenance and inspections represented the key potential impact and formed the basis of the assessment.

8.2.1 Step 1: Hazard potential of dust sources

The unmitigated hazard potential of dust from operational activities was similarly assessed using the guidance from Publication 1943 listed in Table 7-1. The scoring for the operational activities outlined above at the different portions of the Project determined are listed below in Table 8-1. It is noted that the intermediate temporary laydown areas are only planned to be used during construction, and so haven't been assessed with regard to operations.

Table 8-1: Project hazard potential effectiveness weightings, operation

Project element	**Score**				
Score	**Size of dust emitting source**	**Activities being undertaken**	**Type of dust emission**	**Level of control**	**Total**
Transmission lines and associated permanent infrastructure (Bulgana to Allendale)	1	1	1	1	4
Transmission lines and associated permanent infrastructure (Allendale to Sydenham)	1	1	1	1	4
Existing Bulgana Terminal Station	1	1	1	1	4
New 500kV terminal station near Bulgana	1	1	1	1	4
Existing Elaine Terminal Station	1	1	1	1	4

As listed above, the size of the emitting source was reduced for all portions of the Project. This was made on the basis that the extent of any exposed or disturbed areas associated with the operational activities listed above in Section 8.2 would be limited. Emissions associated with the activities listed in Section 8.2 are also expected to be less likely to generate dust and given their nature and limited extent would be able to be effectively controlled.

8.2.2 Steps 2 and 3: Pathway effectiveness and receiving environment sensitivity

The pathway effectiveness and sensitivity of the receiving environment are expected to remain generally consistent throughout operations. As such, the scoring determined for the Project listed in Table 6-11 and Table 6-9 (pathway effectiveness and receiving environment sensitivity respectively) were applied, as for construction.

8.2.3 Step 4: Unmitigated impact assessment

Considering the hazard potential (Step 1), pathway effectiveness (Step 2) and receiving environment sensitivity (Step 3) scoring listed in Table 8-1, Table 6-11 and Table 6-9 respectively, the following overall potential unmitigated operational dust impacts listed in Table 8-2 were determined.

Table 8-2: Unmitigated dust impacts, operations

Project element	Score				Unmitigated impact rating
Score	Receiving environment sensitivity	Pathway effectiveness	Hazard potential	Total and rating	
Transmission lines and associated permanent infrastructure (Bulgana to Allendale)	4	8	4	16	Low, impacts are not likely irrespective of management measures
Transmission lines and associated permanent infrastructure (Allendale to Sydenham)	6	8	4	18	Moderate, without effective management impacts may only occur rarely
Existing Bulgana Terminal Station	4	7	4	15	Low, impacts are not likely irrespective of management measures
New 500kV terminal station near Bulgana	4	7	4	15	Low, impacts are not likely irrespective of management measures
Existing Elaine Terminal Station	4	6	4	14	Low, impacts are not likely irrespective of management measures

Table 8-2 shows how the highest determined potential unmitigated operational risk rating was '**moderate**' for the nearest sensitive receivers surrounding the transmission line and associated activities (as well as the Powercor distribution line crossovers) from Allendale to Sydenham. '**Low**' potential unmitigated impacts were determined for receptors around the remaining Project components.

8.2.4 Mitigation and management

The operational impact assessment above found that the potential for air quality impacts during operations is limited. However, to meet the GED, the following measures are recommended for inclusion in the operational procedures developed for the Project:

- To the extent practicable, limit the extent of cleared areas of vegetation to reduce (i.e., minimise) the potential for dust arising from wind erosion effects.
- Inspect and maintain unsealed access routes to minimise the potential for dust generation
- Review meteorological and ambient air quality conditions, and plan activities accordingly so that adverse conditions can be avoided, or works can be planned in a way that minimises associated emissions to air
- Watering of access tracks and exposed and disturbed areas as required. This will minimise the level of dust generated from Project traffic along unsealed roads and from wind erosion from exposed and disturbed areas, such that associated residual impacts would be minimised.

8.2.5 Residual dust impacts

Measures commensurate to the levels of unmitigated impact assessed were developed in-line with the GED, other relevant guidelines as listed above. Through the application of these measures, residual impacts during operation would be reduced to the extent reasonably practicable whereby impacts could be effectively managed. In the context of the ratings from Publication 1943 above in Table 7-3, with the controls listed above, it is expected that residual risks could be reduced to 'low' (i.e., Dust impacts are very unlikely and may only occur on rare occasions during exceptional circumstances; i.e., existing elevated background conditions and/or inclement weather). There may be occasional short-term (i.e., hours) occurrences where there may be elevated dust levels that could lead to minor nuisance dust soiling but remain non-harmful to human health. These may be highest when winds are blowing in the direction from the Project towards sensitive receptors, and when works are taking place in close proximity to these locations. There is a higher potential for these minor effects in locations where there is a higher density of nearby sensitive receptors. Resulting dust concentrations at surrounding receptors are expected to remain within the range of values already experienced during natural fluctuations and variations in existing background conditions (i.e., imperceptible from existing conditions). Again, it is expected that any impacts could be avoided through adaptive management measures as outlined above in Section 8.2.4.

Unmitigated and residual operational dust impact ratings are summarised below in Table 8-3.

