



Darlington Wind Farm

Preliminary Landscape and Visual Impact Assessment

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Moir Landscape Architecture Pty Ltd
Studio 1, 88 Fern Street
PO Box 111, Islington NSW 2296
admin@moirla.com.au

Ph.(02) 4965 3500
www.moirla.com.au
ACN: 097 558 908
ABN: 48 097 558 908

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Executive Summary

Moir Landscape Architecture (Moir LA) have been commissioned by Global Power Generation Australia Pty Ltd (GPG) to prepare a Preliminary Landscape and Visual Impact Assessment (PLVIA) for the proposed Darlington Wind Farm (the Project).

The Project is located in the western region of Victoria (VIC) along Hamilton Highway approximately 6.2 kilometres (km) east of the edge of Mortlake township and 3.2 km west of the edge of Darlington township. This PLVIA relates to the installation, operation, maintenance and decommissioning of up to 61 Wind Turbine Generators (WTGs) of a maximum tip height of 240 metres.

In addition to the wind turbines, ancillary infrastructure including access tracks, road upgrades, underground and overhead transmission lines, substations, operations and maintenance facility and grid connection to the existing 500 kV transmission line have been assessed in this PLVIA.

A preliminary Community Engagement Plan has been prepared by GPG Australia Pty Ltd to outline the proposed communication and engagement activities and directions for consulting and involving the community at the detailed design stage.

Relevant literature and best practice guidelines relating to visual impact assessment have been considered to formulate a quantitative study method. Moir Landscape Architecture's previous experience undertaking Landscape and Visual Impact Assessments on large scale infrastructure projects has also been utilised in the Study Method.

The PLVIA includes an overview of the relevant policies, comprehensive assessment of the existing landscape character and preliminary assessment from public and private viewing locations.

Field work was undertaken by Moir Landscape Architecture to develop a baseline against which the Project has been assessed. The assessment determined the regional landscape character is typical of the Western Volcanic Plain, characterised by agricultural land predominately utilised for grazing, with some areas of remnant vegetation. The landscape was categorised into seven (7) Landscape Character Units (LCUs). A quantitative frame of reference was applied to establish the Scenic Quality Rating of these LCUs which ranged from low to moderate.

Although the landscape is predominately flat and cleared, landscape features which form a part of the existing landscape character would assist in reducing the potential for viewing the Project. These include large areas of roadside vegetation, windbreak planting and riparian vegetation associated with creek lines.

A selection of 26 public viewpoint locations were selected to assess the potential visual impacts from varying distances, landscape character units and viewing directions. A quantitative methodology was applied to assess the visual impact from each of these locations which found:

- One (1) public viewpoints were assessed as having the potential for a high-moderate visual impact.
- Seven (7) public viewpoints were assessed as having the potential for a moderate visual impact.
- 10 public viewpoints were assessed as having Moderate - Low visual impact.
- Eight (8) public viewpoints were assessed as having the potential for a low visual impact.

A desktop assessment of all non-involved dwellings found the majority of dwellings are likely to have limited views to the Project due to existing dense wind break planting intervening with views.

- 10 non-involved dwellings are located within 2,000 m of the nearest turbine. Eight (8) of these are surrounded by dense screening vegetation and / or structures.
- 30 non-involved dwellings are located within 2,000 - 4,000 m of the nearest turbine. 25 of these are surrounded by dense vegetation and / or structures.
- 84 non-involved dwellings are located between 4,000 - 6,000 m of the nearest turbine. 77 of these are surrounded by dense vegetation.

Practical and feasible mitigation principles have been proposed for residences and roadsides. The proposed mitigation measures would assist in reducing potential visual impacts on majority of the non-involved dwellings. Mitigation measures in keeping with the existing character include screen planting and supplementary planting to existing vegetation.



01

Introduction

1.0 Introduction

1.1 Introduction

Moir Landscape Architecture Pty Ltd (Moir LA) have been commissioned by GPG Australia Pty Ltd to prepare a Preliminary Landscape and Visual Impact Assessment (PLVIA) for the proposed Darlington Wind Farm (referred to hereafter as ‘the Project’).

The Project will include up to 61 turbines, with a maximum power output of approximately 400 MW, with ancillary infrastructure.

1.2 Assessment Requirements

The purpose of this Preliminary Landscape and Visual Impact Assessment (PLVIA) report is to accompany a referral under the *Environment Effects Act 1978*. The PLVIA will assist the Minister for Planning’s assessment as to whether an Environment Effects Statement (EES) is required.

This PLVIA is based on the guidelines set by the *Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria* prepared by the Department of Environment, Land, Water and Planning (DELWP) in January 2016.

The ‘Referral Form’ outlines the objectives for a PLVIA report for a wind energy facility. The report should include the following:

- The landscape character of the site and surrounding areas including landform, vegetation types and coverage, water features, any other notable features and current land use;
- The location of nearby dwellings, townships, recreation areas, major roads, above-ground utilities, tourist routes and walking tracks;
- Views to the site and to the proposed location of wind turbines from key vantage points (including views showing existing nearby dwellings and views from major roads, walking tracks and tourist routes) sufficient to give a sense of the overall site in its setting.
- This report will also examine the implications of the South West Regional Landscape Study.
- The visual impact of the development relates to the:
 - Number, height, scale, spacing, colour and surface reflectivity of the wind turbines
 - Requirement (if any) for aviation obstacle lighting
 - Proximity to sensitive areas and viewing locations
 - Removal or planting of vegetation
 - Avoidance of visual clutter and ability to view through a (visually) well-ordered array of turbines from sensitive locations

- Location and scale of other buildings and works including transmission lines and associated access roads
- Proximity to an existing or proposed wind energy facility, having regard to cumulative visual effects.

