moir STUDIO

Dugald River Wind Farm

Landscape & Visual Impact Assessment

We at Moir Studio acknowledge the traditional custodians of the lands and waters of Australia - most notably the Awabakal Nation in which our office resides and the Kalkadoon Nation, on whose traditional lands this project takes place. As a practice, we recognise First Nations' ongoing contribution to Country and deep spiritual connection to Place. We pay our respects to Elders both past and present.

Dugald River Wind Farm

Landscape & Visual Impact Assessment

Prepared for
ERM

Project Number
2657

Revision	Date	Author	Checked	Comment
A	18/03/2025	TC	AR	Draft For Review
B	17/04/2025	TC	AR	Final

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Executive Summary

ERM has engaged Moir Studio to prepare a Landscape and Visual Impact Assessment (LVIA) for the Dugald River Wind Farm Project (the Project). The Project is proposed on the traditional lands of the Kalkadoon Nation, located in north-western Queensland, approximately 65 kilometers north of Cloncurry. Situated within the Cloncurry Shire Council Local Government area, the Project comprises up to 24 Wind Turbine Generators (WTGs) with a maximum tip height of 212.5 meters, along with ancillary infrastructure including access tracks and transmission lines.

The LVIA was conducted in accordance with State Code 23: Wind Farm Development (2025) and relevant guidelines including the AILA Guidance Note for LVIA (2018) and the Draft National Wind Farm Development Guidelines (2010). Moir Studio's methodology incorporated quantitative analysis and fieldwork carried out in February 2025, which established the baseline landscape character of the Knapdale Range and surrounding area. The regional landscape is compromised of the Dugald River Mine (DRM) and surrounding native grazing lands typical of outback Queensland.

A study area, specific to the LVIA has been established and is based on extent of human vision. Three Landscape Character Units (LCUs) were identified within the study area with a scenic quality rating of Low. The visual impact of the Project is influenced by existing landscape features, the extent of visual change introduced, and community perceptions. Key elements such as the DRM, undulating topography, and riparian corridors contribute to reducing the visual prominence of the Project.

A total of eight (8) viewpoints were assessed, with two (2) viewpoints having a Low visual impact, three (3) viewpoints with a Moderate-low visual impact and three (3) viewpoints with a Moderate visual impact.

Photomontages for four (4) representative viewpoints indicate that visual impacts are generally limited to areas in close proximity to the Project.

Shadow flicker assessments were conducted in compliance with State Code 23 (2025), with no receivers exceeding the maximum allowable threshold.

Mitigation measures are not required due to the low visual impact and remote location of the project.

The existing landscape demonstrates a strong capacity to absorb the Project with a relatively low visual impact. Furthermore, the Project meets the performance objectives outlined in State Code 23 (PO15 and PO18) and can proceed while maintaining the visual character and values of the region.

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Glossary of Terms

Associated Dwelling

A landholder who has reached an agreement with the Applicant in relation to the Project but will not host project related infrastructure on their land.

Associated Infrastructure

All the supporting structures, systems, and facilities that are necessary for the wind farm to operate effectively.

Bioregion

An ecologically and geographically defined area characterised by its combination of geological features, climate, flora, and fauna.

Geographical Information Systems (GIS)

A system that captures, stores, analyses, manages and present data link to specific locations. This spatial data is linked to a digital database.

Land Use

The way the existing land is utilised, including but not limited to residential, commercial, industrial, agricultural, or conservation purposes.

Landscape and Visual Impact Assessment (LVIA)

A technical assessment to identify and assess the potential visual effects resulting from the Project on the landscape, individual receivers and on the overall visual amenity of the region in which the Project is sited.

Landscape

All the visible features, including landform, vegetation, buildings and infrastructure, contained within a holistic area.

Landscape Character

Landscape character refers to the distinct and recognisable pattern of physical elements that occur consistently in a particular landscape. The landscape character of an area is generally defined by the most dominant landscape element or unique combination of elements that occur within that landscape. It reflects how particular combinations of geology, landforms, soils, vegetation, land use and human settlements create a particular sense of place for different areas within the landscape.

Landscape Character Units

An area of landscape with similar properties or strongly defined spatial qualities that are distinct from areas immediately nearby within the Study Area.

Landscape Values

The qualities and attributes of a landscape that contribute to its overall visual, aesthetic, cultural, and environmental significance.

Local Government Area (LGA)

An administrative division of local governance and planning.

Micrositing Corridor

The Projects Boundary

Mitigation Measures

Potential strategies or actions implemented to minimise or offset the adverse visual impacts of the Project.

Non-Associated Dwelling

A dwelling owned by a non-associated landholder.

Photographic Survey & Fieldwork

A systematic process of collecting visual data in the form of photographs and surveys taken from various viewpoints within the Study Area to document the existing visual conditions.

Planning Scheme

A regulatory document that establishes the framework for land use, development, and infrastructure within a specific Local Government Area (LGA). It provides detailed guidance, rules, and standards designed to manage growth, safeguard the environment, and promote the orderly and sustainable development of communities.

Project Area

The lots on which the Project is situated.

Sensitive Receptors

A point or area likely to experience a greater extent of visibility of the Project.

State Code

A set of statutory guidelines or standards that provide specific requirements, criteria, and assessment benchmarks for development applications. These codes are part of the broader planning framework used to ensure that development aligns with the state's planning policies, environmental objectives, and community expectations.

Strategic Plan Map

A visual representation within a planning scheme that depicts the long-term vision and policy direction for the future development of a Local Government Area (LGA).

Study Area

The geographical region or area under consideration in the preparation of a LVIA or VIA assessment. This study area is specific to the visual assessment only.

Viewpoint

A specific location from which a view or landscape is observed. A viewpoint location is the geographic location or physical position (in GPS format) where the viewpoint was captured.

Visual Amenity

The overall visual quality of a landscape that considers factors including but not limited to views, natural features, and the built environment.

Visual Catchment

The geographical area from which a particular view can be observed.

Visual Effects

The effects on specific views and on the general visual amenity experienced by receptors.

Visual Impact

The observable and measurable change in the visual catchment caused by the Project. This is determined by considering the visual sensitivity and magnitude of change.

Visual Magnitude

The degree of visual change resulting from the Project, including but not limited to the size, scale, compatibility and duration of effect.

Visual Receivers/Receptors

Individuals and/or defined groups of people who have the potential to be affected by the Project.

Visual Sensitivity

The susceptibility of a landscape or visual resource to absorb impacts from a Project, land use change or the introduction of a new element into the landscape.

Visual Impact Assessment (VIA)

The process for determining the day-to-day visual effects of a Project on people's views from the private and public domain.

Visualisation

A computer-generated simulation, photomontage or other technique illustrating the predicted appearance and/or massing of the Project within the existing landscape.

Zone of Visual Influence (ZVI)

The extent of landscape area from which the Project can potentially be theoretically viewed based on topography alone.

Abbreviations

AILA
Australian Institute of Landscape Architects

AHL
Aviation Hazard Lighting

BESS
Battery Energy Storage System

CASA
Civil Aviation Safety Authority

DTM
Digital Terrain Model

EPHC
Environment Protection and Heritage Council

ERM
Environmental Resources Management

FOV
Field of View

GIS
Geographic Information System

ha
Hectares

LGA
Local Government Area

LCU
Landscape Character Unit

LVIA
Landscape and Visual Impact Assessment

NSW
New South Wales

NWFG
National Wind Farm Guidelines

NTS
Not To Scale

PM
Photomontage

QLD
Queensland

RVAA
Residential Visual Amenity Assessment

SC
State Code

SNH
Scottish Natural Heritage

VRWFG
Visual Representation of Wind Farms Guidance

WTG
Wind Turbine Generator

ZVI
Zone of Visual Influence

01 Introduction

1.0 Introduction

1.1 Background

Moir Studio have been engaged by Environmental Resource Management Australia Pty Ltd (ERM) to undertake a Landscape and Visual Impact Assessment (LVIA) for the proposed Dugald River Wind Farm (referred to hereafter as 'the Project').

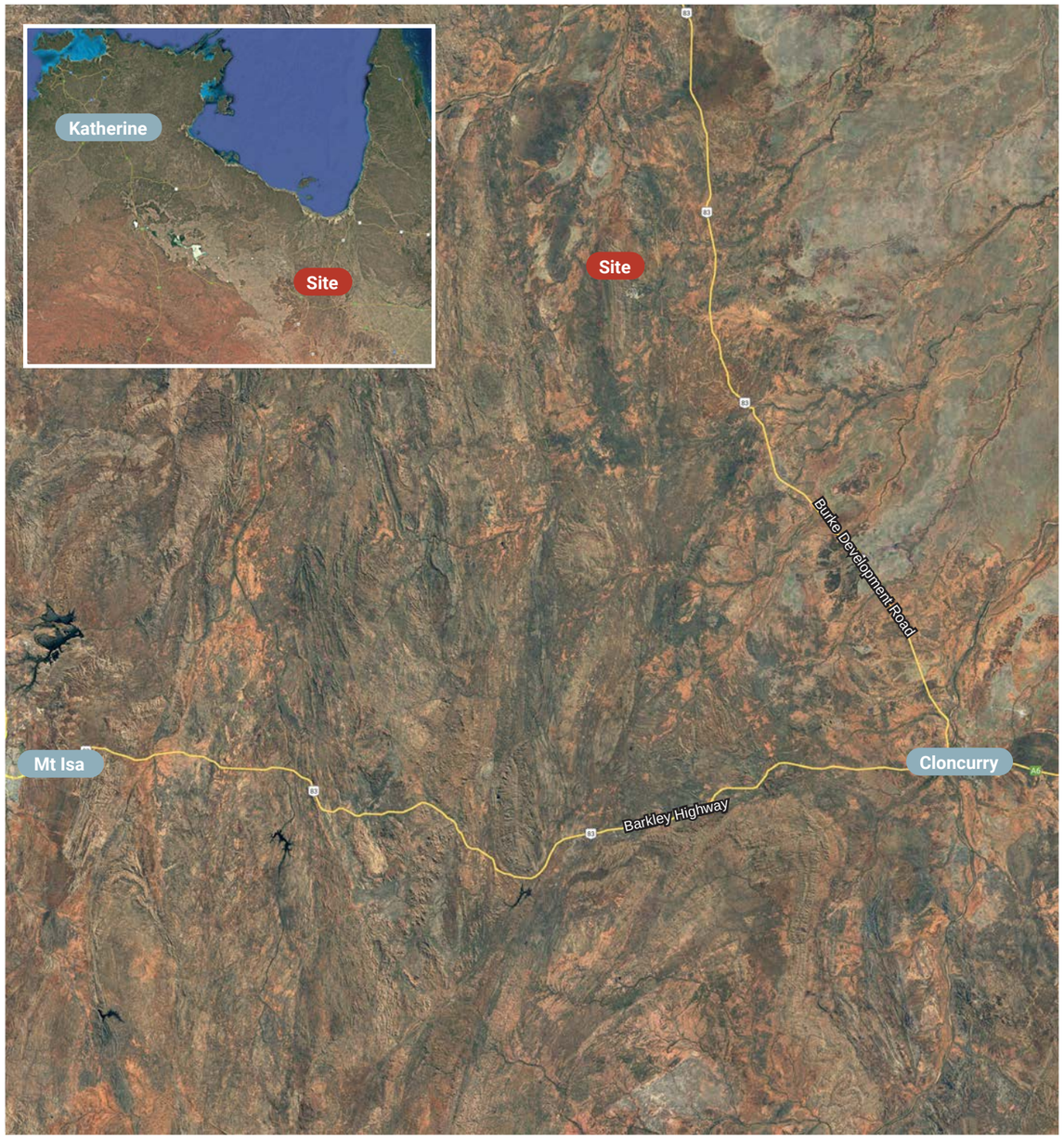
The Project is proposed on the traditional lands of the Kalkadoon People, in north-western Queensland, approximately 65 kilometers north of the town of Cloncurry (**Refer Figure 01)**. The Project is located on the Knapdale Range, and adjacent to the Dugald River Mine (DRM)., which lies within the Mount Isa Inlier region, an area known for its rich mineral deposits. Situated in a relatively remote area, the Site (specific to the LVIA report only) is accessible via the Burke Development Road, with the nearest significant infrastructure being in Cloncurry. The surrounding landscape is arid, with a mix of flat plains and low hills typical of the Queensland outback.

1.2 Relevant Experience

Moir Studio, is a professional design practice and consultancy specialising in Landscape Architecture, Landscape Planning, and Landscape and Visual Impact Assessments (LVIAs). Our team has extensive experience in conducting LVIAs for large-scale renewable energy developments. Drawing on this experience and relevant industry guidelines, we have developed robust methodologies to ensure a thorough and high-quality assessment of the Project.

Our relevant experience includes:

- Lakeland Wind Farm (QLD)
- Stony Creek Wind Farm (QLD)
- Wongalee Wind Farm (QLD)
- Bodangora Wind Farm (NSW)
- Capital II Wind Farm (NSW)
- Uungula Wind Farm (NSW)
- Hills of Gold Wind Farm (NSW)
- Cherry Tree Wind Farm (VIC)



LEGEND

Figure 01 Site Context
Basemap Source - Google Earth, 2025

02 Study Method

2.0 Study Method

2.1 Overview of The Study Method

The fundamental steps in undertaking a LVIA are as follows:

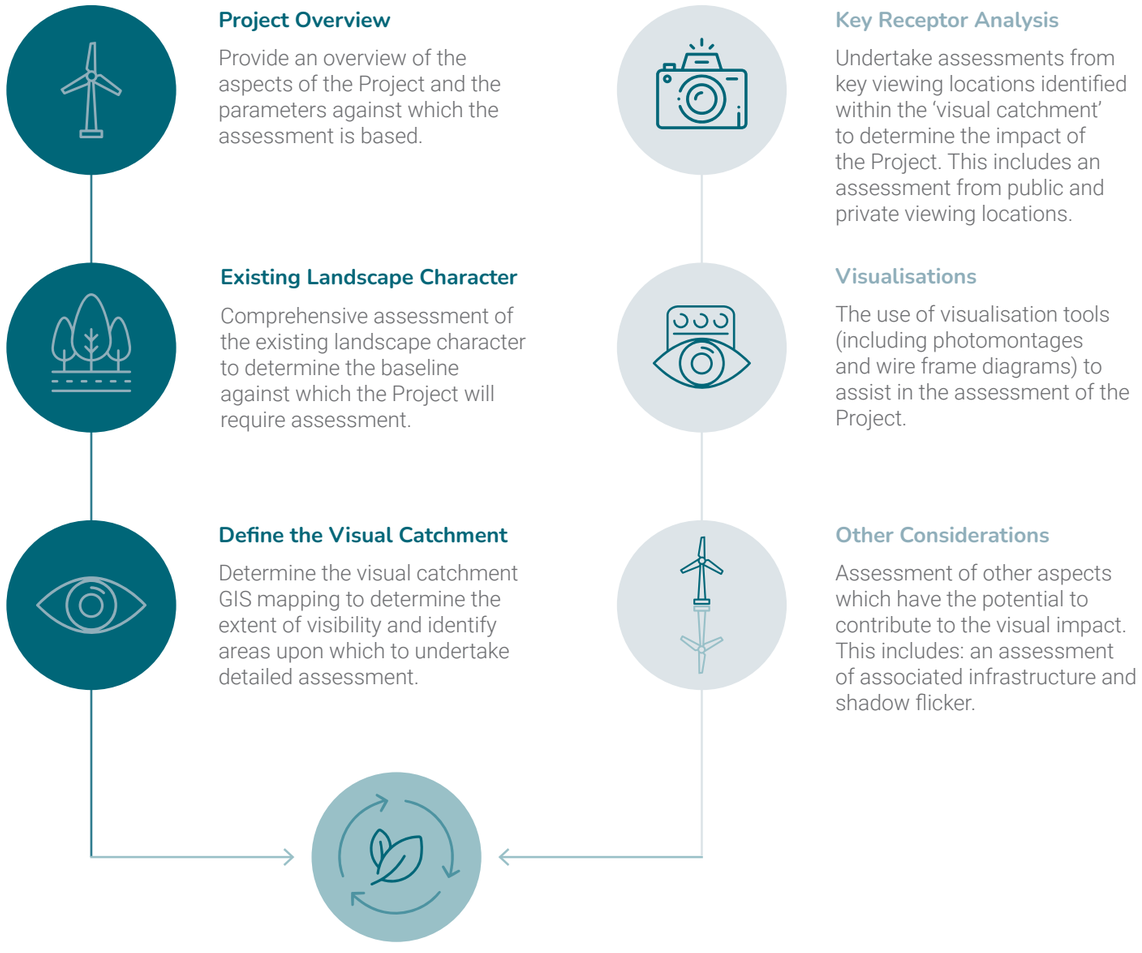


Figure 02 Landscape & Visual Impact Assessment Process

2.2 Relevant Guidelines & Framework

The following provides an overview of the guidelines, relevant frameworks and considerations of authorities utilised to form the methodology for this LVIA.

Wind Farm State Code & State Development Assessment Provisions (2025)

State Code 23, supported by its State Development Assessment Provisions, establishes a consistent, coordinated, whole-of-government approach to assessing and regulating Wind Farm development across Queensland.

State Code 23 and its associated guidelines aim to deliver high-quality renewable energy outcomes while safeguarding communities from the adverse impacts of wind farm development. State Code is part of the State Development Assessment State Code 23: Wind Farm Development.

Relevant Performance Outcomes:

- *PO15 - Development is designed, constructed and operated so that the modelled blade shadow flicker impacts on existing or approved sensitive land uses do not exceed 30 hours per annum and 30 minutes per day.*
- *PO18: Development in an area identified by state or local government planning instruments as having high scenic amenity is sited and designed to protect the scenic amenity and landscape values of the locality and region*

To address the above performance outcomes, a visual assessment should be conducted to identify and propose measures for avoiding or minimising adverse impacts from the development on significant landscape values and scenic amenity, including viewing corridors and viewpoints.

The LVIA should include the following:

- *Include visual simulations or photomontages demonstrating the anticipated visual appreciation of the proposed WTGs from key public viewpoints and viewing corridors.*
- *An assessment of how the WTGs visible from view points and/or viewing corridors does not adversely impact on the scenic amenity.*

2.2.1 AILA Guidance Note for Landscape & Visual Impact Assessment (2018)

The Australian Institute of Landscape Architects (AILA) developed Guidance Notes for preparing LVIAs. This document provides a practical framework for the practice of LVIA among Registered Landscape Architects. The LVIA process follows the best practice guidelines outlined in the Guidance Notes, which cover terminology, principles, and methodology.

2.2.2 Draft National Wind Farms Development Guidelines (2010)

The Environment Protection and Heritage Council (EPHC) developed the Draft National Wind Farms Development Guidelines (July 2010) to provide a consistent framework and methodology for assessing issues unique to wind turbine developments. References to these guidelines are made throughout the report.

2.3 Relevant Planning Schemes

2.3.1 Cloncurry Shire Planning Scheme (2016)

The Planning Scheme requires "the scenic amenity values of Cloncurry Shire are acknowledged, managed and maintained in an appropriate way, including preservation of views to the Selwyn Ranges and maintenance of its outback landscape" (Cloncurry Shire Council 2016)

The Study Area (specific to the LVIA only) and Micrositing Corridor has no views to the Selwyn ranges and does not change outback character of the Cloncurry area. .

Specific outcomes in relation to scenic amenity are as follows:

- *Visual intrusions on the landscape such as mining, extraction or other forms of visually dominant development, are designed, located, operated and rehabilitated to mitigate negative scenic amenity impacts.*
- *Regional landscape and scenic amenity areas are preserved, especially along the Overlander's Way, a predominant tourist route, with additional outdoor recreation activities promoted in these areas.*

The project is located adjacent to the DRM, aligning with the industrial character of the surrounding site. Additionally, the site will not be visible from the Overlanders Way.

2.4 Report Structure

Table 01 provides an outline of the report structure. Detailed methodologies for each part of the assessment have been included in the relevant chapters of the Report.

Report Structure
Project Overview & Defining Visual Catchment
• **Section 3.0** - Project Overview • **Section 4.0** - Defining the Visual Catchment
Landscape Character Analysis
• **Section 5.0** - Existing Landscape Character
Visual Impact Assessment
• **Section 6.0** - Viewpoint Analysis • **Section 7.0** - Photomontages • **Section 8.0** - Shadow Flicker Assessment • **Section 9.0** - Associated Infrastructure

Table 01 Report Structure

03 Project Overview

3.0 Project Overview

3.1 Regional Context

The Project is located in Queensland's Cloncurry Shire Council Local Regional Government area, approximately 65 kilometers north of the town of Cloncurry (Refer **Figure 01**). The project is located within both the Northwest highlands and gulf plains Bio-region (Refer **Figure 03**).

3.2 The Project Layout

The Project Layout refers to the Micrositing Corridor Boundary on which WTGs and associated infrastructure will be constructed The project Layout is shown in **Figure 04**.

3.3 The Project

The Project involves the construction, maintenance and decommissioning of up to 24 Wind Turbines Generators (WTG) and associated infrastructure, which includes:

- WTG foundations and hardstand areas;
- Temporary infrastructure such as concrete batching plants, laydown areas and communications towers;
- Access tracks, underground cabling;
- Electrical connections and substations;
- Permanent meteorological masts; and
- Central operational and maintenance (O&M) facilities.