Table 8-3: Summary of unmitigated and residual operational dust impact ratings

Project element	Unmitigated impact rating	Residual impact rating
Transmission lines and associated permanent infrastructure (Bulgana to Allendale)	Low, impacts are not likely irrespective of management measures	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
Transmission lines and associated permanent infrastructure (Allendale to Sydenham)	Moderate, without effective management impacts may only occur rarely	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
Existing Bulgana Terminal Station	Low, impacts are not likely irrespective of management measures	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
New 500kV terminal station near Bulgana	Low, impacts are not likely irrespective of management measures	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
Existing Elaine Terminal Station	Low, impacts are not likely irrespective of management measures	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances

8.3 Impact assessment - other air quality impacts during operations

Limited exhaust emissions may arise from plant and equipment used during operational inspection and maintenance activities. They are not expected to present any potential impacts to surrounding sensitive receptors (i.e. unmitigated impacts would be negligible) and would not require any additional management measures beyond ensuring that plant and equipment are operated and maintained in a proper and efficient manner. Considering this, no residual impacts from operational exhaust emissions are expected (i.e. impacts would be negligible).

9. Decommissioning impact assessment

9.1 Key issues

This section assesses potential air quality impacts from the Project during decommissioning. As for construction and operations, dust resulting from operational activities was assessed using the EPA's Publication 1943 methodology. The process and results of this assessment are presented below in Section 9.2. A qualitative assessment of other potential air quality impacts during decommissioning is discussed in Section 9.3.

9.2 Impact assessment - dust

Decommissioning of transmission lines and terminal stations at the end of their service life would involve:

- Dismantling and removal of transmission line - Lowering the overhead conductors and earth wires to the ground and cutting them into manageable lengths to roll onto drums or reels. These will be removed from the site and may be sold as scrap. Some minor damage to vegetation may result, but other clearing will not normally be required for this operation. Insulators and line hardware will be removed from structures at the site and disposed of at an approved local authority waste facility.
- Demolition of towers - Dismantling towers in manageable sections and removing from site and usually selling steel as scrap. Steel poles will be cut into pieces small enough to be handled and transported, then removed from site and foundation will be demolished.
- Excavation of footings below finish surface level.
- Decommissioning and removal of terminal stations would involve removal of all terminal station structures, equipment and associated infrastructure.
- Easement restoration and rehabilitation.

The potential for dust impacts from these activities were considered for this assessment.

Exhaust emissions from the combustion of fossil fuels in plant and equipment used during decommissioning represents a potential impact. Localised contamination resulting from leaks and spills, including from operational maintenance activities incurred over the service life of the assets may also be present. Potential impacts associated with these pollutants are considered below in Section 9.3.

9.2.1 Step 1: Hazard potential of dust sources

As for construction and operations, unmitigated hazard potential of dust during decommissioning activities was assessed using the guidance from Publication 1943 above in Table 7-1. The ratings determined for the decommissioning activities outlined above at the different portions of the Project determined are listed below in Table 9-1.

Table 9-1: Project hazard potential effectiveness weightings, decommissioning

Project element	Score				
Score	**Size of dust emitting source**	**Activities being undertaken**	**Type of dust emission**	**Level of control**	**Total**
Transmission lines and associated permanent infrastructure (Bulgana to Allendale)	2	2	1	2	7

Project element	Score				
Score	Size of dust emitting source	Activities being undertaken	Type of dust emission	Level of control	Total
Transmission lines and associated permanent infrastructure (Allendale to Sydenham)	2	2	1	2	7
Existing Bulgana Terminal Station	2	2	1	2	7
New 500kV terminal station near Bulgana	2	2	1	2	7
Existing Elaine Terminal Station	2	2	1	2	7

As listed, the same unmitigated decommissioning dust hazard potential score (7) was determined for all portions of the Project. This rating was based on the extent of disturbance expected, that decommissioning activities (e.g., demolition, deconstruction and site rehabilitation works) have the potential to generate some dust, but not other same nature or extent as more intensive activities during construction (e.g., earthworks).

9.2.2 Steps 2 and 3: Pathway effectiveness and receiving environment sensitivity

The pathway effectiveness and sensitivity of the receiving environment scores applied for construction and operations, were similarly considered for decommissioning. As such, the scoring determined for the Project listed in Table 6-11 and Table 6-9 (pathway effectiveness and receiving environment sensitivity respectively) were applied.

9.2.3 Step 4: Unmitigated impact assessment

Applying the hazard potential (Step 1), pathway effectiveness (Step 2) and receiving environment sensitivity (Step 3) scoring listed in Table 9-1, Table 6-11 and Table 6-9 respectively, the overall potential unmitigated decommissioning dust impacts listed in Table 9-2 were determined.

Table 9-2: Unmitigated dust impacts, decommissioning

Project element	Score				Unmitigated impact rating
Score	Receiving environment sensitivity	Pathway effectiveness	Hazard potential	Total and rating	
Transmission lines and associated permanent infrastructure (Bulgana to Allendale)	4	8	7	19	Moderate, without effective management impacts may only occur rarely managed
Transmission lines and associated permanent infrastructure	6	8	7	21	Moderate, without effective management impacts may only occur rarely

Project element	Score				Unmitigated impact rating
Score	Receiving environment sensitivity	Pathway effectiveness	Hazard potential	Total and rating	
(Allendale to Sydenham)					
Existing Bulgana Terminal Station	4	7	7	18	Moderate, without effective management impacts may only occur rarely
New 500kV terminal station near Bulgana	4	7	7	18	Moderate, without effective management impacts may only occur rarely
Existing Elaine Terminal Station	4	6	7	17	Moderate, without effective management impacts may only occur rarely

Table 9-2 shows that the highest assessed unmitigated decommissioning dust risk rating was 'Moderate'. This was determined for receivers around all components of the Project.

