EAST PILBARA GENERATION HUB VISUAL IMPACT ASSESSMENT

Fortescue Limited

VIEWPORT XR

ecoscape

Revision	Author	QA Reviewer	Approved	Date
0 Draft	S Bateman	P Jordan	P Jordan	22/07/2024
1 Draft	S Bateman	P Jordan	P Jordan	23/10/2024
2 Final	S Bateman	P Jordan	P Jordan	11/11//2024

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This document should be cited as 'Ecoscape (Australia) Pty Ltd (2022) *East Pilbara Generation Hub Visual Impact Assessment'*, prepared for Fortescue Limited

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ACKNOWLEDGEMENTS

Ecoscape would like to acknowledge the Nyamal Traditional Owners, who are the Traditional Owners of the land on which the East Pilbara Generation Hub Project and surrounding landscapes are located, and acknowledge their Elders, past and present.

Ecoscape would also like to thank the following Fortescue personnel for their assistance in the preparation of this Visual Impact Assessment report:

+ Louise Dent, Senior Environmental Advisor | Social Surroundings Lead | Biodiversity and Science
+ Briana Diopenes, Environmental Advisor | Social Surroundings| Biodiversity and Science

EXECUTIVE SUMMARY

Fortescue Limited engaged Viewport XR in collaboration with Ecoscape to prepare a technical report to describe the potential visual impacts of the East Pilbara Generation Hub (EPGH) Project to support consultation with the Nyamal Traditional Owners and the approvals application process.

The focus for the Visual Impact Assessment (VIA) is on large pieces of infrastructure that can be seen from a substantial distance, which are the:

+ wind turbines
+ 220kV transmission line.

Ecoscape applied the methodology described in the *Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design* (WAPC, 2007) to undertake the visual impact assessment (VIA) of the proposed development. The manual specifies a two-stage process to the visual assessment:

1. visual landscape evaluation
2. visual impact assessment.

The Visual Landscape Evaluation (VLE) stage is undertaken to understand the context of the project and the surrounding landscape. It is also undertaken to set objectives for managing the visual landscape character. The Visual Impact Assessment (VIA) describes the potential impacts in context of the landscape evaluation. The stages of the assessment are outlined below:

+ A description of the proposed project and visual elements of proposed infrastructure (**Section 1.1**)
+ Landscape Character Analysis: The identification and evaluation of the existing landscape and Landscape Character Types based on desktop and site analysis (**Section 3.1 – 3.2**)
+ View Experience: The assessment of viewing locations, view experience and valued landscape characteristics to identify appropriate visual management objectives for the study area for the purpose of assessing visual impacts (**Section 3.3 – 3.5**)
+ Visual Management Objectives: used as criteria for assessing visual impacts on the landscape (**Section 3.6**)
+ Visual Impact Analysis: an assessment of viewsheds and photo montages to identify the level of visibility and potential visual impacts on the landscape (**Section 4.3**)
+ Visual Impact Summary: a summary of impacts regarding the visual management objectives and visual management recommendations (**Section 5**).

BACKGROUND

Pilbara Energy (Generation) Pty Ltd (PEG), a wholly owned subsidiary of Fortescue Limited (Fortescue), is proposing to develop the East Pilbara Generation Hub (EPGH) comprising a renewable wind farm and associated 220 kV transmission line for power supply. The site is located approximately 40 kilometres southeast of Marble Bar and extends 90 kilometres to the east to Fortescue's Iron Bridge Project (**Map 1**).

The Project will comprise the following key pieces of infrastructure:

+ Up to 200 turbines, two design options are presented in this assessment:
  + Option 1: the total height of the turbines (to blade tip) is 281 metres and the height to the rotor hub is 190 metres.
  + Option 2: the total height of the turbines (to blade tip) is 228 metres and the height to the rotor hub is 137.3 metres.
+ Access track to each pad (7-10 metre width). Overhead power connection between each turbine and the connection to collector substations.
+ 220 kV transmission line (149 km in length) from EPGH collector substations to Ironbridge substation.
+ Approximately 378 poles spanning 400 metres between poles. Pole height at 40 metres, each with a 25 x 25 metre cleared pad and 6-7 metre wide access track.

VISUAL LANDSCAPE EVALUATION

The EPGH project is located approximately 40 km southeast of Marble Bar and 90 km east of Fortescue's Iron Bridge Project within the Shire of East Pilbara. The Project area is situated on the Eginbah, Panorama and Corunna Downs pastoral leases and lies within the Nyamal Native Title Determination Area (**Map 1**).

The Project area is located within the Nullagine Hills Landscape Character Type (CALM, 1994) (**Map 1**). The landscape is variable, characterised by a gradual spinifex plain and rugged hills dissected by drainage lines at an elevation of 160-480 metres Australian Height Datum (AHD). The land surface elevation where the wind turbines are proposed, ranges from 256 – 339 m AHD (Geoscience Australia, 2010) (**Map 1**). The landscape was further classified into the following four landscape character units for the purpose of describing the visual landscape within the Project area (**Map 5**):

+ LCU 1: Open Spinifex Plain
+ LCU 2: Stony Spinifex Hills
+ LCU 3: Drainage Lines
+ LCU 4: Bare Stony Hills

The view locations selected for visual impact assessment have been identified by Fortescue in consultation with the Nyamal Traditional Owners as being culturally significant locations, VIA 1 is also of pastoral interest. According to the WAPC (2007) guidelines, most of the view locations are 'Level 3: Local Significance' as they are not located on main roads or highways and some areas would not be accessible to the public (**Appendix Two**). The only exception is view location 8 (VIA 4) which is located on Marble Bar Road. This Road is classified by Main Roads WA (MRWA, 2023) as a Primary Distributor Road as it connects Marble Bar with Newman to the south and Port Hedland to the north, therefore it is categorised as 'Level 1: National / State Significance'. Marble Bar Road is also part of the Warlu Way drive trail. Warlu Way consists of four road routes, the East Pilbara Geoheritage Route follows Marble Bar Road from the North West Coastal Highway in the north and south of Marble Bar to Nullagine and Newman (ANW Tourism, 2023).

Many areas contained multiple view types depending on the variations in topography and density of taller vegetation. The different view categories experienced EPGH are listed below:

+ Panoramic: expansive long-range views in all directions.
+ Elevated: a view overlooking the landscape from a high point, usually associated with a panoramic view
+ Open: a clear view that is not restricted by features such as vegetation or landform, views are not as expansive as panoramic views
+ Enclosed by landform: elevated landforms restrict long range views
+ Enclosed by vegetation: this view type is likely to be experienced within the Drainage Line LCU where views are restricted by a dense layer of taller vegetation
+ Focal view: a view that has a focal point created by a gap in the landform
+ Filtered: views are filtered either through scattered vegetation or landform.

VISUAL MANAGEMENT OBJECTIVES

The visual management objective (VMO) of best practice siting and design has been identified as the most appropriate VMO for the majority of the visual landscape within the Project area due to the Level 3 sensitivity of the landscape. To meet this VMO, it is expected that any proposed development is blending; that is, development may be evident but generally not prominent in that it borrows from the existing landscape setting. Strategies to meet this objective may include:

+ the application of practical and sensitive siting and design techniques
+ retaining dominant landscape features and characteristics
+ enhancing or restoring landscape features.

The VMO of **protection and maintenance** has been assigned to the landscape values that are likely to be visible along Marble Bar Road, that is the Drainage Lines LCU and the Stony Spinifex Hills LCU which is a

distinctive large scale landscape feature in the Project area. To meet this VMO, it is expected that the proposed development has minimal visual impact on landscape values.

VISUAL IMPACT ASSESSMENT FINDINGS

Twelve view locations were selected in consultation with the Nyamal Traditional Owners and Fortescue for visual impact assessment. The site visits and photo montaging were undertaken by Viewport XR and the visual impact reporting was undertaken by Ecoscape.

Of the 12 view locations that were assessed, the proposed EPGH Project was at variance from the VMO at nine sites (2, 3, 4, 5, 7, 8, 10, 11). Most of these sites (except VIA11) are located in the eastern section of the Project area within the mid-ground of the proposed development. The three remaining sites (1, 9, 12) are unlikely to be at variance with the VMO of best practice siting and design.

