Appendix N

Air Quality Impact Assessment

KENTBRUCK GREEN POWER HUB

Prepared for
Neoen Australia Pty Ltd
ABN: 57 160 905 706

Air Quality Impact Assessment

Kentbruck Green Power Hub Project EES Technical Report

07-Jun-2024
Kentbruck Green Power Hub

Air Quality Impact Assessment

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Client: Neoen Australia Pty Ltd

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Job No.: 60591699

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Quality Information

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			Name/Position	Signature
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2	23 Jun 2021	Updated report incorporating TRG comments	Kristen Clarke Principal Air Quality Scientist	
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4	15 Mar 2023	Updated report incorporating ERR comments	Kristen Clarke Principal Air Quality Scientist	
5	14-Aug-2023	New revision to assess transmission options	Mitch Ryan Principal Air Quality Specialist	
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Table of Contents

Abbreviations

Abbreviation	Title
AAQ NEPM	National Environment Protection (Ambient Air Quality) Measure
AECOM	AECOM Australia Pty Ltd
AQM	Air Quality Management
BoM	Bureau of Meteorology
°C	Degrees Celsius
EES	Environment Effects Statement
EMF	Environmental Management Framework
EPA Victoria	Environment Protection Authority Victoria
ERS	Environment Reference Standard
GWh	Gigawatt hour
ha	Hectare
IAQM	Institute of Air Quality Management (UK)
kV	Kilovolt
km	Kilometre
km/h	Kilometres per hour
m	Metre
m^2	Square metre
m^3	Cubic metre
mm	Millimetre
MW	Megawatt
PM_{10}	Particulate matter 10 micrometres or less in diameter
$PM_{2.5}$	Particulate matter 2.5 micrometres or less in diameter
ROW	Right of way
SEPP	State Environment Protection Policy
$\mu g/m^3$	Micrograms per cubic metre
µm	Micrometre

Glossary

Term	Definition
Community	A group of people living in a specific geographical area or with mutual interests that could be affected by the Project.
Construction	Includes all physical work required to construct the new structures of Project.
Laydown areas	Areas required for temporarily storing materials, plant and equipment and providing space for other ancillary facilities, such as Project offices, during construction. Some construction laydown areas would be used for stockpiling. There will not stockpiling of soil from the Right of Way or other location at the laydown areas.
Demolition	Any activity involved with the removal of an existing structure (or structures).
Dust soiling	Dust that has fallen out of suspension in the air and which has settled onto a surface.
Dust	Solid particles that are suspended in air or have settled out onto a surface after having been suspended in air. The terms 'dust' and 'particulate matter' (PM) are often used interchangeably. In this report the term ‘dust’ has been used to include the particles that give rise to soiling, and to human health and ecological effects.
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock.
Easement	A ‘right of way’ around infrastructure that allows access to authorised personnel for inspections, repairs and maintenance during operation. The establishment of an easement also restricts certain activities on the land that could endanger members of the public or impact on the safe operation of the infrastructure.
Effects	The consequences of the changes in airborne concentrations and/or dust deposition for a sensitive receptor.
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment.
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of less than 2.5 µm.
PM_{10}	Airborne particulate matter with an aerodynamic diameter of less than 10 µm.
Sensitive receptor	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), child care centres, passive recreation areas (including outdoor grounds used for teaching), active recreation areas (including parks and sports grounds), commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, retail spaces and industrial premises).
Trackout	The transport of soil and sediment from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.
Right of way (ROW)	A specific section of the Project area for carrying out Project construction activities such as trenching and excavation. Public access to the ROW would be restricted and may include associated activities such as traffic management measures.

1.0 Introduction

1.1 Purpose of this report

The purpose of this report is to assess the potential air quality impacts associated with the proposed Kentbruck Green Power Hub ('**the Project'**) to inform the preparation of an Environment Effects Statement (EES) required for the Project.

On 25 August 2019, the Minister issued a decision confirming that an EES was required for the Project due to the potential for significant environmental effects.

The Project was referred to the Commonwealth Government and on 7 November 2019, the Project was declared a 'controlled action' which requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report provides an air quality impact assessment (AQIA) for the EES and proposes mitigation measures for potential impacts. This AQIA assesses potential for adverse effects to air quality at sensitive receptors and on other sensitive land uses during construction of wind turbines, associated infrastructure and use of an on-site quarry.

The findings of the AQIA will inform the development of an Environmental Management Framework (EMF) for the Project. The mitigation measures listed in the EMF will be implemented in the approvals and management plans for the Project.

1.2 Why understanding air quality is important

Victorians place a high value on clean air. They want the cleanest air possible that is consistent with the State's economic and social goals. Poor air quality impacts people's lifestyle, it can reduce interest in exercising, playing sport or simply enjoying the outdoors. Air pollution can impact health and wellbeing. Given the proximity of sensitive receptors such as residential areas and community facilities to the Project, potential air quality impacts during construction and operation were evaluated.

2.0 EES scoping requirements

2.1 EES evaluation objectives

The scoping requirements for the EES by the Minister for Planning set out the specific environmental matters to be investigated and documented in the Project's EES, which informs the scope of the EES technical studies. The scoping requirements include a set of evaluation objectives. These objectives identify the desired outcomes to be achieved in managing the potential impacts of constructing and operating the Project.

The following evaluation objectives are relevant to the air quality assessment:

- To avoid and minimise adverse effects for community amenity and safety, with regard to construction noise, vibration, dust, traffic and transport, operational turbine noise and fire risk management.

2.2 EES scoping requirements

The aspects from the scoping requirements relevant to the air quality evaluation objectives are shown in Table 2-1, as well as the location where these items have been addressed in this report.

Table 2-1 Scoping requirements relevant to air quality

Aspect	Scoping Requirement	Section addressed
Key issues	Potential for adverse effects to air quality at sensitive receptors and on other sensitive land uses during construction of wind turbines, associated infrastructure and use of an on-site quarry.	Section 3.0
Existing environment	Characterise current local conditions in relation to air quality using data collected from existing local monitoring stations, or Project-installed monitoring equipment. Identify sensitive receptors within 3km of wind turbines, associated infrastructure and on-site quarry that may be subject to effects to amenity from the Project including, but not limited to, residential dwellings and visitor accommodation (including camping grounds).	Section 5.5
Likely effects	Assess the potential effects of construction, operation and decommissioning activities on air quality. Assess the potential dust impacts from the proposed on-site quarry in accordance with the requirements of EPA Victoria's *Protocol for Environmental Management: Mining and Extractive Industries (2007).*	Section 6.0
Mitigation measures	Describe and propose siting, design, mitigation and management measures to control emissions to air from construction activities.	Section 7.0
Performance objectives	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. Describe contingency measures for responding to unexpected impacts to amenity values resulting from the Project during construction, operation and decommissioning.	Section 7.0

3.0 Project description

3.1 Overview of Project and study area

Neoen is proposing a renewable energy development, known as the Kentbruck Green Power Hub, comprising a wind energy facility (wind farm) with associated infrastructure. The Project would be mostly located in an actively managed and harvested pine plantation in south west Victoria, between Portland and Nelson, in the Glenelg LGA. Figure 1 shows the location of the Project.

The wind farm site would cover an area of up to 8,325 ha. Once operational, the total amount of land occupied by wind farm infrastructure would be approximately 350 ha (4.2% of the total wind farm area). Land not needed for wind farm infrastructure would continue to be used for forestry and grazing.

The Project would include up to 105 wind turbines, each made up of three blades to harness the wind and turn a rotor. The rotor is connected to a shaft within the nacelle which sits on top of the turbine tower. The nacelle houses a generator that converts mechanical energy into electricity and the wind turbine control systems. Each turbine would produce between 4 and 8 MW of peak power output, with a total wind farm capacity of approximately 600 MW and annual production of approximately 2,000 GWh.

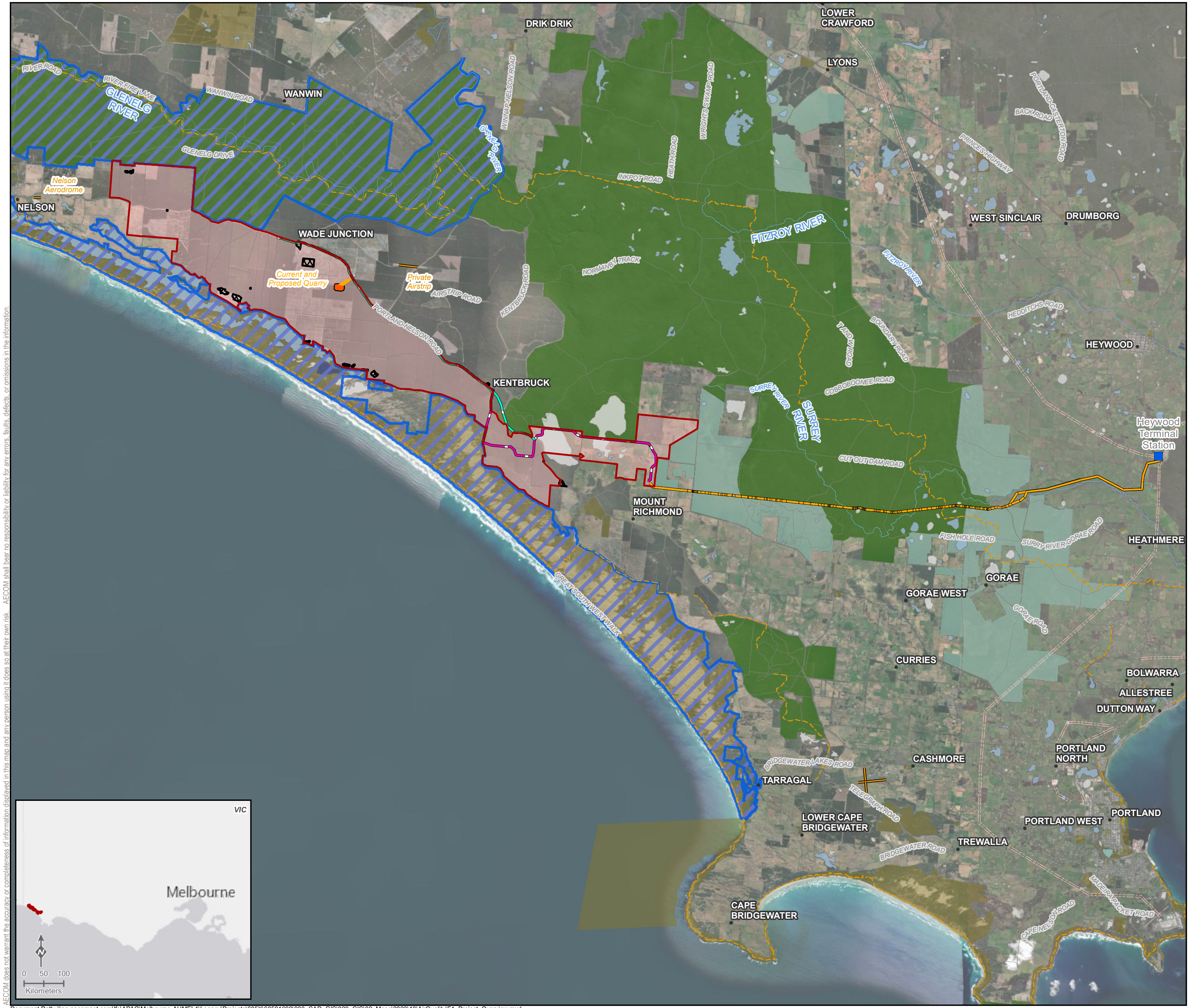
Each wind turbine would have a maximum hub height of 174 m and maximum rotor diameter of 190 m, with blade tip height extending from 60 m above ground level to up to 270 m above ground level. The exact dimensions would be determined during detailed design of the Project depending upon selection of the turbine model.

A new 275 kV transmission line would connect the Project to the existing AusNet electricity transmission network. The preferred option for the transmission line (referred to as Option 1B) would see it extend from the eastern boundary of the wind farm site to the existing 275/500 kV Heywood Terminal Station. The preferred underground transmission line would be up to 26.6 km in length and would traverse underground through Cobboboonee National Park, Cobboboonee Forest and farmland to the Heywood Terminal Station.