9.2.4 Mitigation and management

Prior to decommissioning, a Decommissioning Management Plan (DMP) detailing the proposed decommissioning works, associated environmental risks, and planned management and mitigation measures will be prepared (EPR EM11). This plan would utilise environmental management strategies, practices, and technologies current at the time of decommissioning to comply with regulatory provisions and to appropriately manage environmental issues which may be associated with decommissioning of the Project assets. Where relevant, it is expected that the measures listed above for construction (Section 7.2.4) would be applied.

9.2.5 Residual dust impacts

Measures commensurate to the levels of unmitigated impact assessed were developed in-line with the GED, other relevant guidelines as listed above. Through the application of these measures, residual impacts during decommissioning would be reduced to the extent reasonably practicable whereby impacts could be effectively managed. In the context of the ratings from Publication 1943 reproduced in Table 7-3, with these controls, it is expected that residual risks could be reduced to 'low' (i.e., Dust impacts are very unlikely and may only occur on rare occasions during exceptional circumstances; i.e., existing elevated background conditions and/or inclement weather). These rare instances may be occasional short-term (i.e., hours) occurrences where there may be elevated dust levels that could lead to minor nuisance dust soiling but remain non-harmful to human health. These may be highest when winds are blowing in the direction from the Project towards sensitive receptors, and when works are taking place in proximity to these locations. There is a higher potential for these minor effects in locations where there is a higher density of nearby sensitive receptors. Resulting dust concentrations at surrounding receptors are expected to remain within the range of values already experienced during natural fluctuations and variations in existing background conditions (i.e., imperceptible from existing conditions). As above, it is expected that any impacts could be avoided through adaptive management measures.

Unmitigated and residual decommissioning dust impact ratings are summarised below in Table 9-3.

Table 9-3: Summary of unmitigated and residual decommissioning dust impact ratings

Project element	Unmitigated impact rating	Residual impact rating
Transmission lines and associated permanent infrastructure (Bulgana to Allendale)	Moderate, without effective management impacts may only occur rarely managed	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
Transmission lines and associated permanent infrastructure (Allendale to Sydenham)	Moderate, without effective management impacts may only occur rarely	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
Existing Bulgana Terminal Station	Moderate, without effective management impacts may only occur rarely	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
New 500kV terminal station near Bulgana	Moderate, without effective management impacts may only occur rarely	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances
Existing Elaine Terminal Station	Moderate, without effective management impacts may only occur rarely	Low, impacts are not likely and may only occur on rare occasions during exceptional circumstances

9.3 Impact assessment - other air quality issues during decommissioning

9.3.1 Exhaust emissions

Exhaust emissions would be generated from plant and equipment used during decommissioning activities. They are not expected to pose any issue to surrounding sensitive receptors (i.e. unmitigated impacts would be low) and would not require any additional management measures beyond ensuring that plant and equipment are operated and maintained in a proper and efficient manner. Considering this, only very low residual impacts from exhaust emissions associated with plant and equipment used during decommissioning are expected (i.e., residual impacts would be low).

9.3.2 Odours and airborne hazards

Limited contamination may be generated from asset leaks and from maintenance activities over the service life of the Project assets. Whilst it is possible that odours and other airborne hazards may arise should this contamination be present and disturbed, this is not expected to present any material impact (i.e. unmitigated impacts are expected to be low) that would require any specific management measures beyond those used to clean up any contamination. Associated residual impacts are similarly expected to be negligible in the context of Table 5-3.

10. Cumulative impacts

A cumulative impact assessment considers the impacts of a project together with the impacts of other relevant projects that may interact spatially and temporally to change the level of impact on environmental, social or cultural values. **EES Chapter 4: EES assessment framework and approach** identifies relevant future projects that are proportionate to the scale and potential significance of the impacts of Western Renewables Link Project (WRL); that have sufficient information publicly available in an EES or an environmental approvals application; and that have a spatial and temporal relationship to the Western Renewables Link. Cumulative impacts may occur when incremental, successive and combined effects of actions or projects are added to other proposed actions or projects.

Cumulative air quality impacts may arise from the interaction of construction, operational and decommissioning activities of WRL, and other developments, activities, land uses and projects in the area, both current and future. When considered in isolation, specific WRL impacts may be considered manageable. These manageable impacts may, however, be more substantial, when the impact of multiple projects on the same receptors are considered.

Of the 23 shortlisted projects identified in **EES Chapter 4: EES assessment framework and approach**, the following 12 have been considered as potentially relevant to air quality:

- Elaine Solar Farm
- Lerderderg River Nature Trail
- Lerderderg-Wombat National Park
- Melbourne Renewable Energy Hub
- Merrimu Precinct Structure Plan (PSP)/Bacchus Marsh Urban Growth Framework
- Nyaninyuk Wind Farm
- Outer Metropolitan Ring Road/E6 (OMR)
- Sand quarry, Lot 8 Seereys Road, Coimadai, Vic
- Sydenham Terminal Station Rebuild
- Victoria to New South Wales Interconnector West (VNI)
- Western Irrigation Network (WIN) Scheme – Recycled Water Supply Infrastructure Project
- Elaine (Akaysha) Battery Energy Storage System Project.