The visual assessment framework assumes that a development that is highly visible may not satisfy best practice siting and design principles. However, in the case of wind farms it is almost impossible to hide them within the landscape. Although the visual impacts have been rated as Level 1 for nine view locations, the following factors should be considered when discussing the acceptability of impacts with Nyamal Traditional Owners and other stakeholders:

+ The natural landscape character of the Project area remains prominent due to the simple design and repetitive pattern of the wind turbines, as opposed to a more complex development that is consists of a variety of forms, lines, colours and textures.
+ The landscape value of a high degree of perceived naturalness is altered with the introduction of the proposed development however, the rugged terrain of the Stony Spinifex Hills and Bare Stony Hills LCUs remain a prominent landscape feature.
+ The view categories of the Project area are retained as the wind turbines and transmission line consist of tall individual structures leaving the bulk of horizontal unaffected, which allows the continuation of the views.
+ From a 360 degree view perspective, the development is often surrounded by a larger proportion of open space compared to the development footprint, except at the view locations VIA 6 and VIA 8 which are located within the footprint area.

ACRONYMS AND ABBREVIATIONS

Table 1: Acronyms and abbreviations

Acronyms	
AGL	Above Ground Level
AHD	Australian Height Datum
CALM	Western Australian Department of Conservation and Land Management (1985-2006, now DBCA)
DBCA	Western Australian Department of Biodiversity, Conservation and Attractions
DE	Development Envelope
DEC	Western Australian Department of Environment and Conservation (2006-2013, now DBCA)
DPaW	Western Australian Department of Parks and Wildlife (2013-2017, now DBCA)
EPA	Environmental Protection Authority
EP Act	Environmental Protection Act 1986
EPGH	East Pilbara Generation Hub
GDA 94	Geographic Datum of Australia 1994
GIS	Geographic Information System
GPS	Global Positioning System
ha	hectare/hectares
km	kilometre/kilometres
LCT	Landscape Character Type
LCU	Landscape Character Unit
m	metre/metres
MGA	Map Grid of Australia
NTD	Native Title Determination
SoW	Scope of Works
sp.	Species (generally referring to an unidentified taxon or when a phrase name has been applied)
UTM	Universal Transverse Mercator
VAC	Visual Absorbance Capacity
VIA	Visual Impact Assessment
VLE	Visual Landscape Evaluation
VMO	Visual Management Objective
VP	View Point
WAPC	Western Australian Planning Commission

1 INTRODUCTION

Pilbara Energy (Generation) Pty Ltd (PEG), a wholly owned subsidiary of Fortescue Limited (Fortescue), is proposing to develop the East Pilbara Generation Hub (EPGH) comprising a renewable wind farm and associated 220 kV transmission line for power supply. The site is located approximately 40 kilometres southeast of Marble Bar and extends 90 kilometres to the east to Fortescue's Iron Bridge Project (**Map 1**).

1.1 PROJECT DESCRIPTION

The project will consist of the following elements:

1.1.1 EAST PILBARA GENERATION HUB

+ Up to 200 turbines, two design options are presented in this assessment:
  + Option 1: the total height of the turbines (to blade tip) is 281 metres and the height to the rotor hub is 190 metres.
  + Option 2: the total height of the turbines (to blade tip) is 228 metres and the height to the rotor hub is 137.3 metres.
+ Access track to each pad (7-10 metre width). Overhead power connection between each turbine and the connection to collector substations.

1.1.2 220KV TRANSMISSION LINE FROM IRON BRIDGE TO EPGH (PEC-6)

+ Approximately 149 km, 220 kV transmission line from Ironbridge substation to EPGH terminating at collector substations.
+ Approximately 378 poles spanning 400 metres between poles.
+ Pole height at 40 metres, each with a 25 x 25 metre cleared pad and 6-7 metre wide access track.

1.1.3 CONSTRUCTION OF THE WIND FARM

+ Temporary Facility: Contractor laydown areas containing offices and workshops.
+ Permanent Facility: wind farm operation & maintenance facilities including offices, ablution, workshop, storage, etc.
+ Borrow pits established for material supply and possibly a crushing and screening plant.
+ Concrete batching (semi-mobile).
+ Turkeys nests & water infrastructure.
+ Camp (up to 1,000 people 3 years from early works to commissioning).

1.2 PROJECT SCOPE

Fortescue engaged Viewport XR in collaboration with Ecoscape to undertake a Visual Impact Assessment (VIA) at key view locations identified by Fortescue. The purpose of the VIA is to:

+ undertake a VIA from 12 visually sensitive receptors identified within and outside of the EPGH development envelope
+ enable Nyamal Traditional Owners, stakeholders and the general public to determine whether there are direct or indirect impacts on the visual amenity from Fortescue's proposed activities
+ understand potential closure options and to show clear representation of what the landscape looks like pre, during, and post development.

1.3 PROJECT AREA

The EPGH project is located approximately 40 km southeast of Marble Bar and 90 km east of Fortescue's Iron Bridge Project within the Shire of East Pilbara. The Project area is situated on the Eginbah, Panorama and Corunna Downs pastoral leases and lies within the Nyamal Native Title Determination Area (**Map 1**).

The Project area is located within the Nullagine Hills Landscape Character Type (CALM, 1994) (**Map 1**). The landscape is variable, characterised by a gradual spinifex plain and rugged hills dissected by drainage lines at an elevation of 160-480 metres Australian Height Datum (AHD). The land surface elevation where the wind turbines are proposed, ranges from 256 – 339 m AHD (Geoscience Australia, 2010) (**Map 2**).

1.4 VIEW LOCATIONS

Viewport XR undertook a site visit of 12 view locations that are all cultural points of interest with VIA 1 also being of pastoral interest. These 12 view locations are shown on all maps.

1.5 VISUAL PLANNING CONTEXT

The following documents provide guidance on visual landscape planning in Western Australia.

1.5.1 NATIONAL PLANNING POLICY AND GUIDELINES

1.5.1.1 EPBC Act Policy Statement 2.3 Wind Farm Industry

The purpose of this policy statement is to assist operators in the wind farm industry to decide whether or not proposed actions require referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is recognised that aesthetic values of Heritage Places may be impacted by the presence of a wind farm. According to the Heritage databases the Project does not intersect with a World Heritage Property (DCCEEW, 2024) or any listed National Heritage Places (DCCEEW, 2023)

1.5.1.2 Onshore Wind Farm Guidance Draft May 2024

This guidance document has been published by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) and is currently a Draft for consultation. The guidance aims to support proponents to develop appropriate documentation for the environmental impact assessment process by the Minister for Environment. The focus of this guidance is on protected matters, particularly bird and bats. Reference to visual impact is not specifically detailed in this guideline. However, it is recommended that proponents provide viewshed analysis results for the referral and assessment stages to assist in identifying impacts to visual amenity values.

1.5.2 STATE PLANNING POLICY AND GUIDELINES

1.5.2.1 Western Australian Environmental Protection Act 1986

The Western Australian *Environmental Protection Act 1986* (EP Act) was established to provide for:

+ the prevention, control and abatement of pollution and environmental harm
+ the conservation, preservation, protection, enhancement, and management of the environment
+ matters incidental to or connected with the above.

The EPA is responsible for providing the guidance and policy under which environmental assessments are conducted. It conducts environmental impact assessments (based on the information provided by the proponent), initiates measures to protect the environment and provides advice to the Minister responsible for environmental matters.

The EP Act includes **social surroundings** in the definition of what constitutes 'Environment'. Further guidance on social surroundings is provided in the EPA's *Environmental Factor Guideline – Social Surroundings* (2023).

1.5.2.2 State Planning Policy No 2 Environment and Natural Resources

The *Environment and Natural Resources Policy* (WAPC, 2003) defines the principles and considerations that represent good and responsible planning in terms of environment and natural resource issues within the framework of the State Planning Strategy.

The objectives of the policy are to:

+ integrate environment and natural resource management with broader land use planning and decision-making

+ protect, conserve and enhance the natural environment
+ promote and assist in the wise and sustainable use and management of natural resources.

This policy also identifies the importance of protecting and enhancing landscapes and states the need:

+ to identify and protect landscapes with high natural resource value
+ for careful planning, siting and design of development proposals in a way that is sensitive to the landscape character
+ for landscape or visual impact assessment for proposals that may impact on sensitive landscapes.

1.5.2.3 Environmental Factor Guideline: Social Surroundings (EPA, 2023)

The EPA's objective for the social surroundings environmental factor is, *"To protect social surroundings from significant harm"*

For social surroundings to be considered in Environmental Impact Assessment (EIA) there must be there must be a clear direct link between a proposal or scheme's impact on the physical or biological surroundings and the subsequent effect on a person's aesthetic, cultural, economic or other social surroundings.