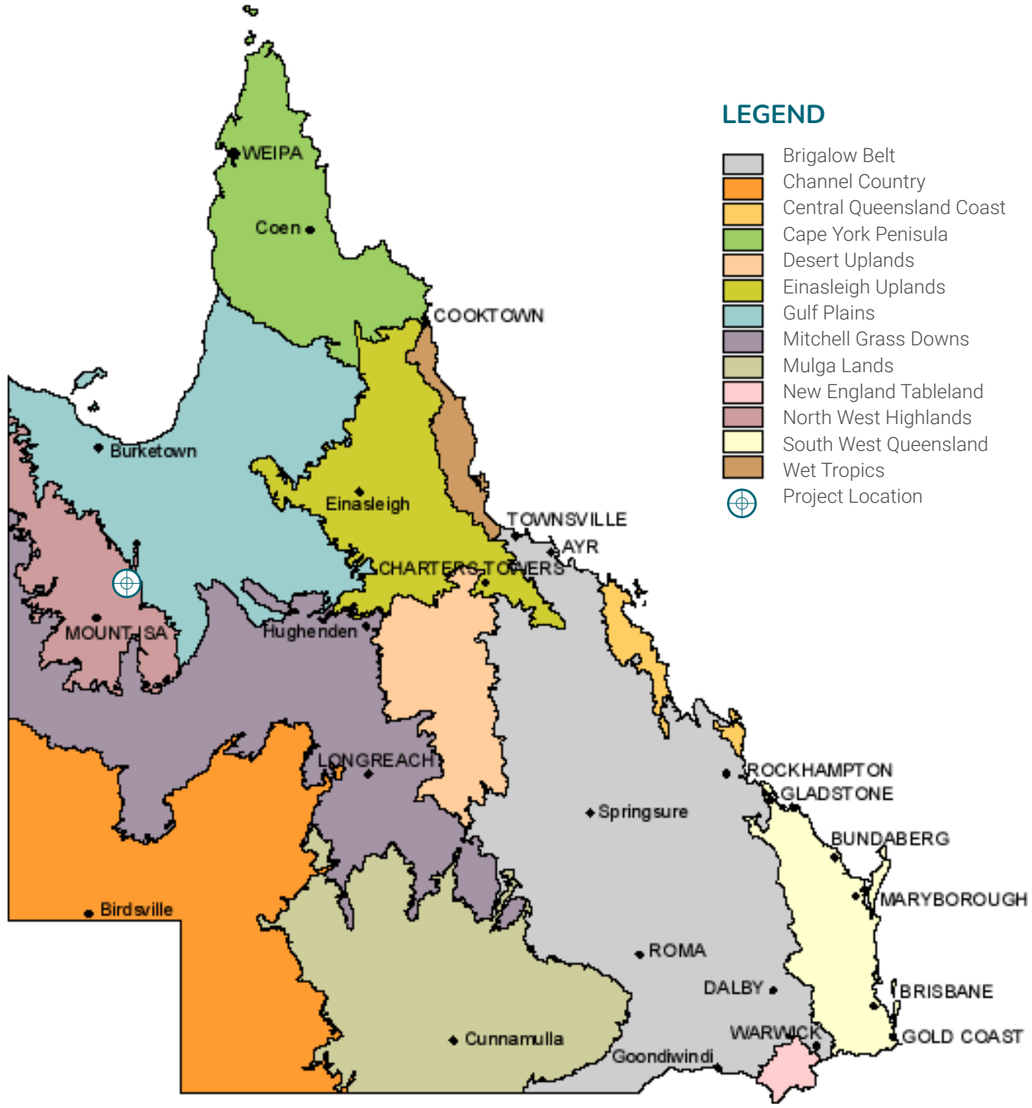
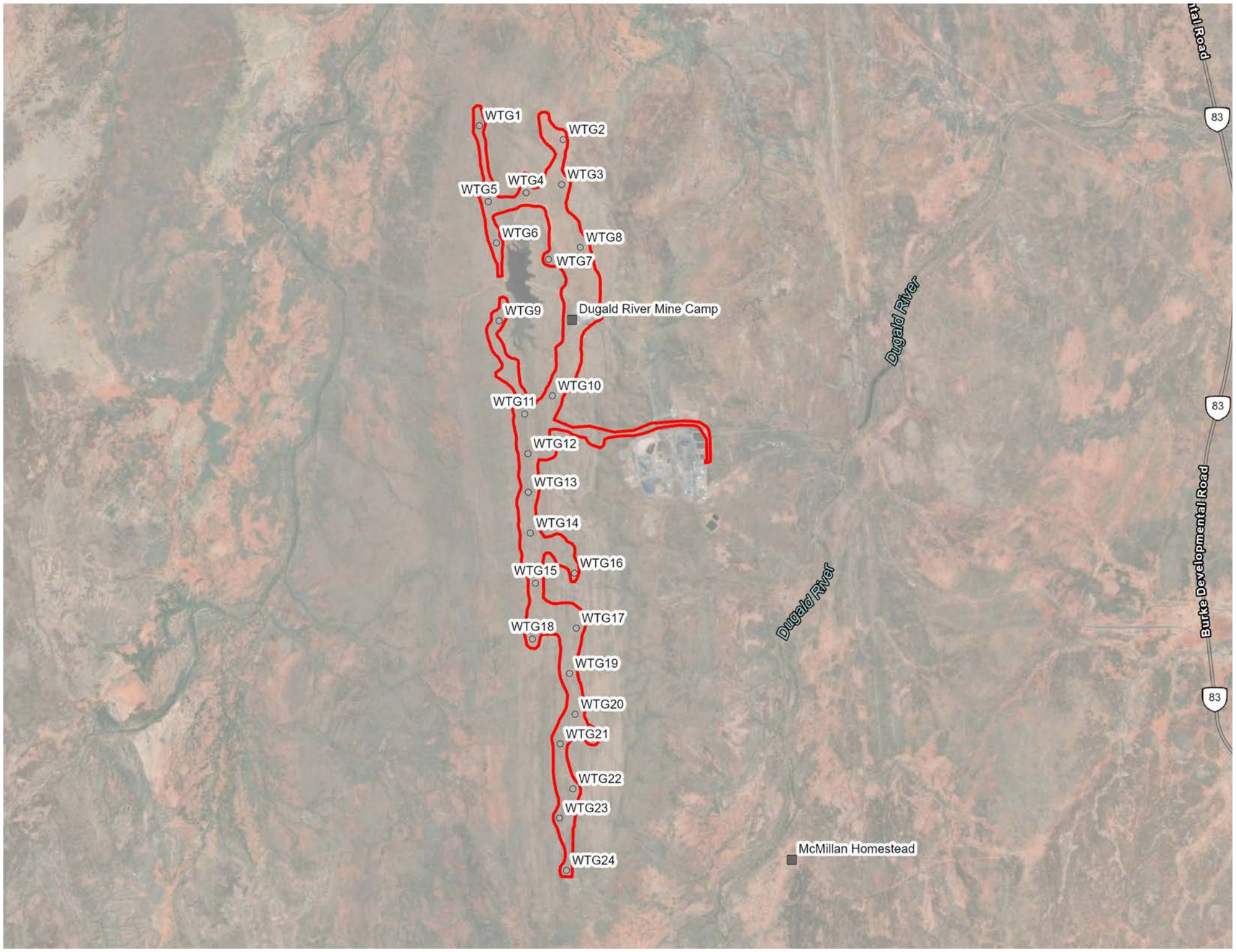


Figure 03 Project Location within QLD Bio-regions



Project Layout

Refer to 3.2

LEGEND

- Micrositing Corridor
- Recievers
- WTG

0 1 2 km

Figure 04 Project Layout
Basemap Source - ESRI, 2024

3.4 Project Components

The proposed Wind Turbine Generators considers a maximum blade tip height of 212.5 metres (m) as a worst case scenario.

Table 02 provides an overview of dimensions of the WTG components that have been used for this assessment. To best represent a worst case scenario, the maximum hub height of 130 m has been used for modelling and visualisation purposes in this report. **Figure 05** illustrates the WTG parameters utilised for this report.

WTG Parameters		
Project Component	**Dimensions used in this LVIA**	**Quantity**
Maximum Blade Tip Height	212.5 m	
Hub Height	130 m	24 WTGs
Blade Length	82.5 m	

Table 02 WTG Parameters

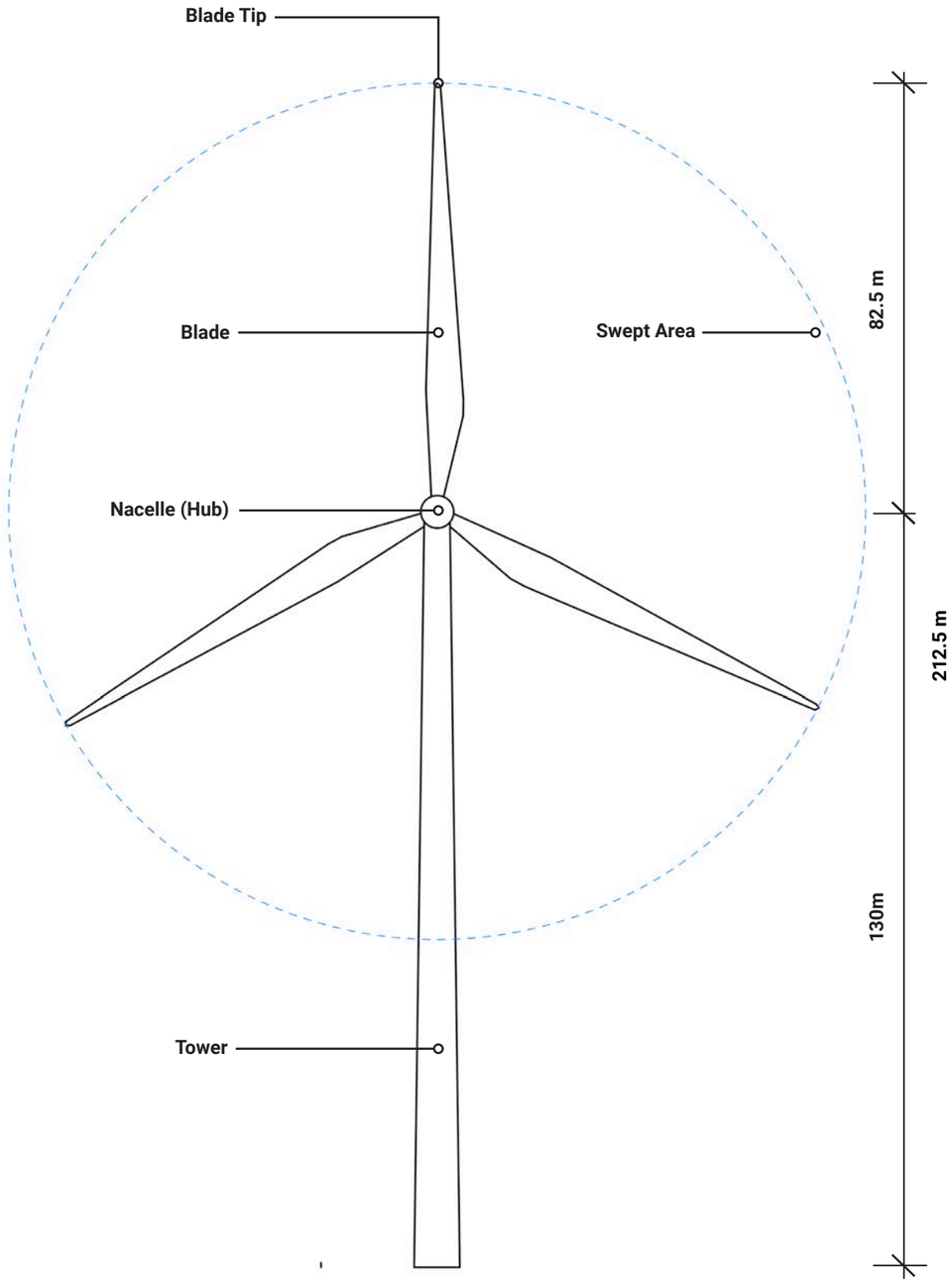


Figure 05 WTG Parameters For Assessment

04 Visual Catchment

4.0 Visual Catchment

4.1 Defining Visual Catchment

The visual catchment of the Project has been defined based on the parameters of the accepted extent of human vision, including our vertical field of view. To facilitate an objective assessment of visibility, the potential visual prominence of the Project is related to the distance from a receptor. Therefore, the extent of the Micrositing Corridor is determined by the distance within which the proposed 212.5 m WTGs have the potential to be a significant element within the view (refer to **Table 03**).

4.1.1 Viewshed Calculation

Distance zones have been calculated using the parameters of the human eye (refer **Figure 06**) and are based on the typical line of sight for a person standing at ground level (*Torrejon et al., 2013; Panero & Zelnik, 1979*). Given the spatial arrangement and layout of the Project - the vertical field of view provides a basis for calculating the extent of the viewshed.

Figure 07 shows that generally the vertical field of view for a person standing at ground level is between 10 - 15º. The theoretical extent of the viewshed is considered to be the distance at which the tallest component of the Project would take up less than 5% or 0.5º of the general field of view experienced. With an overall height of WTGs of up to 212.5 m, the distance that would comprise 5% (0.5°) of the vertical field of view is 24.35 km (as shown in **Table 03**).

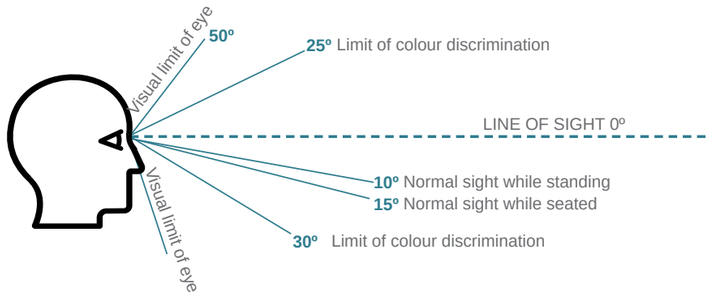


Figure 06 Human Eye Vertical Line of Sight
Source - Torrejon et al., 2013; Panero & Zelnik, 1979

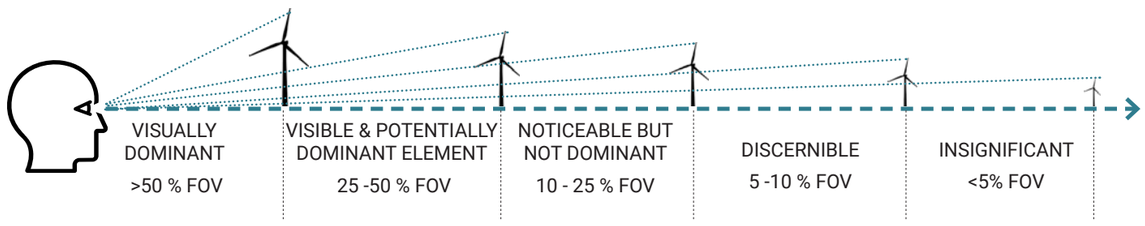


Figure 07 Vertical Field of View and Potential Visual Dominance

4.1.2 Visual Prominence and Distance from the Wind Farm

The National Wind Farm Guidlines (NWFG) offer guidance based on previous studies undertaken when reviewing wind farm developments and the potential visual prominence. This framework has been adopted for this project, the visual dominance of the Project based on distance from receptors is outlined in **Table 03** below.

Potential Visual Dominance		
Visual Catchment (vertical angle of view)	**Distance from Receptor to WTGs**	**Potential Visual Dominance:**
0.5º (<5% FOV)	**24.35km**	**Visually Insignificant** A small thin line in the landscape.
0.5 - 1.0º (5 - 10% FOV)	**12.2 - 24.35km**	**Potentially Noticeable but will not dominate the landscape** The Project may be noticeable. The degree that it intrudes on the view will be dependent on how well it integrates with the landscape setting.
1.0 - 2.5º (10 - 25% FOV)	**4.9 - 12.2 km**	**Noticeable and potentially a visible element in the landscape** The degree that it intrudes on the view will be dependent on sensitivity of the viewer and the landscape.
2.5 - 5.0º (25 - 50% FOV)	**2.4 - 4.9 km**	**Visible and potentially dominant** The Project will be visible, although the degree of visual intrusion will depend on the landscape setting, intervening elements and the extent of visibility. It is likely that beyond 4.9 km the WTGs will diminish in scale relative to other elements in the fore and middleground such as fences, intervening structures such as sheds, vegetation, etc.
> 5º (>50% FOV)	**< 2.4 km**	**Will always be visually dominant** The Project will always be a dominant element in the landscape, unless screened by intervening vegetation or structures.

Table 03 Visual Dominance For The Project

Assessment of the visual scale and prominence of WTGs over a range of distances establishes whether these proposed elements will likely be dominant, noticeable, discernible or insignificant features within the viewshed. **- Image 01- Image 04** illustrate the visual prominence of WTGs.

Image 01 WTGs located at 2 km
Highly visible and are dominant in scale relative to elements such as fence posts and vegetation visible in the foreground

Image 03 WTGs located at 6 km
Likely to appear smaller in scale relative to vegetation and structures in the foreground.

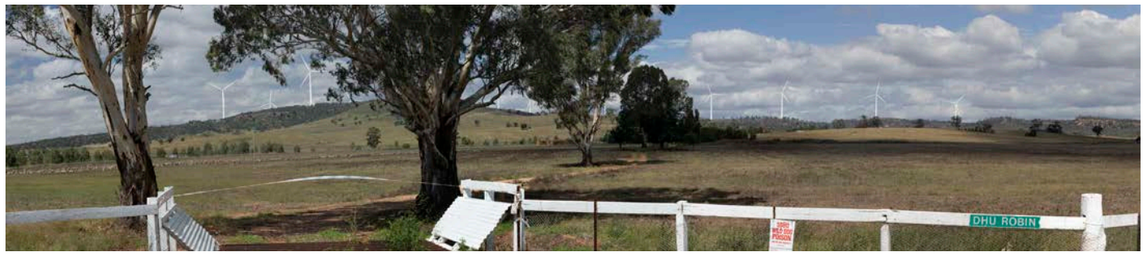


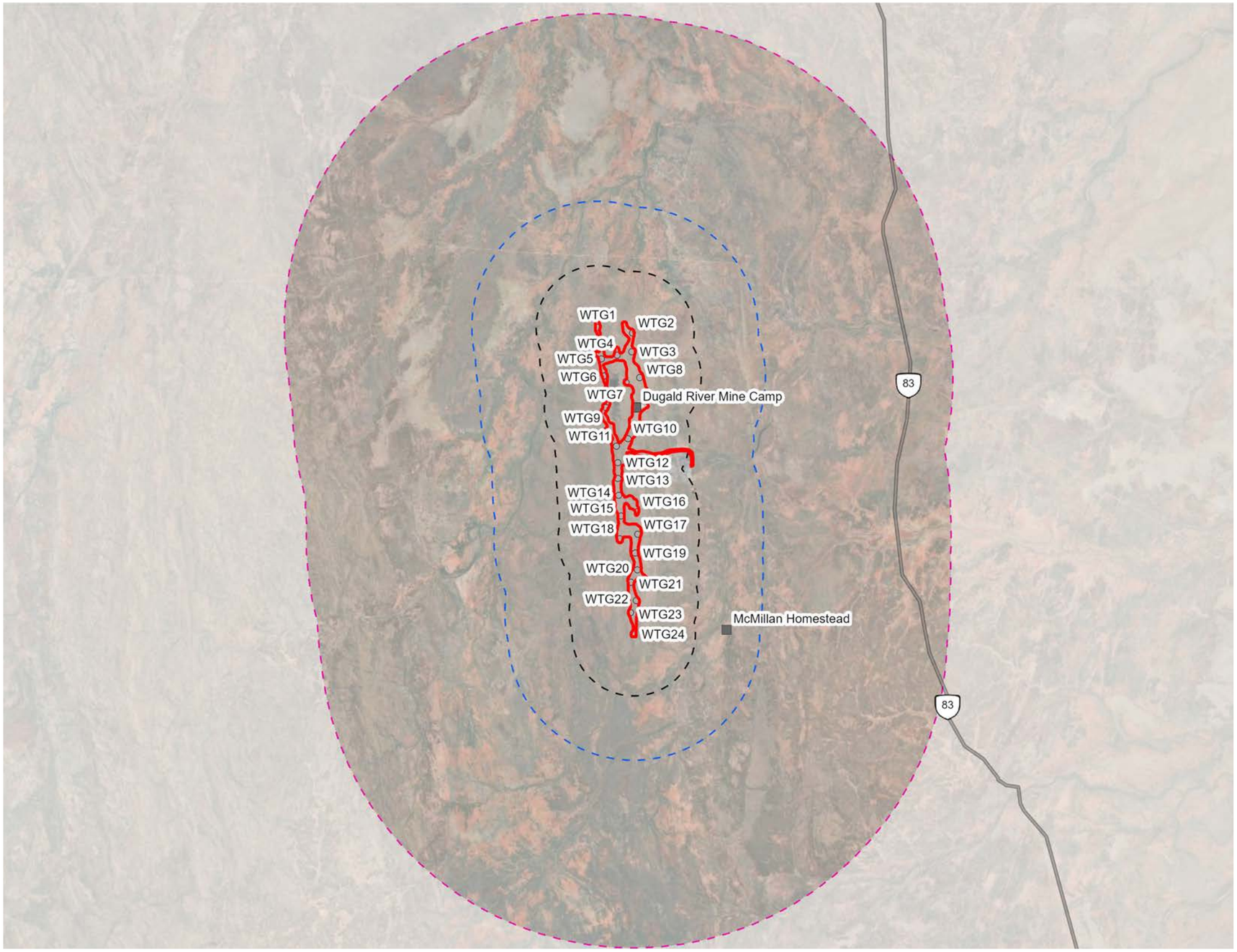
Image 02 WTGs located at 4 km
Likely to diminish in scale relative to other elements such as fence posts and intervening vegetation in the foreground.