All transmission line options that have been considered for the Project, including those which are no longer being pursued by Neoen, have been evaluated in this assessment. The main body of this report considers the design and construction of the preferred option (referred to as Option 1B) for the transmission line corridor. Three alternative transmission line options (referred to as Option 1A, Option 2A and Option 2B respectively) have also been considered and the cumulative (whole Project) impacts for these alternate alignments have been assessed within Appendix A.

The operational life of the Project is anticipated to be between 25 and 30 years.

Aside from turbines, the Project is proposed to include the upgrade and construction of onsite tracks and access to main roads, up to eight meteorological monitoring masts and three collector substations in addition to an operations building. Temporary infrastructure associated with construction of the Project would include construction compounds (with office facilities, parking and toilet facilities), laydown areas, concrete batching plants and an on-site quarry.



NEOEN Boundless Energy

AECOM

DATUM GDA94 VICGRID94

0 3.5 7 Kilometers

1:175,000 (when printed at A3)

Legend

- Wind Farm Site Boundary
- Transmission Line (Underground)
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Existing Terminal Station
- Existing Transmission line
- Work Exclusion Area
- Existing Quarry
- Proposed Quarry

Type of Wetland

- Coastal saltmarsh
- Permanent freshwater
- Temporary freshwater
- Permanent saline
- Temporary saline
- Unknown

Existing Features

- National Park
- Forest Park
- Reserve
- Town
- Roads
- Airstrips
- Great South West Walk
- Watercourses
- Waterbodies
- Ramsar Gleneg Estuary and Discovery Bay

Data Sources:
1. Locality, Railway, Drainage Line, Streets, Features © StreetPro 2014
2. State Controlled Roads © (VICMAP) 2018
3. Essential Habitat © (VICMAP) 2018
4. Conservation Areas © (VICMAP) 2018
5. Protected Area © (VICMAP) 2018
6. Regional Ecosystems v8 © (VICMAP) 2018
7. Protected Plants Flore Survey Trigger © (VICMAP) 2018
8. Waterway Barrier Works© (VICMAP) 2018

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3. © Copyright Commonwealth of Australia (Geoscience Australia) 2016. The Commonwealth gives no warranty regarding the accuracy, completeness, currency or suitability for any particular purpose.

Environmental Effects Statement
Kentbruck Green Power Hub

PROJECT OVERVIEW

PROJECT #: 60578607
CREATED BY: JB
LAST MODIFIED: JM: 6/10/2023
VERSION: 1

Figure 1

A3 size

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3.2 Key construction activities

The Project would be constructed in either a single stage or over two stages. A single stage of construction would involve up to 350 workers, with construction occurring over a two-year period. If constructed over two stages, the construction period would be extended to 2.5 years and have a smaller peak workforce. The average workforce would be 250 workers for single stage construction and 190 workers for two stage construction. Construction would be restricted to a 12-hour window on Monday-Saturday, where possible.

Construction of the Project would involve two main components: the wind farm and the transmission line. The following key construction activities would be undertaken:

- Preliminary works including clearing of pine trees within the plantation, removal of vegetation from agricultural land, and removal and storage of topsoil for future use.
- Internal access road and public intersection upgrades.
- Construction of internal access tracks where needed.
- Establishment of concrete batching plants and construction of site buildings and construction compounds.
- Establishment of new onsite quarry to provide road-base material. Material would be extracted progressively throughout the Project construction period.
- Construction of hardstand and laydown areas.
- Excavation of turbine foundations and form work.
- Construction of cable trenches and power pole foundations; laying of bedding materials, cables and backfill; and replacement of topsoil.
- Construction of the main substation, collector substations and operation and maintenance building, involving excavation and pouring of building foundations and concrete pads at switchyard and transformer locations.
- Installation of wind turbines, collector substations, main substation, cabling and powerlines and other ancillary electricity infrastructure.
- Progressive rehabilitation of the site and landscaping.

3.3 Key operational activities

The operational life of the wind farm facility is expected to between 25 to 30 years. During this period, operational, maintenance and monitoring of the wind farm will include (but not be limited to):

- Service of wind turbines and associated infrastructure.
- Maintenance of internal access tracks and electrical infrastructure.
- The use and maintenance of buildings and plant, including the operational control room.
- Ongoing environmental monitoring in accordance with relevant approval conditions and industry best practice.

3.4 Key decommissioning activities

At the end of the operational life of the Project, the wind farm facility will either be decommissioned or upgraded with new turbines and/or ancillary infrastructure. Upgrading (or repowering) the Project will extend the operational period of the Project.

Key decommissioning activities will include:

- Removal of all above ground non-operational equipment.
- Removal and clean up any residual contamination.
- Rehabilitation of all storage areas, construction areas, access tracks and other areas affected by the decommissioning of the turbines (if those areas are not otherwise useful to the ongoing use or decommissioning of the wind farm).

The Project will comply with any relevant requirements for decommissioning as prescribed under any planning approval or subsequent permit or licence.

3.5 Activities relevant to air quality

Potential air quality impacts are likely to be limited to the duration of the construction period when there is potential for dust to be generated by plant and equipment including the operation of the quarry. The likelihood of substantial air quality impacts during operation is negligible.

Potential impacts associated with construction of the Project include:

- particulate emissions from construction activities, which may include mechanically generated dust due to vehicle movements and wind generated particulate matter from disturbed soil or stockpiles.
- emissions from diesel fuelled construction vehicles and trenching machinery.
- dust impacts associated with the use of the quarry during construction of the Project.
- decommissioning activities that may cause dust to be generated.

4.0 Legislation, policy, guidelines and criteria

4.1 Legislation, policy and guidelines

Table 4-1 summarises the relevant existing primary environmental legislation that apply to air quality as well as the implications for the Project and required approvals (as applicable).

Table 4-1 Key legislation and policy related to Air Quality

Legislation/policy/ guideline	Key policies/strategies	Implications for the Project	Approvals required
Commonwealth			
National Environment Protection Council Act 1994	National Environment Protection (Ambient Air Quality) Measure.	Standard and goal set to achieve equivalent population exposure that protects the beneficial uses of the ambient air environment.	N/A
State			
Environment Protection Act 2017 (Environment Protection Act)	The Environment Protection Act aims to protect Victoria's air, water and land by adopting a 'general environment duty' (GED) which imposes a broad obligation on entities and individuals to take proactive steps to minimise risks of harm to human health and the environment from pollution or waste. EPA Victoria administers the Environment Protection Act and subordinate legislation.	The Environment Protection Act regulates discharges to air by a system of development and operating licences. Any discharge to air during the construction or operation of the project must be in accordance with the requirements of the Environment Protection Act. The GED requires all reasonably practicable steps be taken to minimise impacts from the construction and operation of the project.	N/A
Environment Protection Regulations 2021 (Vic) (Environment Protection Regulations).	Schedule 1 of the Environment Protection Regulations lists activities that require a development and/or operational licence under the EP Act.	Activities which exceed air emissions thresholds are included in the list of prescribed development or operating activities. These activities require a development licence and operating licence.	N/A
Environment Reference Standard (ERS).	The ERS sets out the environmental values of the ambient air that are sought to be achieved or maintained in Victoria and standards to support those values. The ERS generally adopts the objectives in the AAQ NEPM with some modifications. The ERS also contains other environmental values, indicators and/or objectives that are not in the AAQ NEPM.	EPA Victoria must consider the environmental values in the ERS when deciding whether or not to issue development, operating and pilot project licences.	N/A

Legislation/policy/ guideline	Key policies/strategies	Implications for the Project	Approvals required
EPA Victoria Publication 1961, Guideline for Assessing and Minimising Air Pollution in Victoria (EPA 2022)	Provides a framework and Air Pollution Assessment Criteria (APACs) to assess and control risks associated with air pollution. The guideline addresses potential human health and environmental impacts associated with outdoor air pollution emitted from commercial, industrial, agricultural, transport, mining and extractive activities.	Ground level impacts of air emissions (construction and operation) would comply with the air quality standards and objectives provided in the Guideline.	N/A

4.2 Commonwealth legislation

The *National Environment Protection (Ambient Air Quality) Measure* (AAQ NEPM) was formed in 1998 under the *National Environment Protection Council Act 1994* (NEPC Act). It was designed to create a nationally consistent framework for monitoring and reporting on common ambient air pollutants. For the purpose of the operational assessment, pollutants of interest are carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and particulate matter with a diameter less than 10 micrometres (PM_{10}). The AAQ NEPM was varied in 2003 to include particulate matter with a diameter of less than 2.5 micrometres ($PM_{2.5}$) and is therefore also considered in this assessment. The AAQ NEPM was recently updated (May 2021) with new standards for nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and ozone (O_3).

The standards in the AAQ NEPM are not intended to be applied as an environmental standard by regulators without consideration of regulatory impacts in their jurisdictions. The Explanatory Statement clarifies this intent of the NEPM as a standard for reporting representative ambient air quality within an airshed, and not as a regulatory standard. The AAQ NEPM does not constrain a jurisdiction's ability to manage local or regional air quality issues and does not prescribe sanctions for-noncompliance with the air quality standards and does not compel or direct air pollution control measures (NEPC 2021).

4.3 State legislation

4.3.1 Environment Protection Act 2017

Air quality in Victoria is managed primarily through the *Environment Protection Act 2017* (EP Act) and associated regulations. The EP Act applies to noise emissions and the air, water and land to protect the environment in Victoria.

The EP Act requires a development licence and operating licence for prescribed permission activities. The *Environment Protection Regulations 2021* classifies activities that discharge or emit to the atmosphere.

No continuous air emissions are anticipated during operation of the project.

4.3.1.1 General environmental duty

The GED requires proactive steps to be taken to eliminate or reduce the risk of harm to human health and the environment from pollution or waste.

The GED applies at all times, during construction and operation of the project, for any activities posing a risk of harm to human health and the environment. The following sections of the EP Act apply to the GED:

- Section 25(1) of the EP Act states that a person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution must minimise those risks so far as reasonably practicable.
- Section 6 of the EP Act states that minimising risks of harm to human health and the environment requires the duty holder to eliminate risks of harm to human health and the environment so far as reasonably practicable and, if it is not reasonably practicable to eliminate those risks, then reduce those risks as far as reasonably practicable.
- Section 6(2) of the EP Act states factors to give regard to when determining what is reasonably practicable in relation to the minimising of risks to harm to human health and the environment.

4.3.2 Environmental Reference Standard

The Environment Reference Standard (ERS) sets out the environmental values of the ambient air that are sought to be achieved or maintained in Victoria. Environmental values are the uses, attributes and functions of the environment that Victorians value, such as being able to breathe clean air.

The ERS replaced *State Environment Protection Policy (Air Quality Management)* (SEPP AQM) on 1st July 2021 and generally adopts the objectives in the AAQ NEPM with some modifications. The ERS also contains other environmental values, indicators and objectives that are not in the AAQ NEPM. Environmental values of the ambient air environment listed in the ERS are set out in Table 4-2.

Table 4-2 Environmental values of the ambient air environment (Table 2-1, ERS)

Environmental value	Description of environmental value
Life, health and well-being of humans	Air quality that sustains life, health and well-being of humans.
Life, health and well-being of other forms of life, including the protection of ecosystems and biodiversity	Air quality that sustains life, health and well-being of other forms of life, including the protection of ecosystems and biodiversity.
Local amenity and aesthetic enjoyment	Air quality that supports lifestyle, recreation and leisure.
Visibility	Air quality with low levels of particulate matter and very good visible range.
The useful life and aesthetic appearance of buildings, structures, property and materials	Air quality that does not cause physical and structural damage to 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	Air quality that is not undermined, or at risk, by a warming and drying climate together with increasing population and economic growth.

The indicators and objectives provide a basis for assessment and reporting on environmental conditions in Victoria. Although it is not a compliance standard, the EP Act requires EPA Victoria to consider this ERS when assessing development, operating and pilot project licences. The ERS must also be taken into account by the Minister when recommending the making of regulations and compliance codes and deciding whether to declare an issue of environmental concern.

If not otherwise specified, the environmental values in this ERS apply to the whole of Victoria. ERS indicators and objectives for the ambient air environment are presented in Table 4-3.