These 12 projects were identified on the basis of 1) their proximity to the Project and thus their potential to cause cumulative air quality impacts at the same receptors (if both are not effectively managed); 2) their projected timings such that they may overlap with the Project; and 3) the nature of their key emissions being similar to the Project which could lead to cumulative effects. Further details are provided in Table 10-1.

Table 10-1: Relevant future projects with the potential for cumulative air quality impacts

Project	Reason Project presents the potential for cumulative air quality impacts
Elaine Solar Farm	The Project (approved 3 May 2024) involves construction and operation of a 150 megawatt (MW) solar project and a 250 MWh battery on neighbouring land west of Elaine terminal station. Construction of the project has the potential to generate dust. Construction has not yet commenced, but is expected to continue for a duration of 12-months. Given its location and its potential to generate similar emissions to air, as well as the potential for the timelines for both projects to overlap, this Project was identified as being a relevant future Project for the purpose of the cumulative impact assessment.

Project	Reason Project presents the potential for cumulative air quality impacts
Lerderderg River Nature Trail	Lerderderg River Nature Trail proposes a new 5km trail that would extend the Aqualink hike and bike network through to MacKenzies Flat picnic area. The proposed reserve is to protect an internationally significant outcrop of Permian glacial rocks. The project is located within the Project Area of WRL and has a spatial relationship with WRL. Construction of the new 5 km trail has the potential to generate dust. Given its location and its potential to generate similar emissions to air, as well as the potential for the timelines for both projects to overlap, this Project was identified as being a relevant future Project for the purpose of the cumulative impact assessment.
Lerderderg-Wombat National Park	Lerderderg – Wombat National Park will be created by linking existing Lerderderg State Park and much of the existing Wombat State Forest to create a new national park covering more than 44,000 hectares between Daylesford and Bacchus Marsh. The Government is investing in facility upgrades throughout the region, including upgrading campgrounds and new and upgraded walking trails and facilities. This project is located directly south of Project Land, between Lerderderg State Park and Wombat National Park. Following the announcement of this project no information regarding the approvals process or construction timeline has been publicly released. However, it is assumed the opening of the existing parkland as 'Lerderderg-Wombat National Park' will occur within the life of the Project (WRL), bringing an increase of human activity to the area, therefore, it is considered the project has a temporal relationship with the Project. Given its location and its potential to generate similar emissions to air during planned upgrade activities, as well as the potential for the timelines for both projects to overlap, this Project was identified as being a relevant future Project for the purpose of the cumulative impact assessment.
Melbourne Renewable Energy Hub	Melton Renewable Energy Hub is a Battery project that will store wind, hydro and solar energy from regional Victoria and will connect into the adjacent Sydenham Terminal Station. The project is located adjacent to the WRL Project Area, located at 77 Victoria Road and 77 – 347 Holden Road, Plumpton and therefore has a spatial relationship with WRL. Construction timings are likely to overlap with the project. Considering these factors the Project was identified as a relevant future project for the cumulative impact assessment.
Merrimu Precinct Structure Plan (PSP)/Bacchus Marsh Urban Growth Framework	Merrimu Precinct Structure Plan (PSP)/Bacchus Marsh Urban Growth Framework identifies new areas for jobs, housing and infrastructure, while protecting valuable cultural and environmental assets. It sets out a vision to support a proposed 7,200 lot residential precinct near Bacchus Marsh, north-west of Melbourne as part of the Merrimu Precinct Structure Plan (PSP). This northern-most section of this project intersects with Project Land in Merrimu. The Urban Growth Framework is approved and land within the Urban Growth Framework is being developed. Merrimu PSP which (within the Urban Growth Framework) is being prepared and will guide future development. The PSP is currently undertaking background studies, however, the VPA has indicated that Merrimu PSP is anticipated to be on exhibition at the same time as the WRL EES and therefore, a temporal relationship is anticipated. Given its location and its potential to generate similar emissions to air, as well as the potential for the timelines for both projects to overlap, this Project was identified as being a relevant future Project for the purpose of the cumulative impact assessment.
Nyaninyuk Wind Farm	Nyaninyuk Wind Farm is a proposed windfarm consisting of up to 58 wind turbine generators with a total combined capacity of up to 330 megawatts. It would be located between Ecansford, Clunes and Waubra and intersects with the Project. As such, it has a spatial relationship. This project is currently in the feasibility stage; however construction is anticipated to commence in late 2026. As such, potential impacts are expected to have a temporal relationship. Given its location and its potential to generate similar emissions to air, as well as the potential for the timelines for both projects to overlap, this Project was identified as being a relevant future Project for the purpose of the cumulative impact assessment.
Outer Metropolitan Ring Road/E6 (OMR)	The OMR involves the construction of a 51 km long buried gas pipeline between Plumpton and Wollert. The project intersects the WRL Project Area and has a spatial relationship. It has the potential to generate dust and affect common receivers and may also overlap insofar as timings, although this is unlikely with the project not expected to start prior to 2030. On this basis, OMR was also identified as a relevant future project for the cumulative impact assessment.