Furthermore, *for the EPA to consider social surroundings as a factor in EIA, a proposal's or scheme's impacts on the physical or biological environment, must directly and significantly affect or be affected by those social surroundings*.

The EPA is also required to consider potential impacts to Aboriginal cultural heritage (ACH) values which includes *significant visual impacts to ACH cultural landscapes*.

The guideline recognises that *natural landscapes and views often contribute to visual amenity, such as areas of high heritage, cultural or social significance due to their natural features or scenic quality*. Although, *amenity values can be highly subjective.*

The EPA recognises that development activities may impact aesthetic values such as:

+ *large scale quarry or mining activities on landscapes of significant aesthetic value*
+ *major tourism or other developments in or adjacent to natural areas with significant aesthetic values*

The EPA may require information from the proponent where there is the potential to significantly impact the social surroundings, in the case of visual amenity a landscape and visual impact assessment may be required.

1.5.2.4 Environmental Factor Guideline: Landforms (EPA, 2018)

The EPA's environmental objective for the factor Landforms is: "To maintain the variety and integrity of significant physical landforms so that environmental values are protected."

This objective recognises that the geology and morphology of a landform can have value in their own right, as well as the important role significant landforms often have in supporting environmental values.

Landforms can also embody social and cultural values, such as strong historical and cultural associations and also provide enjoyment through aesthetics or active use (e.g. tourism, climbing, hiking, etc.).

Consistent with this objective, the EPA will firstly determine whether the landform to be impacted is a significant landform. If the EPA determines that the landform is significant, further assessment regarding the impacts of the proposal or scheme may be required to demonstrate whether the environmental objective for Landforms can be met.

To determine whether a landform is significant, the EPA may consider criteria such as *variety, integrity, ecological and scientific importance, rarity and social importance*. Concerning the latter, *the landform would support significant amenity, cultural or heritage values.*

1.5.2.5 Technical Guidance: EIA of Social Surroundings – Aboriginal Cultural Heritage (EPA, 2023)

The EPA acknowledges the repealed Aboriginal Cultural Heritage Act 2021 and has adjusted its Environmental Factor Guideline (EFG) - Social Surroundings and related Technical Guidance to reflect the role of the amended and restored Aboriginal Heritage Act 1972.

The Technical Guidance provides additional information on procedures and the EPA's environmental impact assessment process for Social Surroundings under the Environmental Protection Act 1986. This has been updated to support the latest changes made to the EFG and to ensure alignment with the restored AH Act 1972.

Under the EP Act, the EPA is required to consider social surroundings to the extent to which they directly affect or are affected by physical or biological surroundings. This may include significant visual impacts to ACH cultural landscapes.

The Nyamal Traditional Owners have one Native Title claim (Nyamal #1 - WAD20/2019) that intersects with part of the Project area and there are also a number of Heritage Places (**Map 3**).

1.5.2.6 Position Statement: Renewable Energy Facilities (DPLH, 2020)

This document outlines to requirements of the Western Australian Planning Commission (WAPC) to support the consistent consideration and provision of renewable energy facilities in Western Australia. It supersedes *Planning Bulletin 67: Guidelines for Wind Farm Development (2004)*. Renewable energy developments are identified as primarily wind farms and solar arrays but also geothermal, biogas, ocean power and hydro-electric power. The position statement recommends that proponents undertake early consultation with relevant stakeholders and various impact assessments which includes visual and landscape impact. It is recommended that the visual impact assessment identify and address the following aspects:

+ landscape significance and sensitivity to change
+ land use character and community values
+ likely impact to views using viewshed analysis and simulation of proposed views from key view locations
+ the proposed layout of the development and specification
+ mitigation recommendations.

The following documents are referred to which provide more detailed guidance on visual landscape impact assessments:

+ *Visual Landscape Planning in WA: a manual for evaluation, assessment, siting and design* (WAPC 2007)
+ *Wind Farms and Landscape Values: National Assessment Framework* (AusWEA and ACNT 2007)

1.5.3 GUIDELINES FOR WIND FARM DEVELOPMENT

1.5.3.1 Best Practice Guidelines for Implementation of Wind Energy Projects in Australia (CEC, 2018)

This document is aimed to help proponents of onshore wind farms, the community and stakeholders understand the planning process for wind farm proposals. It recommends that a comprehensive landscape and visual assessment is undertaken to identify:

+ landscape values
+ community values
+ potential impacts
+ mitigation measures.

1.5.3.2 Siting and Designing Wind Farms in the Landscape (SNH, 2017)

This document provides siting and design guidance for wind farms in order to minimise potential visual impacts on the landscape. It recognises that there are many variables which affect the visibility of wind farms such as:

+ the nature of the background such as the horizon type and sky conditions
+ prevailing weather conditions
+ seasonal variation in the landscape colours

+ viewing direction
+ distance from the development
+ proposed layout
+ other windfarms in the vicinity that may contribute to a cumulative visual impact
+ turbine colour and texture.

This document provides best practice siting and design strategies to ensure proposed wind farm developments relate to their landscape setting and minimise visual impacts on landscape values.

1.5.3.3 National Wind Farm Development Guidelines (EPHC, 2010)

Although these guidelines are not maintained past their release date, they are still considered a useful reference document for wind farm development proposals. The aim of the guidelines was to provide a consistent best practice approach for assessing the impacts of wind farm developments in Australia. It is recognised that there are many significant landscapes that are valued by the community which do not have statutory protection. These landscape values can be identified through consultation and the landscape assessment process which provides management recommendations to manage the visual landscape appropriately. The following sources were primarily used in the development of these guidelines:

+ *Wind Farms and Landscape Values: National Assessment Framework (AusWEA and ACNT, 2007)*
+ *Visual Landscape Planning in WA: a manual for evaluation, assessment, siting and design* (WAPC 2007)

Regarding Indigenous heritage it is recommend that assessments not only look at physical landscapes but also cultural landscapes which include stories and song lines, hunting and gathering places and the effects on the bush and animals.

Fortescue has undertaken consultation with the Nyamal Traditional Owners and this assessment will be used to further assist in the consultation process.

1.5.3.4 Wind Farms and Landscape Values: A National Assessment Framework (AusWEA and ACNT, 2007)

Auswind (Clean Energy Council's predecessor) in partnership with the Australian Council of National Trusts developed this framework to provide guidance on assessing, evaluating and managing the impact of wind farms on the Australian landscape. The framework recommends a similar assessment approach to WAPC (2007) as follows:

+ undertake a landscape assessment and community consultation
+ describe and model the wind farm in the landscape
+ assess the visual impacts on the landscape values
+ respond to the proposed visual impacts through mitigation strategies.

1.5.4 GUIDELINES FOR VISUAL IMPACT ASSESSMENT IN WESTERN AUSTRALIA

1.5.4.1 Visual Landscape Planning in Western Australia 2007

This comprehensive manual has been developed by the WAPC (2007) to help public and private sector planners address visual landscape in the planning process. The manual explains the fundamental planning tools of visual landscape evaluation and visual impact assessment. It provides guidelines for siting and design in relation to a range of landscape types and land uses. It has been developed through extensive research, workshops and also draws on previous visual methodologies. The manual has been developed specifically for Western Australian landscapes and presents a systematic method for undertaking visual assessments in Western Australia. The process of assessing the visual landscape set out in this manual is generally consistent with other methodologies, however it provides added detail on landscape preferences and specific land uses.

It is recognised by the EPA (2023) that amenity values may be highly subjective, therefore, Ecoscape has adopted the WAPC (2007) methodology to provide a clear and systematic approach to assessing the visual landscape.

2 METHOD

Ecoscape applied the methodology outlined in the Visual Landscape Planning Manual (WAPC, 2007) to undertake the visual impact assessment (VIA) of the proposed development. The manual specifies a two-stage process to the visual assessment:

1. visual landscape evaluation
2. visual impact assessment.

The Visual Landscape Evaluation (VLE) stage is undertaken to understand the context of the project and the surrounding landscape. It is also undertaken to set objectives for managing the visual landscape character. The Visual Impact Assessment (VIA) describes the potential impacts in context of the landscape evaluation. The stages of the assessment are outlined below:

+ A description of the proposed project and visual elements of proposed infrastructure (**Section 1.1**)
+ Landscape Character Analysis: The identification and evaluation of the existing landscape and Landscape Character Types based on desktop and site analysis (**Section 3.1 – 3.2**)
+ View Experience: The assessment of viewing locations, view experience and valued landscape characteristics to identify appropriate visual management objectives for the study area for the purpose of assessing visual impacts (**Section 3.3 – 3.5**)
+ Visual Management Objectives: used as criteria for assessing visual impacts on the landscape (**Section 3.6**)
+ Visual Impact Analysis: an assessment of viewsheds and photo montages to identify the level of visibility and potential visual impacts on the landscape (**Section 4.3**)
+ Visual Impact Summary: a summary of impacts in response to the visual management objectives (**Section 5**).