Image 04 WTGs located beyond 6 km
Likely to be visible and appear smaller in scale relative to vegetation and structures in the foreground and middleground.

4.2 Visual Catchment & Study Area Thresholds

When measuring the visual dominance of the Project, WTGs within 4.9 km will be viewed as a new element in the landscape and potentially dominant. It is likely that beyond 4.9 km, WTGs will diminish in scale and, when viewed in the background, will not visually dominate the landscape. Therefore, with this consideration regarding the nominated thresholds of visual predominance - the Micrositing Corridor thresholds as shown in **Figure 08** is determined to be:

- Landscape Character Assessment (**12.2 km** from nearest WTG)
- Visual Impact Assessment (**4.9 km** from nearest WTG)



Study Area

Refer to 4.2

LEGEND

- Recievers
- WTG
- Visual Catchment (2.4 Km from WTGs)
- Visual Catchment (4.9 Km from WTGs)
- Study Area (12.2 Km from WTGs)
- Micrositing Corridor

0 1 2 4 6 km

Figure 08 Study Area
Basemap Source - ESRI, 2024

4.3 Zone of Visual Influence

An initial visibility assessment was undertaken using Zone of Visual Influence (ZVI) mapping. This tool assists in defining the Project's 'Visual Catchment.'

The ZVI represents the area over which the Project can theoretically be viewed and is based on a Digital Terrain Model (DTM). The ZVI is a desktop tool intended to make fieldwork and assessment more efficient by excluding areas screened by topography. Fieldwork assessments are then undertaken predominantly within the areas with potential visual impacts.

The ZVI presents a bare-ground scenario—i.e., a landscape without screening, structures, or vegetation— and is usually on a base map (*Landscape Institute, 2013*). It is important to note that the ZVI is based solely on topographic information. This form of mapping is acknowledged as providing a worst-case scenario and is used purely as a desktop assessment tool to determine areas for detailed assessment.

The assessment of the ZVI impacts within 12.2 km from the Project.

4.4 Zone of Visual Influence Summary

A WTG with a blade tip height of 212.5 m has been considered to provide a worst case scenario.

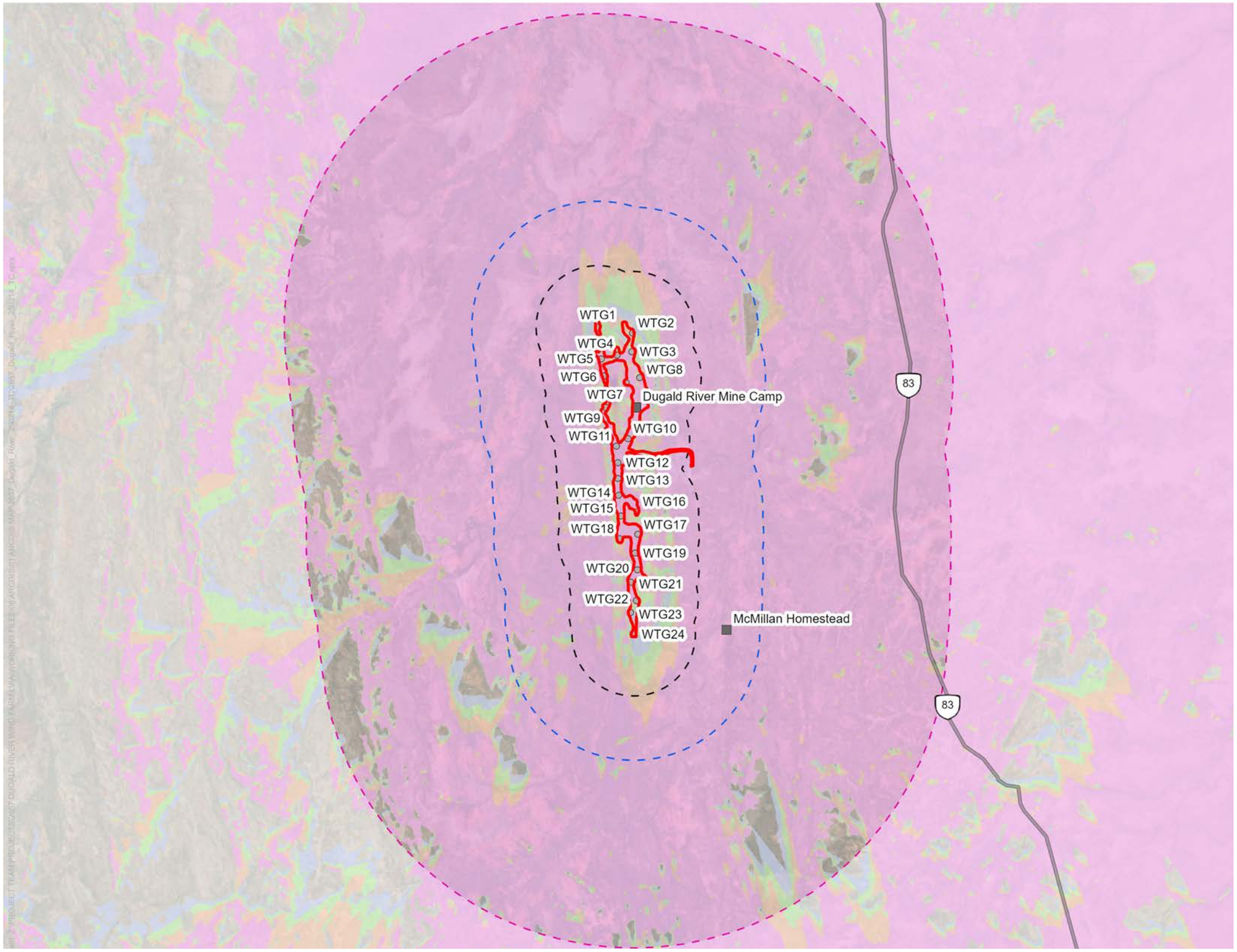
The ZVI diagrams have been determined using Digital Topographic Modelling (DTM) and 3D modelling software, 'ArcGIS'.

Summary of Findings:

- Based on topography alone, due to the gently undulating terrain within the Micrositing Corridor, the Project will be visible to the immediate surroundings, with visibility decreasing as you move beyond the Study Area . (Refer to **Figure 09**)

The ZVI has been used to identify areas of potentially high visibility, which informs fieldwork ground-truthing to identify locations that require further assessments.

It is noted that existing screening, including structures or vegetation, has not been considered in the preparation of the ZVIs. Further assessment and fieldwork ground-truthing would be required to determine the potential visual impacts with consideration to existing screen factors. Therefore, this assessment presents a conservative worst-case scenario.



Zone of Visual Influence

Refer to 4.3

LEGEND

- Micrositing Corridor
- Recievers
- WTG
- Visual Catchment (2.4 Km from WTGs)
- Visual Catchment (4.9 Km from WTGs)
- Study Area (12.2 Km from WTGs)

Viewshed

- 0-25%
- 25-50%
- 50-75%
- 75-100%

0 1 2 4 6 km

Figure 09 Zone of Visual Influence
Basemap Source - ESRI, 2024

05 Existing Landscape Character

5.0 Existing Landscape Character

5.1 Existing Landscape Character Analysis

The Landscape Character Analysis establishes the existing landscape and visual conditions through descriptions, mapping and photographic representations. The Method for undertaking Existing Landscape Character Analysis has been established in accordance with the State Development Assessment State Code 23: Wind Farm Development Provisions (2025) and the AILA Guidance Notes for Landscape and Visual Impact Assessment (2018) where relevant and in conjunction with previous experience on large scale wind energy projects.

5.2 Regional Landscape Character

5.2.1 Bioregional Context

The Project is located within Queensland's Northwest Highland and Gulf Plains bioregions under the Interim Biogeographic Regionalisation for Australia (IBRA). The Northwest Highlands Bioregion is a complex landscape, dominated by dissected metamorphic and volcanic rocky hills, eroded sandstone platforms and limestone karst systems. River systems in the bioregion either flow north to the Gulf of Carpentaria, inland to the Barkly Tableland, or south to the Eyre Basin. (DES 2020) The Gulf Plains bioregion is characterised by extensive alluvial plains and coastal areas. The tropical savanna vegetation comprises mainly eucalypt and tea-tree open woodlands. (DCCEEW 2008)

The Micrositing Corridor extent consists of 2 sub-bioregions:

- Armrayald Plains
- Mount Isa

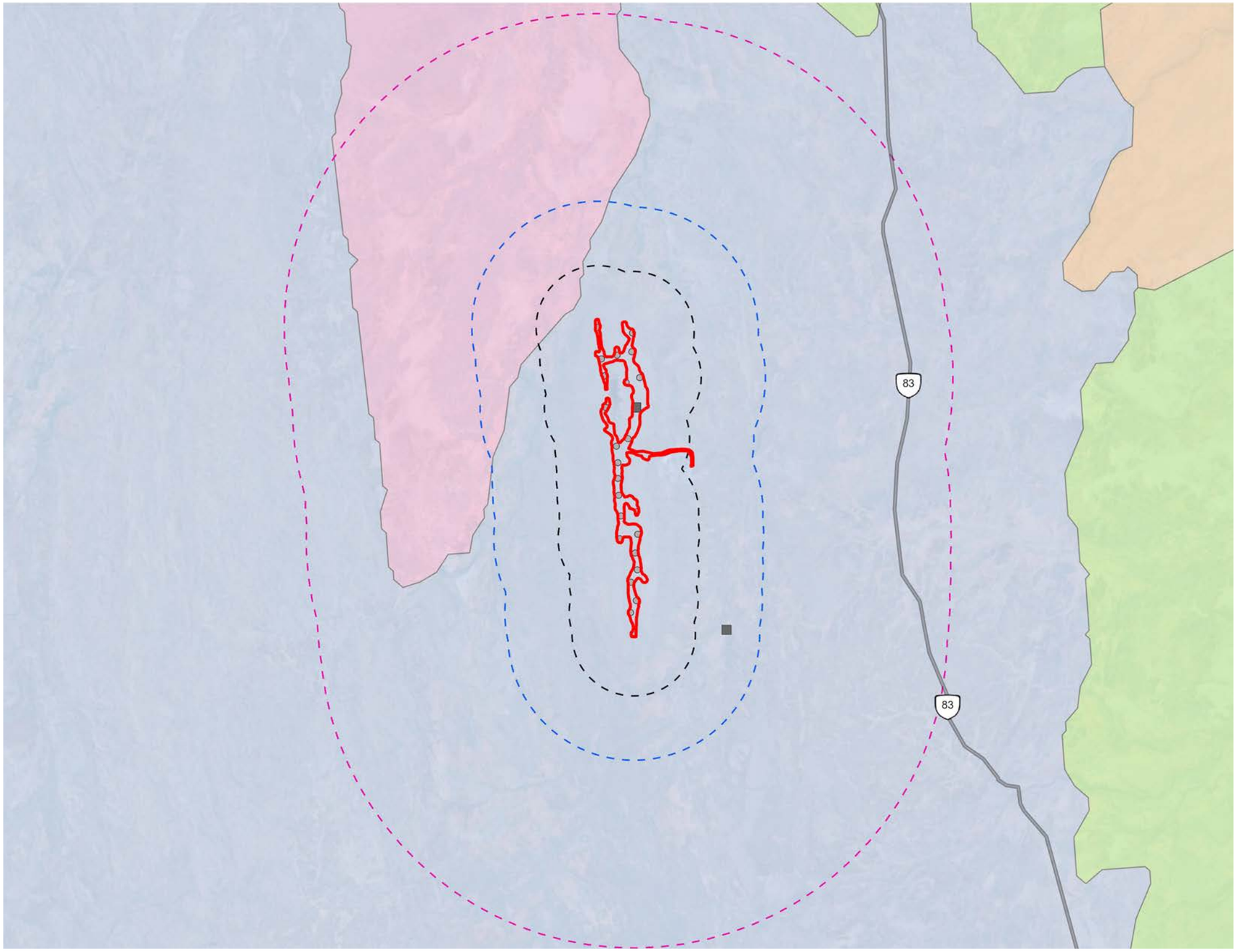
The armrayald plains consists of open plains with natural watercourses, large areas of of this sub-region are used for cattle grazing. The Mount Isa sub-bioregion is characterised by rugged hills and outwash, primarily associated with Proterozoic rocks; skeletal soils andlow open eucalypt woodlands (DCCEEW 2008)

Refer **Figure 10** for sub-regions extents

5.3 Land Use

Figure 11 shows that land within the Micrositing Corridor predominantly comprises of grazing native vegetation. Other land uses defined by land use mapping produced by the Queensland Government (QSpatial, 2024) predominantly comprise of:

- Mining
- Residential
- Transport and Communication
- Lakes, Rivers, Reservoirs/Dams, Marshes



Sub-bioregions

Refer to 5.2

LEGEND

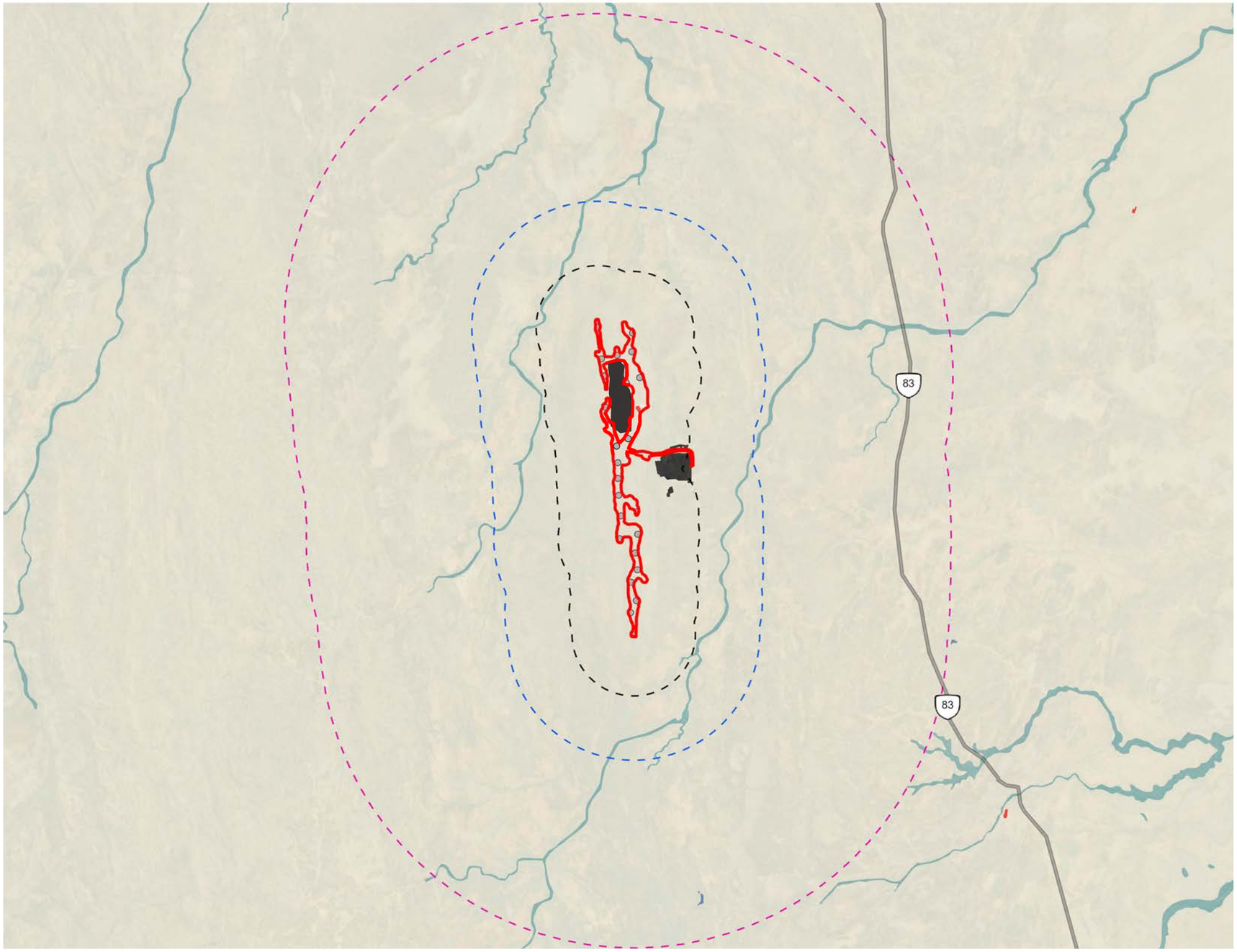
- Micrositing Corridor
- Recievers
- WTG
- Visual Catchment (2.4 Km from WTGs)
- Visual Catchment (4.9 Km from WTGs)
- Study Area (12.2 Km from WTGs)

Sub-bioregions

- Armraynald Plains
- Donors Plateau
- Mount Isa
- Woondoola Plains

0 1 2 4 6 km

Figure 10 Sub-bioregions
Basemap Source - ESRI, 2024



Land Use

Refer to 5.3

LEGEND

- Micrositing Corridor
- WTG
- Visual Catchment (2.4 Km from WTGs)
- Visual Catchment (4.9 Km from WTGs)
- Study Area (12.2 Km from WTGs)

Queensland Land Use - Current

- Grazing native vegetation
- Residential
- Transport and communication
- Mining and Tailings Storage Facilities (TSF)
- Reservoir/dam
- Marsh/wetland

0 1 2 4 6 km

Figure 11 Land Use
Basemap Source - ESRI, 2024

5.4 Key Landscape Features

5.4.1 Geology & Landform

The Micrositing Corridor primarily consists of flat to gently undulating plains, formed from Cainozoic sand deposits. These flat areas are interspersed with steep rises and low hills, characteristic of the region's limestone rock formations, which are typically composed of metamorphosed sediments and interbedded volcanics. (Wilson and Taylor 2012)

Hydrology

A network of rivers and creeks surrounds the site (refer **Figure 12**), with most creeks being seasonal and flowing primarily during the wet season. Major rivers flowing from north to south include the Leichhardt River and the Cloncurry River. The Dugald River, located approximately 1 km east of the project site, flows from southwest to northeast and is a tributary of both the Cloncurry and Flinders Rivers, which ultimately drain into the Gulf of Carpentaria. In addition, a dammed lake exists within a raised ridgeline to the southwest of the Dugald River Miners Accomodation Camp.

5.4.2 Vegetation

The Micrositing Corridor predominantly consist of grazing native vegetation, some particularly species of note present include: Corymbia apparrerinja ssp.dallachiana (Ghost Gum), Eucalyptus leucophylla (Cloncurry Box) and Corymbia capricornia (Small-fruited bloodwood)

5.4.3 Highways

The Burke Development Road is located 10 km east of the Project, with the Quamby Pub and rest area situated 17 km southeast, just outside the Micrositing Corridor. The highway is not a major tourist route and is primarily used by heavy vehicles servicing the nearby mines.

5.4.4 Local Roads

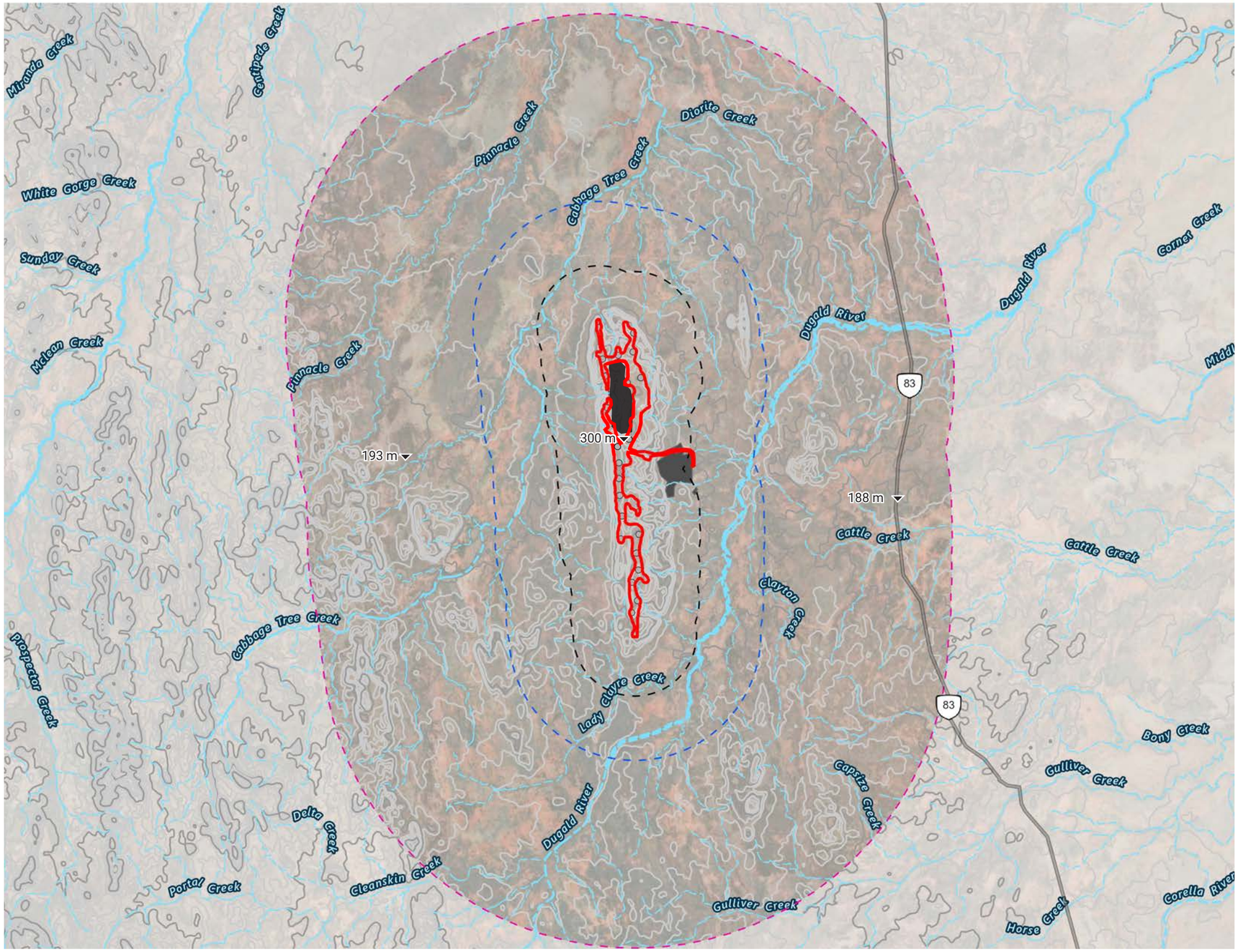
These roads are unsealed and primarily used for access to rural properties and mining maintenance vehicles. They are 4WD-only routes and are often affected by flooding from creeks during the wet season.