Project	Reason Project presents the potential for cumulative air quality impacts
Sand quarry, Lot 8 Seereys Road, Coimadai, VIC	Sand quarry, Lot 8 Seereys Road, Coimadai, VIC involves the re-establishment of a quarry and associated infrastructure the purposes of extracting mineral resources (sand and gravel) at this address. This project is located to the north of Seereys Road, Coimadai, and is approximately 1km north of Project Land. As such, potential impacts are expected to have a spatial relationship with WRL. This project is undertaking assessment under the EPBC Act and is anticipated to be active for approximately 20 years following approval. As such, potential impacts are expected to have a temporal relationship with WRL. Given its location and its potential to generate similar emissions to air, as well as the potential for the timelines for both projects to overlap, this Project was identified as being a relevant future Project for the purpose of the cumulative impact assessment.
Sydenham Terminal Station Rebuild	Previously encompassed within the WRL Project this rebuild includes the construction of a new terminal station north of the existing Sydenham Terminal Station. This was removed from the Project EPBC Referral in August 2023 and is being completed as a standalone project due to its urgency to ensure network reliability. This project is located within the eastern end of Project Land in Plumpton. As such, it has a spatial relationship with WRL. Additionally, given that the Project will connect to the Terminal Station it is considered the project has a temporal relationship with WRL, with construction having commenced in April 2025 and expected to be completed by early 2028. Given its location and its potential to generate similar emissions to air, as well as the potential for the timelines for both projects to overlap, this Project was identified as being a relevant future Project for the purpose of the cumulative impact assessment.
Victoria to New South Wales Interconnector West (VNI)	VNI is a proposed future transmission line (and a potential future terminal station if the Djina Witji Terminal Station is not constructed as part of WRL) connecting clean, low-cost renewable power from renewable energy zones (REZs) in New South Wales and Victoria to the Project. This preferred option for this project connects with WRL at Bulgana. As such, it has a spatial relationship. The project is in the initial planning phase and therefore, there is limited information available publicly regarding project timeline or impacts. However, as WRL will connect to VNI West infrastructure it is considered the project has a temporal relationship. Given its location and its potential to generate similar emissions to air, as well as the potential for the timelines for both projects to overlap, this Project was identified as being a relevant future Project for the purpose of the cumulative impact assessment.
Western Irrigation Network (WIN) Scheme – Recycled Water Supply Infrastructure Project	WIN is an irrigation project that will deliver a new, secure source of Class C recycled water for irrigation of farmland in the Parwan-Balliang agricultural district in Melbourne's outer west. The recycled water is produced in Melton and Bacchus Marsh. WIN intersects the Project Land between Bacchus Marsh, Melton, and Sunbury. Construction of the interconnector pipeline between Sunbury and Melton Recycled Water Plants is planned over to be undertaken from 2023 to 2025. As such, potential impacts are expected to have a temporal relationship with the Project. Considering these factors, and that WIN may generate similar types of emissions to air and affect similar sensitive receptors, it was identified as a relevant future project for the cumulative impact assessment.
Elaine (Akaysha) Battery Energy Storage System Project	The Project involves the construction and operation of a proposed 311 MW / 1,244 MWh battery energy storage system (BESS) at 225 Elaine-Bluebridge Road, Elaine VIC. The site is located immediately southwest of Elaine terminal station which forms part of the Project. The BESS will also include a 220v – 33kV high voltage substation on the northern side that would feed into Elaine Terminal Station via a 300m long above ground transmission line or buried cable. As such, it has a spatial relationship. Ministerial permit PA2302247-1 was granted for the project on 13 September 2024 and the project has an indicative construction duration of 18-months. As such, potential impacts are expected to have a temporal relationship with the Project. Considering these factors, and that Elaine BESS may generate similar types of emissions to air (particularly during construction) and affect similar sensitive receptors, it was identified as a relevant future project for the cumulative impact assessment.

Although the potential for cumulative residual air quality effects at surrounding sensitive receptors would depend on the timings and sequencing of the Project and these other projects listed in Table 10-1, it is considered unlikely that their emission contributions would be significant enough to influence the outcomes of this assessment. Care and co-ordination should be applied to avoid circumstances where the same receptors are affected by the Project, as well as these surrounding projects. With this planning and co-ordination, residual cumulative air quality impacts are expected to be low.

11. Environmental Performance Requirements

Environmental Performance Requirements (EPRs) set out the environmental outcomes to be achieved through the implementation of mitigation measures during construction, operation and decommissioning. While some EPRs are performance based to allow flexibility in how they will be achieved, others include more prescriptive measures that must be implemented. Compliance with the EPRs will be required as a condition of the Project's approval.

To meet the EES evaluation objective of avoiding and/or minimising air quality risks to social, economic and cultural values, the EPRs outlined in Table 11-1 are recommended.

Table 11-1: Air Quality EPRs

EPR code	Environmental Performance Requirements	Project component	Stage
AQ1	**Develop and implement an Air Quality Management Plan** 1. Prior to construction commencing, develop, implement and maintain an Air Quality Management Plan as part of the Construction Environment Management Plan (CEMP) (EPR EM2) to minimise air quality impacts during construction at surrounding sensitive receptors. 2. The Air Quality Management Plan must: a) Identify the main sources of dust and airborne pollutants, and the location of sensitive land uses. b) Include a procedure for how the Project will control and where necessary monitor the emission of dust, exhaust emissions, fumes, odour and other pollution into the atmosphere during construction in accordance with relevant statutes, policies and guidelines to the extent reasonably practicable, including EPA Publication 1834.1: the Civil Construction, Building and Demolition Guide. c) Outline a process for regular review and update of The Air Quality Management Plan and assess the effectiveness of controls implemented. Reviews of the plan would be done when there are changes in design, conditions, monitoring results or as a result of investigating complaints: d) Provide a process to address complaints related to air quality and identify measures. The process must include: i. Follow-up with the potentially affected stakeholder(s) and capture all details. ii. Review the results of air quality and meteorological monitoring and details of project activities for any non-compliance or complaints received. A targeted trigger monitoring criterion with 1-hour averaged PM_{10} above 80 ug/m^3 provides an indication when air quality conditions are poor, and that the 24-hr averaged 50 ug/m^3 PM_{10} concentration objective would be exceeded to inform onsite management and controls as required. iii. Identify Project contributions, including key activities, as well as contributions from other surrounding projects that could be leading to cumulative effects.	All	Construction