Table 4-3 ERS indicators and objectives for the ambient air environment

Pollutant	Objective	Averaging period	Maximum exceedances
Carbon monoxide (max. concentration)	9.0 ppm	8 hours	1 day a year
Nitrogen dioxide (max. concentration)	0.12 ppm	1 hour	1 day a year
	0.03 ppm	1 year	None
Sulfur dioxide (max. concentration)	0.20 ppm	1 hour	1 day a year
	0.08 ppm	1 day	1 day a year
	0.02 ppm	1 year	None
Particulate matter as PM_{10} (max. concentration)	50 µg/m^3	1 day	None
	20 µg/m^3	1 year	None
Particulate matter as $PM_{2.5}$ (max. concentration)	25 µg/m^3	1 day	None
	8 µg/m^3	1 year	None

The ERS indicators and objectives have been considered for this Project to identify the potential pollutants of interest for the AQIA. As a qualitative assessment has been undertaken (refer Section 4.3.3), predictions of pollutant concentrations for comparison against the ERS indicators and objectives has not been undertaken. However, achieving compliance with the ERS indicators and objectives and reducing the potential for impacts as a result of emission of these pollutant species is the objective of the recommendations of this AQIA.

4.3.2.1 Reasonably practicable

Under the EP Act, the GED requires that any person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable.

EPA Publication 1856 Reasonably Practicable provides guidance as to the factors to consider when defining proportionate controls to minimise harm, as follows:

- Eliminate first: Can you eliminate the risk?
- Likelihood: What's the chance that harm will occur?
- Degree (consequence): How severe could the harm be on human health or the environment?
- Your knowledge about the risks: What do you know, or what can you find out, about the risks your activities pose?
- Availability and suitability: What technology, processes or equipment are available to control the risk? What controls are suitable for use in your circumstances?
- Cost: How much does the control cost to put in place compared to how effective it would be in reducing the risk?

The above guidance has been applied when determining the mitigation measures that should be adopted for the project in relation to air quality.

4.3.3 Guideline for Assessing and Minimising Air Pollution in Victoria

The EPA Victoria Publication 1961 *Guideline for Assessing and Minimising Air Pollution in Victoria* (EPA 2022) provides a framework to assess and control risks associated with air pollution. The guideline addresses potential human health and environmental impacts associated with outdoor air pollution emitted from commercial, industrial, agricultural, transport, mining and extractive activities.

The guideline provides a tiered approach to the assessment of risks from air pollution, with three levels of assessment in order of increasing complexity.

- **Level 1** assessments are qualitative or semiquantitative. They are used to assess risks from activities that either have intrinsically low risks, or have common, well-understood risks that can be controlled without extensive assessment.
- **Level 2** assessments are the most common type of risk assessment. They usually involve the use of dispersion modelling or monitoring. Predicted or measured pollutant concentrations are benchmarked against pre-defined air pollution assessment criteria (APACs) to understand risks.
- **Level 3** assessments are detailed risk assessments. These are only used when a simple comparison of a pollutant's concentration to an APAC cannot adequately assess risks.

A Level 1 assessment (qualitative or semiquantitative) was deemed appropriate for the project as described in the guideline "*For certain fugitive emission sources, a full quantitative assessment is prone to such large uncertainties that it is often more effective to invest resources into risk controls rather than into assessment works. This is particularly true of dust emissions from diffuse sources such as:*

- *waste processing facilities accepting solid inert or construction and demolition wastes*
- *earth-moving activities*
- *construction activities*
- *sites processing organic wastes or green wastes."*

A Level 1 assessment (qualitative or semiquantitative) was deemed appropriate for the quarry according to Table 1 in EPA 2022 with residences located further than 500m from the limit of work and extraction rate less than 500,000 tonnes per year. The weight of material proposed to be extracted is 780,000 tonnes over a two-year period.

4.3.4 Guideline for Civil construction, building and demolition

EPA Victoria Publication No. 1834 *Civil construction, building and demolition guide* (EPA 2020) is designed to support the civil construction, building and demolition industries to eliminate or reduce the risk of harm to human health and the environment through good environmental practice. Measures described in the guideline includes identifying hazards, assessing the risks, implementing controls, and checking controls.

Chapter 5 of the guide provides recommendations for managing erosion, sediment, and dust during construction activities. Recommended mitigation methods for construction dust are discussed in Section 7.0 of this report.

5.0 Methodology

5.1 Overview of methodology

This section describes the methodology that was used to assess the potential air quality impacts of the Project.

A risk based semi-quantitative method was chosen as the most appropriate level of assessment for construction dust impacts. Emission sources associated with construction are well understood and common mitigation measures are known to control impacts. There are large uncertainties associated with dust emissions from diffuse sources such as earth moving and construction activities which makes it difficult to accurately assess using a fully quantitative method.

EPA Victoria supported the use of a semi-quantitative method (IAQM) given that:

- the use of the quarry for construction of the Project would be for a period of up to two years
- the volume of material proposed to be extracted is 780,000 tonnes over a two-year period (less than 500,000 tonnes per year)
- the nearest sensitive receptor is more than 4 km from the quarry
- the quarry is surrounded by pine plantation trees which are likely to provide a physical barrier and a mechanism of mitigating dust impact.

Air quality impacts during construction including use of the quarry for the provision of road base material during construction were assessed semi-quantitatively using methods provided in the UK Institute of Air Quality Management (IAQM) documents, *Guidance on the assessment of dust from demolition and construction* (IAQM 2014) and *Guidance on the Assessment of Mineral Dust Impacts for Planning* (IAQM 2016). These documents provide a risk based assessment process to identify potential unmitigated impacts from dust generating activities, that then allows for the identification of appropriate mitigation measures commensurate with the level of risk.

The IAQM approach has been widely used in Australia to assess emissions from construction projects and has been accepted by many regulatory authorities as a suitable approach in the absence of any Australian-based guidance.

The main body of this report assesses the construction impacts of the preferred option (Option 1B) for the transmission line corridor. Assessment of construction impacts for the alternate transmission line options considered (Option 1A, Option 2A and Option 2B respectively) is presented in Appendix A.

5.1.1 Construction pollutants of interest

Emissions of interest for the construction of the Project are expected to be primarily related to vehicle movements, earthworks and materials handling, in particular for the construction of the turbine foundations, access tracks and underground transmission lines. Given the expected sources of pollution during construction, the pollutants considered for this assessment are particulates (dust), which may cause visible dust plumes and elevated PM_{10}[1] concentrations.

Potential dust generated by construction has been assessed semi-quantitatively using the IAQM method. Recommended measures have then been developed to enable the management of those air emissions. Further details on the semi-quantitative assessment are provided in the following section.

Vehicle exhaust emissions such as NO_2, SO_2 and PAH are expected to be a minor contributor to the environment and would be controlled through typical construction mitigation measures identified within the Publication 1834, *Civil Construction, Building and Demolition Guide* (EPA 2020). Mitigation measures include ensuring vehicles are fitted with appropriate emission control equipment, maintained frequently and serviced to the manufacturers' specifications.

Dust containing crystalline silica may be present in sandy soils and become mobilised in construction dust. When workers chip, cut, drill, or grind objects such as concrete, crystalline silica may become

[1] Particulate matter 10 micrometres or less in diameter

respirable. Respirable crystalline silica (RCS) has been classified as a human lung carcinogen and breathing RCS dust can cause silicosis.

As detailed in the *Kentbruck Green Power Hub Quarry Work Plan Requirements report* (October 2022), the proposed quarry is predominantly loose to moderately cemented, fine to coarse grained sand, with occasional interbedded minor limestone layers and occasional shells. Given the nature of the resource located at the proposed quarry site, there will be no need to crush the material, with most of the extracted material able to be loaded out to stockpiles or directly into trucks for dispatch. Although the limestone resource may contain quartz grains, there is minimal potential for the resource to generate any respirable crystalline silica. There are no residences within at least 4 km of the quarry, and no residences that could be impacted by any dust generated by the quarry.

5.2 Assessment of potential impacts from construction

The IAQM (2014) method is a four-step assessment of dust emissions associated with demolition, land clearing and earth moving, and construction activities. The IAQM method is described in the following sections.

This assessment has been informed by the anticipated earthworks and construction volumes and equipment usage information for the Project.

5.2.1 Step 1 – screening assessment

Step 1 of the IAQM assessment requires the determination of whether there are any sensitive receptors close enough to construction activities that have the potential to generate air quality impacts that warrant further assessment. The IAQM assessment methodology requires an assessment be carried out where there is a sensitive receptor within:

- 350 m from the boundary of a site, or
- 50 m from the route used by construction vehicles on public roads up to 500 m from a site entrance.

5.2.2 Step 2 – dust impact assessment

Step 2 in the IAQM is designed to assess the potential for dust impacts due to unmitigated dust emissions. The key components of the assessment involve defining:

- dust emission magnitudes (Step 2A),
- the surrounding area's sensitivity to dust emissions (Step 2B), and
- combining these in a matrix (Step 2C) to determine a potential risk rating for dust impacts on surrounding sensitive receptors.

5.2.2.1 Step 2A – dust emission magnitude

Dust emission magnitudes are estimated according to the scale of works being undertaken classified as 'small', 'medium' or 'large'. The IAQM method provides examples of demolition, earthworks, construction and trackout to aid classification (refer Table 5-1).

Table 5-1 Classification criteria for small, medium and large demolition and construction activities

Activity		Small	Medium	Large
Demolition	Total building volume (m^3)	<20,000	20,000–50,000	>50,000
Earthworks	Total site area (m^2)	<2,500	2,500–10,000	>10,000
	Number of heavy earth moving vehicles active at one time	<5	5-10	>10
	Total material moved (tonnes)	<20,000	20,000–100,000	>100,000
Construction	Total building volume (m^3)	<25,000	25,000–100,000	>100,000
Trackout	Number of heavy vehicle movements per day	<10	10-50	>50

5.2.2.2 Step 2B – sensitivity of surrounding area

The IAQM method allows the sensitivity of an area to dust soiling, human health impacts due to PM_{10}, and ecological effects to be classified as 'high', 'medium', or 'low'.

Sensitivity of the area to dust soiling and human health effects

The IAQM method classifies the sensitivity of an area to dust soiling and human health impacts due to particulate matter effects as 'high', 'medium', or 'low'. The classification is determined by a matrix for both dust soiling and human health impacts (refer Table 5-2 and Table 5-3, respectively). Factors used in the matrix tables to determine the sensitivity of an area are as follows:

- receptor sensitivity (for individual receptors in the area):
  - 'high' sensitivity: locations where members of the public are likely to be exposed for eight hours or more in a day. (e.g. private residences, hospitals, schools, or aged care homes)
  - 'medium' sensitivity: places of work where exposure is likely to be eight hours or more in a day
  - 'low' sensitivity: locations where exposure is transient, around one or two hours maximum. (e.g. parks, footpaths, shopping streets, playing fields)
- number of receptors of each sensitivity type in the area
- distance from source
- annual mean PM_{10} concentration (only applicable to the human health impact matrix).

Table 5-2 Surrounding area sensitivity to dust soiling effects on people and property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Surrounding area sensitivity to dust soiling effects on people and property corresponding to the risk categories need to be modified to match Australian conditions. The annual average criterion for PM_{10} chosen for the Project site is the ERS criteria of 20 µg/m^3 (refer to Table 4-3) and therefore the scaled criteria for Victoria are >20, 18-20, 15-17 and <15 µg/m^3.

The background PM_{10} concentrations in the region surrounding the Project are outlined in Section 5.5.3 and fit within the 15-17 µg/m^3 concentration range (refer to Table 5-6). Table 5-3 provides the IAQM sensitivity levels for human health impacts for the ranges outlined above.

Table 5-3 Surrounding area sensitivity to human health impacts for annual average PM_{10} concentrations

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)				
		<20	<50	<100	<200	<350
High	>100	High	Medium	Low	Low	Low
	10-100	High	Medium	Low	Low	Low
	1-10	Medium	Low	Low	Low	Low
Medium	>10	Low	Low	Low	Low	Low
	1-10	Low	Low	Low	Low	Low
Low	≤1	Low	Low	Low	Low	Low

Note: Annual average PM_{10} concentration has been conservatively adopted as 15-17 µg/m^3 (refer to Table 5-6)

The sensitivity for each construction activity defined by the IAQM method is assessed for the full site, along with individual selected portions of the construction footprint. This results in a sensitivity rating for the full construction footprint along with ratings for portions of the construction footprint for each construction activity. The ratings depend on the sensitivity of the receptors and the distance from the edge of the footprint. As shown in Table 5-2 and Table 5-3, the greater the distance from the construction footprint (the source), the lower the rating. The highest rating achieved is adopted as the final rating for that particular group of receptors.