2.1 DESKTOP ANALYSIS

A desktop investigation was undertaken before the site assessment to understand the landscape context of the study area. The following information was analysed in ArcGIS, which is Geographic Information System (GIS) software for working with maps and geographic information:

+ surface elevation (Geoscience, 2010)
+ soil landscape units (DPIRD, 2017)
+ pre-European vegetation (DPIRD, 2017)
+ Landscape Character Types (CALM, 1994)
+ fauna habitat types (SLR, 2022)
+ viewsheds from infrastructure (wind turbines and 220kV transmission poles).

Photographs from the detailed fauna survey undertaken by Ecoscape in March 2024 were also reviewed to assist the visual landscape evaluation stage.

2.2 SITE ANALYSIS

A site analysis was undertaken by Viewport XR on 25-28 March 2024. Site photographs were taken from 12 view locations both within and outside the EPGH Project area. A 360 degree view was photographed from each view location to record the landscape character, view experience and landscape values.

For each of the viewpoints the following information was obtained from the photographs post site analysis. The terminology used to describe landscape character have been adapted from CALM (1994), WAPC (2007) and The Landscape Institute (2013).

+ view description: general description of view
+ topography: flat, undulating, rugged
+ vegetation: description of vegetation type and form

+ waterform: evident or not evident, type of waterform
+ colours: monochrome, muted, colourful, type of colours
+ texture: smooth, textured, rough
+ line: straight, angular, curved, sinuous
+ form: vertical, sloping, rolling, horizontal.

Visual terminology such as line, form, colour and texture are used to describe Landscape character (**Figure 1**). This description allows for the comparison of the visual elements of a proposed development with the surrounding landscape to assist in the visual impact analysis.

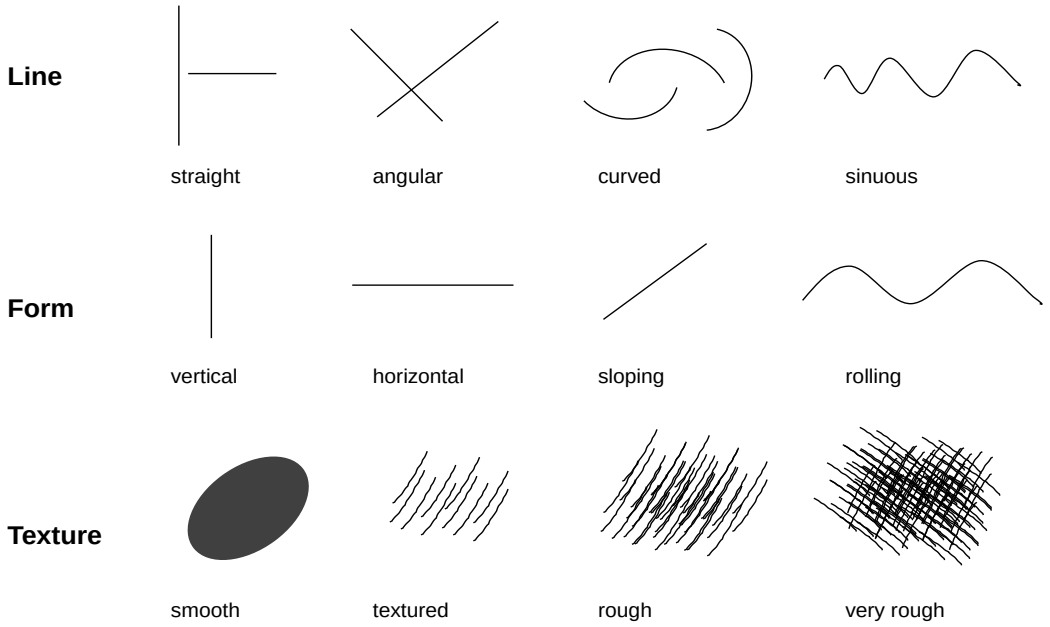

Figure 1: Visual terminology to describe landscape character

2.3 PHOTO MONTAGE ANALYSIS

A key component of visual impact analysis is the preparation and analysis of photo montages.

Viewport XR produced the photo montages using the method outlined below:

+ **Data Collation**: The data sources included shapefiles, turbine layout general drawings, and turbine schematics provided by Fortescue, along with GPS location data collected and photos captured with a Nikon camera during the site visits.
+ **3D Modelling**: The provided shapefiles underwent processing in a procedural modelling tool and were then imported into 3DS Max software. Here, the information was integrated with GPS location data referencing the site photos. Simultaneously, 3D models of two types of turbines were created in 3DS Max and positioned according to the provided drawings. This process ensured accurate placement of the digital turbine models and setup of camera positions for panoramic renders.
+ **Photo Montages**: The output of the 3D modelling process is a series of rendered 3D images depicting the proposed development. For each location, three renders were produced to match the panoramic photos. These renders were overlaid onto panoramic photos created by stitching together three photos using a cylindrical projection method, resulting in a cohesive photo montage of the proposed development area.

Photo montages were analysed using visual impact criteria to determine dominant visual elements, which include visibility, line, form, colour and texture. The outcome of this analysis is a percentage score that determines the level of visual impact, either being not visible, moderately visible (blending) or highly visible

(prominent). To determine the overall impact level or the significance of the impact, the result of the visual impact analysis is combined with the Significance Level and the Visual Management Objective (VMO) of the study area.

Photo montages were prepared from 12 view locations that were selected by Fortescue. The photo montages show an indicative view standing at each site of wind turbines and 220kV transmission line. The photographs were taken on site by Viewport XR with a digital SLR camera using a 35mm focal length to represent what the human eye can see.

At view location 4 (VIA4) the following additional montages have been presented to illustrate the two different wind turbine designs and the post operational views. The overhead powerline that connects the wind turbines has also been shown at this view location:

+ Operational phase showing option 1 wind turbine and connecting power line with 20 m high poles
+ Operational phase showing option 2 wind turbine and connecting power line with 20 m high poles
+ Post-operational phase after 1 year
+ Post-operational phase after 50 years.

2.4 VISUAL IMPACT ANALYSIS

To assess visual impact, a visual landscape evaluation must be undertaken to understand the landscape values of an area and the significance level of viewing locations. The Landscape Institute (2013) developed criteria to determine the level of impact which were based on landscape values and viewer sensitivity. The criteria are 'sensitivity' and 'magnitude' which are categorised into high, medium and low. Sensitivity being either the significance of the viewing location or the landscape value. Depending on the sensitivity of the landscape and magnitude of change, the impact can be described as either slight, moderate or substantial. The principle of this criteria is similar to the visual impact levels used in this assessment which are Level 1, 2 and 3. These impact levels are based on:

+ Visibility rating which relates to the magnitude of change and the visual prominence of the development
+ Significance Level which refers to the significance of the viewing location and degree of public sensitivity (**Appendix Two**)
+ Visual Management Objective (VMO) which reflects landscape values and public sensitivity.

The visual impact levels outlined in **Table 2** have been developed by Ecoscape to reflect current assessment guidelines with the aim of providing a clear interpretation of visual impact. The impact levels are:

+ Level 1: Visual impact is likely to be at variance with the VMO.
+ Level 2: Visual impact may be at variance with the VMO.
+ Level 3: Visual impact is unlikely to be at variance with the VMO.
+ None: There is no visual impact.

Table 2: Visual impact level matrix table

	Visibility rating	Prominent			Blending			Not Visible
	Significance Level rating	**1**	**2**	**3**	**1**	**2**	**3**	**1-3**
Visual Management Objective	**Protection and Maintenance**	L1	L1	L1	L2	L2	L2	None
	Best Practice Siting and Design	L1	L1	L1	L3	L3	L3	None
	Restoration and Enhancement	L2	L2	L2	L3	L3	L3	None
		VISUAL IMPACT LEVEL						

2.5 VISUAL ABSORBANCE CAPACITY

The Visual Absorbance Capacity (VAC) of a landscape will affect the visual impact level of the Project. VAC is the ability of the landscape to absorb a visual change, which is associated with the dominance and variable elements which have been used to assess the impact from each viewpoint. Views with simple form and line may be more sensitive to change compared to views that are more detailed in form, line and colour, such as varied and undulating landform and variable vegetation structure (FPA, 1990). In the latter example, infrastructure can be strategically placed within the landscape using the topography and vegetation to minimise its visual impact. Other factors that affect the level of VAC are listed in **Table 3** (FPA, 1990).