EPR code	Environmental Performance Requirements	Project component	Stage
	iv. Review associated controls for Project activities, and where necessary modifying these controls or the intensity of activities to address the measured/reported issue. v. Provide feedback on action taken to the affected stakeholder(s) and confirm the complaint is closed out. 3. Monitors are required to be installed at or near works associated with the existing Bulgana Terminal Station, the new 500kV terminal station near Bulgana, Sydenham Terminal Station connection works and all laydown areas to reflect long term prevailing wind conditions and specific areas where sensitive receptors are located for the duration of construction works. The data collected would be used for compliance and management purposes.		
AQ2	**Implement air quality management and mitigation measures for operations** 1. Implement mitigation measures to avoid the generation of off-site visible dust during specific operational activities (i.e., dust from vehicles, plant and equipment used during schedule maintenance activities or routine vegetation management required within the easement).	All	Operation
EM11	**Develop and implement a Decommissioning Management Plan** 1. Prior to commencement of decommissioning, develop and implement a Decommissioning Management Plan detailing mitigation measures required to manage the environmental impacts associated with decommissioning and seek to minimise the risk of harm to human health or the environment of all activities associated with decommissioning 2. Management and mitigation measures shall be consistent with environmental management strategies, practices, and technologies current at the time and shall include, but not be limited to measures for communications and stakeholder engagement, environmental protection measures, waste management and recycling, emergency response and measures to minimise disturbance to agriculture, recreation and other enterprises. This shall include measures for communications and stakeholder engagement, environmental protection measures, waste management and recycling and measures to minimise disturbance to agriculture, recreation and other enterprises.	All	Decommissioning

The draft Incorporated Document has been informed by the above EPRs and includes conditions to avoid, minimise and manage impacts associated with the development of the workforce accommodation facilities. For air quality, this includes developing a Construction Environmental Management Plan (CEMP) that includes consideration of air quality. It is considered that these conditions are sufficient to meet the requirements of any relevant EPR applying to air quality impacts of the workforce accommodation facilities.

12. Conclusion

This report provides an assessment of the potential air quality impacts of the Project. The purpose of the assessment was to determine air quality values that are likely to be impacted by the proposed works.

The assessment has been based on a review of applicable legislation, policy and guidelines, characterisation of the existing conditions, identification of construction, operation and decommissioning impacts, evaluation of the significance of impacts, and recommendation of Environmental Performance Requirements. The key outcomes are outlined below.

12.1 Existing conditions

A review of the background air quality conditions showed that:

- There are no long-term (compliance) AQMS near the Project Area, but background air quality concentrations around Sydenham can be approximated using observations from the EPA air quality monitoring station in Geelong.
- Background air quality over most of the Project Area will be better (i.e., lower pollutant concentrations) than around Sydenham, due to being in rural areas with low population density and low vehicle traffic. However, occasional dust storms and bushfires will still affect background air quality across the Project Area.

A review of local sources of pollutants showed that:

- The pollutants that would potentially be discharged into air from the Project can also be discharged into air every day from other industrial activities, such as manufacturing sites, energy generation and quarries. The only such sites that have been identified as potentially interacting with the Project are the Boral, Hanson and Barro Group quarries north of Bacchus Marsh and the quarries at Rockbank west of the Sydenham Terminal Station.
- The Project Area contains mostly rural land; some which is intensively farmed, and some which covers larger and less intensive grazing properties. Local sources of dust emissions therefore may arise from this land, particularly in drier months of the year and when wind speeds are high. The dust erosion potential will vary throughout the year and will depend on the extent of vegetation cover, topsoil moisture content, and the type of farming carried out on the land (for example tilling or harvesting activities).
- Local unsealed roads are also a source of dust emissions, both when vehicles are moving on the roads and when the roads are empty. The dust emission potential again will depend on surface moisture content and compaction, wind speed and direction, and vehicle weights.

Various current and planned future local projects were also identified. The potential for impacts from these projects was also considered as part of the cumulative assessment completed as part of the study.

A review of aerial imagery and land-use information was completed to identify sensitive receptors in and around the 'study area' developed for the assessment. The 'study area' for the assessment comprised of a 500m buffer around the Project Area. As described above in Section 5.2, the 'study area' was established using guidance from 'Guidance on the assessment of dust from demolition and construction Version 2.2', (UK IAQM, 2024) which identifies that when there are no sensitive receptors within 500m the risk of impacts from construction activities would be 'negligible' and that any effects 'would not be significant'.

The sensitivity of the receiving environment around different portions of the project was evaluated in-line with Publication 1943. Using this approach, higher levels of sensitivity were identified around the Allendale to Sydenham portion of the transmission line. For these locations there was a higher density of nearby sensitive receivers, with many located downwind of the Project for the prevailing local winds.