5.4.5 Infrastructure

The Dugald River Mine is the only major infrastructure within the Study Area, which includes a processing plant, Tailings Storage Facility, water management systems, Waste Rock Dumps, Vehicle Workshops, Minerology / Exportation areas, and a dam.

Image 05 Intermittent creek crossings, prone to flooding.

Image 06 Rocky Outcrop with low woodland vegetation



Key Landscape Features

Refer to 5.4

LEGEND

- Micrositing Corridor
- WTG
- Visual Catchment (2.4 Km from WTGs)
- Visual Catchment (4.9 Km from WTGs)
- Study Area (12.2 Km from WTGs)
- Mine & Associated Infrastructure

Watercourse lines

- Major - non perennial
- Minor - perennial
- Minor - non perennial

Contour

- 50m Contour
- 10m Contour

0 1 2 4 6 km

Figure 12 Key Landscape Features
Basemap Source - ESRI, 2024

5.5 Landscape Character Units (LCUs)

Landscape Character Units refer to '*areas of homogenous patterns of visual, physical, environmental and cultural characteristics such as landform, vegetation, water form and land use, as well as individual features*' (Draft National Wind Farm Development Guidelines, 2010).

Due to the large scale of the Micrositing Corridor and varying landscape character, the Micrositing Corridor has been categorised into three Landscape Character Units (LCU) to assist in the assessment. The LCUs are classified by slight variations in the landscape's geology, topography, land use and vegetation, which create distinct character areas within the Micrositing Corridor. A combination has informed the LCUs of land use patterns, vegetation coverage, topographical maps, site images and site inspection findings.

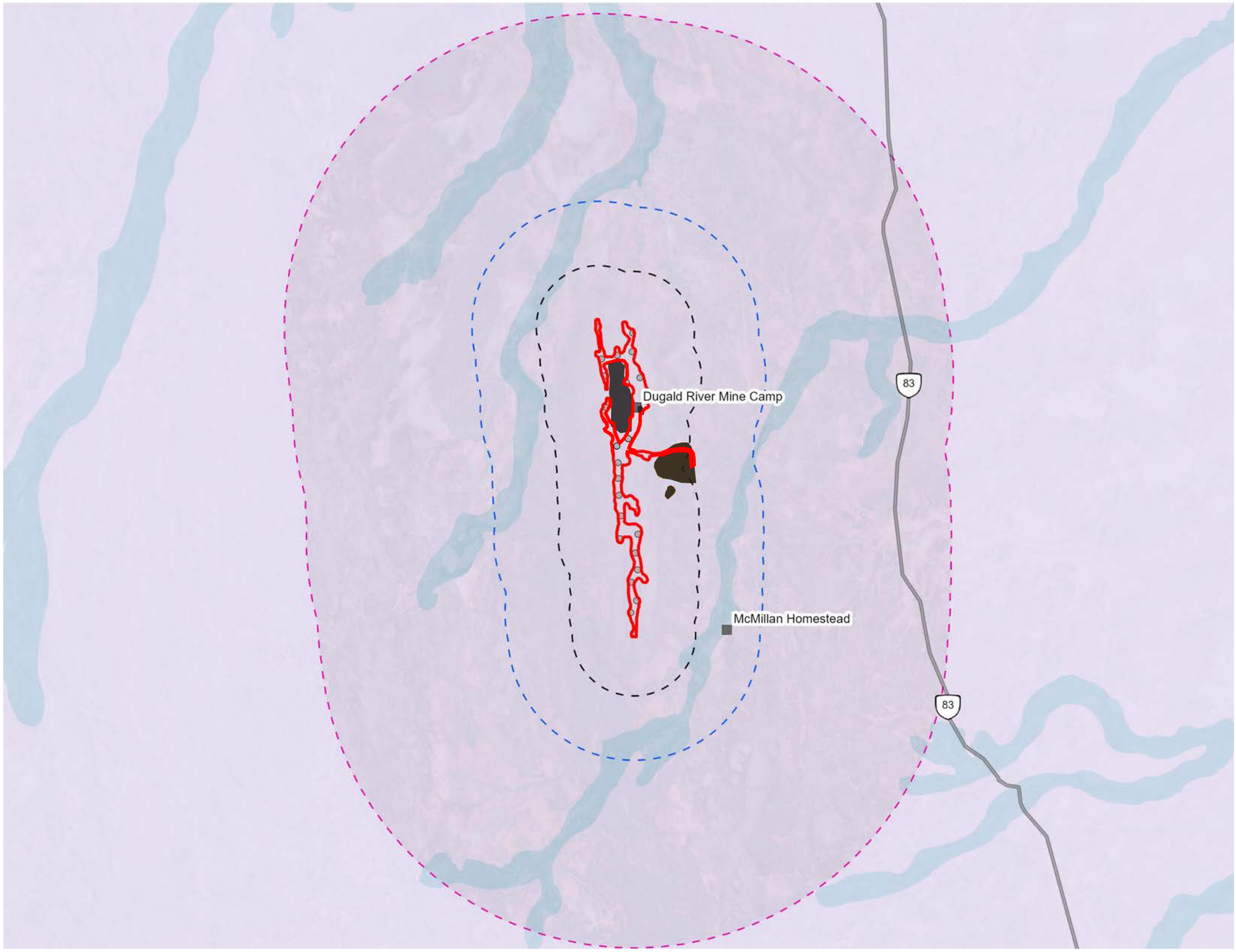
The general extent of the LCUs is shown in **Figure 13** on the following page, and a detailed description has been provided for each LCU.

The Scenic Quality 'Frame of Reference' has been applied to each LCU (refer to **Table 04**) to determine the level of visual significance. A Scenic Quality 'frame of reference' has been formulated by MS utilising an approach to landscape sensitivity assessment by Natural England (Tudor & Natural England, 2019).

Each category of the 'Frame of Reference' has been quantified for each Landscape Character Unit to determine a Low, Moderate or High Scenic Quality Rating.

SCENIC QUALITY FRAME OF REFERENCE		
SCENIC QUALITY RATING	**LOW** ← **MODERATE** → **HIGH**	
LANDFORMS	• Flat topography • Absence of landscape features • Open, broad extents of spaces	• Diversity in topographical range • Unique landscape features • Intimate spaces
WATERFORM	• Absence of water	• Presence of water • Visually prominent lakes, reservoirs, rivers streams and swamps.
VEGETATION	• Absence of vegetation • Lack of diversity • Land cleared of endemic vegetation • Low level of connection between vegetation and landscape / topography	• Abundant vegetation • High diversity • High retention of endemic vegetation • High level of connectivity between natural landscape and landforms
HUMAN INFLUENCE	• High population • High density in settlement • High presence of infrastructure • High levels of landscape modification	• Low / dispersed population • No settlement • Absence of infrastructure • Landscape in natural state
ACTIVITY	• High levels of traffic movement • Presence of freight and passenger transport networks • Presence of production or industry	• Low traffic movement • Absence of freight and passenger transport • Absence of production or industry
RARITY	• Typical landscape within a local and regional context	• Unique combination of landscape features in a local and regional context
RELATIONSHIP WITH ADJOINING LANDSCAPES	• Low visible connection with adjoining landscapes • Low variability between adjoining landscapes • Landscape features do not contribute to amenity from adjoining landscapes	• High visibility with adjoining landscapes • High variability and contrast with adjoining landscapes • Landscape features contribute significantly to amenity of adjoining landscapes

Table 04 Scenic Quality Frame of Reference



Landscape Character Units

Refer to 5.5

LEGEND

- LCU1 Mining
- LCU2 Riparian
- LCU3 Rural
- Micrositing Corridor
- Recievers
- WTG
- Visual Catchment (2.4 Km from WTGs)
- Visual Catchment (4.9 Km from WTGs)
- Study Area (12.2 Km from WTGs)

0 1 2 4 6 km

Figure 13 Landscape Character Units
Basemap Source - ESRI, 2024

5.5.1 LCU01 - Mining

A part of the Micrositing Corridor comprises mining operations and associated infrastructure. This includes a processing plant, tailings storage facility, water management systems, dams, and accommodation areas.

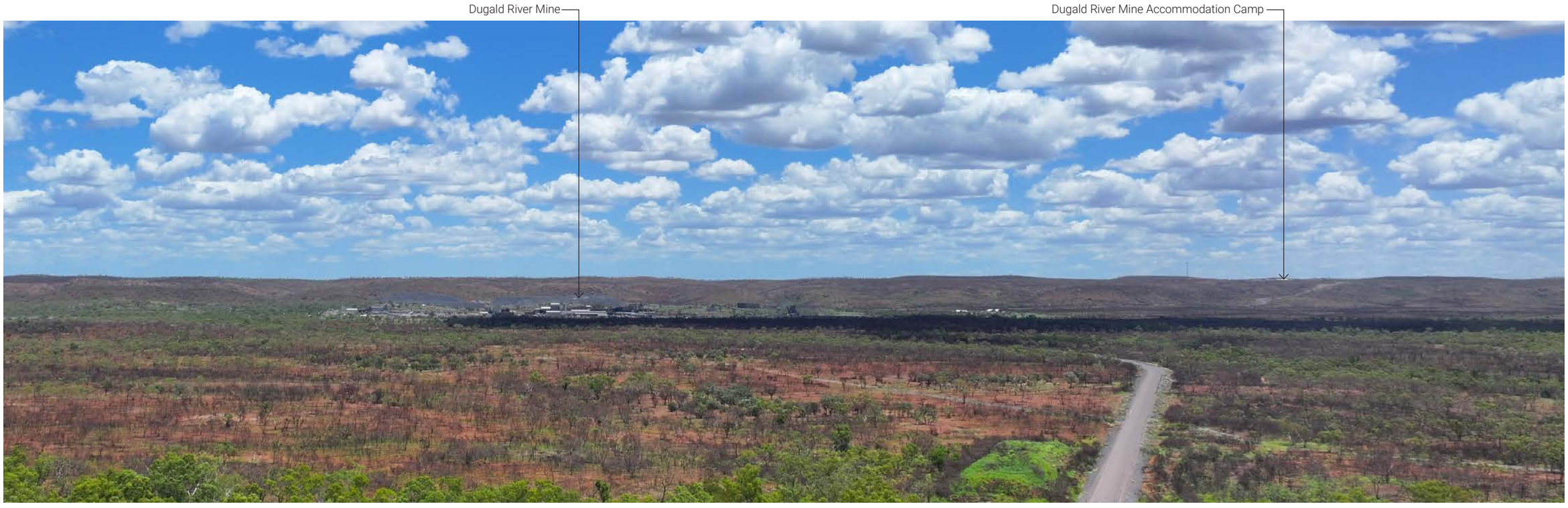


Image 07 Dugald River Mine

LANDSCAPE CHARACTER UNIT	KEY LANDSCAPE FEATURES (dominant features within this zone)	KEY VIEWPOINTS		Application of Scenic Quality Rating Frame of Reference							SCENIC QUALITY RATING
				Landform	Waterform	Vegetation	Human Influence	Activity	Rarity	Relationship with Adjoining Landscapes	
LCU01 -	Mining and associated infrastructure	Dugald River Mine Camp	H								LOW
			M								
			L	■	■	■	■	■	■	■	

Table 05 LCU01 - Agricultural Pastures

5.5.2 LCU02 - Riparian Corridors

The Micrositing Corridor is surrounded by a network of rivers and creeks, with most creeks being seasonal and flowing mainly during the wet season. Major rivers that flow from north to south include the Leichhardt River and the Cloncurry River. The Dugald River, located about 1 km to the east of the project site, flows from southwest to northeast

The riparian vegetation is predominately dominated by open eucalypt woodlands.

Image 08 Dugald River

LANDSCAPE CHARACTER UNIT	KEY LANDSCAPE FEATURES (dominant features within this zone)	KEY VIEWPOINTS		Application of Scenic Quality Rating Frame of Reference							SCENIC QUALITY RATING
				Landform	Waterform	Vegetation	Human Influence	Activity	Rarity	Relationship with Adjoining Landscapes	
LCU02 - Watercourse Corridors	Dugald River	McMillan Homested Mine Access Road	H M L								LOW

Table 06 LCU02 - Watercourse Corridors

5.5.3 LCU03 - Rural

The majority of the Micrositing Corridor consists of rural land used for native grazing. The landscape is dominated by open woodland vegetation, including eucalyptus leucophylla (Cloncurry Box) and corymbia aparrerinja (Ghost Gum), with an understory of acacia and grasses, which remains largely intact. Agricultural disturbances to the natural vegetation are limited to stock routes, access roads, watering holes, and fencelines

Image 09 Native grazing

LANDSCAPE CHARACTER UNIT	KEY LANDSCAPE FEATURES (dominant features within this zone)	KEY VIEWPOINTS		Application of Scenic Quality Rating Frame of Reference							SCENIC QUALITY RATING
				Landform	Waterform	Vegetation	Human Influence	Activity	Rarity	Relationship with Adjoining Landscapes	
LCU03 - Rural	Low open eucalyptus woodlands	Burke Development Road	H								LOW
			M								
			L								

Table 07 LCU03 - State Forests & Vegetated Hills

06 Viewpoint Analysis

6.0 Viewpoint Analysis

6.1 Viewpoint Analysis Methodology

The viewpoint analysis considers the likely visual impacts of the Project on the existing landscape character and visual amenity by selecting prominent sites, otherwise referred to as viewpoints.

Once the viewpoints have been selected, panoramic photographs are taken on a level tripod at a height of 150 cm (to represent eye level). Photographs were taken with a Canon EOS R5 Mirrorless Camera through a 50 mm fixed-focal lens, which closely represents the central field of vision of the human eye.

To ensure accuracy, the viewpoints' visual impact and topographic and aerial information are assessed on-site. The potential visual impacts are analysed for each viewpoint through a combination of 3D terrain modelling, topographic maps, and on-site analysis. Viewpoint photographs and analysis have been included in the following pages. The findings of the viewpoint analysis have been quantified and are summarised in **Table 09**.

6.2 Viewpoint Selection Process

Figure 15 identifies the locations of the viewpoints. Each viewpoint sheet notes the direction of the viewpoints. Topographical maps, fieldwork observations, and other relevant influences, such as access, landscape character, and the popularity of vantage points, have informed the selection of the viewpoints.

Eight (8) viewpoints were selected from locations to represent a range of views surrounding the Micrositing Corridor.

Viewpoints are selected to illustrate a combination of the following:

- Areas of high landscape or scenic value.
- Visual composition (e.g. focused or panoramic views, simple or complex landscape patterns).
- Range of distances.
- Varying aspects.
- Various elevations.
- Various extents of development visibility (full and partial visibility).
- Views from major routes.

6.3 Viewpoint Analysis Methodology

The potential visual impact of the Project is then assessed based on the relationship between the visual sensitivity (refer to **Section 6.3.1**) and visual magnitude (refer to **Section 6.3.2**).

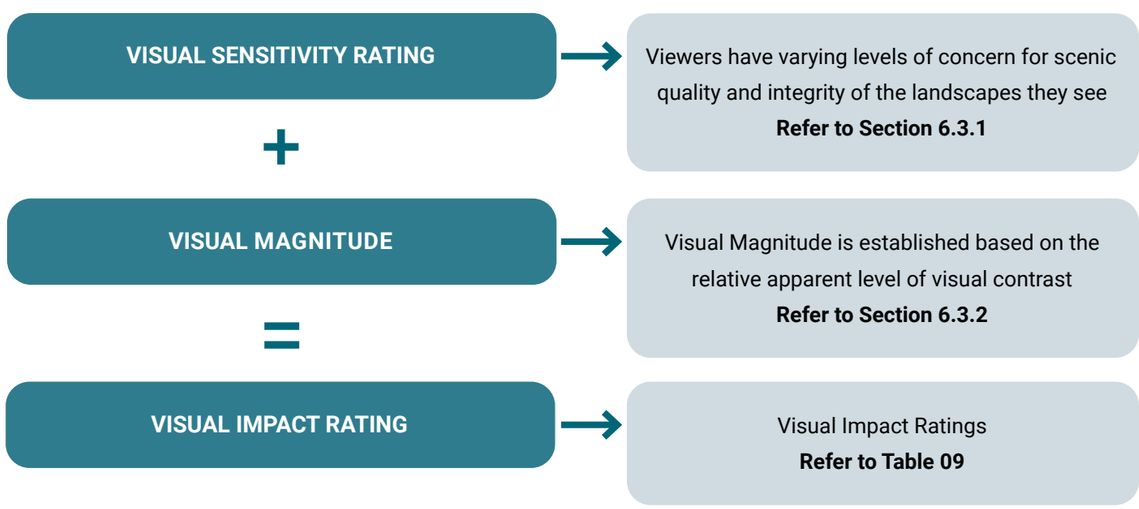


Figure 14 Viewpoint Analysis Methodology

6.3.1 Visual Sensitivity

Visual sensitivity measures how critically people from different areas view a change to the existing landscape. The assessment is based on the number of people affected, land use, and the viewer's distance from the proposal. As **Section 5.1** outlines, the scenic quality of the receptor has also been considered when determining the visual sensitivity.

For example, a significant change not frequently seen may result in low visual sensitivity, although its impact on a landscape may be high. Generally, the following principles apply:

- Visual sensitivity decreases as the viewing time decreases.
- Visual sensitivity decreases as the number of potential viewers decreases.
- Visual sensitivity can also be related to viewer activity (e.g. a person viewing an affected site whilst engaged in recreational activities will be more strongly affected by change than someone passing a scene in a car travelling to a desired destination).

6.3.2 Visual Magnitude

Visual Magnitude refers to the extent of change that receptors will experience. The objective ways of measuring and assessing the magnitude of change are determined by the combination of these factors identified below. These factors include:

- **Size and scale** - including the extent of existing landscape elements that may be lost and the contribution of that element to the character of the landscape;
- The **extent** to which the development becomes a minor or major element in the landscape and its **dominance** in the visual catchment;
- The extent to which the development changes the key characteristics of the landscape, which are critical to its distinctive character;
- The geographic area of the landscape over which the effects will be experienced. This could vary from the immediate setting of the development to larger scales where the development may influence several landscape character units;
- The **duration** and **reversibility** of the effects on the landscape; and/or
- The level of **contrast** and **compatibility**

6.3.3 Visual Impact

Visual Impact refers to the change in the landscape appearance due to the Project. Visual impact is the combined effect of Visual Sensitivity and Visual Magnitude (refer to **Table 08**).

This process involves a qualitative assessment of the conclusions of visual impact ratings for each viewpoint. The analysis considers other relevant influencing factors that are not easily addressed through the quantitative analysis.