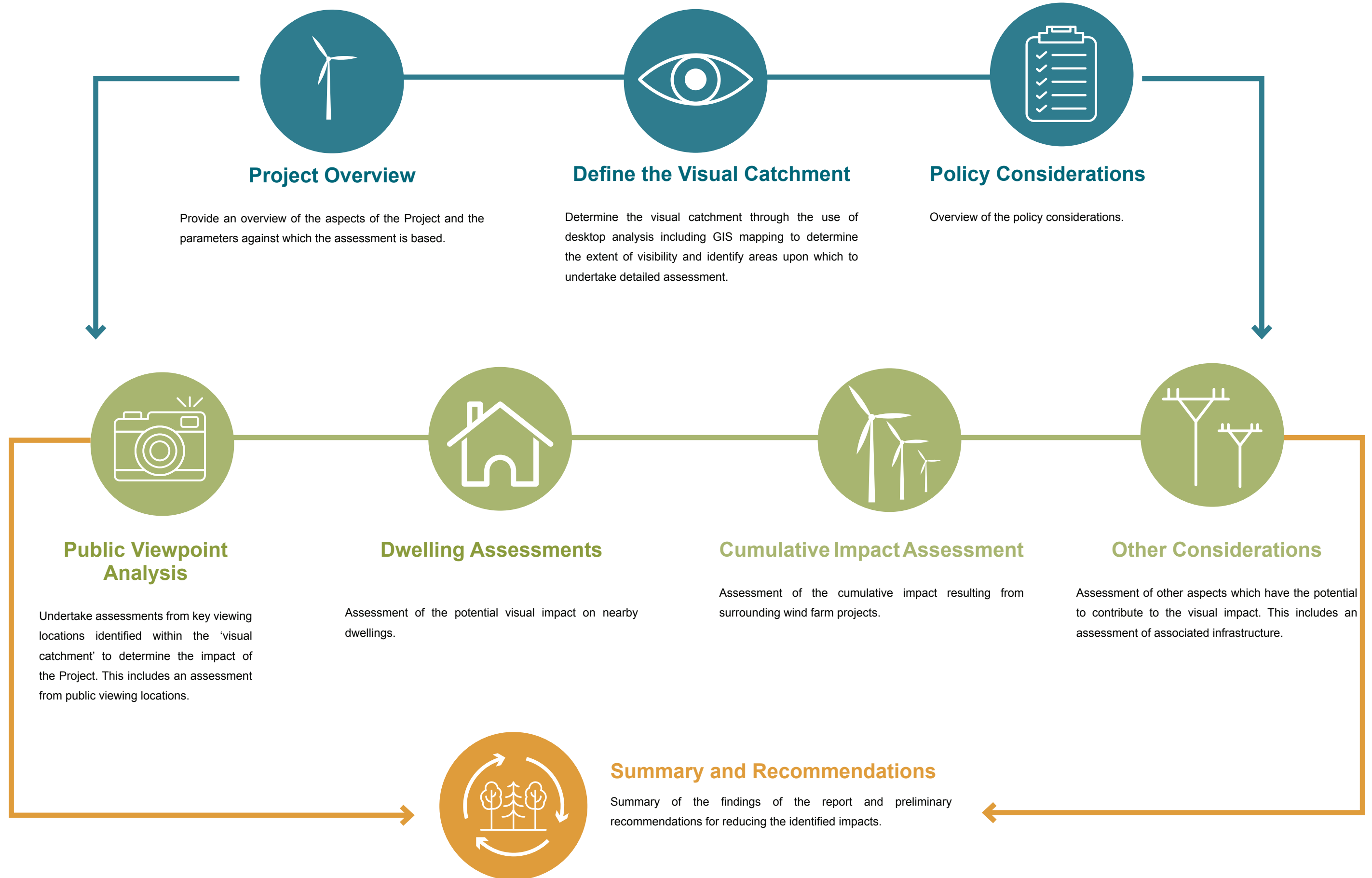
1.3 Purpose of this Report

The purpose of this report is to provide an assessment of visibility and potential visual impacts associated with the Project on the landscape character, landscape values, landscape amenity and any scenic vistas. The report details the results of the field work, documents the assessment of the landscape character and visual setting, and makes recommendations to assist in the mitigation of any potential impacts resulting from the proposed development.

1.4 Report Structure

The flow chart on the following page provides a high level overview of the PLVIA process utilised to undertake the assessment. **Table 1** provides an outline of the report structure, a brief overview of the objectives of the Referral Form and a summary of how these have been addressed in the PLVIA.

The project methodology is derived from Moir LA’s experience and best practice in landscape and visual impact assessment. Detailed methodologies for each part of the assessment have been included in the relevant chapters of the report.



02

Project Overview



2.0 Project Overview

2.1 Regional Context

The Project is located within the Moyne Shire Council Local Government Area in Victoria’s Western Plains region. It is situated approximately 3.2 km west of the edge of Darlington township and approximately 6.2 km east of the edge of Mortlake township. The Project can be accessed via Hamilton Highway (refer to **Figure 1**).

The Project is located centrally within Victoria’s South-West Renewable Energy Zone (REZ) which is generally identified around the Western Victorian Plains region. The flat, planar topography and minimal obtrusive elements across this landscape allow efficient and optimal harvest of wind energy. The Project is therefore strategically located in a broad area identified as suitable for renewable energy project.

Preliminary wind studies undertaken by the GPG Australia Pty Ltd have guided the development of the preliminary turbine layout for the Project. The Project will connect to the existing 500 kV transmission line which runs east - west as shown in **Figure 3**.

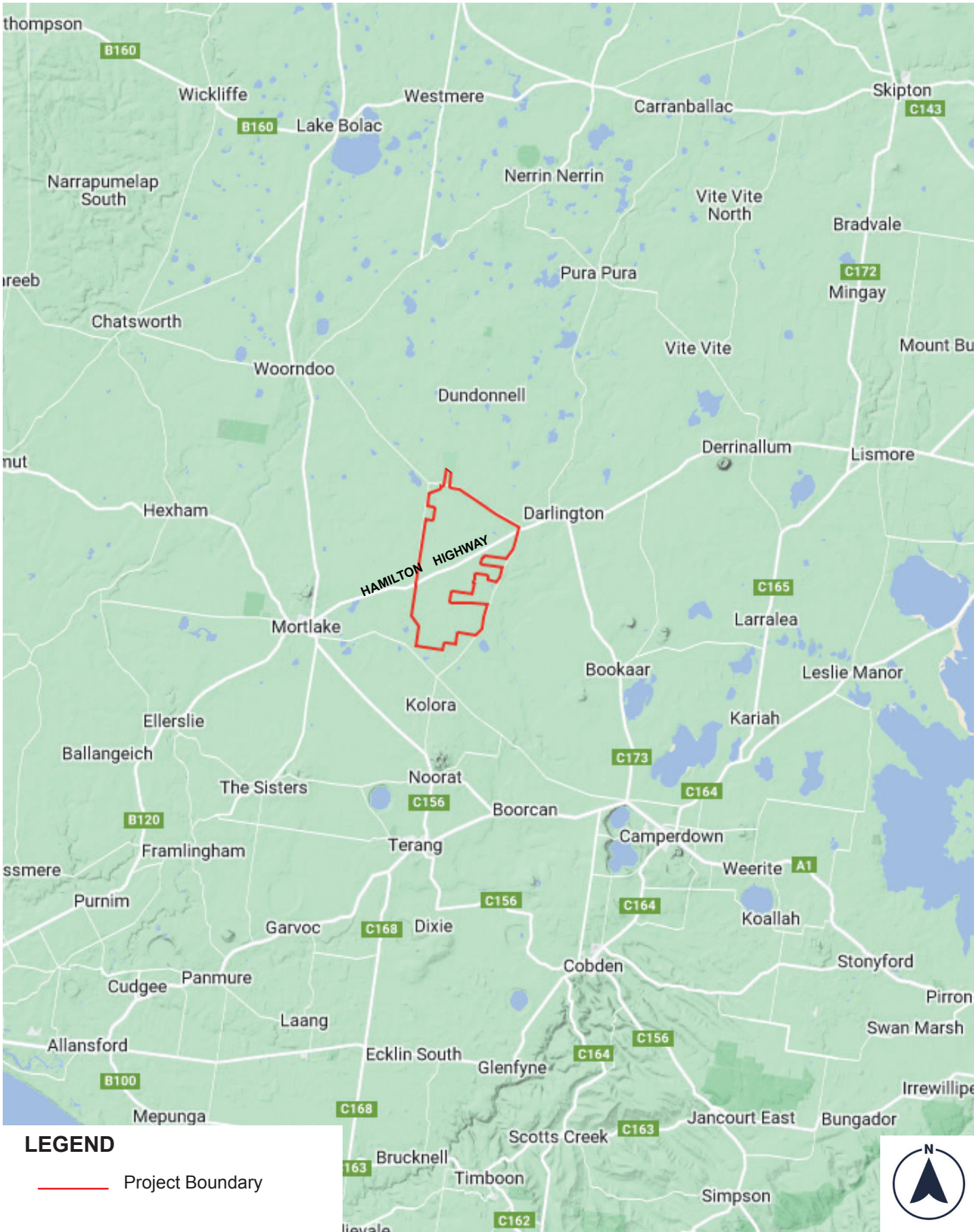


Figure 1. The Project Site (Source: Google Earth 2022, Not to scale)

2.2 The Project Site and Study Area

The Project is located on private land holdings comprising farmlands and homestead areas. For the purposes of this report, the area covered by the Project boundary has been referred to as the 'Project Site' and the overall area that this study encompasses (areas that fall within a 15 km radius from the site centre) has been referred to as 'Study Area'. Most of the Project Site has been cleared of native vegetation although scattered trees and tracts of dense windbreak vegetation are common within and around the Project (see **Figure 2**). The Project Site ranges from between 150m and 160m above sea level with a generally flat topographic character that is consistent with the character of the Basalt Plains in the Western Plains region. Several ephemeral creeks and shallow salt and freshwater lakes dot the landscape in the Project Site's surrounds. Predominant land uses include agricultural activity, especially sheep and cattle grazing.