12.2 Impact assessment

Potential dust impacts of the Project were assessed using the semi-quantitative method developed by the EPA in Publication 1943. This method assesses the potential impacts posed by nuisance dust by considering three elements:

- The hazard potential of dust sources. This is evaluated based on the size, nature of activities, type of emissions generated and level of control.
- The exposure pathway between the source and receiving environment. The framework considers the separation distance, orientation, and intervening terrain and land uses features between the activity or project and the surrounding receivers.
- The sensitivity of the receiving environment. This aspect considers the historical context of air quality-related issues experienced by people in the receiving environment, as well as the overall land use across this setting.

The following unmitigated impacts were initially determined (refer to the Glossary above and further details provided in Section 7 to Section 9 in relation to the potential impact terminology listed and used throughout this assessment:

- Unmitigated dust from construction of the Project presenting varying levels of potential impacts from **moderate** to **medium** for different components. The highest rating (**medium**) was determined at receivers around the Allendale to Sydenham portion of the transmission line and associated activities.
- Unmitigated dust from operational inspection and maintenance (including vegetation clearance) activities assessed as presenting **low** to **moderate** levels of potential impacts for different components of the Project. The highest rating (**moderate**) was determined at receivers around the Allendale to Sydenham portion of the transmission line and associated activities.
- **Moderate** unmitigated potential impacts were determined for all components of the Project during decommissioning.

Residual impacts were then evaluated, with the application of recommended mitigation and management controls.

Other potential air quality-related impacts including exhaust emissions from plant and equipment, and odours, fumes and airborne hazards resulting from uncovered contaminated materials and groundwater were assessed qualitatively. Like for dust, potential impacts associated with these aspects were qualitatively considered based on the magnitude of expected emissions, and the likelihood that they would affect surrounding receptors.

12.3 Environmental Performance Requirements

To meet the GED, mitigation measures consistent with relevant guidance and standard practice were recommended to reduce residual impacts to the extent reasonably practicable. Recommended measures also include inspections and monitoring to review and verify the effectiveness or need for additional controls, primarily during construction. Considering the potential impacts and committed controls the following EPRs have been recommended in order to meet the EES evaluation objective and intent of the GED, namely:

AQ1 – Develop and implement an Air Quality Management Plan

As part of the Construction Environment Management Plan (CEMP), develop an Air Quality Management Plan and implement measures to minimise the risk of air quality impacts during construction to surrounding sensitive receptors, including monitoring.

AQ2- Implement air quality management and mitigation measures for operations

Implement mitigation measures to effectively manage emissions to air which may arise during specific operational activities (i.e., dust from vehicles, plant and equipment used during schedule maintenance activities or routine vegetation management required within the easement)

EM11 – Develop and implement a Decommissioning Management Plan

The Principal Contractor appointed at the time of decommissioning shall prepare a Decommissioning Management Plan, encompassing management and mitigations measures which seek to minimise the risk of harm to human health, or the environment of all activities associated with decommissioning. Management and mitigation measures shall be consistent with environmental management strategies, practices, and technologies current at the time and shall include, but not be limited to measures for communications and stakeholder engagement, environmental protection measures, waste management and recycling, emergency response and measures to minimise disturbance to agriculture, recreation and other enterprises.

12.4 Residual impacts

With the implementation of the recommended controls and monitoring developed in-line with the EPRs and the conditions of the draft Incorporated Document, and with consideration to the guidance from the EPA's Publication 1943, it was determined that residual dust impacts would be **low** (i.e., Dust impacts are very unlikely). In these unlikely occasional instances, impacts would be short-term (i.e., hours) where there may be elevated dust levels that could lead to minor nuisance dust soiling but remain non-harmful to human health.

Low residual potential impacts were also determined from exhaust emissions from plant and equipment during construction and decommissioning stages of the Project. For odours, fumes and airborne hazards resulting from uncovered contaminated materials and groundwater, **low** residual impacts were determined for construction and **negligible** impacts were determined from these emissions during decommissioning.

Although the potential for cumulative air quality effects at surrounding sensitive receptors would depend on the timings and sequencing of the Project and the other identified current or future planned projects, it is unlikely that their contributions would be significant enough to influence the outcomes of the assessment. As such, a **low** potential for residual impacts was determined.

Based on this assessment, the maximum potential impact at some nearby receptors was rated as **low** (i.e., impacts are not likely) after controls have been implemented.

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Appendix A. Background Air Quality

Table A.1: Percentiles of 24-hour average PM_{10} at Geelong AQMS (2014–2022).

Year	ERS objective (µg/m³)	No. of exceedances of ERS objective	Maximum (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2014	50	8	71	57	51	42	33	22	17
2015	50	10	286	75	57	40	29	19	15
2016	50	5	68	57	47	37	30	20	15
2017	50	3	74	44	37	31	28	20	15
2018	50	6	96	70	47	39	33	21	17
2019	50	9	102	66	58	44	35	21	16
2020	50	6	238	80	52	39	30	22	17
2021	50	1	61	43	40	34	30	20	16
2022	50	0	38	34	33	29	26	19	14

Source: EPA, 2023

Table A.2: Annual average PM_{10} at Geelong AQMS (2014–2022).

Year	ERS objective (µg/m³)	Annual average (µg/m³)
2014	20	19.3
2015	20	18.4
2016	20	17.1
2017	20	17.3
2018	20	19.5
2019	20	19.4
2020	20	20.9
2021	20	19.0
2022	20	17.4

Source: EPA, 2023

Table A.3: Percentiles of 24-hour average $PM_{2.5}$ at Geelong AQMS (2014–2022).