It should be noted that this is not a quantitative human health assessment and risks discussed in this context need to be understood in terms of the IAQM method. For a particular group of receptors, a risk rating indicates the risk that group of receptors may experience unmitigated dust concentrations above the Victorian criteria, with the associated potential health effects linked to that criterion.

Sensitivity of area to ecological impacts

Ecological impacts from construction activities may occur due to deposition of dust on ecological areas. The IAQM method classifies the level of sensitivity for ecological receptors as follows:

- ‘High’ sensitivity ecological receptors
  - locations with international or national designation and the designation features may be affected by dust soiling
  - locations where there is a community of particularly dust sensitive species
- ‘Medium’ sensitivity ecological receptors
  - locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown
  - locations within a national designation where the features may be affected by dust deposition
- ‘Low’ sensitivity ecological receptors
  - locations with a local designation where the features may be affected by dust deposition.

The sensitivity of an ecological area to dust impacts is assessed using the criteria listed in Table 5-4.

Table 5-4 Sensitivity of an ecological area to dust impacts

Receptor sensitivity	Distance from source (m)	
	<20	20–50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

It should be noted that this is not a quantitative ecological assessment and impacts discussed in this context need to be understood in terms of the IAQM method. For a particular group of receptors, a rating indicates the potential impact that an ecologically sensitive area may experience where dust concentrations are unmitigated.

5.2.2.3 Step 2C – Potential for unmitigated dust impacts

Dust emission magnitude (Step 2A) and sensitivity of the surrounding area (Step 2B) are combined determine the potential for unmitigated dust impacts. Table 5-5 provides the IAQM (2014) matrix to assess dust impacts from construction activities.

Table 5-5 Potential unmitigated dust impacts (for dust soiling, human health and ecological impacts)

Activity	Surrounding area sensitivity	Dust emission magnitude		
		Large	Medium	Small
Demolition	High	High	Medium	Medium
	Medium	High	Medium	Low
	Low	Medium	Low	Negligible
Earthworks	High	High	Medium	Low
	Medium	Medium	Medium	Low
	Low	Low	Low	Negligible
Construction	High	High	Medium	Low
	Medium	Medium	Medium	Low
	Low	Low	Low	Negligible
Trackout	High	High	Medium	Low
	Medium	Medium	Low	Negligible
	Low	Low	Low	Negligible

5.2.3 Step 3 – management strategies

The outcome of Step 2C is used to determine the level of management required to ensure that dust impacts on surrounding sensitive receptors are maintained at an acceptable level. A potential impact of ‘high’ or ‘medium’ means that suitable management measures must be implemented during the Project.

5.2.4 Step 4 – reassessment

The final step of the IAQM method is to determine whether there are significant residual impacts, post mitigation, arising from a proposed development. The method states that:

For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be “not significant” (hereafter referred to as “negligible”).

Based on this expectation, as well as experience in Australia, it can be demonstrated that construction activities with targeted mitigation measures can achieve high degrees of dust mitigation which significantly minimise dust impacts to a negligible level.

5.3 Assessment of potential impacts from quarrying

The IAQM (2016) method is designed for use in the planning process to assess quarry operations for various minerals types including granitic, sand and gravel, limestone, opencast coal and clay. This method uses a distance-based screening process to identify those minerals sites where the dust impacts are unlikely to be significant and therefore require no further assessment. The predicted scale of dust effects may be classified as either ‘significant’ or ‘negligible’. Where effects are predicted to be ‘significant’, further mitigation is likely to be required before the proposal is considered to be acceptable.

IAQM (2016) method recommends that if there are no sensitive receptors within one kilometre of the dust generating activities, then a detailed dust assessment is not required. In such a case, it is considered that irrespective of the nature, size and operation of the site, the risk of an impact is likely to be negligible. In cases where sensitive receptors are located within one-kilometre, further assessment should be undertaken.

5.4 Study area

The study area for the air quality impact assessment covered areas where Project construction and decommissioning activities are expected to occur. The assessment focused on the potential impact of dust generating activities on nearby sensitive receptors.

Sensitive receptors in the context of a typical air quality impact assessment relate to locations where people may work or reside and may be affected by air pollutants emitted from a particular activity. This may include dwellings, schools, hospitals, offices or public recreational areas (such as campgrounds).

An ecological receptor refers to any sensitive habitat affected by dust soiling. This includes the direct impacts on vegetation or aquatic ecosystems of dust deposition, and the indirect impacts on fauna (e.g. on foraging habitats) (IAQM, 2014).

In terms of the Institute of Air Quality Management (IAQM) construction dust impact assessment method as outlined in Section 5.2, the locations of receptors are relevant where:

- a ‘sensitive receptor’ is within:
  - 350 m of the boundary of the site, or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).
- an ‘ecological receptor’ is within:
  - 50 m of the boundary of the site, or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

The study area for the construction assessment has been defined as the land within 350 metres of the proposed Project site boundary (refer to Figure 2) and transmission line alignments (refer to Figure 3). The proposed transmission line will be underground.

For the purposes of this assessment, sensitive receptors are considered as those likely to be present during the construction of the Project and does not include receptors that may be present sometime in the future after the Project has been constructed.

NEOEN Boundless Energy

AECOM

DATUM GDA94 VICGRID94

0 2 4

Kilometers

1:100,000 (when printed at A3)

Legend

- Turbine location
- Internal access roads
- Reticulation
- Wind Farm Site Boundary
- 100m Buffer
- 350m Buffer
- Quarry Area
- Quarry Area 1km Buffer
- House
- House - Abandonded
- Town

Ecological Receptors

- Ramsar Gleneg Estuary and Discovery Bay
- National Park / Forest

Data Sources:
1. Locality, Railway, Drainage Line, Streets, Features © StreetPro 2014
2. State Controlled Roads © (VICMAP) 2018
3. Essential Habitat © (VICMAP) 2018
4. Conservation Areas © (VICMAP) 2018
5. Protected Area © (VICMAP) 2018
6. Regional Ecosystems v8 © (VICMAP) 2018
7. Protected Plants Flore Survey Trigger © (VICMAP) 2018
8. Waterway Barrier Works© (VICMAP) 2018

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Environmental Effects Statement
Kentbruck Green Power Hub

LOCATION OF SENSITIVE RECEPTORS WITH 100 - 350M BUFFERS FROM SITE BOUNDARY

PROJECT #: 60591699
CREATED BY: JB
LAST MODIFIED: JM: 5/10/2023
VERSION: 1

Figure 2

A3 size

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Document Path: \\na.aecomnet.com\lfs\APAC\Melbourne-AUMEL1\Legacy\Projects\605X\60591699\900_CAD_GIS\920_GIS\02_Maps\2023\10\AirQuality\F2_Project_Area_Receptors.mxd

DATUM GDA94 VICGRID94

0 1.5 3

Kilometers

1:80,000 (when printed at A3)

Legend

- House
- Town
- Existing Terminal Station
- 275 kV Powerline - Underground
- Transmission Line (Underground)
- Existing Transmission line
- 100m Alignment
- 350m Alignment
- Wind Farm Site Boundary

Ecological Receptors

- Ramsar Gleneg Estuary and Discovery Bay
- National Park / Forest

Data Sources:
1. Locality, Railway, Drainage Line, Streets, Features © StreetPro 2014
2. State Controlled Roads © (VICMAP) 2018
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7. Protected Plants Flore Survey Trigger © (VICMAP) 2018
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Environmental Effects Statement
Kentbruck Green Power Hub

LOCATION OF SENSITIVE RECEPTORS WITH 100 - 350M BUFFERS FROM THE TRANSMISSION LINE ALIGNMENT

PROJECT #: 60591699
CREATED BY: JB
LAST MODIFIED: JM: 6/10/2023
VERSION: 1

Figure 3

A3 size

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5.5 Existing conditions

5.5.1 Air Quality in the Project Area

From an air quality perspective, the existing conditions are characterised by the location of sensitive receptors (such as residences, schools and hospitals), meteorology and background air quality. The following sections discuss these attributes in more detail.

5.5.2 Location of sensitive receptors

Sensitive receptors within the study area were classified as follows:

- residential buildings
- community buildings
- outdoor recreation and public open spaces
- commercial and industrial buildings.

The location of sensitive receptors is set out in Figure 2 and Figure 3.

5.5.3 Meteorology in the Project Area

The nearest Bureau of Meteorology (BoM) stations to the Project Area are the Portland Airport station, about 18 kilometres to the south, and the Dartmoor station, about 18 kilometres to the north. Of the two stations, the Portland Airport station provides the best representation of meteorology in for the Project due to its proximity to the ocean; Portland Airport is about five kilometres from the coast, while Dartmoor is further inland at about 24 kilometres to the coast. The Project is generally between about one and five kilometres form the coast and weather patterns are expected to be similar to those observed at Portland Airport. Data from the Portland station has therefore been included here to describe meteorology in the Project Area.

Average maximum and minimum temperature and rainfall by month at Portland Airport are presented in Figure 4. Monthly maximum temperatures range from about 13 ºC in winter to 23 ºC in summer. Minimum temperature ranges from approximately 6 ºC in winter to 13 ºC in summer. Rainfall is most common in winter with up to about 110 mm falling in July. Summers are typically dry with monthly rainfall down to about 30 mm in February.

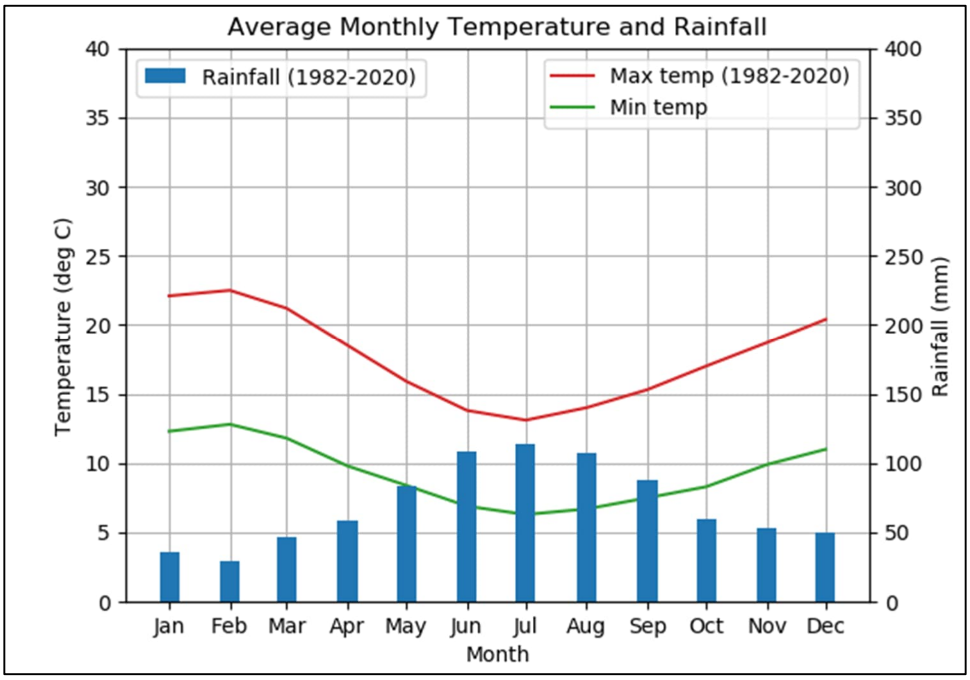

Figure 4 Average temperature and rainfall at Portland Airport BoM by month

Morning (9 am) and afternoon (3 pm) relative humidity and wind speeds at Portland Airport are presented in Figure 5. Humidity is highest during the winter months as temperature drop and rainfall increases. Humidity is lowest in the summer months with higher temperatures and less rainfall. Average monthly winds speeds range from about 15 km/h in autumn mornings to around 25 km/h on late winter to early summer afternoons.