Table 3: Factors that influence the Visual Absorbance Capacity (VAC) of a landscape

Factor	Increased VAC	Decreased VAC
Biophysical	+ Landform: variable, undulating landform + Vegetation: greater vegetation diversity in structure, colour and form	+ Slope: increased slope + Soil: greater contrasting soil colour with surrounding vegetation + Site recovery: slower site recovery rate
Perception	+ Increased distance from site + Slope facing away from observer + Lower public sensitivity level + Short view duration (e.g. from moving vehicle)	+ Close distance to site + Slope facing the observer + Greater public sensitivity level + Long view duration + Development in direct line of sight
Proposed Development	+ Similar visual elements to surrounding landscape, i.e. shape, colour, texture + Short term activity	+ Large scale development + Longer duration activity

2.6 DISTANCE ZONES

The distance between the observer and the proposed development can affect the level of visual impact. The further the distance the less space the target occupies in the observer's field of view and therefore the visual impact may not be as significant (WAPC, 2007). The WAPC (2007) guidelines adopt the following categories which have been based on the amount of colour and textural detail that is visible:

+ Foreground zone: 0-500 metres
+ Mid-ground zone: 0.5-6.5 kilometres
+ Background zone: beyond 6.5 kilometres.

3 VISUAL LANDSCAPE EVALUATION

This section documents how the landscape is viewed and valued, both of which are related to the community's 'sense of place'. The way a landscape is perceived will differ amongst observers, but general valued characteristics can be categorised from the extensive desktop research undertaken by CALM (1994) and WAPC (2007). Understanding the visual landscape is an integral part to developing strategies to manage landscape character.

3.1 LANDSCAPE CHARACTER TYPE

The purpose of characterising the landscape for a visual impact assessment is to understand the visual setting of the landscape surrounding the proposed Project to determine if the proposed infrastructure will visually fit within the landscape. Landscape character is derived from a combination of biophysical and social characteristics.

A Landscape Study undertaken by the former Department of Conservation and Land Management (CALM, 1994) classified Western Australian landscapes into broad Character Types. The main objective was to provide a reference guide to assess the representation and significance of WA's visual landscape to develop appropriate planning and design guidelines and polices to protect and enhance the visual landscape. The term landscape is defined as a combination of physical and cultural features. A Landscape Character Type (LCT) is where there is a common combination of these characteristics such as landform, waterform, vegetation and land use (CALM, 1994).

The EPGH Project occurs within the Nullagine Hills LCT (**Map 1**) which is described in **Table 4** below.

Table 4: Landscape Character Types at EPGH (CALM 1994)

LCT	Landform & Land Use	Vegetation	Waterform
Nullagine Hills	*Steep ranges and dissected flat topped hills. Valley Plains and narrow gorges created by several rivers dissecting the landscape.*	*Scattered low Eucalypt savanna and Acacia shrubland consisting of mulga and mixed grasses.*	*The Nullagine, Oakover and Shaw Rivers traverse the landscape.*

3.2 LANDSCAPE CHARACTER UNITS

A Landscape Character Unit (LCU) is a smaller unit than a Landscape Character Type (LCT). While the LCT has common characteristics at a regional scale, there will be variations within an LCT that can be identified at a local scale. An LCU is a geographic area sharing common characteristics such as landform, vegetation, waterform and cultural land use patterns relevant to human interaction and experience.

The landscape of the Project area is predominately a natural character with little disturbance evident, with the exception at the western boundary that contains the Ironbridge mine. The landform varies from steep rolling ranges to flat open plains with elevation ranging from 160 – 480 metres above height datum (AHD) (**Map 2**). The vegetation is predominantly covered by hummock grasses with a layer of scattered shrubs, with some areas devoid of vegetation such as the Bare Stony Hills LCU. The landscape is also dissected by many creeklines that contain tall Eucalypt trees and a dense shrubland layer.

Four landscape character units were identified and mapped by analysing site photographs taken during the VIA site visit, photographs and habitat assessment information from the detailed fauna survey (undertaken by Ecoscape in March 2024), soil landscape units (**Table 5** and **Map 4**), contour data and fauna habitat types (SLR, 2022). The LCUs are shown on **Map 5** and summarised in **Table 6** and are also described in the following section.

Table 5: Soil Landscape Units within the EPGH Project Area (DPIRD, 2017)

Map Unit Name	Description	Extent of Project Area (%)
Macroy system	Stony plains and occasional tor fields based on granite supporting hard and soft spinifex shrubby grasslands	55.03
Rocklea system	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex and occasionally soft spinifex grasslands with scattered shrubs	25.58
Capricorn system	Rugged sandstone hills, ridges, stony footslopes and interfluves supporting low acacia shrublands or hard spinifex grasslands with scattered shrubs	4.96
Talga system	Hills and ridges of greenstone and chert and stony plains supporting hard and soft spinifex grasslands	4.03
Granitic system	Rugged granitic hills supporting shrubby hard and soft spinifex grasslands	3.50
River system	Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex	2.40
Boolgeeda system	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands	1.29
Satirist system	Stony plains and low rises supporting hard spinifex grasslands, and gilgai plains supporting tussock grasslands	1.03
Black system	Linear ridges of dolerite or basalt supporting hard spinifex grasslands, with unvegetated boulder slopes and rock piles along summits	0.92
Platform system	Dissected slopes and raised plains supporting shrubby hard spinifex grasslands	0.54
Calcrete system	Low calcrete platforms and plains supporting shrubby hard spinifex grasslands	0.47
River bed phase	River bed with no vegetation	0.17
Taylor system	Stony plains and isolated low hills of sedimentary rocks supporting hard and soft spinifex shrubby grasslands	0.10

Table 6: Landscape Character Units within the EPGH Project Area

Landscape Character Unit	Soil Landscape System / Fauna Habitat Unit	Elevation Range (m AHD)	Area (Ha)	Extent of Project Area (%)	View Locations
1- Open Spinifex Plain	Black, Boolgeeda, Calcrete, Capricorn, Granitic, Macroy, Platform, Satirist, Taylor	160 – 350 m	54,319	54.99	1, 2, 4, 5, 6, 7, 8, 9, 10
2 - Stony Spinifex Hills	Capricorn, Rocklea, Talga	160 – 480 m	31,095	31.48	3, 12
3 - Drainage Lines	Boolgeeda, Capricorn, Macroy, Rocklea, River bed phase, River system and SLR (2022) major and minor drainage habitat units	160 – 380 m	11,817	11.96	none
4 - Bare Stony Hills	Black, Granitic	200 – 390 m	1,542	1.56	11

3.2.1 LCU 1 – OPEN SPINIFEX PLAIN

This LCU covers about 55% of the Project area and is characterised by a flat to gently undulating plain covered in hummock grasses with scattered tall shrubs with an elevation ranging from 160-350 m AHD (**Figure 2**). This LCU occurs at the base of hilly terrain and covers an extensive area in the eastern part of the project area. This expansive LCU is dissected by drainage lines which are expressed as dense bands of green foliage traversing the landscape (**Figure 3**).

A summary of the visual characteristics is provided below:

+ Scale: the open nature of this LCU contributes to a vast sense of scale. A sense of enclosure is created when this LCU occurs near drainage lines or elevated landforms.

- Texture: the overall impression is a textured landscape which is created by the variety of textures present in the natural landscape, such as areas of rough stony soils, smooth sandy areas and rock formations, spikey spinifex clumps with soft and wispy flower stalks and rough barked tall shrubs.
- Form: the open spinifex plain is characterised by a horizontal landform that is punctuated by vertical and sloping tall shrubs / low trees with the rolling hills on the distant horizon line. Other forms are the rolling spinifex canopy at ground level and the rolling shrub/tree canopy where present.
- Line: the line of the landform is straight and the horizon line is sinuous where hills are present. Curved spinifex clumps are a dominant feature at ground level. The scattered tall shrubs have angular and straight branches and a curved canopy.
- Colour: this LCU consists of a simple colour palette of greens, pale yellow, browns and oranges. While the colour pallet is simple, the colour contrast is striking between the vibrant green spinifex clumps and rich orange soils.