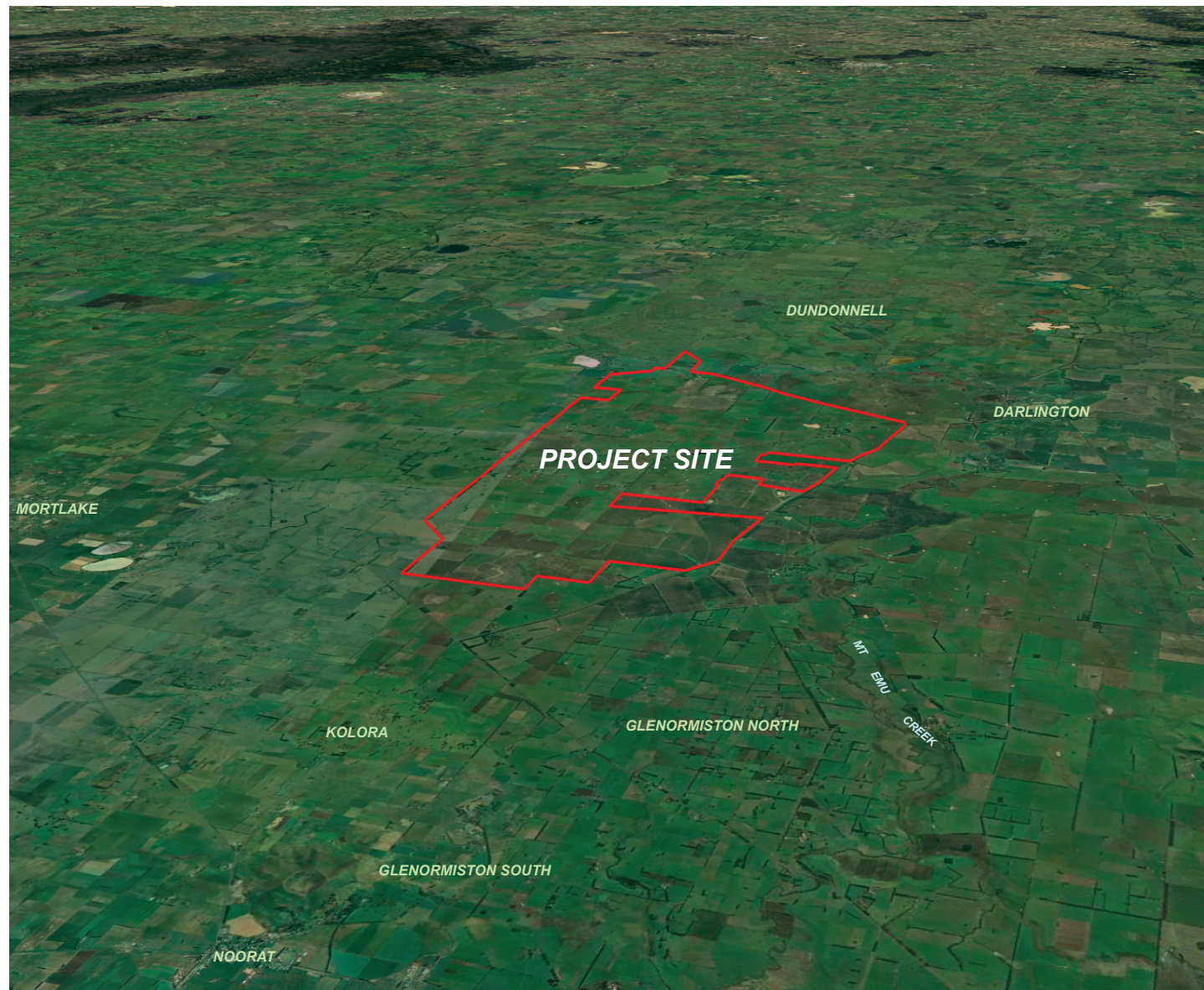


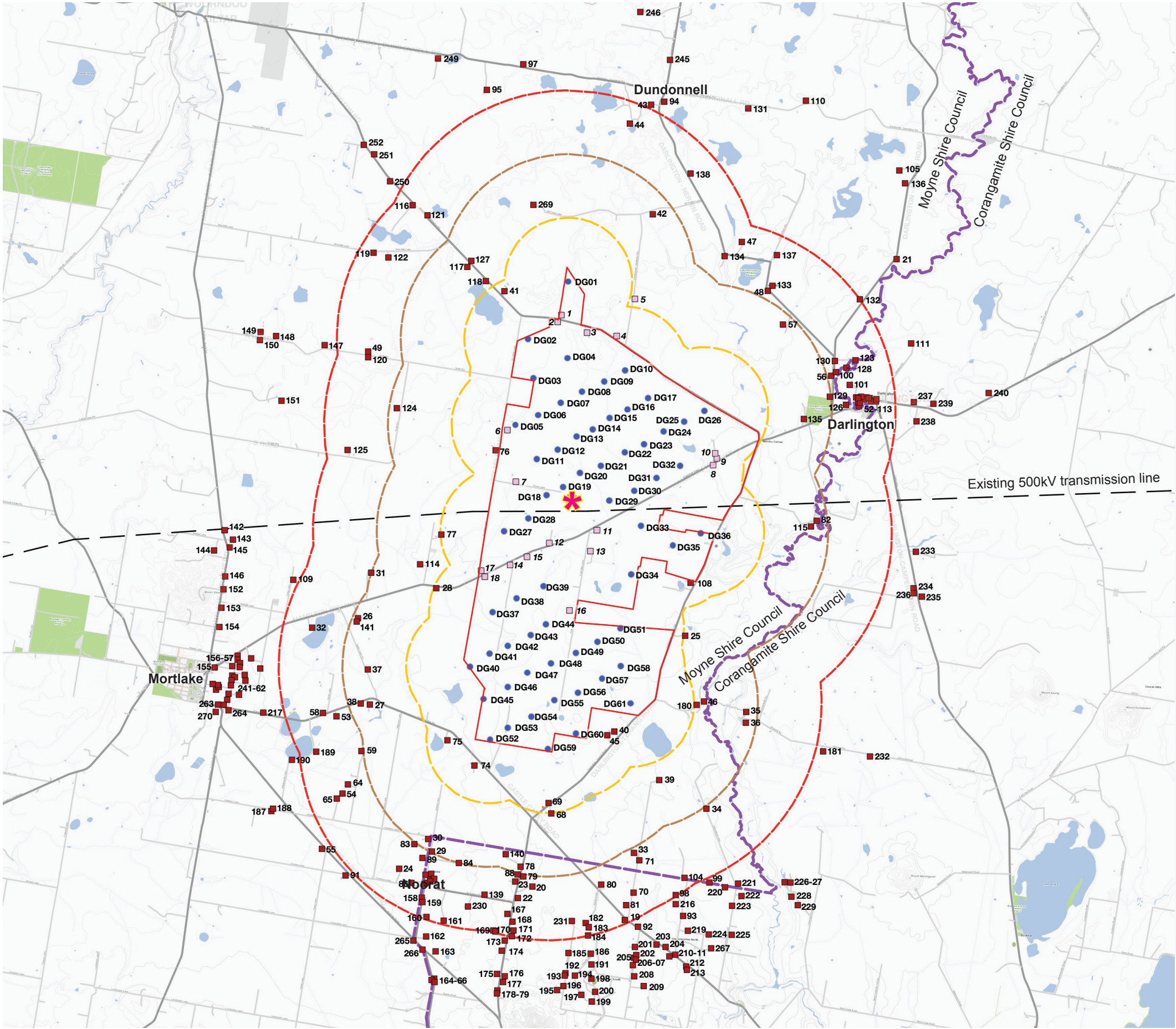
Figure 2 Birds Eye View of the Project Site (Map Source: Google Earth 2022)