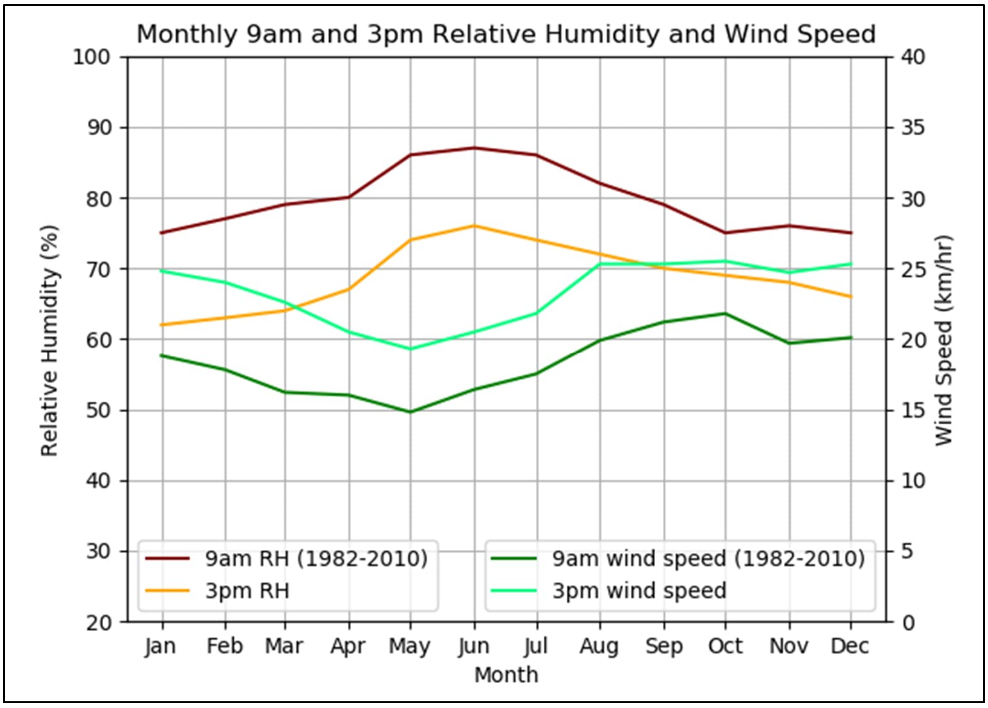

Figure 5 Average 9 am and 3 pm relative humidity and wind speed at Portland Airport BoM by month

Seasonal wind roses for Portland Airport are presented in Figure 6. Winds at Portland Airport are summarised as follows:

- Spring is dominated by strong south west to north west winds with a smaller and slightly lighter northerly component.
- Summer sees a mix of wind directions with south east winds blowing most frequently. Winds from the west are common in summer and are generally stronger than the south east winds.
- Autumn winds blow from all directions, with northerly winds most frequent. Winds from the west are strongest.
- North and northwest winds dominate winter however the less frequent westerly winds are stronger.

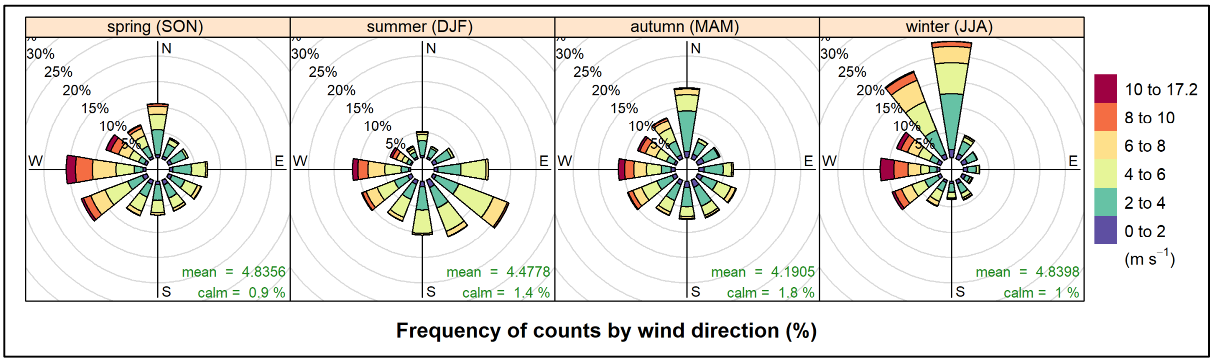

Figure 6 Seasonal wind roses for Portland Airport

5.5.4 Background air quality

The Project Area is located in a rural setting with no major sources of air pollution nearby. The primary source of dust and particulate matter in the Project Area would be wind driven dust, disturbance of material due to farming activities, wheel-generated dust from vehicles moving along unsealed roads, occasional bushfire smoke and sea salt blown inland by strong sea breezes. The only major source of air pollution is the Portland alumina smelter, about 30 km to the south east. Due to the distance of this source, concentrations of air pollutants in the Project Area are not expected to be affected significantly by the smelter.

Existing air quality has not been measured at the Project Area for the Project and there are no known nearby monitoring stations. EPA Victoria operate several ambient monitoring stations in Victoria to establish compliance with the AAQ NEPM. However, none of these stations are located near the Project, with the nearest station in Geelong, 250 km to the east. Additionally, all of these are located in urban areas with significant air pollution sources such as traffic or heavy industry such as coal mines, refineries and power stations. Due to the differences in land use and lack of major air pollution sources, PM_{10} and $PM_{2.5}$ concentrations in the Project Area are expected to be significantly less than those measured at the EPA Victoria stations.

For the IAQM method that is adopted for this assessment, an estimate of annual average PM_{10} concentrations in the Project Area is necessary to determine the sensitivity of the surrounding environment (see Section 5.2.2). The IAQM method specifies four categories of annual average PM_{10} concentrations: >20, 18-20, 15-17 and <15 µg/m^3. An estimate of which category the Project Area falls into must be made without local or site-specific PM_{10} data. To do this, annual average PM_{10} data from the EPA Victoria monitoring stations at Alphington and Geelong South were sourced from the EPA's 2018 and 2019 air monitoring reports – Compliance with the National Environment Protection (Ambient Air Quality) Measure (EPA 2018 and EPA 2019) are presented in Table 5-6.

Table 5-6 Average annual PM_{10} results, EPA Victoria

Year	Annual Average concentration PM_{10} (µg/m^3)	
	Alphington	Geelong South
2015	15.8	19.9
2016	15.0	15.9
2017	16.4	18.6
2018	18.2	19.5
2019	18.2	19.7

Annual average PM_{10} concentrations at Alphington and Geelong South range from 15.0 µg/m^3 to 19.9 µg/m^3. As discussed above, these concentrations are likely higher than those in the Project Area and annual average PM_{10} concentrations in the Project Area are generally expected to be below the 15.0 µg/m^3 measured at Alphington in 2016. However, as a conservative approach, an annual average PM_{10} concentration in the range of 15-17 µg/m^3 has been selected to define the sensitivity of the surrounding area according to the IAQM method (see Table 6-3).

6.0 Impact assessment

6.1 Construction and decommissioning impacts

Air emissions for the construction and decommissioning phases of the Project are expected to be typical or consistent with the proposed construction activities and primarily related to: vehicle movements, and earthworks and materials handling, in particular for the construction of the turbine foundations, access tracks and underground transmission lines (refer Section 3.2 and 3.4) Based on this, the construction and decommissioning phases were considered together in a single IAQM semi-quantitative assessment.

Air emissions during operation of the Project are expected to be negligible and primarily associated with the use of light vehicles on existing access roads associated with operation and maintenance of the Project.

The majority of construction activities would occur in a progressive manner (i.e. not all wind turbine foundations would be excavated at the same time, instead, turbine foundations would be established progressively). Typically, each turbine foundation would take about one to two months to construct. Up to 10 turbine foundations may be under construction at any one time.

The construction compounds, access road network, concrete batching plants and quarry would be used for the majority of the construction program, at different levels of intensity.

During construction, sensitive receptors are likely to be exposed to relatively short periods of construction activity at any given point along the alignment due to the progressive manner in which this line would be constructed.

This assessment has considered the construction of the preferred transmission line option and configuration as described in Section 3.1 (underground through Cobboboonee National Park, Cobboboonee Forest and farmland to the Heywood Terminal Station, referred to as Option 1B).

The potential air quality impacts of the construction activities listed above have been assessed as:

- off-site dust levels resulting in perceived loss of amenity
- off-site dust levels above regulatory limits causing potential health impacts
- combustion emissions from construction equipment resulting in deterioration of the existing air quality environment
- odour from contaminated soils (including acid sulfate soils) resulting in amenity impacts.

RCS presents a negligible risk of potential impact on sensitive receptors and was not specifically assessed. This is primarily due to the progressive construction of the works, meaning that annual dust concentrations due to the Project at any sensitive receptor are likely to be negligible. Additionally, RCS is only a fraction of $PM_{2,5}$, which is turn is only a fraction (generally 10 to 15 per cent for construction-type activities) of PM_{10} emissions. Given that short-term PM_{10} impacts are expected to be low (see Section 6.1.6), annual $PM_{2.5}$ and therefore RCS impacts would be negligible, even if RCS is present in the underlying geology.

There is also the potential for odour impacts during excavation works which may encounter acid sulfate soils which naturally occur in soils and sediments that contain iron sulphides. When exposed to air the iron sulphides in the soil react with oxygen and water to produce a variety of iron compounds and sulphuric acid; which are generally odorous. Locations of identified contaminated land and potential acid sulfate soils which have the potential to generate odorous material during construction are discussed in EES Technical Report: *Contamination and acid sulfate soils impact assessment*. Odorous or contaminated material should be removed from site as soon as practicable (not stockpiled) and management measures described in the *Contamination and acid sulphate soils impact assessment* are expected to address potential odour impacts from any acid sulfate soils encountered during excavation works.

6.1.1 Step 1 – Screening assessment

Step 1 of the IAQM method involves a screening assessment of the number of sensitive receptors located near the Project (as discussed in Section 5.2.1). Sensitive receptors identified near the Project are residential buildings (houses) and two campgrounds. A residential building is classified as one receptor, even though there may be a number of structures on the property (such as sheds) and multiple occupants.

A summary of the approximate number of sensitive receptors that might experience air quality impacts due construction works is presented in Table 6-1. The location of sensitive receptors that were considered for the assessment are presented in Figure 2 to Figure 3. As there are receptors located within 350 m of the site boundary, the assessment moves to Step 2.

Table 6-1 Approximate number of impacted sensitive receptors during construction activities

Distance from site boundary	Number of Sensitive Receptors		
	Project (wind farm) boundary	Transmission line	Total
<20 m	3	0	**3**
21-49 m	0	2	**2**
51-99 m	0	2	**2**
100-350 m	1	4	**5**
Total <350 m	**4**	**8**	**12**

6.1.2 Step 2A – Dust emission magnitude

Potential dust emission magnitudes for the construction of the Project were estimated based on the IAQM (2014) method. The dust emission magnitudes are based on the scale of the anticipated works and are classified as 'small', 'medium', or 'large'. Activities on construction sites have been divided into four types to reflect their different potential impacts. These are:

- demolition
- earthworks
- construction
- trackout.

Justification and the factors used in determining the dust emissions magnitudes are presented in Table 6-2. Potential dust magnitudes for dust soiling and human health should be considered conservative as they represent the entire Project. Dust emission magnitudes for a particular section of the site are expected to be much less ('medium' or 'small') for earthworks, construction and trackout due to the progressive construction method and distance required between turbines. There are ecological locations of international significance (Cobboboonee National Park and Cobboboonee Forest Park) which the transmission line bisects (refer to Figure 3). The Project is also located adjacent to an internationally significant wetland area (Glenelg Estuary and Discovery Bay at Ramsay). The sensitivity of this area of significance to dust soiling is considered in the Biodiversity Impact Assessment. Dust impacts are expected to be within the range of natural variability and construction work near (<50m) each Ramsar area is expected to be short term (1-2 months). Proposed turbine construction footprints are located at least 100 m away from Ramsar areas.

Potential dust emission magnitude for earthworks, construction and trackout within 50 m of highly sensitive ecological receptors is conservatively classified as 'Medium'.