Visual Impact				
		SENSITIVITY		
		LOW	MODERATE	HIGH
MAGNITUDE	HIGH	MODERATE	HIGH-MODERATE	HIGH
	MODERATE	MODERATE-LOW	MODERATE	HIGH-MODERATE
	LOW	LOW	MODERATE-LOW	MODERATE

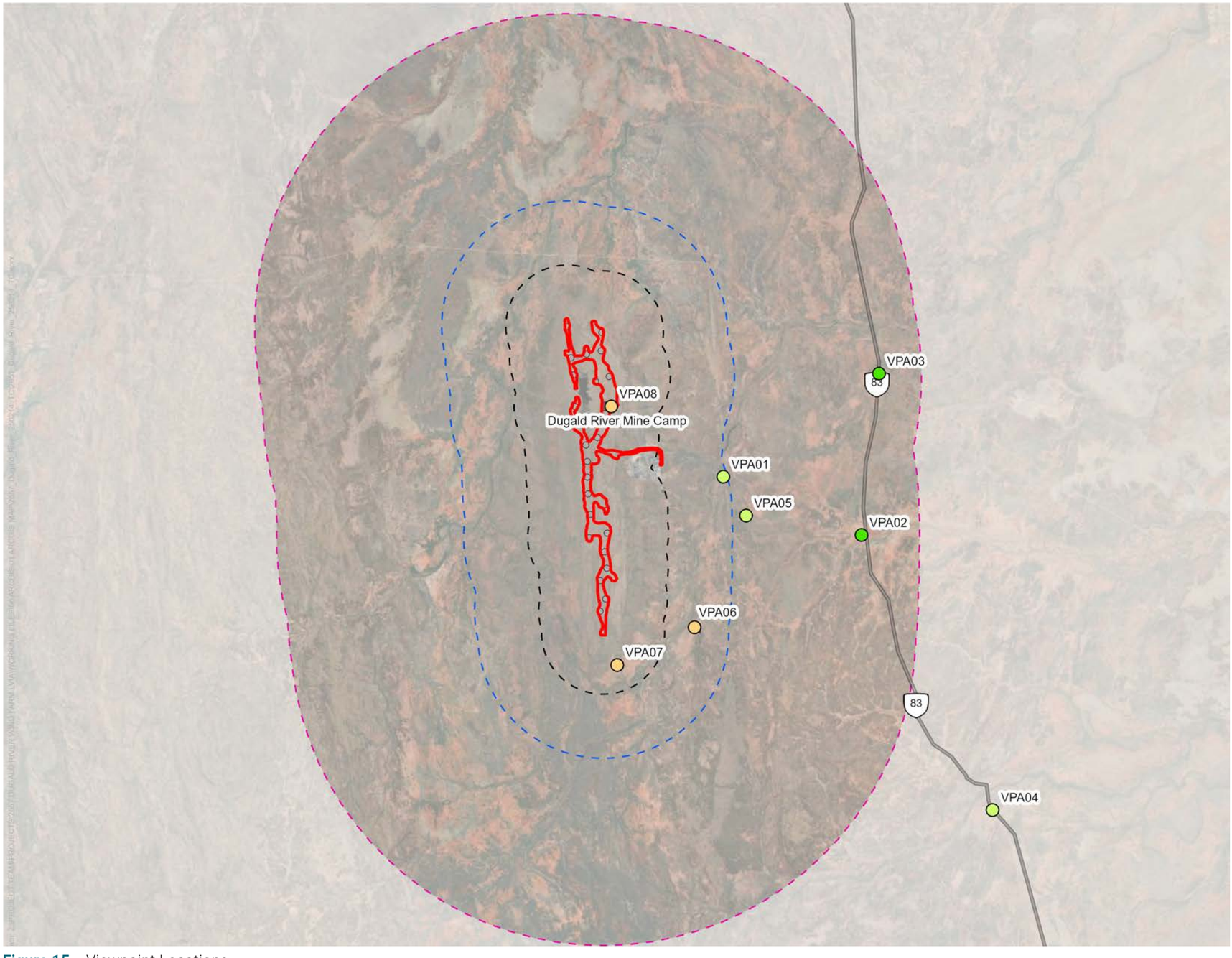
Table 08 Visual Impact Rating

6.4 Summary of Viewpoint Analysis

The viewpoint analysis determined that two (2) viewpoints have a LOW visual impact, three (3) viewpoints have a MODERATE-LOW visual impact, three (3) viewpoints have a MODERATE visual impact,

Results of the Viewpoint Analysis					
Viewpoint	**Location**	**Distance to Nearest WTG**	**Visual Sensitivity**	**Visual Magnitude**	**Visual Impact Rating**
VP01	Dugald River Mine Access Road	2.43 km	LOW	MODERATE	**MODERATE-LOW**
VP02	Burke Development Road	8.25 km	LOW	LOW	**LOW**
VP03	Burke Development Road	9 km	LOW	LOW	**LOW**
VP04	Quamby Rest Area	16.57 km	MODERATE	LOW	**MODERATE-LOW**
VP05	Dugald River Mine Access Road	3.82 km	LOW	MODERATE	**MODERATE-LOW**
VP06	McMillan Residence	3.46 km	HIGH	LOW	**MODERATE**
VP07	Mine Maintenance Road	1.25 km	LOW	HIGH	**MODERATE**
VP08	Dugald River Mine Camp	1 km	HIGH	LOW	**MODERATE**

Table 09 Results of the Viewpoint Analysis



Viewpoint Locations

Refer to 6.4

LEGEND

- Viewpoint - Moderate Visual Impact
- Viewpoint - Moderate-low Visual Impact
- Viewpoint - Low Visual Impact
- Micrositing Corridor
- Recievers
- WTG
- Visual Catchment (2.4 Km from WTGs)
- Visual Catchment (4.9 Km from WTGs)
- Study Area (12.2 Km from WTGs)

0 1 2 4 6 km

Figure 15 Viewpoint Locations
Basemap Source - ESRI, 2024

Viewpoint:
VP01 Dugald River Mine Access Road

Extent of Potential Visibility

Aerial Source: Google Earth, 2023

Viewpoint Summary:	
Location:	Elevation:
Access Road, Three Rivers, QLD	189 m
Coordinates:	Distance to Project:
20°15'14.39"S 140°10'59.28"E	2.43 km
Viewing Direction:	
West	
Visual Sensitivity:	
LOW	
Visual Magnitude:	
MODERATE	
Visual Impact:	
MODERATE-LOW	

Extent of Panorama

Approximate Extent of Project

Existing Landscape Character Description:

This viewpoint is situated along the Dugald River Mine access road, about 300 m east of the Dugald River.

The surrounding landscape features gently rolling terrain with low open woodlands, primarily used for native grazing. In the distance, the escarpment on the Micrositing Corridor is visible. The road is used by vehicles servicing the Dugald River Mine.

The visual sensitivity of this viewpoint has been assessed as **LOW**

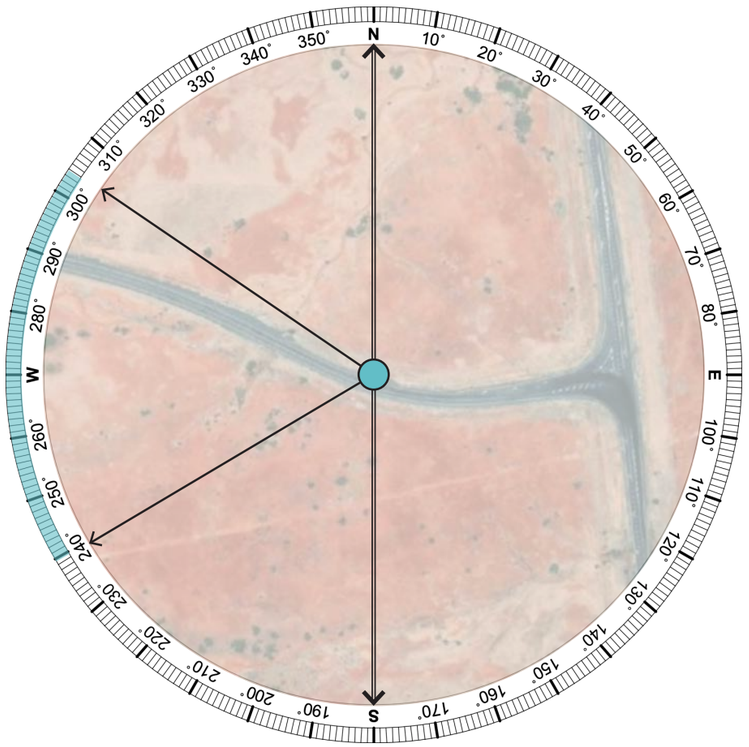
Potential Visual Impact:

The distance and visibility of the Project on the escarpment result in a **MODERATE** magnitude of visual change, leading to an overall **MODERATE-LOW** visual impact.

VP Location

Viewpoint:
VP02 Burke Development Road intersection with Access Road

Extent of Potential Visibility



Viewpoint Summary:	
Location:	Elevation:
Burke Development Road, Three Rivers, QLD	190 m
Coordinates:	Distance to Project:
20°16'29.06"S 140°14'4.73"E	8.25 km
Viewing Direction:	
West	
Visual Sensitivity:	
LOW	
Visual Magnitude:	
LOW	
Visual Impact:	
LOW	

Extent of Panorama

Approximate Extent of Project

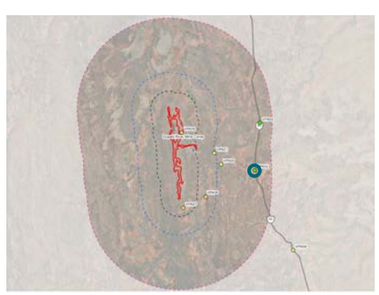
Aerial Source: Google Earth, 2023

Existing Landscape Character Description:

This viewpoint is located at the intersection of the Burke Development Road and the Dugald River Mine Access Road. These roads are primarily used by mining vehicles.

The surrounding landscape consists of cattle grazing paddocks with scattered low native trees. In the background, towards the DRM, the vegetation appears denser.

The visual sensitivity of this viewpoint has been rated as **LOW**



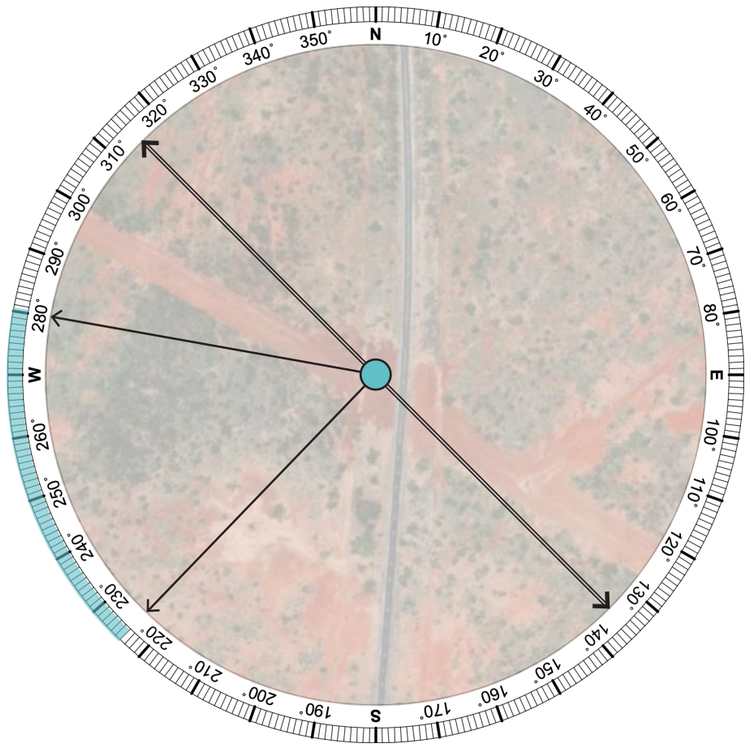
VP Location

Potential Visual Impact:

The distance and intervening vegetation beyond the paddocks make the visual magnitude of change **LOW,** resulting in an overall **LOW** visual impact

Viewpoint:
VP03 Burke Development Road

Extent of Potential Visibility



Viewpoint Summary:	
Location:	Elevation:
Burke Development Road, Three Rivers, QLD	183 m
Coordinates:	Distance to Project:
20°13'4.37"S 140°14'29.13"E	9 km
Viewing Direction:	
Southwest	
Visual Sensitivity:	
LOW	
Visual Magnitude:	
LOW	
Visual Impact:	
LOW	

Extent of Panorama

Approximate Extent of Project

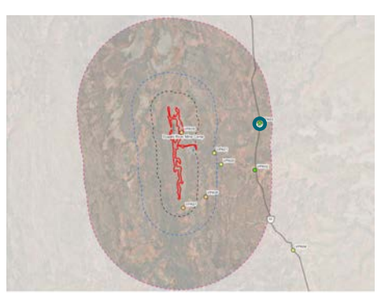
Aerial Source: Google Earth, 2023

Existing Landscape Character Description:

This viewpoint is located along the Burke Development Road. While the road has some minor tourist use, it is primarily used for servicing the region's mines and cattle properties.

Scattered low eucalyptus woodlands line the road. The cleared area in the foreground is an access road servicing the Lake Julies pipeline.

The visual sensitivity of this viewpoint has been rated as LOW.



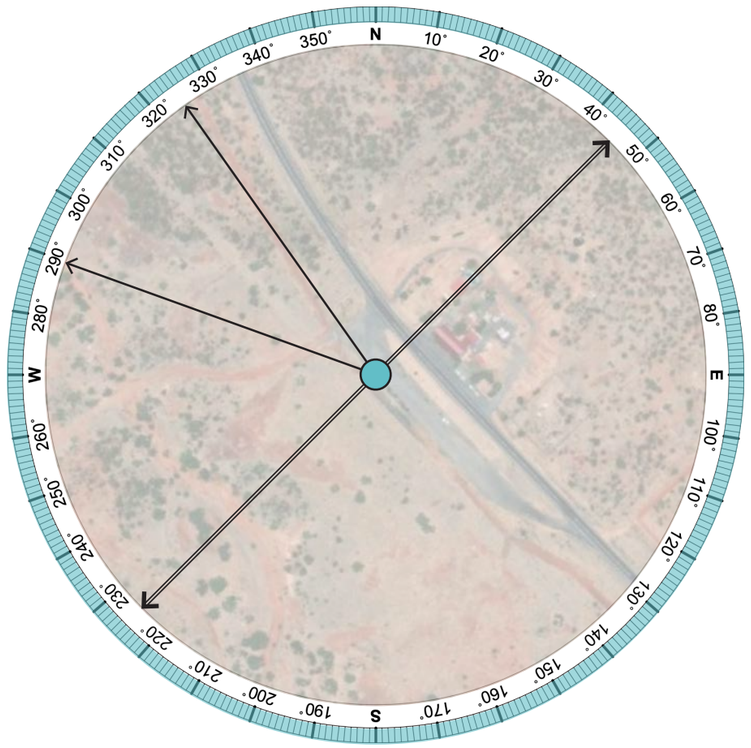
VP Location

Potential Visual Impact:

The topography and vegetation limit visibility of the escarpment of the Project site. This results in a **LOW** magnitude of change and an overall **LOW** visual impact.

Viewpoint:
VP04 Quamby Rest Area

Extent of Potential Visibility



Viewpoint Summary:	
Location:	Elevation:
Quamby Rest Area, Quamby QLD	184 m
Coordinates:	Distance to Project:
20°22'18.33"S 140°16'59.48"E	16.57 km
Viewing Direction:	
Northwest	
Visual Sensitivity:	
MODERATE	
Visual Magnitude:	
LOW	
Visual Impact:	
MODERATE LOW	

Extent of Panorama

Approximate Extent of Project

Aerial Source: Google Earth, 2023

Existing Landscape Character Description:

This viewpoint is located at the Quamby Rest Area along the Burke Development Road, adjacent to the Quamby Pub.

The surrounding land consists of cattle grazing paddocks, with transmission lines and facilities associated with the pub and accommodation across the road. Dense woodland vegetation is present int he background.

The visual sensitivity of this viewpoint has been rated as **MODERATE**

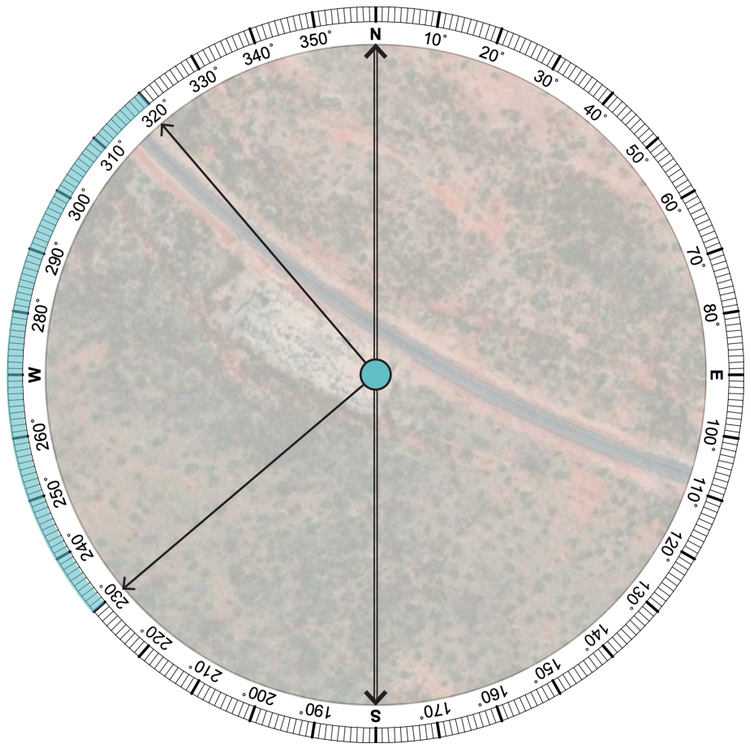
VP Location

Potential Visual Impact:

The distance, over 16 km (outside the Micrositing Corridor), and the intervening vegetation in the background result in a **LOW** magnitude of visual change, leading to an overall **MODERATE-LOW** visual impact.

Viewpoint:
VP05 Dugald River Mine Access Road

Extent of Potential Visibility



Viewpoint Summary:	
Location:	Elevation:
Access Road, Three Rivers QLD	200 m
Coordinates:	Distance to Project:
20°16'3.56"S 140°11'29.50"E	3.82 km
Viewing Direction:	
West	
Visual Sensitivity:	
LOW	
Visual Magnitude:	
MODERATE	
Visual Impact:	
MODERATE-LOW	

Extent of Panorama

Approximate Extent of Project

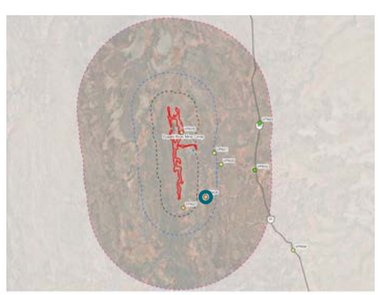
Aerial Source: Google Earth, 2023

Existing Landscape Character Description:

This viewpoint is located halfway along the mine access road, 3.8 km from DRM.

In the foreground, low shrubs cover what appears to be an abandoned laydown area. More dense woodland vegetation is present in both the foreground and background. The vegetation consists of regrowth following a fire event.

The visual sensitivity of this viewpoint has been rated as LOW.



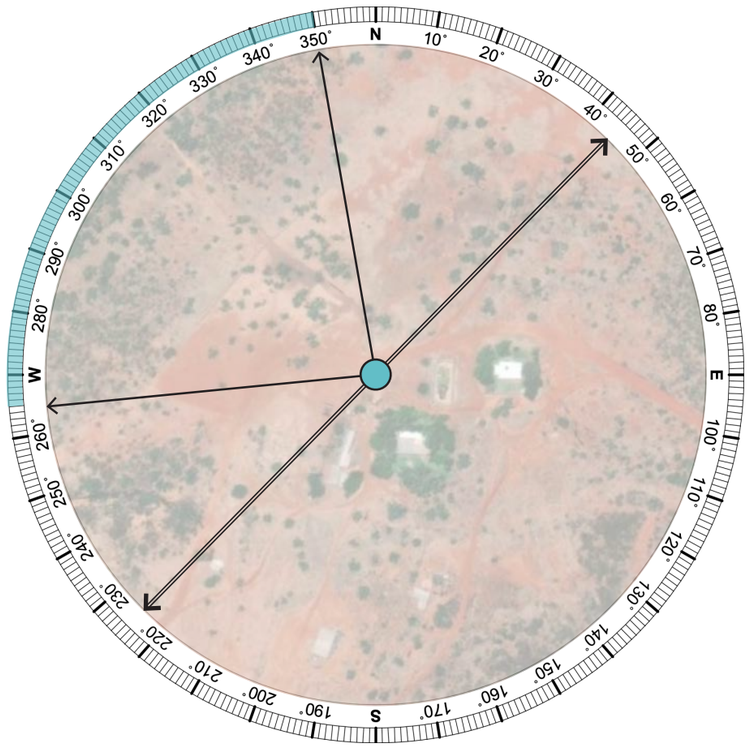
VP Location

Potential Visual Impact:

The close proximity to the Project and visibility of the escarpment in the background result in a **MODERATE** magnitude of change. Overall, the visual impact is rated as **MODERATE-LOW**.

Viewpoint:
VP06 McMillan Residence

Extent of Potential Visibility



Viewpoint Summary:	
Location:	Elevation:
McMillan Residence, Three Rivers, QLD	198 m
Coordinates:	Distance to Project:
20°18'25.02"S 140°10'19.52"E	3.46 km
Viewing Direction:	
Northwest	
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
LOW	
Visual Impact:	
MODERATE	

Extent of Panorama

Approximate Extent of Project

Aerial Source: Google Earth, 2023

Existing Landscape Character Description:

This viewpoint is located at the McMillan Residence, approximately 3.5 km from the Project site. It's important to note that this represents a conservative estimate of visibility—due to the dense screening vegetation surrounding the residence, it is likely that no views of the project site will be visible from the dwelling.

The surrounding land is flat, consisting of cattle grazing pastures, a wind mill, and scattered vegetation within the paddocks. In the background, the vegetation becomes denser.

The visual sensitivity of this viewpoint has been rated as **HIGH**

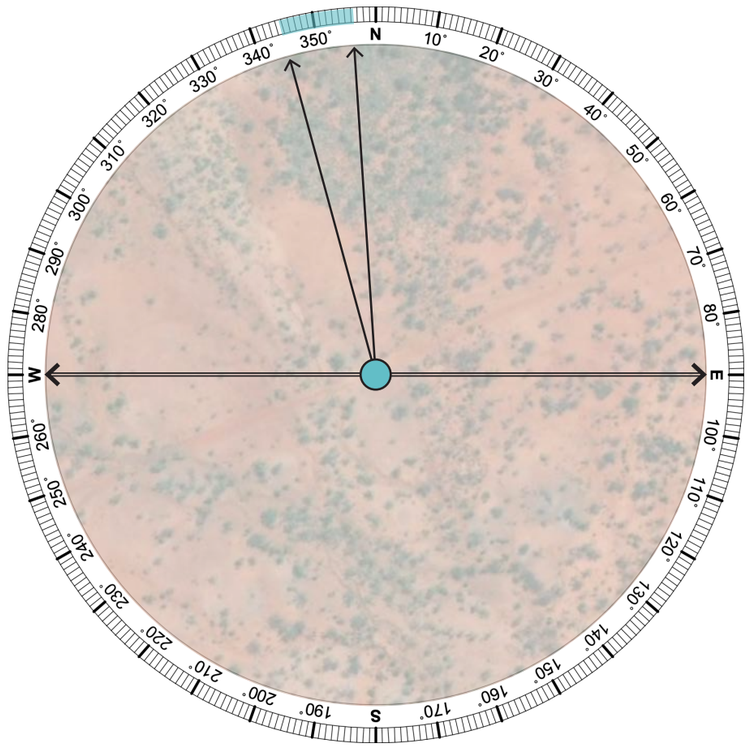
VP Location

Potential Visual Impact:

Due to the existing windmill on site and the intervening vegetation, the magnitude of change has been rated as **LOW**, resulting in an overall **MODERATE** visual impact.