Figure 2: LCU 1 at VIA1 (east view)

Figure 3: Drainage line indicated by dense band of taller vegetation at VIA10 (south view)

3.2.2 LCU 2 – STONY SPINIFEX HILLS

This LCU is characterised by rolling to rugged terrain that is covered in a sparse to open layer of hummock grasses on stony soils. It is an expansive landscape that is visible from most areas within the EPGH project area (**Figure 4**) and covers about 31% of the Project area. The elevation ranges from 160-480 m AHD.

A summary of the visual characteristics is provided below:

- Scale: the elevated terrain that is visible from most areas contributes to a large sense of scale.
- Texture: at a close viewing range, the hills have a textured appearance which is created by the rough stony soils and spikey spinifex clumps.

- Form: the hills have a predominantly rolling a sloping form that contrasts with the horizontal form of the open spinifex plain. At a close viewing distance, more variation in form such as sloping hill faces are apparent.
- Line: the hills are a sinuous line on the horizon and at a closer viewing distance the line is also angular and curved.
- Colour: this LCU consists of vibrant orange stony soils and exposed rocks which contrast with bright green spinifex clumps. Colour variation is less apparent where the hills are visible on the distant horizon.

Figure 4: LCU 2 – Stony Spinifex Hills

3.2.3 LCU 3 – DRAINAGE LINES

Within the Project area the landscape is highly dissected by the Drainage Lines LCU. This LCU is visually expressed as green bands of dense vegetation (**Figure 5**). The vegetation is variable containing shrublands and distinctive white barked Eucalypt trees (**Figure 6**). The elevation of the Drainage Lines LCU ranges from 160-380 m AHD.

A summary of the visual characteristics is provided below:

- Scale: the scale of the Drainage Line LCU is variable, for smaller creeklines the sense of scale is intimate and enclosed which is created by the dense cover of vegetation. For larger river systems the open nature of the drainage line results in a broader sense of scale.
- Texture: this LCU can appear textured from a distance which is created by the vegetation canopy. Within the Drainage Line LCU, smooth textures are also present consisting of water (if present), sandy riverbeds and smooth barked Eucalypt trees.
- Form: a rolling form of the dense vegetation canopy is evident from a distance with a variety of forms such as vertical and sloping branches when viewed at a closer range.
- Line: the vegetation canopy is curved with trees and shrubs consisting of angular and straight branches. From an aerial perspective, the Drainage Lines LCU dissect the landscape in a series of sinuous lines.
- Colour: at a distance this LCU consists of a simple colour palette of greens. At a closer viewing range, the colours are variable depending on the composition of plant species and can consist of various greens of the diverse vegetation foliage, white barked Eucalypt trees, orange sandy soils, grey/brown leaf litter and shrub branches, vibrant green tussock grasses and tannin coloured water (where present).

Figure 5: Dense band of vegetation indicating the presence of a Drainage Line near VIA 10 (south view)

Figure 6: Dense mix of vegetation with the Drainage Line LCU

Figure 7: Waterform and tall Eucalypt trees lining the Drainage Line LCU

3.2.4 LCU 4 – BARE STONY HILLS

The Bare Stony Hills LCU is a small unit within the Project area and consists of hilly terrain devoid of vegetation. This LCU was observed near VIA 11 (**Figure 8**). The characteristics are similar to the Stony Spinifex Hills LCU, however the predominant feature is the bare orange stony soils. The elevation of this LCU ranges from 200-390 m AHD.

A summary of the visual characteristics is provided below:

+ Scale: the Bare Stony Hills are a large scale feature.
+ Texture: the stony soils result in a rough texture.
+ Form: the hills have a predominantly rolling a sloping form. At a close viewing distance, more variation in form such as sloping hill faces are apparent.
+ Line: the hills are predominantly curved and sinuous with angular lines also present.
+ Colour: the predominant colour is the vibrant orange stony soils and exposed rocks, secondary colours are green groundcover herbs and sparsely scattered dark brown burnt shrubs.

Figure 8: LCU 4 – Bare stony hills

3.3 LANDSCAPE VALUES

The WAPC (1997) identified key character indicators that can be used as a basis for classifying the landscape into two preference categories; 'most' preferred and 'least' preferred landscapes. These preference categories were established for natural, rural and built landscapes. All landscape character units described above fall within the 'natural' category for preference indicators.

'Most' preferred characteristics are defined as landscape features that are highly valued by the community and contribute to the visual character (WAPC, 1997). 'Least' preferred are features not valued by the community and detract from the visual character (WAPC, 1997). The preference indicators for natural environments are summarised in **Appendix One**.

The character preferences found within the EPGH Project area are:

+ high degree of perceived naturalness
+ distinctive displays of colour: striking contrasting colours between orange soils and vibrant green spinifex clumps (**Figure 9**)
+ visually distinctive vegetation along drainage lines (**Figure 10**)
+ high degree of topographic variety – rugged terrain of the Stony Spinifex Hills LCU (**Figure 11**)
+ distinctive landscape features – rugged ranges and isolated hills (**Figure 12**)
+ presence of waterbodies – presence of water in drainage lines (**Figure 13**)

The least preferred characteristics include:

+ evidence of mining – no mining was encountered during the field survey, however there are various mining activities in the area
+ some areas impacted by weed infestations such as Buffel grass along drainage lines
+ some areas impacted by grazing.

Figure 9: Striking colour contrast

Figure 10: Vegetation diversity (Drainage Line)

Figure 11: Rugged terrain provides topographic variety within the Project area

Figure 12: Distinctive landscape feature

Figure 13: Presence of water

3.4 VIEW SIGNIFICANCE

How a landscape is viewed is of critical importance in understanding changes in the landscape and how people perceive them. Visual landscapes relayed to peoples' sense of place and quality of life.

The *Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design (*WAPC, 2007) identified components that can be used to document viewing experiences, the significance of the viewing location and specifically what is in the landscape that is valued to understand how people experience a landscape.

The document presents three levels of significance to categories views: national/state, regional and local. Some viewing locations, views and areas visible in views will be considered more important than others by those experiencing the landscape, and some viewers will be more aware of the landscape and more concerned about its appearance depending on their reasons for being in the landscape.

The view locations selected for visual impact assessment have been identified by Fortescue in consultation with the Nyamal Traditional Owners as being culturally significant locations. According to the WAPC (2007) guidelines, most of the view locations are 'Level 3: Local Significance' as they are not located on main roads or highways and some areas would not be accessible to the public (**Appendix Two**). The only exception is view location 4 (VIA 4) which is located on Marble Bar Road. This Road is classified by Main Roads WA (MRWA, 2023) as a Primary Distributor Road as it connects Marble Bar with Newman to the south and Port

Headland to the north. Therefore, it is categorised as 'Level 1: National / State Significance'. Marble Bar Road is also part of the Warlu Way drive trail. Warlu Way consists of four road routes, the East Pilbara Geoheritage Route follows Marble Bar Road from the North West Coastal Highway in the north and south of Marble Bar to Nullagine and Newman (ANW Tourism, 2023).

3.5 VIEW EXPERIENCE

Many areas contained multiple view types depending on the variations in topography and density of taller vegetation. The different view categories experienced EPGH are listed below:

+ Panoramic: expansive long range views in all directions.
+ Elevated: a view overlooking the landscape from a high point, usually associated with a panoramic view
+ Open: a clear view that is not restricted by features such as vegetation or landform, views are not as expansive as panoramic views
+ Enclosed by landform: elevated landforms restrict long range views
+ Enclosed by vegetation: this view type is likely to be experienced within the Drainage Line LCU where views are restricted by a dense layer of taller vegetation
+ Focal view: a view that is has a focal point created by a gap in the landform
+ Filtered: views are filtered either through scattered vegetation or landform.

These view categories are described in more detailed in the visual analysis of each view location in **Section 4.3**.

3.6 VISUAL MANAGEMENT OBJECTIVES

The aim of Visual Management Objectives (VMOs) is to provide criteria that enable the assessment of visual impacts for each Landscape Character Unit (LCU).

The VMOs adopted by WAPC (2007) to manage landscape character are:

+ best practice siting and design, which should be the baseline objective for all landscapes
+ protection and maintenance
+ restoration of degraded character or enhancement of opportunities.

3.6.1 BEST PRACTICE SITING AND DESIGN

This VMO has been identified as the most appropriate VMO for the majority of the visual landscape within the Project area due to the Level 3 sensitivity of the landscape. To meet this VMO, it is expected that any proposed development is blending; that is, development may be evident but generally not prominent in that it borrows from the existing landscape setting. Strategies to meet this objective may include:

+ the application of practical and sensitive siting and design techniques
+ retaining dominant landscape features and characteristics
+ enhancing or restoring landscape features.