2.3 The Project

The Project will deliver much needed renewable energy to the region. It will support the reduction of carbon emissions and assist Australia achieve its target for net-zero emissions by 2050. The proposal will comprise up to 61 wind turbines providing a total generation capacity of approximately 400 MW. Refer to **Figure 3**.

The Project comprises the following:

- Up to 61 individual wind turbines
- The approximate maximum tip height will be around 240m;
- Each turbine will have up to 7.2 MW generating capacity (depending on the type of turbine to be used);
- Permanent components:
 - One (1) on-site electrical substation and compound (including site office and warehouse);
 - One (1) 132/500kV Transformer (420 MVA);
 - Three (3) 22/132kV Transformer (140 MVA);
 - Power connection to the electricity grid via the existing 500kV transmission line;
 - Up to three (3) wind monitoring towers (anemometers);
 - Underground cables (electricity and communications);
 - Vehicle access tracks.
- Temporary components:
 - A temporary concrete batching plant;
 - A temporary site construction office;
 - One (1) wind monitoring tower (anemometers).



The Project

Darlington Wind Farm

LEGEND

- Project Boundary
- DG03 Proposed 240 m Turbine Location
- Involved Dwelling
- Non-involved Dwelling
- Proposed substation location
- Main Road
- Minor Road
- Existing 500kV transmission line
- LGA Boundary
- 2000 m from turbines
- 4000 m from turbines
- 6000 m from turbines



Figure 3 The Project (Base Map Source: VicPlan 2022)

2.4 Wind Turbine Design

The proposed turbine parameters used for the assessment in this report are based on the most conservative scenario whereby GPG select the largest of the three candidate turbines that they are considering. The specifications are as follows:

- A generating capacity of up to 7.2 MW;
- a 4-7 part tubular steel tower holding the nacelle;
- three blades mounted to a rotor hub in front of the nacelle which sits on the top of a tubular steel tower, with a combined height of blade and tower limited to a maximum tip height of 240 m AGL;
- a gearbox and generator assembly housed in a nacelle; and
- adjacent hardstands for use as crane pads and assembly and laydown areas.

Table 1 provides an overview of dimensions of the turbine components that have been used for this assessment. To best represent a worst case scenario, the maximum hub height of 154 metres has been used for modelling and visualisation purposes in this report. **Figure 4** illustrates the turbine parameters utilised for this report. **Image 1** shows the appearance of a typical wind turbine.

Wind Turbine Components		
Project Component	Dimensions used in LVIA:	Quantity
Uppermost Tip	240 metres AGL	61 (max)
Hub height	154 metres	
Rotor diameter	86 metres	

Table 1 Wind Turbine Parameters for Visual Assessment

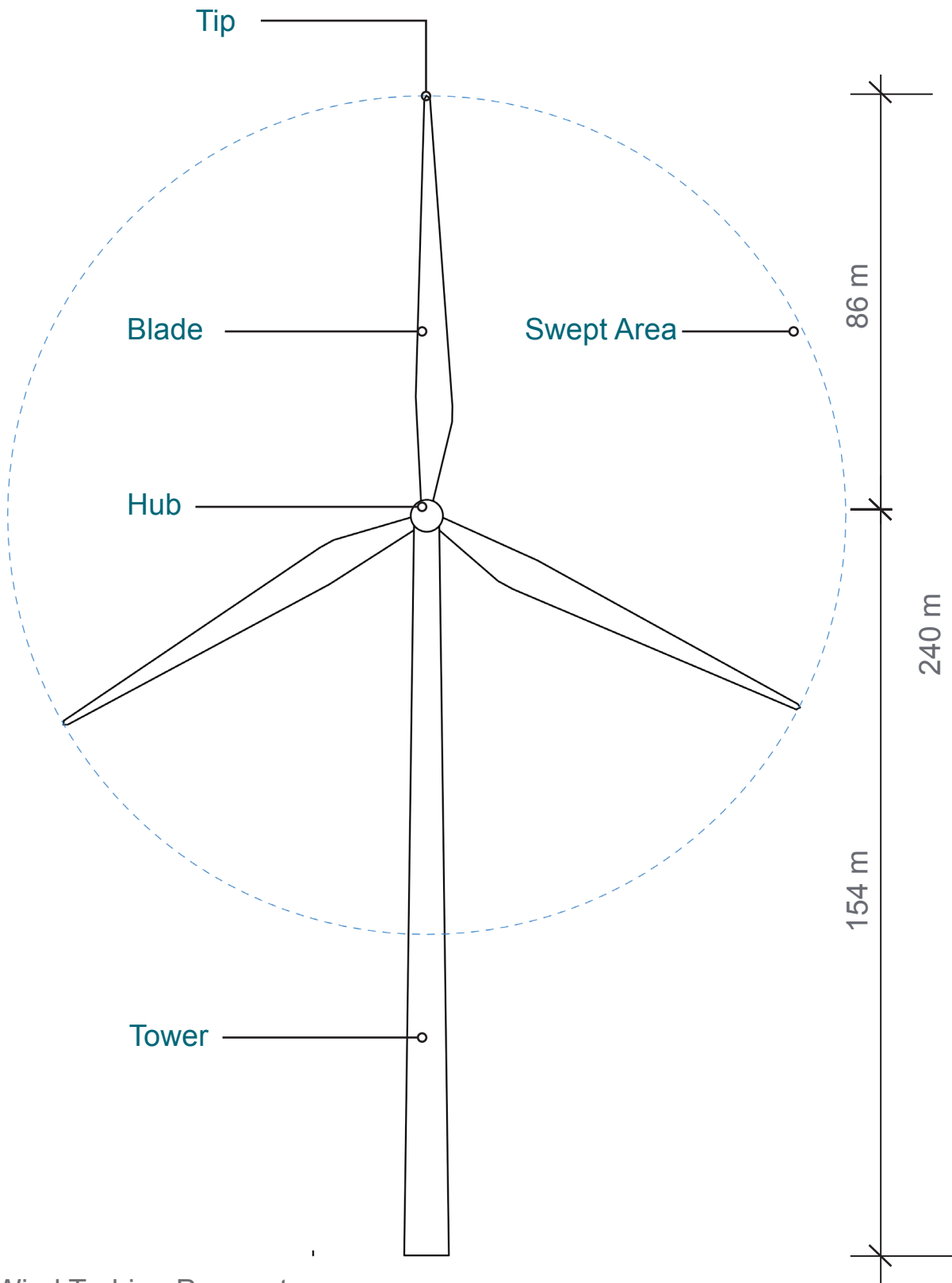


Figure 4 Wind Turbine Parameters



Image 1 Typical Wind Turbine



Image 2 Typical HV power line



Image 3 Typical LV Power Line



Image 4 Typical Operations & Maintenance Facility



Image 5 Typical Substation

03

Defining the Visual Catchment

3.0 Defining the Visual Catchment

3.1 Defining the Visual Catchment

The visual catchment of the Project has been defined based on the height of the wind turbines to determine the extent of the Study Area for assessment. Although turbines have the potential to be viewed from outside of the ‘visual catchment’, it is generally recognised that they would form a small element in the landscape and the visual impact would be negligible from a distance.