Table 6-2 Dust emission magnitudes in accordance with IAQM (2014) method

Activity	Potential Dust Emission Magnitude*	Justification
Demolition	**Small** • Total building volume <20,000 m^3, construction material with low potential for dust release (metal and wood), demolition activities <10 m above ground.	• No demolition proposed during construction phase. • Demolition of buildings and turbine structures during decommissioning phase total volume less than 20,000 m^3.
Earthworks	**Large** for dust soiling and human health • Area greater than 10,000 m^2, potentially dusty soil, more than 10 heavy earth moving vehicles active at one time, total material moved more than 100,000 tonnes. **Medium** for ecological receptors • Site area 2,500 m^2 to 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, total material moved 20,000 tonnes to 100,000 tonnes.	• Up to 105 turbines, foundation excavation area approximately 1,600m^2 per turbine = 168,000 m^2 total. • Quarry excavation over 2 years 350,000m^3 = 770,000 tonnes (at an estimated density of 2.2 t/m^3). • A wheel trencher, rock saw or excavator would be used to dig the trench to lay the transmission lines in. Trenches would typically be excavated to a depth of approximately 1.2 metres. Trench volume for underground line option = 0.9 x 1.2 x 26,600 m = 28,700 m^3 = 45,900 tonnes (at an estimated density of 1.6 t/m^3 density). • Decommissioning phase is expected to require less earthworks than construction.
Construction	**Large** for dust soiling and human health • Total building volume >100,000 m^3, on site concrete batching. **Medium** for ecological receptors • Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete).	• Up to 105 turbines, an operations and maintenance building, temporary infrastructure including construction compounds, concrete batching plants, car parking, site buildings and amenities.
Trackout	**Large** for dust soiling and human health • >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m. **Medium** for ecological receptors • (10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m).	• Estimated construction traffic volumes for trucks carrying concrete, crushed rock, aggregate, cement, sand and water truck exceed 300 one-way trips per day (assuming a nine-month civil construction program). New and upgraded access tracks will primarily be constructed using crushed rock from the on-site quarry.

Note: ***** Potential dust emission magnitudes are defined in IAQM method. Potential dust emission magnitude for dust soiling and human health are conservative as they represent the entire Project. Potential dust emission magnitude within 50 metres of highly sensitive ecological receptors classified as 'Medium'.

6.1.3 Step 2B – Sensitivity of the surrounding area

As discussed in Section 5.2.2.2, the IAQM method classifies the sensitivity of an area based on the number of receptors in the area, receptor distance from the source and annual mean PM_{10} concentration. According to IAQM (2014), the overall sensitivity of the area was assessed as '**medium**' for dust soiling and human health, and '**high**' for ecological receptors. Justifications for the assessment are provided in Table 6-3.

Table 6-3 Sensitivity of the Project area in accordance with IAQM (2014)

Potential Impact	Sensitivity of the Area	Justification
Dust Soiling	Medium	Three sensitive receptors (houses) are located within 20 m of the Project boundary, which results in a medium rating. Eight sensitive receptors (houses) are located within 21 m – 350 m of the transmission line alignment, but this does not change the overall rating of medium.
Human Health (PM_{10})	Medium	Three sensitive receptors (houses) are located within 20 m of the Project boundary which results in a medium rating. Eight sensitive receptors (houses) are located within 21 m- 350 m of the transmission line alignment, but this does not change the overall rating of medium. Annual average PM_{10} concentration is within the range of 15-17 µg/m^3 in the Project Area (see Section 5.5.4).
Ecological	High	The transmission line bisects Cobboboonee National Park and Cobboboonee Forest Park and the Project boundary borders an area of international significance (Glenelg Estuary and Discovery Bay Ramsar wetland).

6.1.4 Step 2C – Potential of unmitigated impacts

The unmitigated dust impacts for each IAQM activity have been calculated as described in Section 5.2 and Table 5-5. Dust emission magnitudes for each activity in Table 6-2 were then combined with sensitivity of the area in Table 6-3 to assess unmitigated air quality impacts. Unmitigated dust impacts according to IAQM (2014) are summarised in Table 6-4.

Table 6-4 Summary of unmitigated dust impacts using the IAQM method

Activity	Step 2A: Potential for dust emissions*	Step 2B: Sensitivity of area			Step 2C: Potential of unmitigated dust impacts		
		Dust soiling	Human health (PM_{10})	Ecological	Dust soiling	Human health (PM_{10})	Ecological
Demolition	Small	Medium	Medium	High	Low	Low	Medium
Earthworks	Large	Medium	Medium	-	Medium	Medium	Medium
	Medium	-	-	High			
Construction	Large	Medium	Medium	-	Medium	Medium	Medium
	Medium	-	-	High			
Trackout	Large	Medium	Medium	-	Medium	Medium	Medium
	Medium	-	-	High			

Note: * Potential dust emission magnitudes are defined in IAQM method. Potential dust emission magnitude for dust soiling and human health are conservative as they represent the entire Project. Potential dust emission magnitude within 50 metres of highly sensitive ecological receptors classified as 'Medium'.

The outcome of the air quality impact assessment shows that the unmitigated air emissions from the construction and decommissioning phases of the Project pose a '**medium**' to '**low**' impact for dust soiling and human health.

Due to the proximity to significant ecological areas (the Glenelg Estuary and Discovery Bay Ramsar site), unmitigated air emissions from the construction and decommissioning phases of the Project pose a '**medium**' impact for ecological receptors.

6.1.5 Step 3 – Management strategies

Measures to minimise potential environmental impacts, health risks and nuisance to receptors during construction and decommissioning of the Project should be implemented with reference to the EPA Victoria Publication 1834, *Civil Construction, Building and Demolition Guide* (EPA 2020). The guidelines recommend a dust prevention strategy be developed at the Project planning stage and outlines a range of dust control and suppression measures such as water sprays, water carts or other devices (MM-AQ01). In addition to implementing dust management measures such as dust suppression, restricted vehicle movements (MM-AQ02), placing crushed rocks on existing unsealed access tracks if required and agreed (MM-AQ03), speed restrictions (MM-AQ04) and covering loads (MM-AQ05) would minimise air quality impacts on nearby receptors. Weather monitoring (MM-AQ06) is recommended in order to enable scheduling of work to avoid adverse weather conditions that are likely to result in air quality impacts (e.g. extremely hot days or windy days). Observational dust monitoring (MM-AQ07) is also recommended to monitor dust levels during construction and modify work where required to avoid or minimise dust generation. Odorous soils management (MM-AQ08) and equipment maintenance (MM-AQ09) should also be undertaken to minimise potential impacts. An assessment of off-site air quality impacts shows that management and mitigation measures are capable of maintaining ratings to '**low**' levels. Management measures and a monitoring program can be incorporated into the Environmental Management Plan or a Construction Environmental Management Plan for the Project to minimise off-site impacts. Recommended mitigation measures are summarised in Section 7.0.

6.1.6 Step 4 – Reassessment

Residual impacts are those that remain once mitigation and management measures have been implemented. With the recommended mitigation measures outlined in Section 7.0, the post-mitigation dust impacts of the Project are expected to be '**negligible**'.

6.2 Potential impact from use of the quarry

The IAQM (2016) method was used to assess potential impacts of quarry operations on sensitive receptors. The method recommends that if there are no sensitive receptors within one kilometre of the dust generating activities, then a detailed dust assessment is not required.

The nearest sensitive receptor is more than six kilometres from the quarry site (refer to Figure 2). Based on the IAQM (2016) method, it is considered that the risk of any dust impact from the quarry is likely to be '**negligible**'. No further assessment was required. Management measures and a monitoring program can be incorporated into the Environmental Management Plan for the quarry to minimise off-site impacts. Recommended mitigation measures are summarised in Section 7.0.

7.0 Recommended environmental management and monitoring

Mitigation strategies to be utilised during the construction and decommissioning phases of the Project shall align with management described in the EPA Victoria Publication 1834, *Civil Construction, Building and Demolition Guide* (EPA 2020).

An Environmental Management Plan and/or Construction Environmental Management Plan (CEMP) should be developed and implemented based on the best practice controls, mitigation and practices listed in this assessment. The CEMP should also detail the process and protocols that will be used during the project that ensures they are being undertaken appropriately and when required.

Mitigation measures relevant to the Project construction and decommissioning phase are listed in Table 7-1.

Table 7-1 Mitigation measures relevant to air quality

Measure ID	Mitigation measure
MM-AQ01	**Dust suppression** Dust suppression will be used at construction areas and batching plants as required using water sprays, water carts, screens or other devices on: • unpaved work areas • sand, spoil and aggregate stockpiles • during the loading and unloading of dust generating materials.
MM-AQ02	**Restricted vehicle movements** After arrival at the Project site, vehicles, plant and equipment should remain within the construction footprint and on designated roads and tracks.
MM-AQ03	**Crushed rock on access tracks** Crushed rock will be placed on existing unsealed access tracks if required and as agreed with relevant stakeholders to prevent vehicle movements raising dust.
MM-AQ04	**Speed restrictions** Vehicle speed limit will be restricted to 40 km/hr on unsealed access tracks and 20 km/hr near sensitive areas.
MM-AQ05	**Covering vehicle loads** Construction vehicles with potential for loss of loads (such as dust or litter) should be covered when using public roads.
MM-AQ06	**Weather monitoring** Weather conditions should be monitored for extreme heat and/or wind events using systems such as the Bureau of Meteorology forecasts and works should be modified if conditions are likely to result in air quality impacts at sensitive receptors.
MM-AQ07	**Dust monitoring** Observational monitoring of dust along the construction right of way (ROW) and facilities should be undertaken. If dust is observed to be causing a hazard, then MM-AQ01 will be implemented. If dust levels cannot be contained works will be modified or stopped until the dust hazard is reduced to a manageable level.

Measure ID	Mitigation measure
MM-AQ08	**Odorous soils management** In the event that odorous soils are uncovered during construction, the following measures will be undertaken: • Cessation of ground disturbance at the location and within the immediate vicinity. • Assessment of site contamination and determination of appropriate management actions in consultation with suitably qualified personnel. • If odorous material is found to be contaminated, EPA Victoria will be notified as soon as reasonably possible.
MM-AQ09	**Equipment maintenance** Plant and equipment will be maintained in good condition to minimise spills and air emissions that may cause nuisance. Diesel vehicles and machinery will be fitted with diesel particulate filters.

Earthworks may be required during operation for activities such as corrective maintenance, construction of additional facilities, maintenance or tracks and drainage controls, or to stabilise areas of erosion. The mitigation measures listed in Table 7-1 would need to be implemented should any earthworks be required during operation.

The above mitigation measures were developed in consultation with the recommendations of the *Guidance on the assessment of dust from demolition and construction* (IAQM, 2014), which provides mitigation measures specific to dust management for each of the four construction activities identified in Step 2C. These mitigation measures will reduce construction phase emissions to reduce the likelihood of significant impacts and to meet the ERS indicators and objectives, in addition to safeguarding Victorian air quality values.

7.1 Monitoring and contingency measures

The monitoring and contingency measures that are proposed to assess air quality impacts associated with the project are summarised in Table 7-2.

Table 7-2 Monitoring and contingency measures relevant to air quality

Measure ID	Monitoring or contingency measure
MM-AQ07	**Dust monitoring** Observational monitoring of dust along the construction corridor and facilities will be undertaken. If dust is observed to be causing a hazard, then MM-AQ01 would be implemented. If dust levels cannot be contained works would be modified or stopped until the dust hazard is reduced to a manageable level.

8.0 Conclusion

The purpose of this report is to assess the potential air quality impacts associated with the proposed Kentbruck Green Power Hub to inform the preparation of an EES required for the Project.

Sensitive receptor locations and existing background air quality were described for the Project. The Project Area is located in a rural setting with no major sources of air pollution nearby. Existing air quality has not been measured at the Project Area and there are no known nearby monitoring stations. EPA Victoria operate several ambient monitoring stations in Victoria however, none of these stations are located near the Project.

The primary source of dust and particulate matter in the Project Area would be wind driven dust, disturbance of material due to farming activities, wheel-generated dust from vehicles moving along unsealed roads, occasional bushfire smoke and sea salt blown inland by strong sea breezes. Background air quality data was conservatively sourced from the Victoria EPA's air monitoring network stations at Alphington and Geelong South. Due to the differences in land use and lack of major air pollution sources, PM_{10} and $PM_{2.5}$ concentrations in the Project Area are expected to be significantly less than those measured at the EPA Victoria stations.