3.6.2 PROTECTION AND MAINTENANCE

Protection and maintenance is the maximum retention of existing visual character which is likely to apply to highly valued visual landscapes. Therefore, future development should be planned and designed to have minimal visual impact on landscape character. Any alterations to the visual landscape character assigned this objective should be planned and designed to have minimal visual impact, in which development would either be not evident (i.e. development may be hidden, screened or not visible, from specified viewing locations) or blending (i.e. development may be evident, but generally not prominent in that it borrows from the existing landscape setting) (WAPC, 2007).

This VMO has been assigned to the landscape values visible along Marble Bar Road as it is a Significance Level 1 route. The landscape values that are likely to be visible from this road are the Drainage Lines LCU and the Stony Spinifex Hills LCU which is a distinctive large scale landscape feature in the Project area. To

meet this VMO, it is expected that the proposed development has minimal visual impact on landscape values. The VMO of best practice siting and design is considered appropriate for the remainder the landscape units along Marble Bar Road as these landscapes are likely to be experienced over many kilometres, whereas the landscape values are likely to be stand out features which contribute to a significant view experience. Further to this the WAPC (2007) notes that significance of a view increases with:

+ importance of views, including type, features and rarity
+ volume of use of roads, trails and navigable waterways
+ degree of sensitivity of viewers; those who are more likely to be more sensitive include wilderness users, other recreational users, tourists, people who choose to live in an area because of its landscape character and views (e.g. assessed by noting how vocal observers are about specific travel routes or use areas, indicated in letters, protests etc.)
+ degree to which experiencing the landscape is integral to enjoyment of a travel route or site Is it the focus of the use, as in recreational use, or just incidental, as is more likely with people using a route to work?
+ length of duration of a view; range could include glimpses from a high-speed road, longer duration views obtained from roads used for sightseeing or from recreation sites and Lookouts and very long and frequent views from the main living areas of homes.

3.6.3 RESTORATION AND ENHANCEMENT

This ‘restoration and enhancement’ VMO applies to degraded landscapes that require rehabilitation to enhance the visual amenity (WAPC, 2007). This VMO is not applicable to the LCUs of the EPGH Project.

4 VISUAL IMPACT ASSESSMENT

A Visual Landscape Evaluation (VLE) was undertaken which described landscape character, landscape values and view experience to understand the visual context of the landscape surrounding the proposed wind farm development and identify appropriate Visual Management Objectives (VMOs) to manage landscape character. The outcomes of the VLE also establishes landscape criteria to enable the assessment of visual impacts.

This section describes the potential visual impacts associated with the development area and assesses these against the recommended VMOs. Through this assessment, the visual impacts to view experience and landscape character can be identified and described.

4.1 VISUAL IMPACT CRITERIA

To determine the level of visual impact of the development on the landscape, visual impact criteria are assessed at a selection of viewpoints within the landscape. These criteria were developed as a conceptual framework for analysing landscapes.

Ecoscape has adapted these criteria into an assessment table (**Table 2**) to categorise visual impacts into three levels. These visibility categories relate to how much the proposed change contrasts with the surrounding landscape:

+ Not visible: development is hidden, screened or not visible, from specified viewing locations.
+ Blending: development is evident, but not a dominant feature and blends with the existing landscape.
+ Prominent: development is a dominant feature in the landscape, drawing attention to itself.

4.2 VIEWSHED ANALYSIS

The objective of the viewshed analysis was to determine the potential visible area from the VIA locations. Seen area or viewshed analysis is a tool performed using a GIS computer program, in this case ArcGIS Pro. It is a conceptual desktop method best complemented by a site visit to confirm the results of the analysis as it does not account for features such as vegetation. A viewshed analysis calculates the areas that are visible from an observation point using a set of user defined parameters such as height of observer and target height. The analysis used a 30 m resolution smoothed digital elevation model (DEM-S) derived from the Shuttle Radar Topography Mission (SRTM) 1 second digital elevation model (Geoscience Australia, 2010).

Viewsheds were generated from the full height of the wind turbines for both options and the 40 m high poles along the 220kV transmission line to identify the areas in the landscape that may have views of the development. The viewshed results were used in conjunction with the photo montages to assess visibility of the proposed development.

4.2.1 WIND TURBINES

A composite viewshed map was produced from 189 wind turbines to determine the extent of visibility in relation to the view locations for both turbine options. The wind turbines are located in the eastern portion of the Project area and are distributed over a total area of about 170 km^2 with the terrain ranging between 256-340 m AHD. For option 1, the total height of the turbines (to blade tip) are 281 m and the height to the rotor hub is 190 m. For option 2, the total height of the turbines are 228 m and the height to the rotor hub is 137.3 m.

The viewshed analysis shows that the potential visibility of the wind turbines extends to 10 view locations for both turbine options, as shown on **Map 6-7**. It does not extend to view locations 16 or 22 which are at the western extent of the project area. The viewshed covers an extensive area as a result of the height of the turbines and the gradually sloping terrain of the Open Spinifex Plain LCU, which is the predominant landscape character of the eastern section of the Project area. The wind turbines will also be potentially visible from the ridgelines of the Stony Spinifex Hills LCU. As the viewshed analysis does not account for vegetation screening in the analysis, it is anticipated that views to the wind turbines would be limited by vegetation screening from within the Drainage Lines LCU. **Table 7** list the potential number of turbines visible at each view location.

Table 7: Potential number of wind turbines visible at each view location

View Location	LCU	Potential number of Turbines visible (Option 1 - 281m)	Potential number of Turbines visible (Option 2 – 228m)	Distance to nearest turbine (km)	Distance Zone
VIA 01	Open spinifex plain	189	182	11.88	Background
VIA 02	Open spinifex plain	128	112	0.61	Mid-ground
VIA 03	Stony spinifex hills	104	100	1.92	Mid-ground
VIA 04	Open spinifex plain	159	143	3.59	Mid-ground
VIA 05	Open spinifex plain	189	183	3.23	Mid-ground
VIA 06	Open spinifex plain	176	164	1.11	Mid-ground
VIA 07	Open spinifex plain	189	185	1.96	Mid-ground
VIA 08	Open spinifex plain	189	189	0.52	Mid-ground
VIA 09	Open spinifex plain	185	173	5.0	Mid-ground
VIA 10	Open spinifex plain	141	122	13.57	Background
VIA 11	Bare stony hills	0	0	77.2	Background
VIA 12	Stony spinifex hills	0	0	89.64	Background

4.2.2 220KV TRANSMISSION LINE

A composite viewshed map was produced from the 378 transmission poles using a maximum height of 40 m to determine the extent of visibility in relation to the view locations. The 149 km long 220kV transmission line extends from the wind turbines in the east to the Ironbridge Project at the western extent of the Project area. The Transmission line traverses terrain that ranges from 158-390 m AHD.

The viewshed analysis shows that the potential visibility of the transmission poles extends to all view locations (**Map 8-11**). It is anticipated that views to the transmission line would be limited by vegetation screening in the Drainage Lines LCU.

Further viewshed analysis was also undertaken of the transmission poles at 10 m height intervals from each viewpoint to help determine the proportion of the pole that may be visible. The results of these viewsheds are shown in **Table 8** and discussed further in the visual impact analysis at each view location.

Table 8: Potential number of 220kV transmission poles visible at each view location

View Location	LCU	Potential number of poles visible at each height interval				Distance to nearest pole(km)	Distance Zone
		> 10m	> 20m	> 30m	40m		
VIA 01	Open Spinifex Plain	0	30	75	85	6.44	Mid-ground
VIA 02	Open Spinifex Plain	59	86	92	94	2.62	Mid-ground
VIA 03	Stony Spinifex Hills	21	38	54	78	4.9	Mid-ground
VIA 04	Open Spinifex Plain	23	35	43	49	2.86	Mid-ground
VIA 05	Open Spinifex Plain	17	21	33	34	6.37	Mid-ground
VIA 06	Open Spinifex Plain	23	37	44	45	0.5	Foreground
VIA 07	Open Spinifex Plain	2	12	23	40	7.27	Background
VIA 08	Open Spinifex Plain	43	45	45	47	3.87	Mid-ground
VIA 09	Open Spinifex Plain	0	29	68	82	9.83	Background
VIA 10	Open Spinifex Plain	37	72	80	88	1.11	Mid-ground
VIA 11	Bare Stony Hills	4	5	8	8	0.73	Mid-ground
VIA 12	Stony Spinifex Hills	13	19	19	19	1.06	Mid-ground

4.3 VISUAL IMPACT ANALYSIS

This section presents a visual summary and impact analysis at each view location with images from each view location depicting the existing view and proposed view (photo montage). Also listed for each view location is a summary of the viewshed results that lists the potential number of wind turbines visible for both options and the potential number of transmission poles visible at 10 metre heigh intervals to demonstrate the proportion of the transmission pole that is likely to be visible. The interval viewshed analysis was done for the transmission poles as they can be difficult to see in the photo montage compared to the wind turbines.