The visual catchment is defined based on the extent of the central field of vision the proposed turbines occupy. Due to their large vertical scale, the height of the turbine (240 m) has been considered to determine the preliminary level of visibility.

Using the parameters of the human eye, distance zones have been calculated based on the typical line of sight for a person standing at ground level. Refer to **Figure 5**.

Table 2 provides an overview of the distances based on the vertical field of view occupied by a turbine height at 240 metres. It states that generally, turbines are noticeable when a viewer is located 5.5 - 27km from a turbine. The degree of intrusion of a project to a view depends on the way a project integrates with the existing landscape setting. Therefore, as a worst case scenario, detailed public viewpoint assessment and dwelling assessment has been provided for dwellings within 6,000 metres of the nearest turbine to understand the potential visual impact of the Project.

The Study Area generally extends up to 15 kilometres from north to south (longest distance) and up to 8 km from east to west (shortest distance). It is assumed that beyond a distance of 27 km the turbines would be a very minor element in the landscape. At a distance of 5.5 - 27 kilometres the development may be visible, therefore Moir LA have undertaken a Zone of Visual Influence (see Section 3.2) up to this distance to determine the extent of visibility.

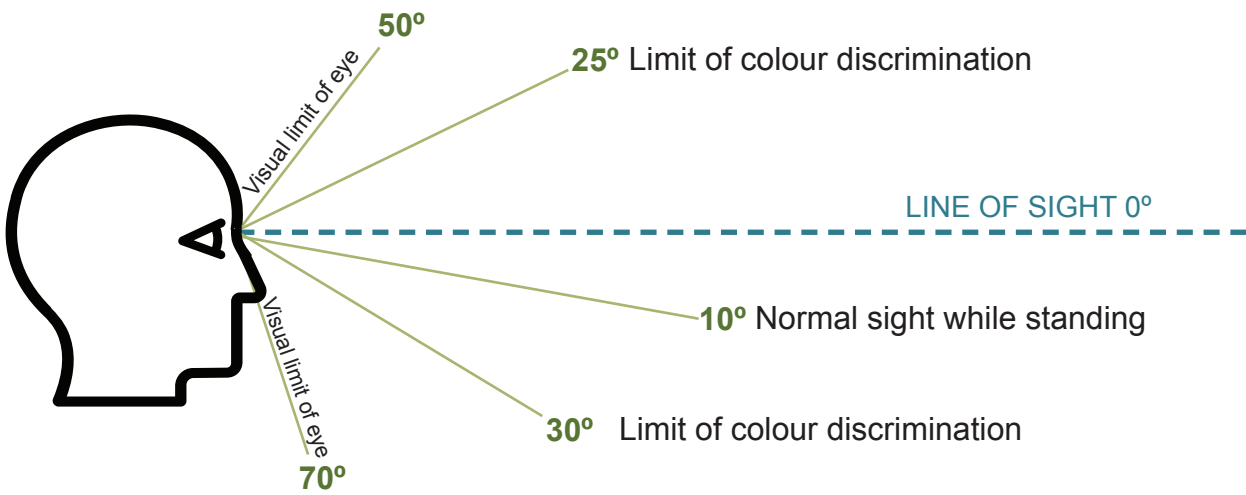


Figure 5 Human Eye Vertical Line of Sight (Adapted from Urbis)

Vertical Field of View - Zone of Visibility		
Field of View	Distance from viewer to turbine	Potential visual dominance:
0.5°	> 27 km	Insignificant A small thin line in the landscape.
0.5 - 2.5°	5.5 - 27 km	Potentially Noticeable The development may be noticeable. The degree that it intrudes on the view will be dependent on how well it integrates with the landscape setting.
> 2.5°	5.5 km	Potentially Dominant The development will be highly noticeable, although the degree of visual intrusion will depend on the landscape setting, intervening elements and the extent of visibility.

Table 2 Wind Turbine Parameters for Visual Assessment (Adapted from Urbis)

3.2 Zone of Visual Influence

A Zone of Visual Influence (ZVI) has been prepared for the Project based on a nominal turbine height of 240 m to represent a worst case scenario (maximum tip height) to be pursued for the Project. (Refer to **Figure 6**).

The ZVI represents the area over which a development can theoretically be seen, and is based on a Digital Terrain Model (DTM). The ZVI presents a bare ground scenario - ie. a landscape without screening, structures or vegetation, and is usually presented on a base map. It is also referred to as a zone of theoretical visibility (The Landscape Institute and the Institute of Environmental Management and Assessment, 2002).

The ZVI diagram has been determined through the use of digital topographic information and 3D modelling software *WindPro*. The ZVI has been assessed to approximately 27 kilometres from the outer extent of the Project. Although it is possible for the development to be visible from a location further than 27 kilometres away, it is generally accepted that beyond this distance, the visibility is greatly diminished (refer to **Section 3.1**).