Potential air quality impacts from the Project are likely to be limited to construction activities and operation of the quarry, when there is potential for dust to be generated by plant and equipment. The likelihood of air quality impacts during operation is '**negligible**'. The study area for the construction assessment has been defined as the land within 350 m of the proposed Project site boundary and transmission line alignment.

Impacts from construction activities were assessed using the IAQM (2014) method. Given the expected sources of pollution during construction, the pollutants considered for this assessment are particulates (dust), which may cause visible dust plumes and elevated PM_{10} concentrations. Vehicle exhaust emissions such as NO_2, SO_2 and PAH are expected to be a minor contributor to the environment and would be controlled through typical construction mitigation measures.

Unmitigated air emissions from the construction and decommissioning phases of the Project pose a '**medium**' to '**low**' impact for dust soiling and human health. Due to significant ecological areas (Glenelg Estuary and Discovery Bay Ramsar site) being within 50 metres of the project footprint, the unmitigated air emissions from the construction and decommissioning phases of the Projects pose a '**medium**' impact for ecological receptors.

Quarrying activities were assessed using the IAQM (2016) method which uses a distance-based screening process to identify sites with a potential for dust impacts. The nearest sensitive receptor is more than six kilometres from the quarry site. It is considered that the risk of any dust impact from the quarry is likely to be '**negligible**'. Management measures and a reactive dust management plan can be incorporated into the Environmental Management Plan for the quarry to minimise off-site impacts.

With the recommended mitigation measures outlined in Section 7.0, the post-mitigation dust impacts of the Project for dust soiling, human health and ecological areas are expected to be '**negligible**'. Given that short-term PM_{10} impacts are expected to be low, annual $PM_{2.5}$ and therefore RCS impacts would be '**negligible**', even if RCS is present in the underlying geology.

The assessment of potential air quality impacts demonstrates that the Project will not result in ongoing or widespread (i.e. regional) adverse impacts on air quality. With the implementation of recommended mitigation measures and a reactive dust management plan, potential impacts on air quality will be minimised. As such it is considered that the Project satisfies the relevant air quality evaluation objective as set out in the EES scoping requirements, and that this AQIA fulfils the EES scoping requirements.

9.0 References

EPA (2018), Air monitoring report 2018 – Compliance with the National Environment Protection (Ambient Air Quality) Measure, October 2019.

EPA (2019), Air monitoring report 2019 – Compliance with the National Environment Protection (Ambient Air Quality) Measure, August 2020.

EPA (2020), *Civil Construction, Building and Demolition Guide*, EPA Publication 1834, 2020.

EPA (2022), EPA Victoria Publication 1961, *Guideline for Assessing and Minimising Air Pollution in Victoria.*

ERS, Victoria Government, *Environment Reference Standard*, Victoria Government Gazette, SPECIAL No. S 245, 26 May 2021.

IAQM (2014), *Guidance on the assessment of dust from demolition and construction*, Version 1.1, Institute of Air Quality Management, London.

IAQM (2016), *Guidance on the Assessment of Mineral Dust Impacts for Planning*, Version 1.1, Institute of Air Quality Management, London.

NEPC (2021) *Summary of Public Submissions and National Environment Protection Council Response; Variation to the National Environment Protection (Ambient Air Quality) Measure*, April 2021 National Environment Protection Council, Commonwealth of Australia; Accessed 3 June 2021

PEM, EPA Victoria Publication 1191 *Protocol for Environmental Management – State Environment Protection Policy (Air Quality Management) – Mining and Extractive Industries* (December 2007)

SEPP (AQM), Victoria Government, *State Environment Protection Policy (Air Quality Management)*, Victoria Government Gazette, SPECIAL No. S 240, 21 December 2001.

Appendix A

Transmission line options analysis

A1 Transmission line options

A1.1 Background

The Project being pursued by Neoen, and subject to full impact assessment in this report, comprises a preferred transmission line route and configuration as described in Section 3.0 (wholly underground through Cobboboonee National Park, Cobboboonee Forest and farmland to the Heywood Terminal Station; referred to as Option 1B). A feasible alternative is for this alignment to be underground through Cobboboonee National Park and Cobboboonee Forest Park and overhead through farmland to the Heywood Terminal Station (Option 1A).

Two other options were initially identified as feasible but are no longer being pursued by the Project due to a lack of landowner and community support, with these referred to as Options 2A and 2B. These options run south east from the wind farm site and connect to the Heywood-Portland 500 kV line north of Portland. Option 2A is wholly overhead, while Option 2B is wholly underground.

The preferred and three alternate transmission line options are described as follows:

- Option 1B (preferred option): The transmission line would be entirely underground from the main wind farm substation and traverse Cobboboonee National Park and Cobboboonee Forest Park beneath an existing road, through freehold rural landholdings to reach Heywood Terminal. The total length of underground line would be 26.6 km.
- Option 1A: The transmission line would follow the same route as Option 1B but would be overhead once it exits the Cobboboonee Forest Park through freehold rural landholdings to reach Heywood Terminal Station. The total length of underground line is 18.8 km, with 7.8 km of overhead line.
- Option 2A: The overhead transmission line would extend southeast from the main wind farm substation and traverse several freehold rural landholdings used primarily for grazing. This option would require development and construction of a new terminal station adjacent to the existing Heywood-Portland 500 kV line north of Portland. The total length of overhead line would be 26 km.
- Option 2B: The transmission line would follow the same route as Option 2A but would be entirely underground. This option would also require development and construction of a new terminal station adjacent to the existing Heywood-Portland 500 kV line north of Portland. The total length of underground line would be 26 km.

This appendix presents an air quality assessment for the construction of the alternative transmission line options (Options 1A, 2A and 2B).

The methodology used for the assessment is the same IAQM risk based semi-quantitative method applied for assessment of the preferred option (Option 1B) within the main body of this report. The methodology adopted from the *Guidance on the assessment of dust from demolition and construction* (IAQM, 2014) is detailed in Section 5.0. This assessment has been informed by the anticipated earthworks and construction volumes and equipment usage information for the entire Project, including the transmission line options.

A1.1 Construction pollutants of interest

Pollutants of interest for the construction of alternate transmission line options are particulate matter (dust), the same as those considered for the construction of the preferred option.

A2 Study area

The study area for the transmission line options analysis covers areas where construction and decommissioning activities are expected to occur. This options analysis focuses on the potential impact of dust generating activities on nearby sensitive receptors.

Sensitive receptors in the context of a typical air quality impact assessment relate to locations where people may work or reside and may be affected by air pollutants emitted from a particular activity. This may include dwellings, schools, hospitals, offices or public recreational areas (such as campgrounds).

An ecological receptor refers to any sensitive habitat affected by dust soiling. This includes the direct impacts on vegetation or aquatic ecosystems of dust deposition, and the indirect impacts on fauna (e.g. on foraging habitats) (IAQM, 2014).

In terms of the Institute of Air Quality Management (IAQM) construction dust impact assessment method, the locations of receptors are relevant where:

- a ‘sensitive receptor’ is within:
  - 350 m of the boundary of the site, or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).
- an ‘ecological receptor’ is within:
  - 50 m of the boundary of the site, or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

The study area for the construction assessment has been defined as the land within 350 m of the alternate transmission line alignments. The study area for Option 1A is shown in Figure A-1. The study area for Option 2 (A and B, which follow the same alignment) is shown in Figure A-2.

For the purposes of this assessment, sensitive receptors are considered as those likely to be present during the construction of the Project and does not include receptors that may be present sometime in the future after the Project has been constructed.

NEOEN BOUNDLESS ENERGY

AECOM

DATUM GDA94 VICGRID94

0 1.5 3 Kilometers

1:80,000 (when printed at A3)

Legend

- Sensitive Receptor
- Transmission Line Overhead Poles (Option 1A)
- Alignment Option 1A/1B
- 275 kV Powerline - Underground
- 100m Alignment Buffer
- 350m Alignment Buffer
- Wind Farm Site Boundary

Ecological Receptors

- Ramsar Gleneg Estuary and Discovery Bay
- National Park / Forest

Data Sources:
1. Locality, Railway, Drainage Line, Streets, Features © StreetPro 2014
2. State Controlled Roads © (VICMAP) 2018
3. Essential Habitat © (VICMAP) 2018
4. Conservation Areas © (VICMAP) 2018
5. Protected Area © (VICMAP) 2018
6. Regional Ecosystems v8 © (VICMAP) 2018
7. Protected Plants Flore Survey Trigger © (VICMAP) 2018
8. Waterway Barrier Works© (VICMAP) 2018

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Environmental Effects Statement
Kentbruck Green Power Hub

LOCATION OF SENSITIVE RECEPTORS WITHIN 100M AND 350M BUFFERS FROM ALIGNMENT

PROJECT #: 60591699
CREATED BY: JM
LAST MODIFIED: JM: 5/10/2023
VERSION: 1

Figure A1

A3 size

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NEOEN BOUNDLESS ENERGY

AECOM

DATUM GDA94 VICGRID94

0 1 2 Kilometers

1:56,000 (when printed at A3)

N

Legend

- Sensitive Receptor
- Alignment Option 2 (A and B)
- 100m Buffer
- 350m Buffer

Ecological Receptors

- Ramsar Gleneg Estuary and Discovery Bay
- National Park / Forest

Data Sources:
1. Locality, Railway, Drainage Line, Streets, Features © StreetPro 2014
2. State Controlled Roads © (VICMAP) 2018
3. Essential Habitat © (VICMAP) 2018
4. Conservation Areas © (VICMAP) 2018
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Environmental Effects Statement
Kentbruck Green Power Hub

LOCATION OF SENSITIVE RECEPTORS WITHIN 100M AND 350M BUFFERS FROM ALIGNMENT

PROJECT #:	60578607
CREATED BY:	JM
LAST MODIFIED:	JM: 5/10/2023
VERSION:	1

Figure A2

A3 size

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A3 Impact assessment

A3.1 Step 1 – Screening assessment

Step 1 of the IAQM method involves a screening assessment of the number of sensitive receptors (human receptors) located near the Project. A summary of the approximate number of sensitive receptors that might experience air quality impacts due to construction works are presented in Table A-1. The locations of sensitive receptors identified are presented in Figure A-1 and Figure A-2.

Table A-1 Approximate number of impacted sensitive receptors during construction activities

Distance from site boundary	Number of Sensitive Receptors		
	Wind farm Project boundary (refer Figure 1 in Section 5.4)	Transmission Option 1A (refer Figure A-1)	Transmission Option 2 (A and B) (refer Figure A-2)
<20 m	3	1	0
21-49 m	0	0	0
51-99 m	0	0	0
100-350 m	1	7	7
Total <350 m	**4**	**8**	**7**

As there are receptors located within 350 m of both Option 1A and Option 2 (A and B) transmission line boundaries, the assessment moves to Step 2.

A3.2 Step 2A – Dust emission magnitude

Potential dust emission magnitudes for the construction of the Project were estimated based on the IAQM (2014) method. The dust emission magnitudes are based on the scale of the anticipated works and are classified as 'small', 'medium', or 'large'. Activities on construction sites have been divided into four types to reflect their different potential impacts. These are:

- demolition
- earthworks
- construction
- trackout.

Justification and the factors used in determining the dust emissions magnitudes are presented in Table A-2.

There are ecological locations of international significance adjacent to both alignment options, specifically:

- Cobboboonee National Park and Cobboboonee Forest Park, which transmission line alignment Option 1A bisects.
- Mount Richmond National Park, which is located immediately north of transmission line alignment Option 2.

The Project is also located adjacent to an internationally significant wetland area (Glenelg Estuary and Discovery Bay at Ramsay). The sensitivity of this area of significance to dust soiling is considered in the Biodiversity Impact Assessment. Dust impacts are expected to be within the range of natural variability and construction work near ecological conservation or internationally significant wetland areas is expected to be short term (1-2 months).

Potential dust emission magnitude for earthworks, construction and trackout within 50 metres of highly sensitive ecological receptors is conservatively classified as 'Medium'.