Year	ERS objective (µg/m³)	No. of exceedances of ERS objective	Maximum (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2014-2016	25	No data*							
2017	25	2	26	23	18	13	10	7.9	6.5
2018	25	2	31	22	18	14	10	7.1	5.6
2019	25	1	33	19	16	13	10	7.0	5.5
2020	25	5	155	55	23	15	12	7.2	5.7
2021	25	0	23	19	16	13	10	6.2	5.2
2022	25	Insufficient data*							

* Insufficient $PM_{2.5}$ data were captured at the station in 2022.

Source: EPA, 2023

Table A.4: Percentiles of 24-hour average $PM_{2.5}$ at Melton AQMS (2021–2022).

Year	ERS objective (µg/m³)	No. of exceedances of ERS objective	Maximum (µg/m³)	Percentiles (µg/m³)					
				99th	98th	95th	90th	70th	50th
2020	25	Insufficient data*							
2021	25	0	22	16	14	11	9	5.8	4.8
2022	25	0	15	14	13	11	10	6.4	5.0

* Monitoring of $PM_{2.5}$ at Melton commenced in August 2020.

Source: EPA, 2023

Table A.5: Annual average $PM_{2.5}$ at Geelong AQMS (2014–2022).

Year	ERS objective (µg/m³)	Annual average (µg/m³)
2014-2016	8	No data*
2017	8	7.0
2018	8	6.5
2019	8	6.4
2020	8	7.8
2021	8	6.0
2022	8	insufficient data*

* Monitoring for $PM_{2.5}$ commenced in August 2016. Insufficient data were captured at the station in 2022.

Source: EPA, 2023

Table A.6: Annual average $PM_{2.5}$ at Melton AQMS (2021-2022).

Year	ERS objective (µg/m³)	Annual average (µg/m³)
2020	Insufficient data*	
2021	8	5.9
2022	8	6.2

* Monitoring of $PM_{2.5}$ at Melton commenced in August 2020.

Source: EPA, 2023

Table A.7: Percentiles of 1h average NO_2 at Geelong AQMS (2014–2022).

Year	ERS objective (ppb)	Max (ppb)	Percentiles (ppb)					
			99th	98th	95th	90th	70th	50th
2014	120	36	24	22	17	14	6	4
2015	120	38	26	22	18	14	6	4
2016	120	44	25	23	18	14	7	4
2017	120	42	27	24	19	15	7	4
2018	120	51	26	23	18	13	6	4
2019	120	38	25	23	18	13	6	3

Year	ERS objective (ppb)	Max (ppb)	Percentiles (ppb)					
			99th	98th	95th	90th	70th	50th
2020	120	53	26	23	19	14	6	4
2021	120	44	26	23	18	14	7	4
2022	120	33	22	19	15	11	5	3

Source: EPA, 2023

Table A.8: Annual average NO_2 at Geelong AQMS (2014–2022).

Year	ERS objective (ppb)	Annual Average (ppb)
2014	30	5.7
2015	30	5.7
2016	30	6.2
2017	30	6.3
2018	30	5.7
2019	30	5.5
2020	30	5.9
2021	30	6.0
2022	30	5.0

Source: EPA, 2023

Table A.9: Percentiles of 1-hour average SO_2 at Geelong AQMS (2014–2022).

Year	ERS objective (ppb)	Maximum (ppb)	Percentiles (ppb)					
			99th	98th	95th	90th	70th	50th
2014	200	29	9	6	3	2	1	0
2015	200	26	5	3	2	1	0	0
2016	200	10	3	3	2	1	0	0
2017	200	17	3	2	2	1	0	0
2018	200	29	4	3	2	1	0	0
2019	200	47	5	3	2	1	0	0
2020	200	27	3	2	2	1	0	0
2021	200	20	4	4	2	2	1	0
2022	200	14	2	2	2	1	1	1

Source: EPA, 2023

Table A.10: Annual average SO_2 at Geelong AQMS (2014–2022).

Year	ERS objective (ppb)	Annual Average (ppb)
2014	20	0.7
2015	20	0.4
2016	20	0.3
2017	20	0.3
2018	20	0.4
2019	20	0.4
2020	20	0.3
2021	20	0.7
2022	20	0.7

Source: EPA, 2023

Table A.11: Percentiles of 8-hour rolling average CO at Geelong AQMS (2014–2022).

Year	ERS objective (ppb)	Maximum (ppm)	Percentiles (ppm)					
			99th	98th	95th	90th	70th	50th
2014	9	1.4	0.6	0.5	0.3	0.2	0.1	0.1
2015	9	1.1	0.5	0.4	0.3	0.2	0.1	0.1
2016	9	1.3	0.6	0.5	0.3	0.2	0.2	0.1
2017	9	1.0	0.5	0.4	0.3	0.3	0.2	0.1
2018	9	1.1	0.6	0.5	0.3	0.3	0.2	0.1
2019	9	1.5	0.6	0.4	0.3	0.2	0.1	0.1
2020	9	2.9	0.8	0.6	0.4	0.3	0.2	0.1
2021	9	0.8	0.5	0.4	0.3	0.2	0.2	0.1
2022	9	0.8	0.4	0.3	0.3	0.3	0.2	0.1

Source: EPA, 2023

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