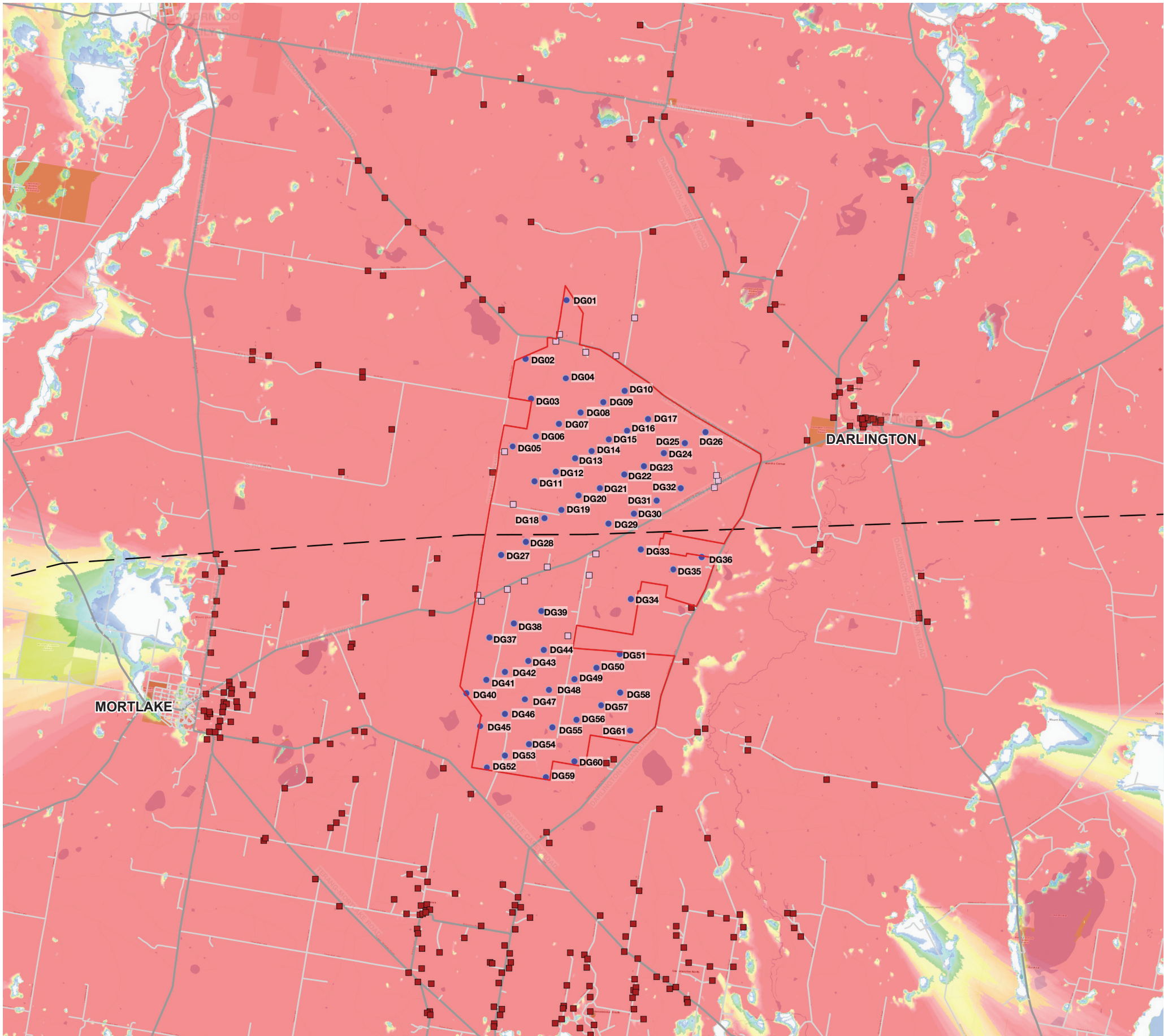
3.3 Summary of Zone of Visual Influence

The ZVI is a preliminary assessment tool utilised to determine areas of land from which the Project has potential visibility (based on an assessment of topography alone). Due to the flat topography of the Study Area, the ZVI indicates the Project is likely to be visible in its entirety from most land within close proximity to the Project.

Limited pockets of land in excess of 8,000 m have been identified as having views to the Project screened by topography. This includes land to the north of Dundonnell, North of Mortlake, north of Noorat and east of Woorndoo.

Although the ZVI appears to indicate a high level of visibility, it is important to reiterate the ZVI does not take into account vegetation. Due to the flat topography, intervening vegetation plays a role in significantly reducing visibility of the Project from surrounding areas.

Although a high level of visibility is indicated on the ZVI, a detailed assessment from nearby townships of Mortlake and Darlington identified vegetation would play a role in screening the Project. Views to the Project would be very limited from these townships.



Zone of Visual Influence Darlington Wind Farm

LEGEND

- Project Boundary
- Proposed 240 m Turbine Location
- Involved Dwelling
- Non-involved Dwelling
- Main Road
- Minor Road
- Existing 500kV transmission line

ZVI Number of Visible Turbines at Tip Height:

- 0 Turbines
- 1 - 9 Turbines
- 10 - 19 Turbines
- 20 - 29 Turbines
- 30 - 39 Turbines
- 40 - 49 Turbines
- 50 - 61 Turbines

Figure 6 Zone of Visual Influence (Tip Height 240m)

04

Planning Context

4.0 Planning Context

4.1 Overview of Planning Context

In accordance with the requirements of the Department of Environment, Land, Water and Planning (DELWP), the Landscape and Visual Impact Assessment will be undertaken in two stages:

Stage 1: A preliminary assessment to understand existing landscape and visual character that would inform the wind farm design process and assist the Minister of Planning in assessing the need for Environment Effects Statement (EES);

Stage 2: A detailed assessment as part of the planning and approvals process following the determination of the need for an EES.

This report relates to **Stage 1: preliminary visual impact assessment** phase. The objective of the preliminary assessment is to inform the final design of the wind farm and ensure compliance with relevant legislation and policy. This section of the report provides an overview of the planning guidelines for consideration.

4.1.1 Moyne Shire Council LGA

The Project is located within the Moyne Shire Council Local Government Area. With specific reference to the proposal of a wind energy facility in the Moyne LGA, Clause 52.32 of the Moyne Planning Scheme specifies that all land within 5 km of the urban area of Warnambool is prohibited from wind energy facility development (Moyne Shire Council, 2020). The following Section of the report provides an overview of the zoning designations and sensitive landscape overlays specific to Moyne Shire Council (Refer to Sections 4.2 - 4.4).

4.1.2 Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria

The *Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria* help to inform planning decisions about proposals and set out:

- a framework to provide a consistent and balanced approach to the assessment of wind energy facilities;
- operational performance standards to inform the assessment and operation of wind energy facilities;
- guidance as to how planning permit application requirements might be met.

4.2 Sensitive Land Zoning Designations

4.2.1 FZ - Farming Zone

The Project Site and surrounding land is zoned FZ - Farming Zone under the Moyne Planning Scheme. The objectives of the Farming Zone relevant to landscape and visual impact within this LGA is ‘to ensure that non-agricultural uses do not adversely affect the use of land for agriculture and the use and development of land based on comprehensive and sustainable land management practices and infrastructure provision’ (Moyne Shire Council, 2020).

4.2.2 RLZ - Rural Living Zone

Semi-rural residences on the outskirts of Mortlake (located approximately 8.5 km south west of the Project) fall in this category of zoning. The objective of this zone is ‘to protect and enhance the heritage values of the area and provide for residential use in a rural environment’ (Moyne Shire Council, 2020).

4.2.3 GRZ - General Residential Zone and TZ - Township Zone

Other zoning designations within township areas include GRZ - General Residential Zone and TZ - Township Zone. They are located within and around Mortlake, Darlington and Worndoo. Mortlake is characterized by bluestone buildings and a unique historic character with a regional country charm. These zoning designations aim to “encourage development that respects the neighbourhood character and community needs” and “provide for residential development and a range of commercial, industrial and other uses in small towns”.

4.2.4 Other Zones in vicinity

Other land zoning designations within the Study Area are PPRZ - Public Park and Recreation Zone , PUZ - Public Use Zone, and SUZ - Special Use Zone. Most of these zoning designations are associated with Mortlake, Glenormiston, Noorat and Terang. They aim to provide for public land uses and utilities such as quarries.