Table A-2 Dust emission magnitudes in accordance with IAQM (2014) method

Activity	Potential Dust Emission Magnitude*	Justification
Option 1A (overground and underground)		
Demolition	**Small** Total building volume <20,000 m^3, construction material with low potential for dust release (metal and wood), demolition activities <10m above ground.	• No demolition proposed during construction phase. • Demolition of buildings and turbine structures during decommissioning phase total volume less than 20,000 m^3.
Earthworks	**Large** for dust soiling and human health • Area greater than 10,000 m^2, potentially dusty soil, more than 10 heavy earth moving vehicles active at one time, total material moved more than 100,000 tonnes. **Medium** for ecological receptors • Site area 2,500 m^2 to 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, total material moved 20,000 tonnes to 100,000 tonnes.	• Up to 105 turbines, foundation excavation area approximately 1,600m^2 per turbine = 168,000 m^2. • total Quarry excavation over 2 years 350,000m^3 = 770,000 tonnes (at an estimated density of 2.2 t/m^3). • Trench excavations: A wheel trencher, rocksaw or excavator would be used to dig the trench to lay the transmission lines in. Trenches would typically be excavated to a depth of approximately 1.2 metres. Trench volume for underground line option = 0.9 x 1.2 x 18,800 m = 20,300 m^3 = 32,500 tonnes (at an estimated density of 1.6 t/m^3 density). • Decommissioning phase is expected to require less earthworks than construction.
Construction	**Large** for dust soiling and human health • Total building volume >100,000 m^3, on site concrete batching. **Medium** for ecological receptors • Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete).	• Up to 105 turbines, an operations and maintenance building, temporary infrastructure including construction compounds, concrete batching plants, car parking, site buildings and amenities.
Trackout	**Large** for dust soiling and human health • >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m. **Medium** for ecological receptors • (10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m).	• Estimated construction traffic volumes for trucks carrying concrete, crushed rock, aggregate, cement, sand and water truck exceed 300 one-way trips per day (assuming a nine-month civil construction program). New and upgraded access tracks will primarily be constructed using crushed rock from the on-site quarry.
Option 2A (overground)		
Demolition	**Small** • Total building volume <20,000 m^3, construction material with low potential for dust release (metal and wood), demolition activities <10m above ground.	• No demolition proposed during construction phase. • Demolition of buildings and turbine structures during decommissioning phase total volume less than 20,000 m^3.
Earthworks	**Large** for dust soiling and human health • Area greater than 10,000 m^2, potentially dusty soil, more than 10 heavy earth moving vehicles active at one time, total material moved more than 100,000 tonnes. **Medium** for ecological receptors	• Up to 105 turbines, foundation excavation area approximately 1,600m^2 per turbine = 168,000 m^2 total. • Quarry excavation over 2 years 350,000 m^3 = 770,000 tonnes (at an estimated density of 2.2 t/m^3).

Activity	Potential Dust Emission Magnitude*	Justification
	• Site area 2,500 m^2 to 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, total material moved 20,000 tonnes to 100,000 tonnes.	• Overhead transmission lines supported by double circuit arrangement on single poles spaced at approximately 300 m intervals. • Decommissioning phase is expected to require less earthworks than construction.
Construction	**Large** for dust soiling and human health • Total building volume >100,000 m^3, on site concrete batching. **Medium** for ecological receptors • Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete).	• Up to 105 turbines, an operations and maintenance building, temporary infrastructure including construction compounds, concrete batching plants, car parking, site buildings and amenities. • Construction of a new terminal station required to cut in to the existing transmission line.
Trackout	**Large** for dust soiling and human health • >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m. **Medium** for ecological receptors • (10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m).	• Estimated construction traffic volumes for trucks carrying concrete, crushed rock, aggregate, cement, sand and water truck exceed 300 one-way trips per day (assuming a nine-month civil construction program). New and upgraded access tracks will primarily be constructed using crushed rock from the on-site quarry.
Option 2B (underground)		
Demolition	**Small** Total building volume <20,000 m^3, construction material with low potential for dust release (metal and wood), demolition activities <10m above ground.	• No demolition proposed during construction phase. • Demolition of buildings and turbine structures during decommissioning phase total volume less than 20,000 m^3
Earthworks	**Large** for dust soiling and human health • Area greater than 10,000 m^2, potentially dusty soil, more than 10 heavy earth moving vehicles active at one time, total material moved more than 100,000 tonnes. **Medium** for ecological receptors • Site area 2,500 m^2 to 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, total material moved 20,000 tonnes to 100,000 tonnes.	• Up to 105 turbines, foundation excavation area approximately 1,600 m^2 per turbine = 168,000 m^2 total. • Quarry excavation over 2 years 350,000 m^3 = 770,000 tonnes (at an estimated density of 2.2 t/m^3). • A wheel trencher, rock saw or excavator would be used to dig the trench to lay the transmission lines in. Trenches would typically be excavated to a depth of approximately 1.2 m. Trench volume for underground line option = 0.9 x 1.2 x 26,000 m = 28,090 m^3 = 44,900 tonnes (at an estimated density of 1.6 t/m^3 density). • Decommissioning phase is expected to require less earthworks than construction.

Activity	Potential Dust Emission Magnitude*	Justification
Construction	**Large** for dust soiling and human health • Total building volume >100,000 m^3, on site concrete batching. **Medium** for ecological receptors • Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete).	• Up to 105 turbines, an operations and maintenance building, temporary infrastructure including construction compounds, concrete batching plants, car parking, site buildings and amenities. • Construction of a new terminal station required to cut in to the existing transmission line.
Trackout	**Large** for dust soiling and human health • >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m. **Medium** for ecological receptors • (10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m).	• Estimated construction traffic volumes for trucks carrying concrete, crushed rock, aggregate, cement, sand and water truck exceed 300 one-way trips per day (assuming a nine-month civil construction program). New and upgraded access tracks will primarily be constructed using crushed rock from the on-site quarry.

Note: ***** Potential dust emission magnitudes are defined in IAQM method. Potential dust emission magnitude for dust soiling and human health are conservative as they represent the entire Project. Potential dust emission magnitude within 50 metres of highly sensitive ecological receptors classified as 'Medium'.

A3.3 Step 2B – Sensitivity of the surrounding area

As discussed in Section 5.2.2.2, the IAQM method classifies the sensitivity of an area based on the number of receptors in the area, receptor distance from the source and background annual mean PM_{10} concentration. The overall sensitivity of the study areas for Option 1A and Option 2 (A and B) were assessed as '**medium**' for dust soiling and human health, and '**high**' for ecological receptors. Justifications for the assessment are provided in Table A-3.

Table A-3 Sensitivity of the study areas in accordance with IAQM (2014)

Potential Impact	Option 1A		Option 2 (A and B)	
	Sensitivity of the Area	Justification	Sensitivity of the Area	Justification
Dust Soiling	Medium	Four sensitive receptors (houses) are located within 20 m of the Project boundary (three receptors) and transmission line alignment (one receptor). Two sensitive receptors (houses) are located within 21 m-350 m of the Project boundary and transmission line alignment, but this does not change the overall rating of medium.	Medium	Three sensitive receptors (houses) are located within 20 m of the Project boundary which results in a medium rating. Seven sensitive receptors (houses) are located within 21 m-350 m of the transmission line alignment, but this does not change the overall rating of medium.
Human Health (PM_{10})	Medium	Four sensitive receptors (houses) are located within 20 m of the Project boundary (three receptors) and transmission line alignment (one receptor). Two sensitive receptors (houses) are located within 21 m-350 m of the Project boundary and transmission line alignment, but this does not change the overall rating of medium. Annual average PM_{10} concentration between the range of 15-17 µg/m^3 in the Project Area (see Section 5.5.4).	Medium	Three sensitive receptors (houses) are located within 20 m of the Project boundary which results in a medium rating. Seven sensitive receptors (houses) are located within 21 m-350 m of the transmission line alignment, but this does not change the overall rating of medium. Annual average PM_{10} concentration between the range of 15-17 µg/m^3 in the Project Area (see Section 5.5.4).
Ecological	High	Ecological sensitivity has been classified as 'High'. There are locations of international significance adjacent (<50 m) to the southern and north western site boundary (Glenelg Estuary and Discovery Bay Ramsar site).	High	The transmission line runs directly adjacent to Mount Richmond National Park and the Project boundary borders an area of international significance (Glenelg Estuary and Discovery Bay Ramsar wetland)

A3.4 Step 2C – Potential of unmitigated impacts

The unmitigated dust impacts for each IAQM activity have been estimated as described in Section 5.2 (refer Table 5-5). Dust emission magnitudes for each activity in Table A-2 were then combined with sensitivity of the area in Table A-3 to assess unmitigated air quality impacts. Unmitigated dust impacts according to IAQM (2014) are summarised in Table A-4 to Table A-6.

Table A-4 Summary of unmitigated dust impacts using the IAQM method for Option 1A

Activity	Step 2A: Potential for dust emissions*	Step 2B: Sensitivity of area			Step 2C: Potential of unmitigated dust impacts		
		Dust soiling	Human health (PM_{10})	Ecological	Dust soiling	Human health (PM_{10})	Ecological
Demolition	Small	Medium	Medium	High	Low	Low	Medium
Earthworks	Large	Medium	Medium	-	Medium	Medium	Medium
	Medium	-	-	High			
Construction	Large	Medium	Medium	-	Medium	Medium	Medium
	Medium	-	-	High			
Trackout	Large	Medium	Medium	-	Medium	Medium	Medium
	Medium	-	-	High			

Table A-5 Summary of unmitigated dust impacts using the IAQM method for Option 2A

Activity	Step 2A: Potential for dust emissions*	Step 2B: Sensitivity of area			Step 2C: Potential of unmitigated dust impacts		
		Dust soiling	Human health (PM_{10})	Ecological	Dust soiling	Human health (PM_{10})	Ecological
Demolition	Small	Medium	Medium	High	Low	Low	Medium
Earthworks	Large	Medium	Medium	-	Medium	Medium	Medium
	Medium	-	-	High			
Construction	Large	Medium	Medium	-	Medium	Medium	Medium
	Medium	-	-	High			
Trackout	Large	Medium	Medium	-	Medium	Medium	Medium
	Medium	-	-	High			

Table A-6 Summary of unmitigated dust impacts using the IAQM method for Option 2B

Activity	Step 2A: Potential for dust emissions*	Step 2B: Sensitivity of area			Step 2C: Potential of unmitigated dust impacts		
		Dust soiling	Human health (PM_{10})	Ecological	Dust soiling	Human health (PM_{10})	Ecological
Demolition	Small	Medium	Medium	High	Low	Low	Medium
Earthworks	Large	Medium	Medium	-	Medium	Medium	Medium
	Medium	-	-	High			
Construction	Large	Medium	Medium	-	Medium	Medium	Medium
	Medium	-	-	High			
Trackout	Large	Medium	Medium	-	Medium	Medium	Medium
	Medium	-	-	High			

The assessment determines that unmitigated dust impacts from the construction and decommissioning phases of the Project would result in a '**medium**' to '**low**' impact for dust soiling and human health for each of the alternate transmission line options. The assessment also determines that unmitigated dust impacts would result in a '**medium**' impact for ecological receptors for each of the alternate transmission line options.

The unmitigated dust impact ratings are the same for each of alternate transmission line options. The unmitigated dust impact ratings for the alternate alignment options are also the same as the unmitigated dust impact ratings determined for the preferred alignment option (Option 1B) as presented in Table 6-4 in Section 6.1.4. This indicates that the potential construction dust impact of each of the alignment options is comparable.

Consistent with the preferred option, it is expected that with the recommended mitigation measures outlined in Section 7.0, the post-mitigation dust impacts of the Project for the alternate alignment options are expected to be '**negligible**'.

A4 Summary

The study area for the construction assessment has been defined as the land within 350 metres of the proposed Project site boundary and transmission line alignment.

Impacts from construction activities were assessed using the IAQM (2014) method. Pollutants considered for this assessment are particulates (dust), which may cause visible dust plumes and elevated PM_{10} concentrations.

Unmitigated air emissions from the construction phase of the Project pose a '**medium**' to '**low**' impact for dust soiling and human health. Due to significant ecological areas (Glenelg Estuary and Discovery Bay Ramsar site) being within 50 metres of the project footprint, the unmitigated air emissions from the construction phase of the Projects pose a '**medium**' impact for ecological receptors.

With the recommended mitigation measures outlined in Section 7.0, the post-mitigation dust impacts of the Project for dust soiling, human health and ecological areas are expected to be '**negligible**'.

This transmission line options analysis has determined that the construction of any of the alternative transmission lines is not expected to result in ongoing or widespread (i.e. regional) adverse impacts on air quality.