Viewpoint:
VP07 Mine Maintenance Road

Extent of Potential Visibility



Viewpoint Summary:	
Location:	Elevation:
Maintenance Road, Three Rivers, QLD	205 m
Coordinates:	Distance to Project:
20°19'12.15"S 140° 8'35.51"E	1.25 km
Viewing Direction:	
North	
Visual Sensitivity:	
LOW	
Visual Magnitude:	
HIGH	
Visual Impact:	
MODERATE	

Extent of Panorama

Approximate Extent of Project

Aerial Source: Google Earth, 2023

Existing Landscape Character Description:

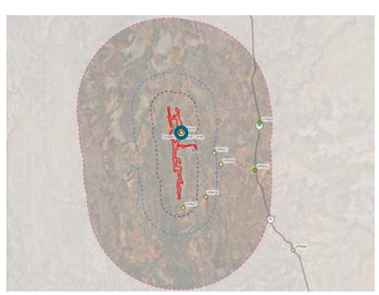
This viewpoint is located along the mine maintenance road to the south of the Project. This road is not accessible to the public and is used only by mine and farming vehicles.

The landscape is flat, consisting of low open woodlands typical of the area. In the background, the escarpment of the Micrositing Corridor is visible.

The visual sensitivity of this viewpoint has been rated as **LOW**.

Potential Visual Impact:

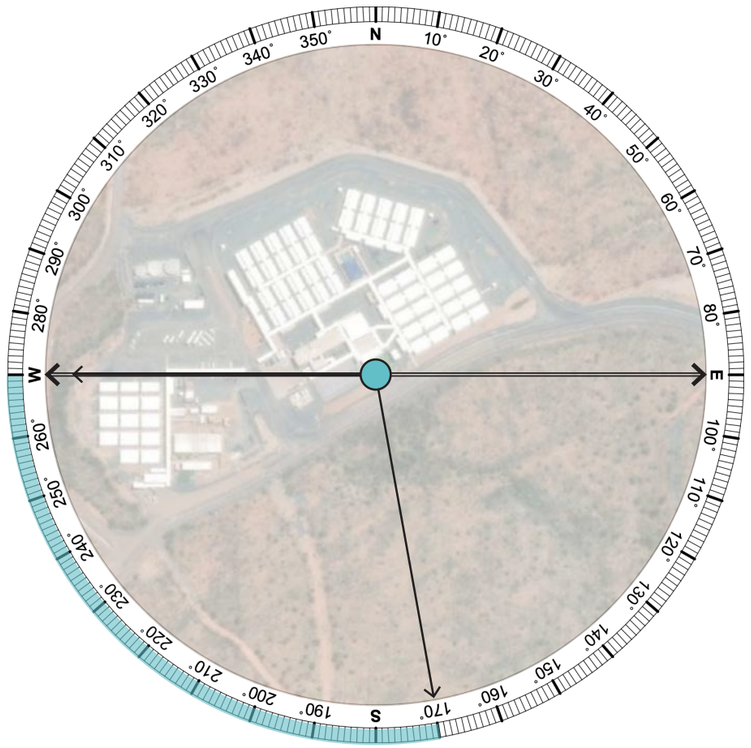
The close proximity to the Micrositing Corridor a and the open nature of the woodland vegetation result in a **HIGH** visual magnitude of change. Overall, this leads to a **MODERATE** visual impact rating for this viewpoint.



VP Location

Viewpoint:
VP08 Dugald River Mine Camp

Extent of Potential Visibility



Viewpoint Summary:	
Location:	Elevation:
Dugald River Mine Camp, Three Rivers, QLD	290 m
Coordinates:	Distance to Project:
20°13'44.26"S 140° 8'29.29"E	1 km
Viewing Direction:	
South	
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
LOW	
Visual Impact:	
MODERATE	

Extent of Panorama

Approximate Extent of Project

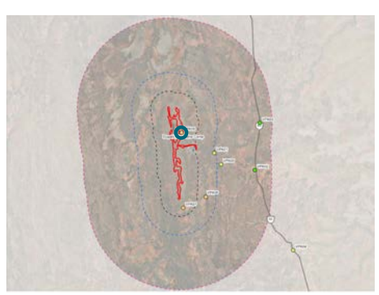
Aerial Source: Google Earth, 2023

Existing Landscape Character Description:

This viewpoint is located at the top of the Micrositing Corridor's escarpment, at the Dugald River Mine Accommodation Camp.

The surrounding landscape consists of dense woodland vegetation and a communication tower. Additional facilities for the mining accommodation are present, including a basketball court and bar.

The visual sensitivity of this viewpoint has been rated as **HIGH**



VP Location

Potential Visual Impact:

The existing large communication tower and the small visual extent result in a **LOW** visual magnitude of change. This leads to a **MODERATE** visual impact.

07 Photomontages

7.0 Photomontages

7.1 Overview of Photomontages

7.1.1 Photomontages

The NWFG define a photomontage as a composite image made by combining elements of real imagery with 3D digitalisation (*Environment Protection and Heritage Council 2010*).

A photomontage combines a photograph of an existing view with a computer-rendered image of a proposed development. It illustrates the likely view of a proposed development as it would be seen in a photograph (not as it would appear to the human eye in the field).

Although photomontages are based on photographs of the existing landscape, they are not a substitute for visiting a viewpoint in the field. They are only one tool to aid visual assessments. They provide a two-dimensional image that can be compared with an actual view of the landscape to provide information, such as the scale and potential appearance of a proposed development.

7.1.2 Wireframe Diagrams

A wireframe is a computed image generated based on a digital terrain model that indicates the 3D shape of the landscape in combination with additional elements. It is a valuable tool in the Wind Farm LVIA process as it allows the assessor to compare the WTGs' position and scale to the existing landscape view (Scottish Natural Heritage 2017). Wireframe images are a worst

Wireframe diagrams are utilised in this LVIA to verify photomontage accuracy.

7.1.3 Photomontage Limitations

Visualisations can never provide the complete picture of potential visual impacts as they only inform the assessment process by which judgments are made. Visualisations of Wind Farms and the Project have several limitations that should be considered when using them to form a decision on a Projects visual impact.

As noted in the Visual Representation of Wind Farms Guidance (VRWFG) published by the Scottish Natural Heritage (SNH) - these include:

- A visualisation can never show precisely what the Wind Farm will look like in reality due to factors such as different lighting, weather and seasonal conditions, which vary through time and the resolution of the image;
- The images provided give a reasonable impression of the scale of the WTGs and the distance to the WTGs, however can never be 100% accurate;
- A static image cannot convey WTG movement, flicker, or the sun's reflection on the blades as they move. (Scottish Natural Heritage 2017)

7.2 Photomontage Selection Process

A total of four (4) viewpoints have been selected to prepare photomontages that best illustrate the potential appearance of the Project from varying distances and locations with differing views (refer to **Figure 17**.

Exact photomontage locations were selected following detailed analysis to represent the views with the highest magnitude of change in combination with the varying distances mentioned above. Localised screening factors such as vegetation were avoided (where possible) to ensure maximum exposure to the Project.

7.3 Photomontage Development Methodology

The process for generating the photomontages involves computer generation of a wire-frame perspective view of the Project and the topography from each viewpoint. **Figure 16** demonstrates the process of photomontage development.

The photomontages are based on Project parameters outlined in **Section 7.0**. Moir Studio has prepared the photomontages using the most current available version of Wind Pro software using the following process:

Step 1

Develop 3D Model

In Wind Pro, a detailed 3D Model of the Site is developed. The WTGs, are modelled and sited in the 3D Model to scale.

Step 2

Align Photograph and Model

The digital panorama is imported into Wind Pro, and the EXIF properties of the file are inserted automatically, defining all relevant visualisation information, such as the type of camera lens used, the field of view for panoramas, and the position and direction. Topography, control points, obstacle objects, and existing wind masts can be used as references to calibrate the camera model very precisely.

Step 3

Render Photomontage

The software calculates the sun's position based on the photograph's time and date and renders the WTG according to the specific weather conditions and the sun's position. Once rendered, detailed removal of intervening elements (such as vegetation) is undertaken to provide an accurate representation of the Project.

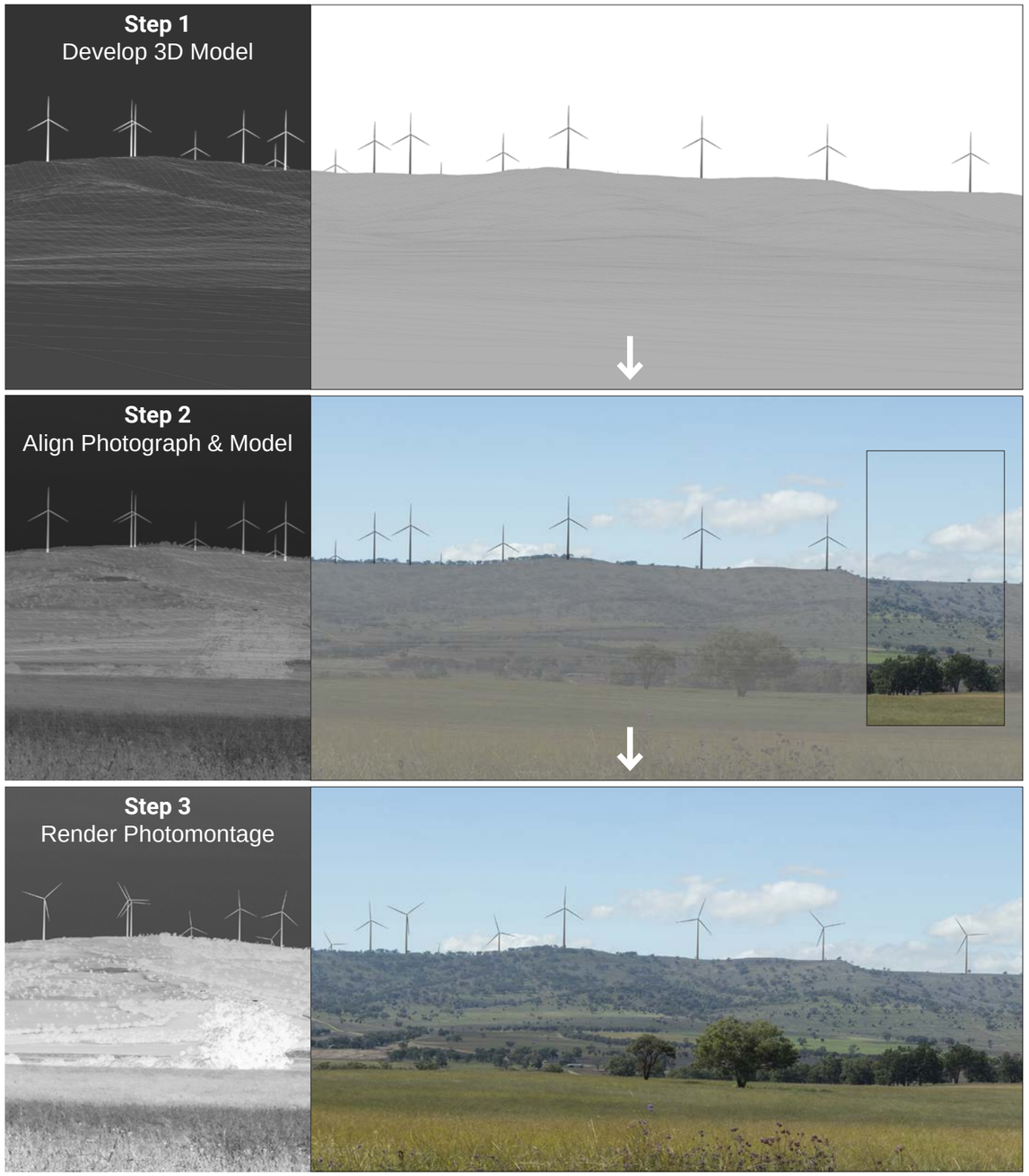
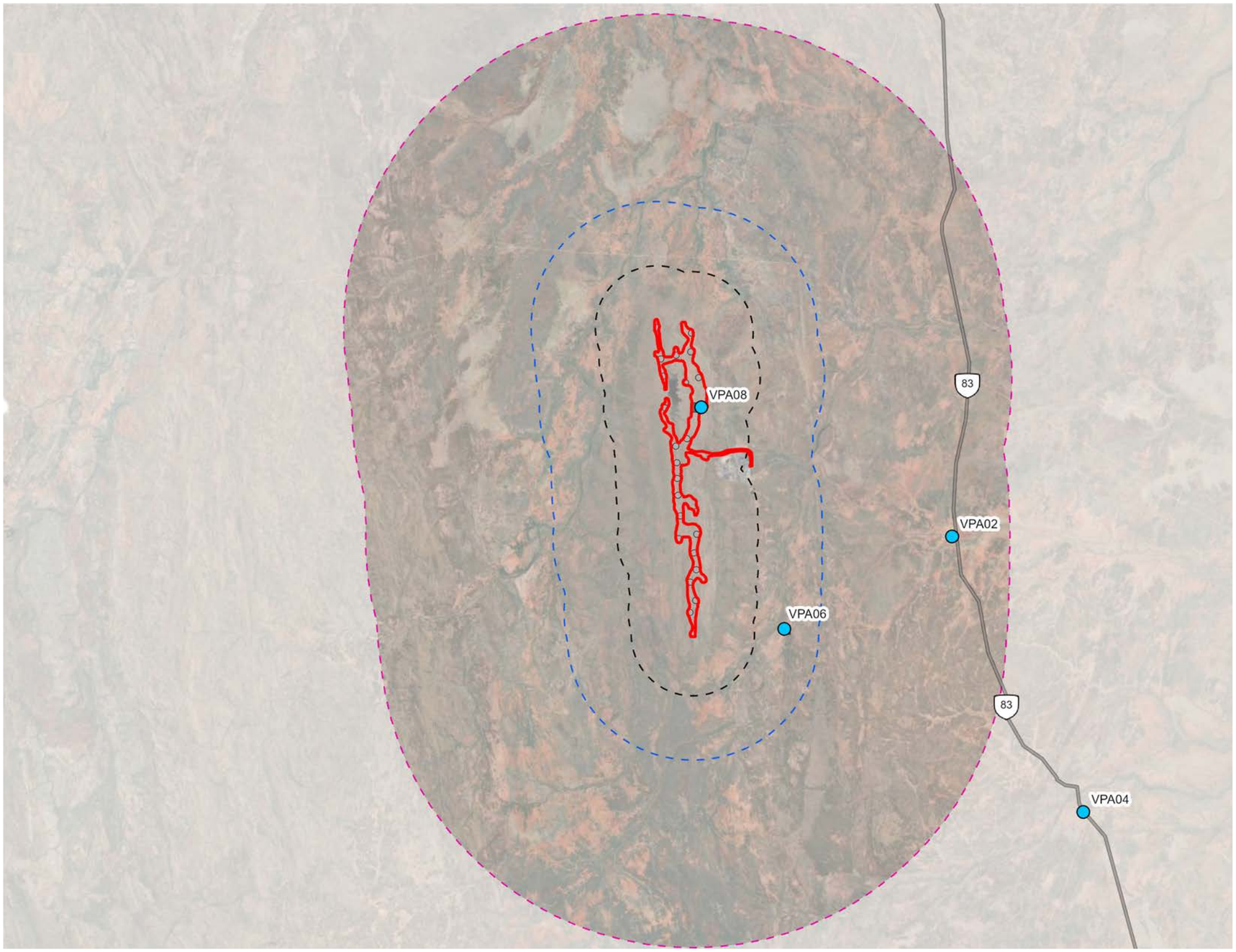


Figure 16 Photomontage Development



Photomontage Locations

Refer to 7.1

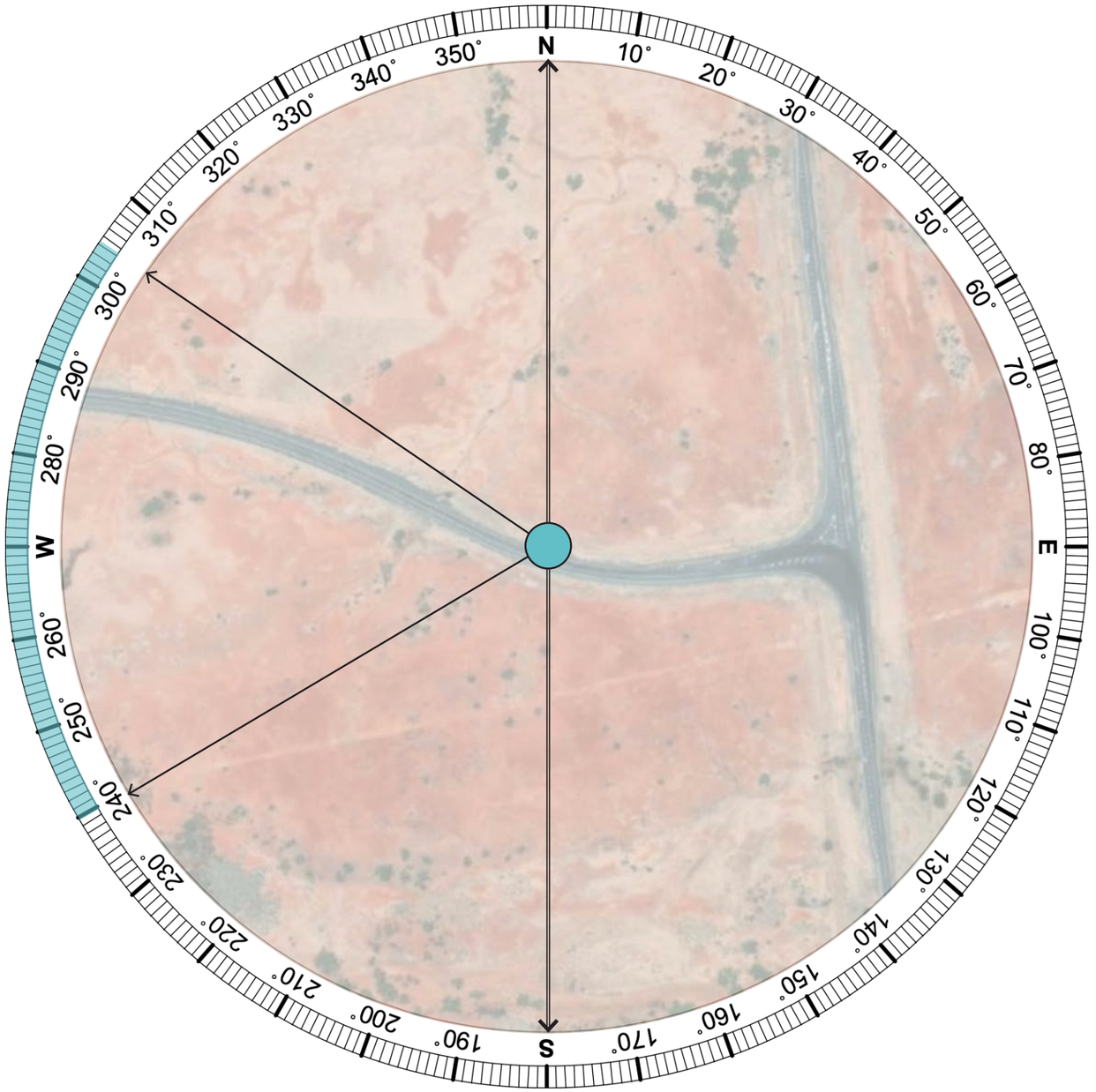
LEGEND

- Photomonatge locations
- Micrositing Corridors
- Recievers
- WTG
- Visual Catchment (2.4 Km from WTGs)
- Visual Catchment (4.9 Km from WTGs)
- Study Area (12.2 Km from WTGs)

0 1 2 4 6 km

Figure 17 Photomontage Locations
Basemap Source - ESRI, 2024

Photomontage:
PM01



Aerial Source - ESRI 2024

Summary:

Location:

Burke Development Road, Three Rivers, QLD

Coordinates:	Distance to Project:
20°16'29.06"S 140°14'4.73"E	8.25 km

Viewing Direction:	Elevation:
West	190 m

Turbine Tip Height	Turbine Hub Height
212.5 m	130 m

Viewpoint Date & Time:

25/2/2025, 2:38 PM

WTG Layout used:

DRWF Turbine locations dated 13.02.2025

Photomontage Preparation Date:

14.03.2025

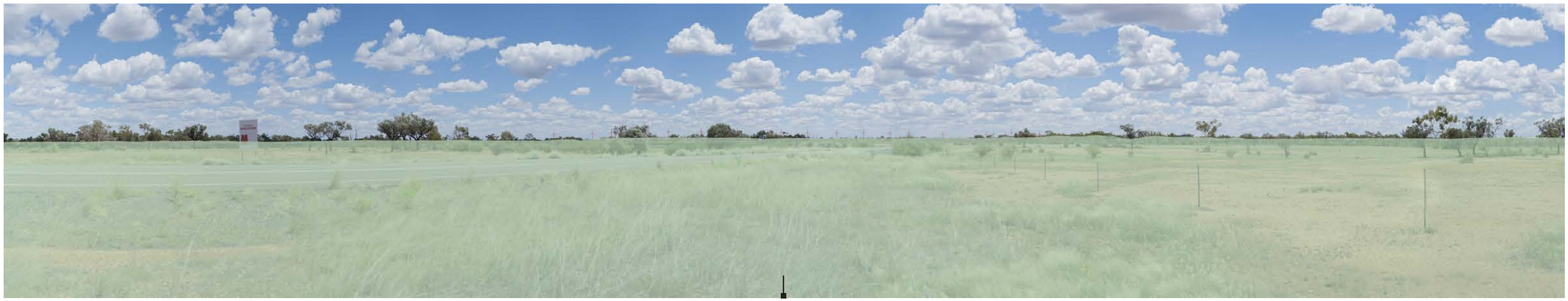
LEGEND

- Extent of Potential Visibility
- Extent of Panorama
- Approximate Extent of Project

Photomontage:

PM01 Burke Development Road , Three Rivers

180° Existing View

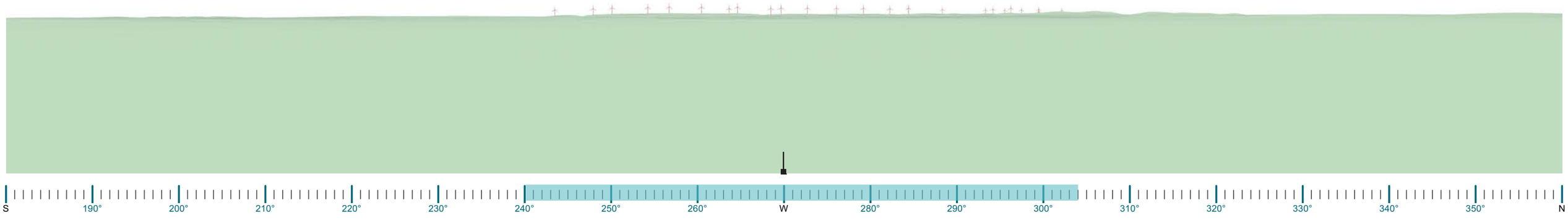


180° Proposed Overlay

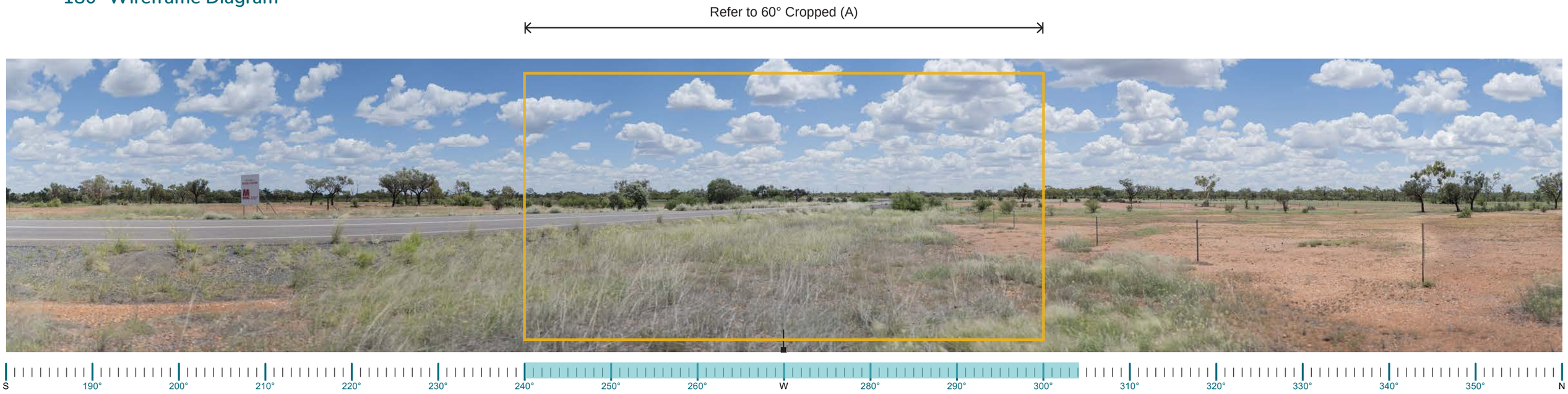
Extent of Potential Visibility

Photomontage:

PM01 Burke Development Road, Three Rivers



180° Wireframe Diagram



180° Proposed View

Extent of Potential Visibility

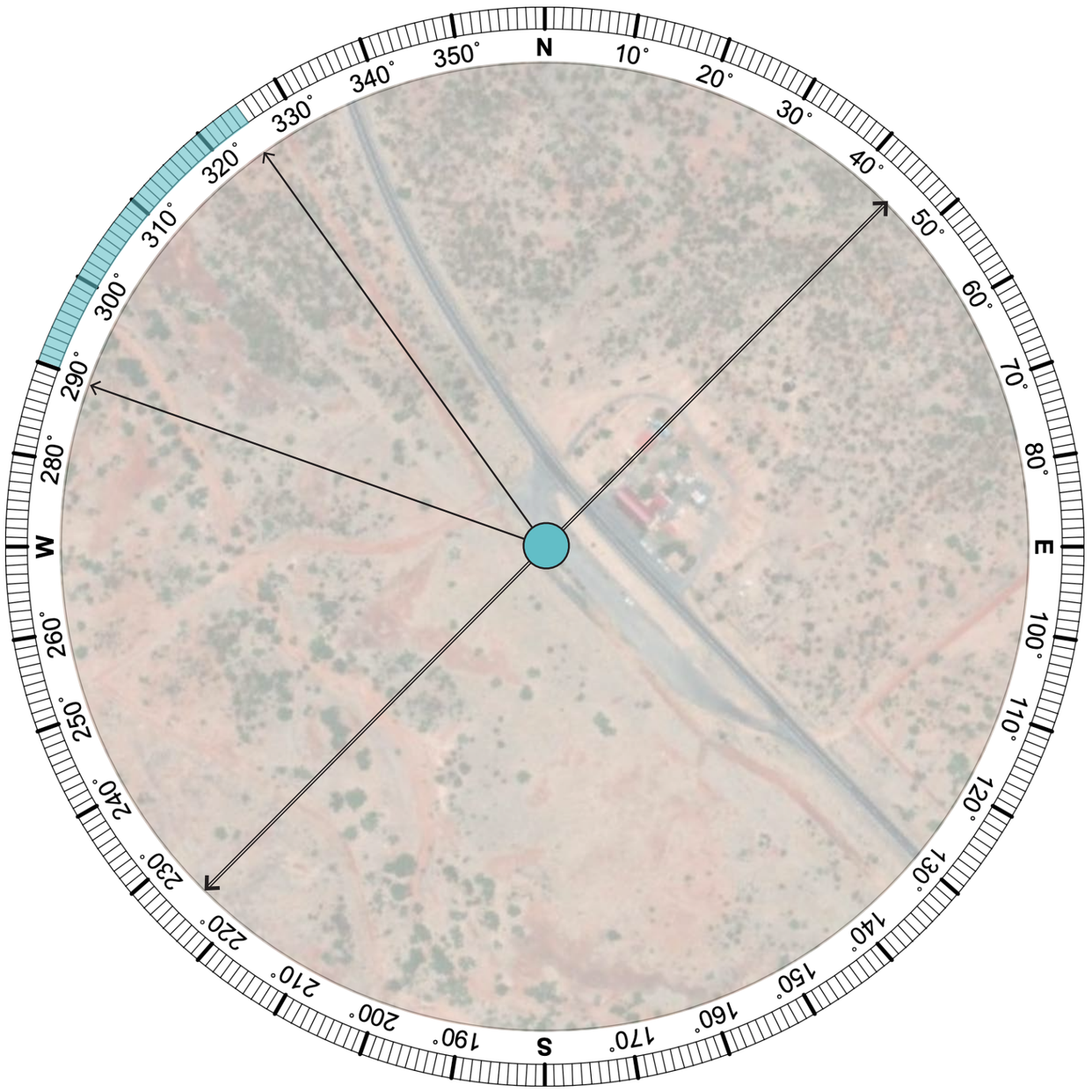
Photomontage:

PM01 Burke Development Road, Three Rivers

Proposed View | 60° Cropped (A)

Extent of Potential Visibility

Photomontage:
PM02



Aerial Source - ESRI 2024

Summary:

Location:
Quamby Rest Area,
Quamby QLD

Coordinates:	Distance to Project:
20°22'18.33"S 140°16'59.48"E	16.57 km

Viewing Direction:	Elevation:
Northwest	184 m

Turbine Tip Height	Turbine Hub Height
212.5 m	130 m

Viewpoint Date & Time:
25/2/2025, 3:11 PM

WTG Layout used:
DRWF Turbine locations
dated 13.02.2025

Photomontage Preparation Date:
14.03.2025

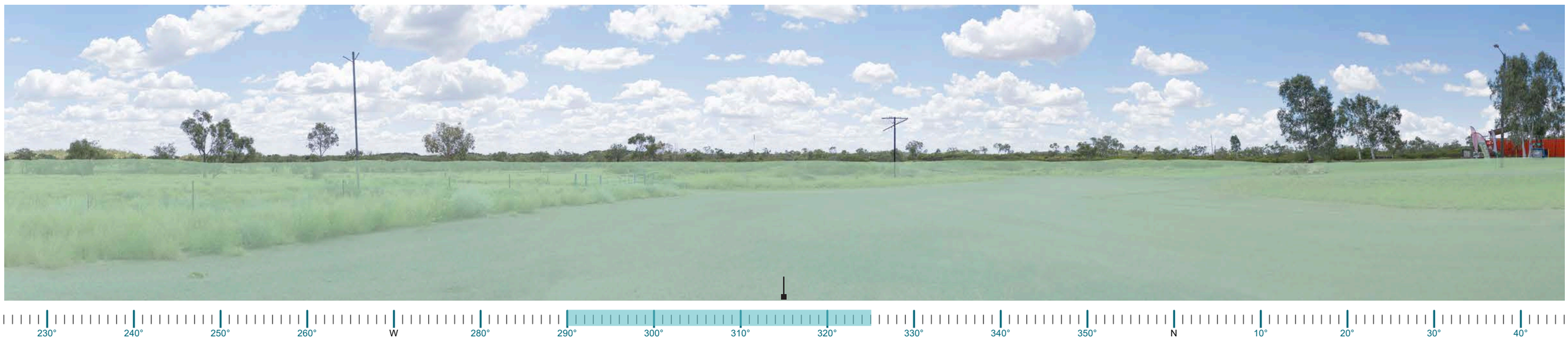
LEGEND

- Extent of Potential Visibility
- Extent of Panorama
- Approximate Extent of Project

Photomontage:

PM02 Quamby Rest Area, Quamby

180° Existing View

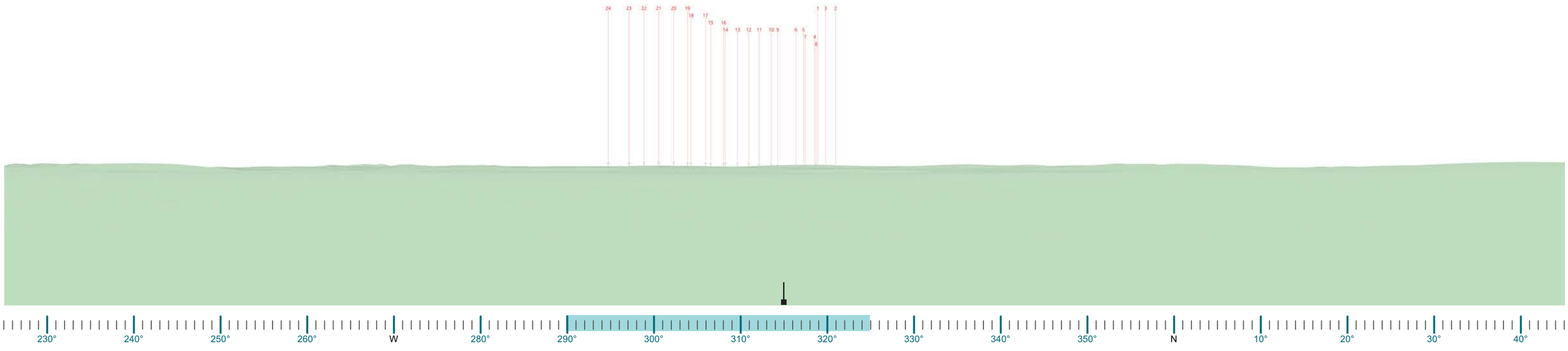


180° Proposed Overlay

Extent of Potential Visibility

Photomontage:

PM02 Quamby Rest Area, Quamby



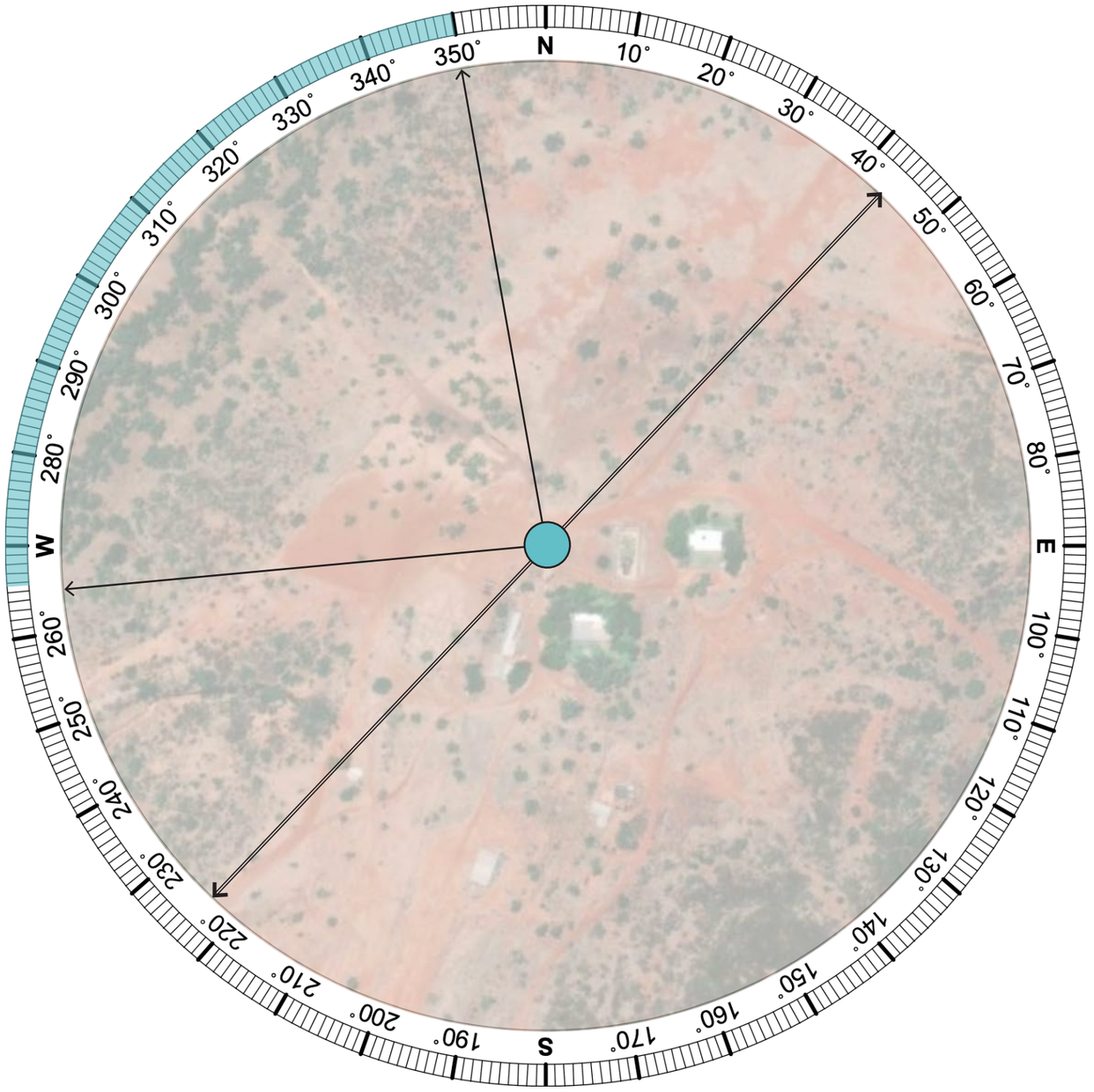
180° Wireframe Diagram

Refer to 60° Cropped (A)

180° Proposed View

Extent of Potential Visibility

Photomontage:
PM03



Aerial Source - ESRI 2024

Summary:

Location:
McMillan Residence,
Three Rivers QLD

Coordinates:	Distance to Project:
26°36'28.61"S 151° 7'28.19"E	3.46 km

Viewing Direction:	Elevation:
Northwest	198 m

Turbine Tip Height	Turbine Hub Height
212.5 m	130 m

Viewpoint Date & Time:
25/2/2025, 5:12 PM

WTG Layout used:
DRWF Turbine locations
dated 13.02.2025

Photomontage Preparation Date:
14.03.2025

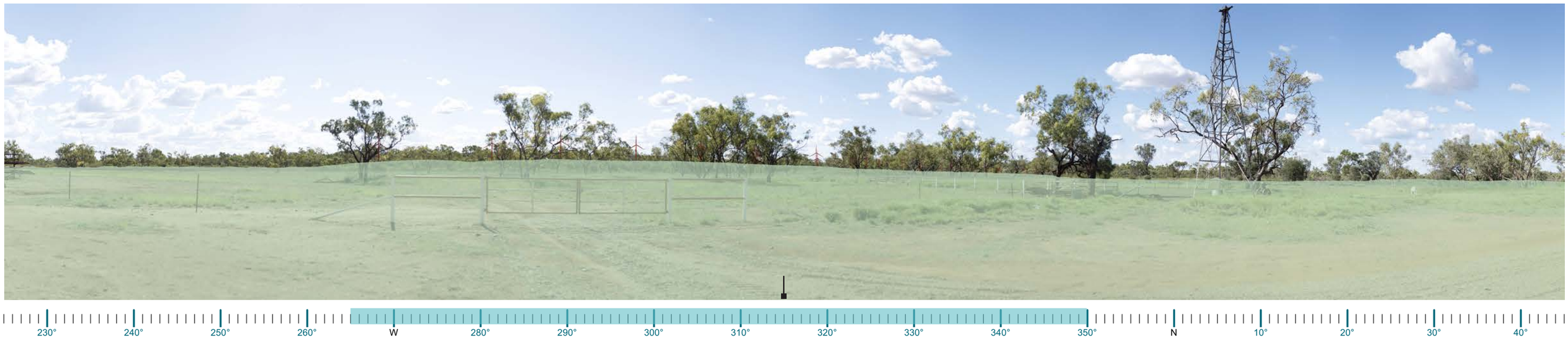
LEGEND

- Extent of Potential Visibility
- Extent of Panorama
- Approximate Extent of Project

Photomontage:

PM03 McMillan Residence, Three Rivers

180° Existing View

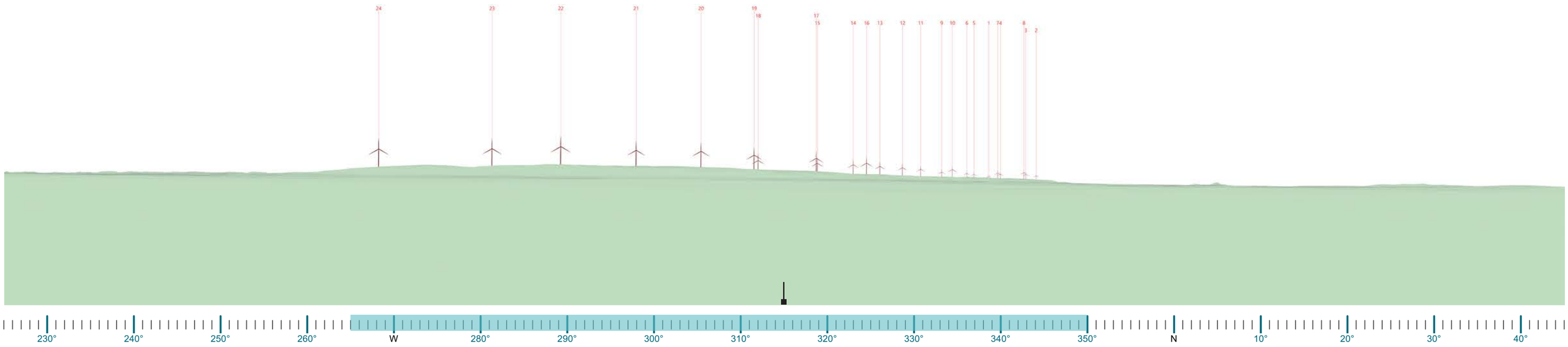


180° Proposed Overlay

Extent of Potential Visibility

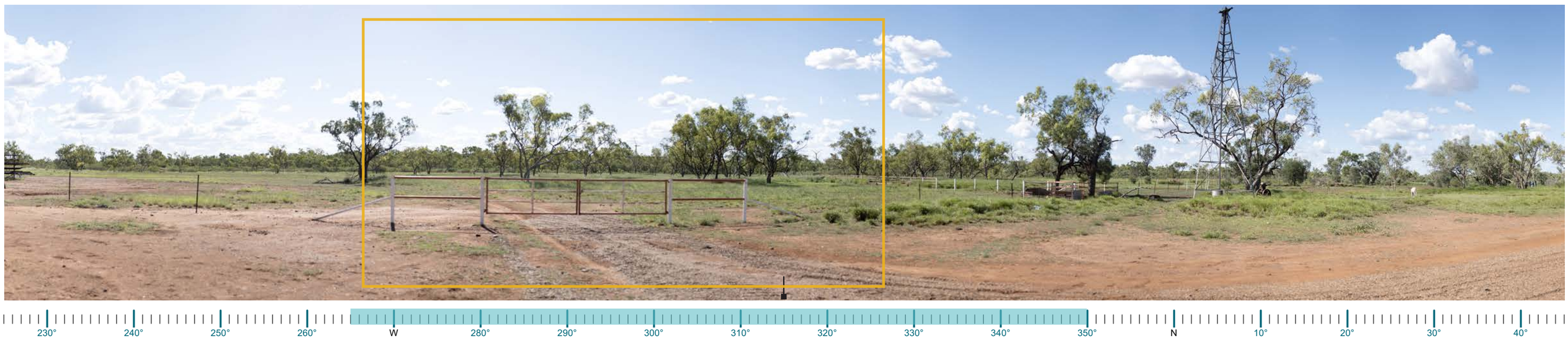
Photomontage:

PM03 McMillan Residence, Three Rivers



180° Wireframe Diagram

Refer to 60° Cropped (A)



180° Proposed View

Extent of Potential Visibility

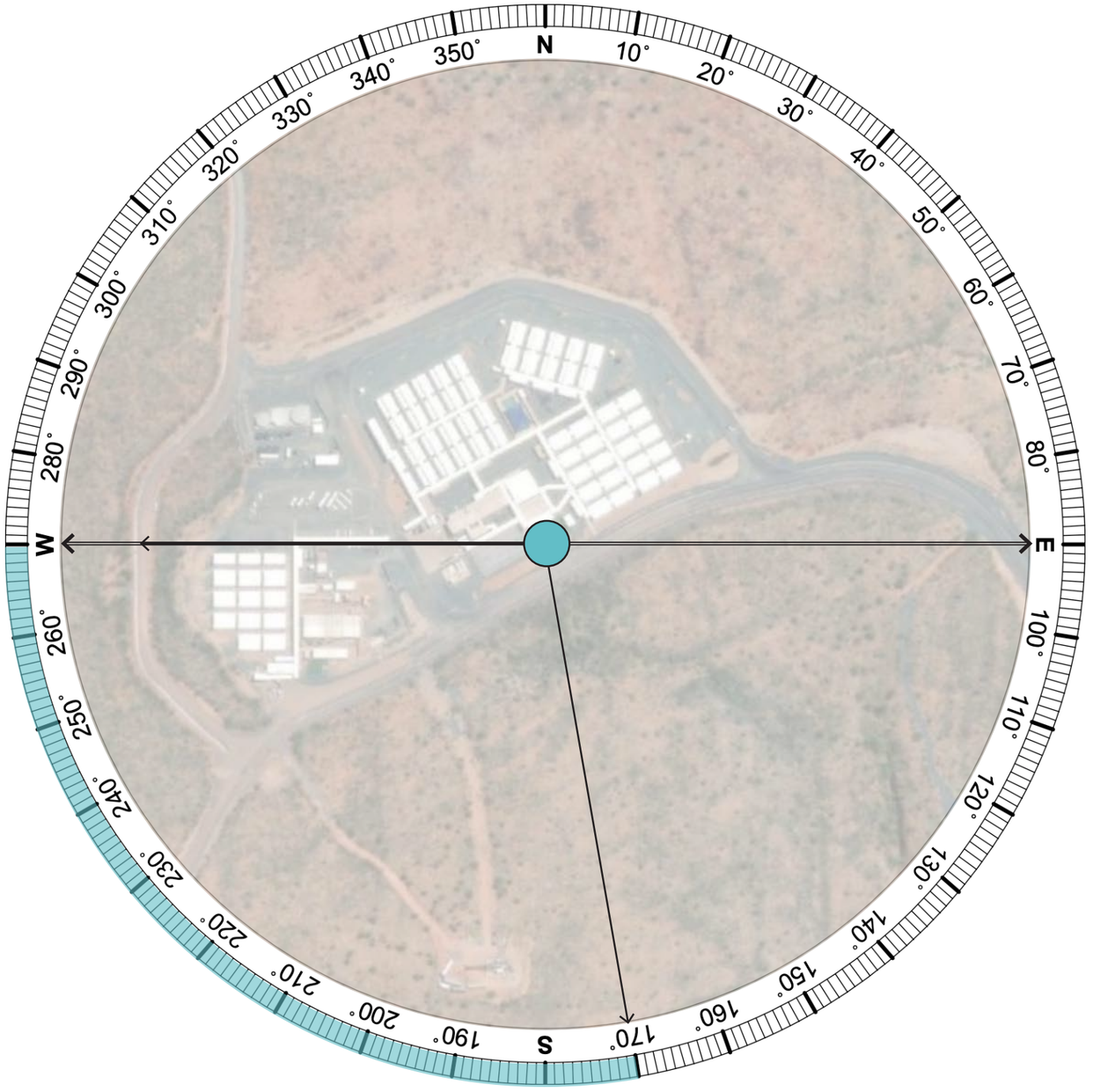
Photomontage:

PM03 McMillan Residence, Three Rivers

Proposed View | 60° Cropped (A)

Extent of Potential Visibility

Photomontage:
PM04



Aerial Source - ESRI 2024

Summary:

Location:

Dugald River Mine Camp,
Three Rivers, QLD

Coordinates:	Distance to Project:
20°13'44.26"S 140° 8'29.29"E	1 km

Viewing Direction:	Elevation:
South	290 m

Turbine Tip Height	Turbine Hub Height
212.5 m	130 m

Viewpoint Date & Time:

25/02/2025, 6:07 PM

WTG Layout used:

DRWF Turbine locations
dated 13.02.2025

Photomontage Preparation Date:

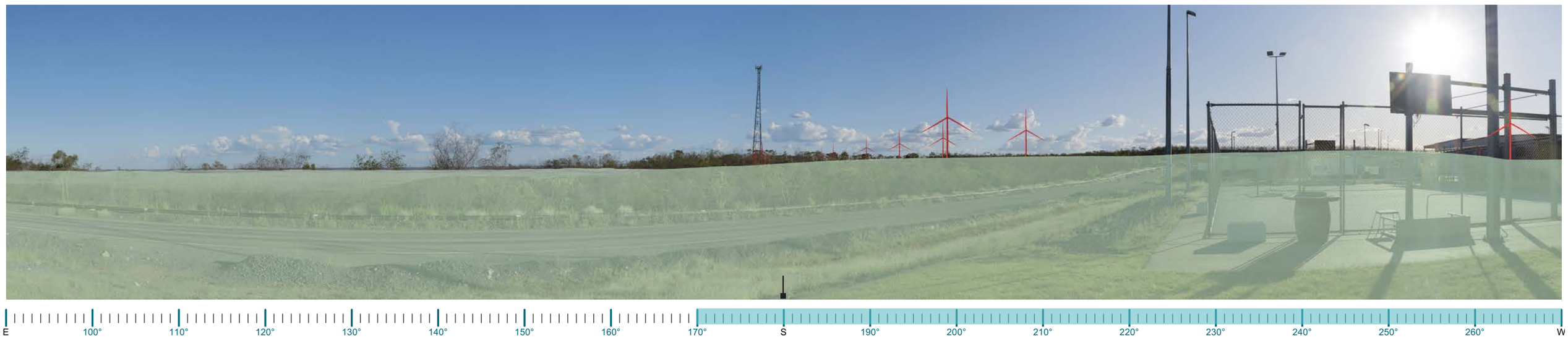
14.03.2025

LEGEND

- Extent of Potential Visibility
- Extent of Panorama
- Approximate Extent of Project

Photomontage:
PM04 Dugald River Mine Camp

180° Existing View

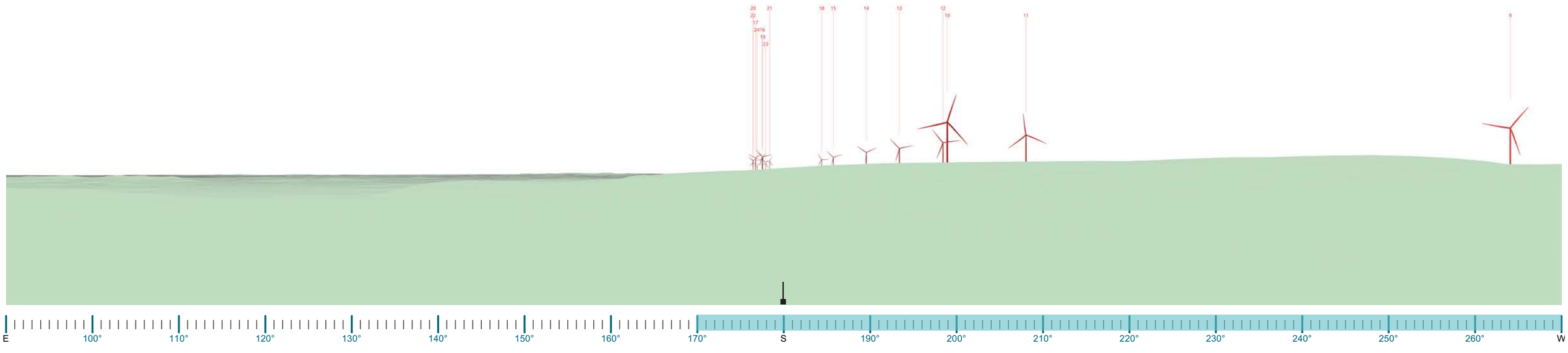


180° Proposed Overlay

Extent of Potential Visibility

Photomontage:

PM04 Dugald River Mine Camp



180° Wireframe Diagram

Refer to 60° Cropped (A)

180° Proposed View

Extent of Potential Visibility

Photomontage:

PM04 Dugald River Mine Camp

Proposed View | 60° Cropped (A)

Extent of Potential Visibility

08 Shadow Flicker Assessment

8.0 Shadow Flicker Assessment

8.1 Overview of Shadow Flicker

Shadow flicker is defined as the visual effect that occurs when rotating WTGs cause moving shadows as the blades pass in front of the sun. The effect will occur under circumstances where the WTG is located such that at certain times of day the sun's rays pass through the swept area of the rotating blades, potentially affecting the viewpoint. The effect is diminished by the distance of the viewpoint from the WTG. Shadowing is also influenced by increased cloud cover, and is dependent on the angle of the sun's rays (Draft National Wind Farm Development Guidelines, 2016).

8.2 Shadow Flicker Assessment Methodology

Moir Studio have referred to the State Code 23: Wind Farm Development Planning Guideline PO15 Shadow flicker to determine the parameters for the assessment of Shadow Flicker.

Modelling of the shadow flicker was conducted using specialist industry software (Wind Pro), assessing the largest WTG (based on a 212.5 m maximum tip height) proposed for the Project to represent the worst case impact scenario.

The parameters used for the Shadow Flicker Assessment are as follows:

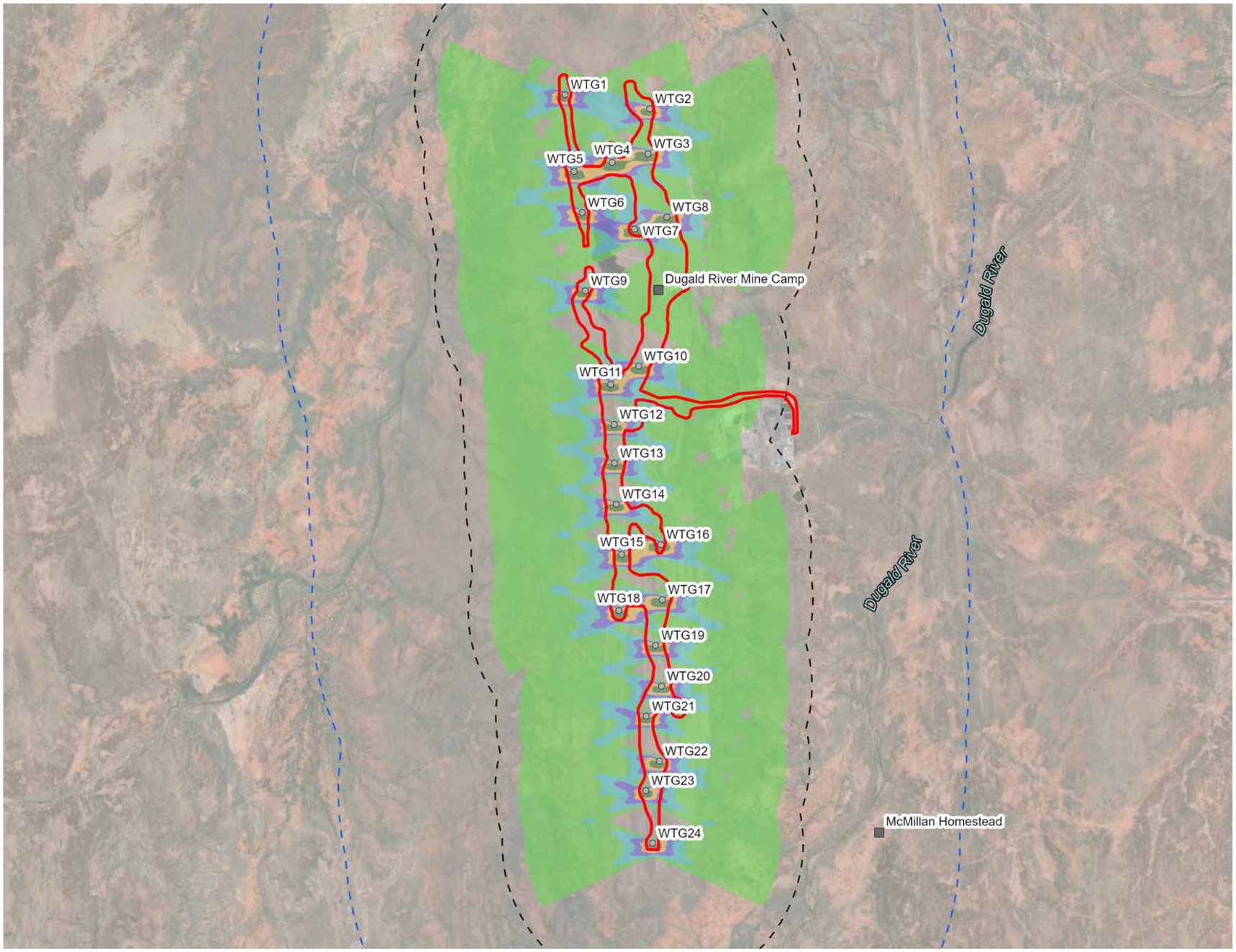
Model Parameter	Setting Used:
Zone of Visual Influence of Shadows	265 x Maximum blade chord
Minimum angle of sun	3 degrees
Shape of the sun	Disk
Time and duration of modelling	One full year
Orientation of the rotor	The rotor plane is always perpendicular to the line from the WTG to the sun
Time step	1 minute
Effects of topography	Included
Receptor Height	1.7 metres
Grid size	1 metre

It is important to note the shadow flicker modelling undertaken for the Project is based on topography alone and therefore the extent of impact may be decreased by a number of variables including:

- The aspect of the residence relative to the WTG(s) (window locations, living area locations etc);
- The extent of natural or screening vegetation between the WTG(s) and the receptor;
- The existence of other screening elements (buildings, structures etc) between the WTG(s) and the receptor;
- The time of year;
- The proportion of daylight hours in which the WTGs operate;
- The frequency of bright sunshine and cloudless skies (particularly at low elevations above the horizon).

Refer to **Figure 18** to see shadow flicker modelling

Image 10 Example of shadow flicker at base of a WTG



Shadow Flicker Assessment

Refer to Section 8.2

LEGEND

- Micrositing Corridor
- Recievers
- WTG
- Visual Catchment (2.4 Km from WTGs)
- Visual Catchment (4.9 Km from WTGs)
- Study Area (12.2 Km from WTGs)

Shadow Flicker

- 0-10 Hrs
- 10-30 Hrs
- 30-100 Hrs
- 100-500 Hrs
- 500-1000 Hrs
- 1000-2000 Hrs

Assumptions for Shadow Calculations:

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. The calculated times are "worst case" given by the following assumptions:

- The sun is shining all the day, from sunrise to sunset.
- The rotor plane is always perpendicular to the line from the WTG to the sun.
- The WTG is always operating.

0 0.75 1.5 3 km

Figure 18 Shadow Flicker Assessment
Basemap Source - ESRI, 2024

8.3 Results of Shadow Flicker Assessment on Dwellings

The Code requires that the Proponent conduct a shadow flicker assessment to identify potential impacts and outline appropriate mitigation or management measures. This assessment must address effects on existing or approved sensitive land uses and ensure that modelled blade shadow flicker impacts do not exceed 30 hours per year or 30 minutes per day. The shadow impact from WTGs is calculated based on a distance of 265 meters multiplied by the maximum blade chord length (5 meters), resulting in a radius of 1,325 meters. According to Appendix 5 of the State Code 23 (SC23) Guidelines, no assessment is required for dwellings located beyond this distance.

No receiver will exceed the maximum annual threshold of 30 hours of shadow flicker. Therefore, the project complies with the shadow flicker requirements outlined in State Code 23 (SC23) Guidelines.

8.4 Results of Shadow Flicker Assessment on Road Users

Although the SC23 Code does not specify acceptable levels of shadow flicker for road users, it is recognised that shadow flicker can potentially cause disruptions. However, no publicly used roads will be affected by shadow flicker from the project.

09 Associated Infrastructure

9.0 Associated Infrastructure

9.1 Overview of Associated Infrastructure

In addition to the proposed WTGs, the associated infrastructure (refer **Section 3.3**) has the potential to contrast with the existing visual landscape. Due to the large scale of the Project, access roads, transmission lines and other ancillary structures have the potential to alter the existing visual landscape. An overview of the potential visual impact resulting from associated infrastructure and Project components is provided below.

9.1.1 Access Roads

The construction and maintenance of the Project will require construction of access roads to provide access to WTGs. Where possible, the internal road network will be aligned on the route of existing access roads. The internal roads will be up to approximately 7.5 m wide, at this time drainage requirements have not been identified, with localised widening where required (maximum buffer of 25m) to support transportation of the WTG components.

Generally, the internal roads have been sited to reduce potential vegetation loss and limit earth work requirements. Due to the existing agricultural land use of the Micrositing Corridor, farm roads traversing the landscape form a significant part of the existing landscape character. The proposed access roads are likely to be viewed as part of the existing character of the landscape and therefore visual impact would be low.

Additional measures for reducing visual impact resulting from the construction of access roads have been considered. These include:

- Where possible utilise or upgrade existing roads, trails or tracks to provide access to the proposed WTGs to reduce the need for new roads;
- Allow for the provision for down sizing roads or restoring roads to existing condition following construction where possible;
- Any new roads must minimise cut and fill and avoid the loss of vegetation; and
- Utilise local materials where possible and practical.

9.1.2 Transmission Lines

Each of the WTGs will be connected to on-site substations via a system comprising a network of underground and overhead electrical cables. The proposed transmission infrastructure design is in keeping with the scale and appearance of existing power lines which are an existing element in the landscape.

Proposed mitigation methods to be considered during detailed design phase include:

- Where possible underground cabling is to be used to connect WTGs to the North West Power System.
- Align or co-locate new transmission lines with existing transmission lines where possible.
- The route for any proposed overhead transmission lines should be chosen to reduce visibility from surrounding areas.
- Plan route to minimise vegetation loss.
- Use of subtle colours and a low reflectivity surface treatment on power poles to ensure that glint is minimised.

Currently, the potential visual impact resulting from the transmission lines is anticipated to be low due to the existing character of the immediate visual catchment.

10 Conclusion

10.0 Conclusion

10.1 Summary.

The Project is proposed on the traditional lands of the Kalkadoon Nation, in north-western Queensland, approximately 65 kilometers north of the town of Cloncurry. The Project area is located within Local Government area and includes up to 24 WTGs with a maximum tip height of 212.5 m. Ancillary infrastructure such as access tracks, transmission lines were also accessed.

The assessment adhered to State Code 23: Wind Farm Development (2025) and other relevant guidelines, including the AILA Guidance Note for LVIA (2018), Draft National Wind Farm Development Guidelines (2010). Moir Studio's methodology was informed by quantitative analysis and fieldwork undertaken in February 2025, which established the baseline landscape character of the Project area. The regional landscape is characterised of Dugald River Mine and surrounding native grazing areas typical of outback Queensland.

Three Landscape Character Units (LCUs) were identified, all with low scenic quality. The visual impact of the Project depends on the existing landscape features, the extent of change introduced, and community perceptions. Key features such as the Dugald River Mine, undulating topography, and riparian corridors help reduce the visual prominence of the Project. Overall, the assessment found that the Project could proceed while preserving the essential visual features and landscape character.

Eight (8) viewpoints were assessed with:

- Two (2) viewpoints with a low visual impact
- Three (3) viewpoints with a moderate-low visual impact
- Three (3) viewpoints with a moderate visual impact

Photomontages for four (4) representative viewpoints illustrated that visual impacts are generally confined to areas in close proximity to the Project.

Shadow flicker assessments were conducted in line with State Code 23.. No receivers exceeded the maximum allowable hours

Ultimately, the existing landscape demonstrates the capacity to absorb the Project with a relatively low visual impact. With the implementation of recommended mitigation measures, the Project satisfies the performance objectives outlined in SC23 (PO15 and PO18) and can proceed while maintaining the area's visual character and values.

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