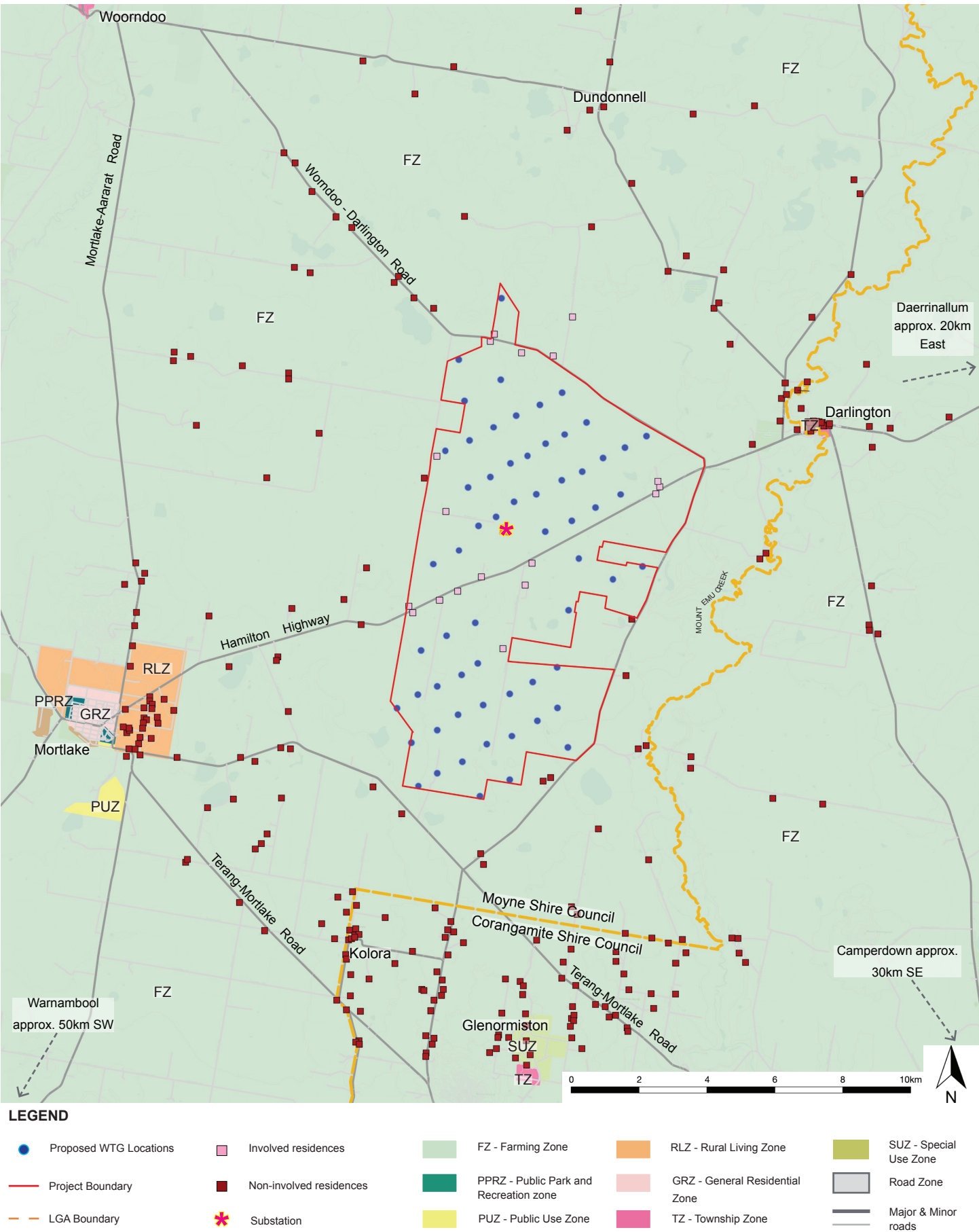


Figure 7 Land Zoning Designations within the Study Area (Source: VicPlan 2022)

4.3 Sensitive Landscape Overlay Designations

The Project does not fall under any significant landscape overlay as designated by the Victorian Planning Scheme. However, surrounding areas that have landscape, environmental and building overlays impose restrictions on built form and development. Land within the Project boundary is classified as bushfire prone land (refer **Figure 8**).

4.3.1 ESO - Environmental Significance Overlay

Natural assets that are in close proximity of the Project and fall under this overlay classification include Mount Emu Creek, Lake Keilambete, Lake Bookar and other lakes that drain the volcanic plain. The overlay ensures that all development is compatible with their environmental values.

4.3.2 SLO - Significant Landscape Overlay

These areas include some of the identified high points in an otherwise planar landscape. It includes Mount Noorat, Mount Meningoort and Mount Koang. Most of these peaks are dormant volcanoes with unique landscape characteristics that this policy seeks to conserve.

4.3.3 VPO - Vegetation Protection Overlay

A corridor of vegetation along Hamilton Highway is protected under the VPO. The corridor plantation offers windbreak opportunities, landscape amenity and habitat values.

4.3.4 DDO - Design and Development Overlay

This Overlay is applicable to Mortlake where restrictions are applied on aspects such as density of residential development in order to restrict the growth of certain areas.

4.3.5 Heritage Overlay

This Overlay is applicable to areas with very high historic significance, and this comprises mainly of buildings in Mortlake, Glenormiston South, Noorat, and Terang to conserve their character and cultural significance.

4.3.5 Bushfire Management Overlay and bushfire prone areas

Certain areas to the west and south of the Project are affected by the Bushfire Management Overlay to help identify the hazards of bushfire within this region. Victorian Planning Maps also suggest that the entire area within and around the Project Site is prone to bushfire.

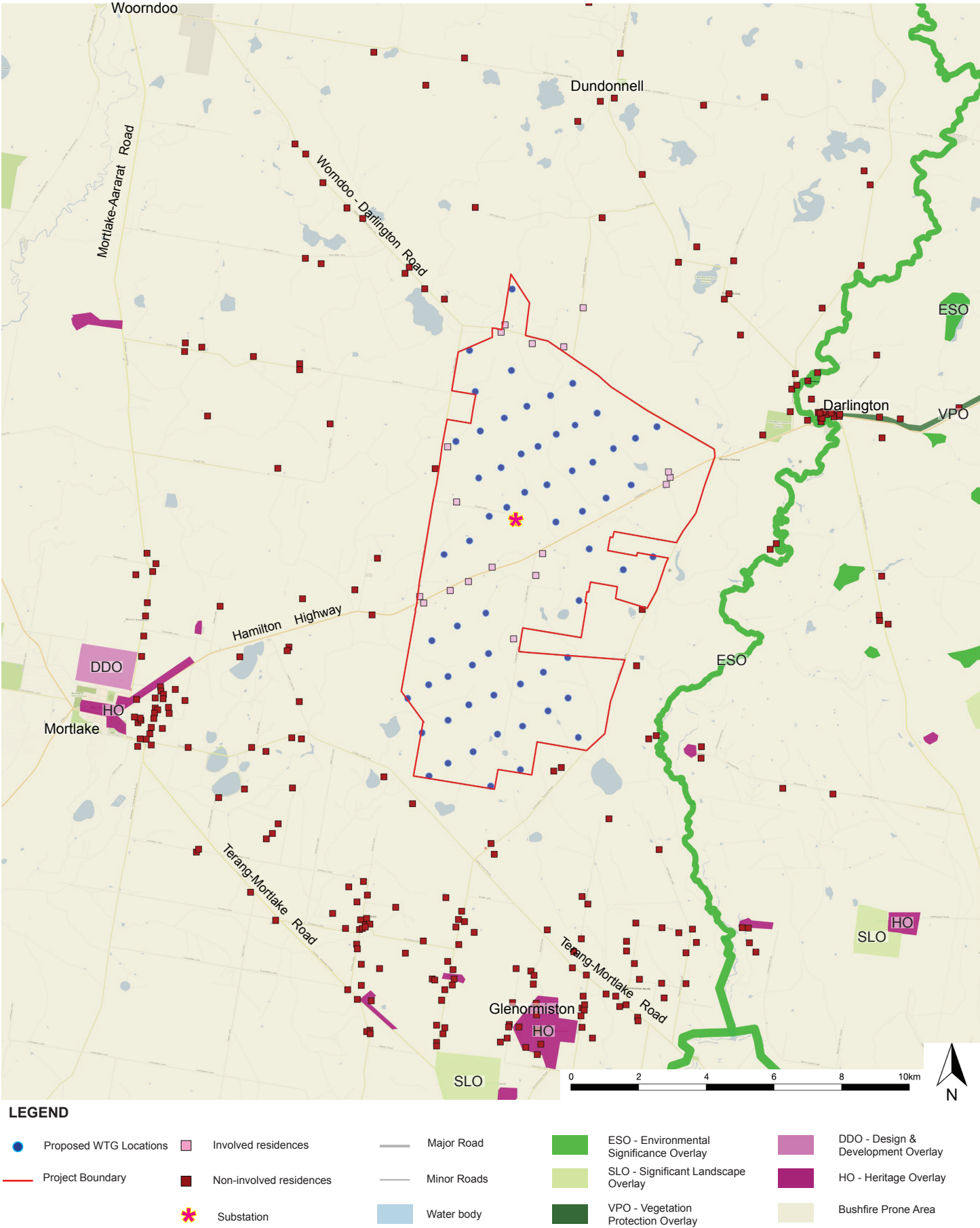


Figure 8 Landscape Overlay Designations within the Study Area (Source: VicPlan 2022)

4.4 Sensitive Heritage Designations

The Moyne Planning Scheme seeks to protect Aboriginal cultural heritage and buildings recorded under the Victorian Heritage Register. It provides for the protection and conservation of these areas.

4.4.1 Areas with Aboriginal cultural heritage significance

Figure 9 shows areas of Aboriginal cultural sensitivity that are around or within the extents of the Project. Some of these areas can be identified as areas of high ecological significance. This includes creeklines, lakes and wetlands that drain the volcanic plain. It includes Mt Emu Creek, Salt Creek, Lake Bernie Bolac, Lake Bookar, Lake Keilambete. It also includes geological formations / high points such as Mt Shadwell, Mt Noorat, Mt Meningoort, The Sisters and Mount Fyans amongst others.

Mt Emu Creek holds a very important place in Aboriginal cultural significance as the site of a historic massacre that occurred in 1839. Though the massacre took place closer to Camperdown, a cemetery dedicated to the last surviving Djargurd Wurrung people was constructed on the banks of this creek in Darlington. Other hydrological elements have both ecological and cultural significances.

The landscape is also dotted with extinct volcanoes such as Mount Shadwell and Mount Noorat. Historically, these sites were the traditional meeting place for the Kirrae Wurrung people. Subsequently, they become important mining and quarry sites that were established to obtain volcanic rock for road construction.

4.4.2 Areas under the Victorian Heritage Register

Areas registered under the Victorian Heritage Register include the historic towns of Meningoort and Glenormiston South.

Meningorot gains its historical significance because of its association with the early pastoral settlements in Victoria. The original character of a number of buildings and gardens has been retained over the years. They signify the wealth of the Western District pastoralists in the 1800s and offer an understanding of the complex working of pastoral stations. The town is located about 9 km southeast of the Project.

Glenormiston is a rural town with agricultural and horticultural significance and a population of 274 people as per the 2011 Census (ABS, 2016b). It is located 10 km north of Terang and about 8 km south of the Project.

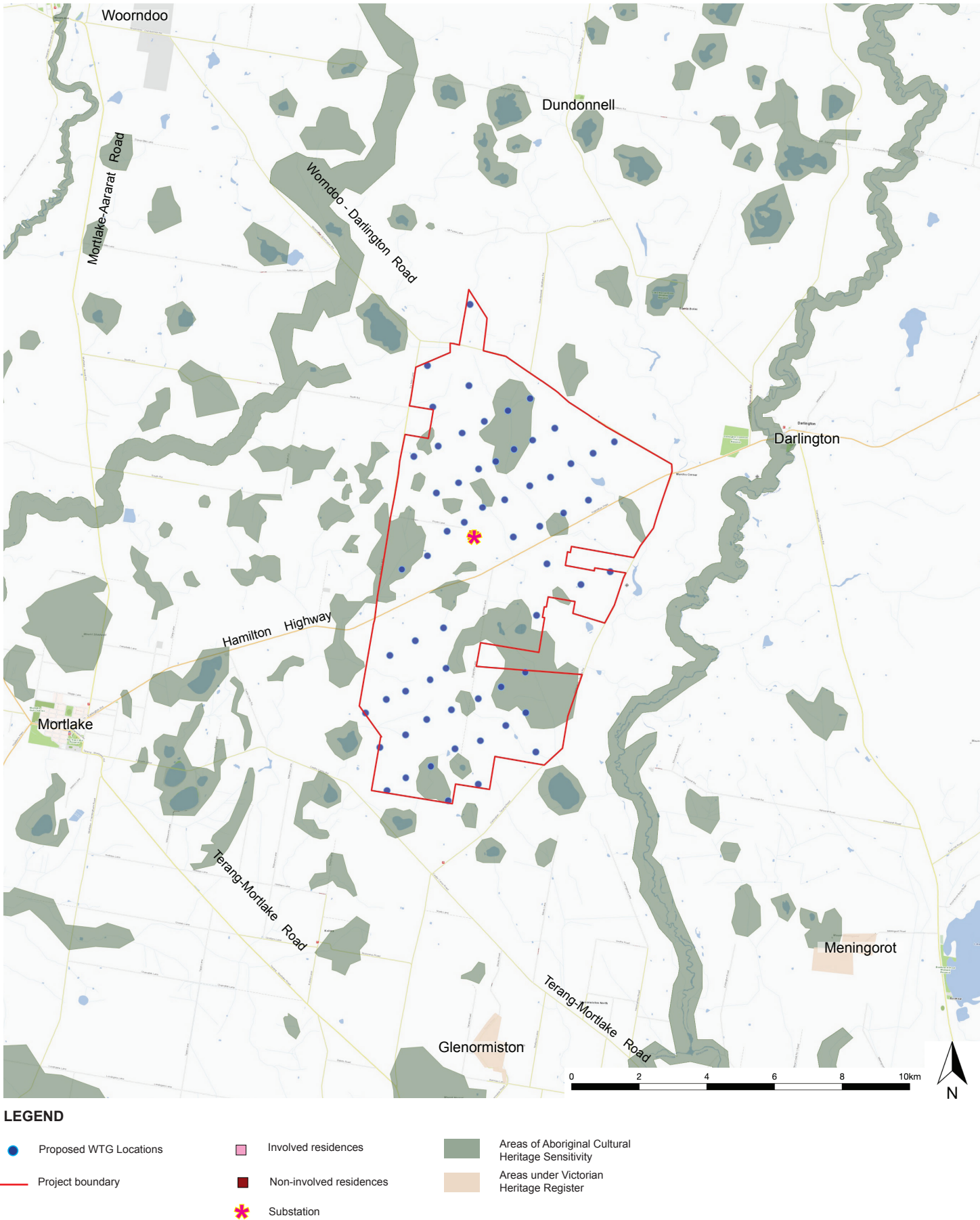


Figure 9 Landscape Heritage Overlays within the Study Area (Source: VicPlan 2022)