4.3.1 VIA 1

+ Location (UTM): 790885E; 7625889N
+ Elevation: 266.17 m AHD
+ LCU: Open Spinifex Plain
+ Sensitivity: Level 3 – views of local significance
+ View direction to wind turbines: NE – SE
+ Minimum distance to wind turbines: 11.88 km (background)
+ Wind turbines visible (viewshed): 189 (option 1); 182 (option 2)
+ View direction to transmission line: NW – SE
+ Minimum distance to transmission line: 6.44 km (mid-ground)
+ Transmission poles visible (viewshed): 85 (40 m), 75 (>30 m), 30 (>20 m), 0 (>10 m)

Description of existing view

This view location is within the Open Spinifex Plain LCU. The existing view is predominantly open. The landscape is characterised by a dense layer of green spinifex grass that contrast with the vibrant orange soils. Tall shrubs are scattered across the landscape and consist of straight to angular dark brown branches with blue green textured foliage. These shrubs create a filtered view through to the distant horizon line which is generally straight and horizontal with a few sections of rolling landform visible. The character is natural with no existing development visible. The existing east view is shown on **Figure 14**.

Visual Absorption Capacity

The VAC from this view has low to moderate ability to accommodate a visual change depending on where the development is located as summarised below:

+ Foreground: low capacity due to a combination of low vegetation height and gently relief resulting in an open view experience.
+ Mid-ground and background: low to moderate capacity, development may be screened behind drainage line vegetation, however taller development may ‘skyline’ above the vegetation canopy and landform.

Anticipated visual change

At view location 1, the wind turbines are located in the background (11.88 km and beyond) of the view point and are visible in the east view depicted in the photo montages. The transmission line is also visible in the background (8 km and beyond) however to the naked eye it is not likely to be obvious at this distance (**Figure 15**). The photo montage analysis has rated the visibility of the turbines as **blending** and the transmission line as **blending** (**Table 9**). A summary of the visual analysis is presented in **Table 10**.

Table 9: VIA 1 – Photo montage analysis

Category	Not Visible	Blending	Prominent
Visibility		TL, T1	
Line		TL, T1	
Form		TL, T1	
Colour		TL, T1	
Texture		TL, T1	
Total Score (%)		**100% (TL, T1)**	
Overall Visibility Rating	**BLENDING (TL, T1)**		

T1 = wind turbine (option 1); TL = 220kVTransmission Line

Table 10: VIA 1 – Visual analysis

Category	Wind Turbines	Transmission Line
Visibility	The wind turbines are visible above the vegetated horizon line and although they introduce a new element to the existing natural view, they are not prominent due to the distance from the view point which reduces their visible scale.	The transmission line is not immediately obvious in the north east and east view compared to the wind turbines. As they are not as large scale as they tend to blend more with the vegetated horizon line
Line	At this distance, the straight and angular lines of the wind turbines do not noticeably contrast with the natural landscape. As the turbines are located in the background their reduced scale is not dissimilar from the scale of the straight and angular shrubs in the foreground view.	The transmission poles consist of straight lines which does dominate the view from this distance The filtered view experience through the scattered tall shrubs also help the transmission to blend.
Form	Although the vertical form of wind turbines protrude above the flat to rolling horizon line, the scale of the form is not dissimilar from the vertical and sloping form of the tall shrubs present in the existing view.	The singular vertical form of the transmission poles also blends with the vertical tall shrubs that are visible in the foreground.
Colour	Due to the atmospheric conditions during the site visit, the white colour of the turbines blend into the sky background that consists of light blue and white.	The dark colour of the transmission poles do not contrast with the natural landscape at this distance.
Texture	At this distance the smooth texture of the turbines does not obviously contrasts with the existing landscape.	The smooth texture of the transmission poles does not contrast with the natural landscape at this distance.

Significance of visual change

From VIA 1 the existing east view will be altered in the mid-ground and beyond. However, the visibility of the wind turbines and the transmission line have been assessed as blending with the existing landscape primarily due to the distance from the view point and the presence of tall shrubs that filter the view. Furthermore, varying weather conditions can affect the visibility of the wind turbines, particularly when they are located further away from the view point. However, depending on the time of day and atmospheric conditions the white smooth wind turbines may also reflect the sun which can make them more visible. The visual impact rating is summarised below:

+ Visibility rating: Blending (wind turbines and transmission line)
+ VMO: Best practice siting and design
+ Significance level: 3
+ Visual impact rating: Level 3 (wind turbines and transmission line)

Figure 14: VIA1 – Existing east view

Figure 15: VIA 1 – Proposed operational view

4.3.2 VIA 2

+ Location (UTM): 804483E; 7626614N
+ Elevation: 290.68 m AHD
+ LCU: Open Spinifex Plain
+ Sensitivity: Level 3 – views of local significance
+ View direction to wind turbines: NE – S
+ Minimum distance to wind turbines: 610 m (mid-ground)
+ Wind turbines visible (viewshed): 128 (option 1); 112 (option 2)
+ View direction to transmission line: NE – NW
+ Minimum distance to transmission line: 2.62 km (mid-ground)
+ Transmission poles visible (viewshed): 94 (40 m), 92 (>30 m), 86 (>20 m), 59 (>10 m)

Description of existing view

This view location is within the Open Spinifex Plain LCU with open and panoramic views across a flat sandy plain covered in vibrant green spinifex grassland which contrast with pale orange soils. Orange termite mounds are sparsely dotted amongst the spinifex clumps. The terrain is predominantly straight and horizontal and on the distant horizon line is the gently rolling silhouette of the Stony Spinifex Hills LCU. The character is natural with no existing development visible. The existing view is shown on **Figure 16**.

Visual Absorption Capacity

The VAC from this view has low to moderate ability to accommodate a visual change depending on where the development is located as summarised below:

+ Foreground – mid-ground: low capacity due to a combination of low vegetation height and gentle relief resulting in an open view experience.
+ Background: low to moderate capacity. For taller development the capacity is generally low as there is minimal opportunity to screen development due to a combination of low vegetation height and gentle relief resulting in an open view experience. Elevated terrain occurs in the distant background at 7 km and beyond from this view point, development located behind the elevated terrain is likely to be screened from view.

Anticipated visual change

The photo montages depict an eastern view which illustrates that the wind turbines and transmission line are visible in the mid-ground and beyond (**Figure 17** and **Figure 18**). The transmission line that is highly visible in the photo montage is the 20 m high overhead powerline that connects the wind turbines. The 220kV transmission line is also visible mid-ground, however it is not immediately obvious as the eye is drawn to the wind turbines and the smaller transmission line in the near foreground. The photo montage analysis has rated the wind turbines and overhead powerline as **prominent** and the 220kV transmission line as **blending** (**Table 11**). The visual analysis for the operational phase is presented in **Table 12** and in **Table 13** for the post operational phase.

Table 11: VIA 2 – Photo montage analysis

Category	Not Visible	Blending	Prominent
Visibility	50 yr	1 yr, TL	T1, T2, PL
Line	50 yr	1 yr, TL	T1, T2, PL
Form	50 yr	1 yr	T1, T2, TL, PL
Colour	50 yr	1 yr	T1, T2, TL, PL
Texture	50 yr	1 yr, TL	T1, T2, PL
Total Score (%)	**100% (50 yr)**	**100% (1 yr,), 60% (TL)**	**100% (T1, T2, PL), 40% (TL)**
Overall Visibility Rating	**NOT VISIBLE (50 yr) | BLENDING (TL, 1 yr) | PROMINENT (T1, T2, PL)**		

T1 = wind turbine (option 1); T2 = wind turbine (option 2); TL = 220kV Transmission Line; PL = 20 m high overhead powerline; 1 yr = post operational (1 year); 50 yr = post operational (50 years)

Table 12: VIA 2 – Visual analysis – operational phase

Category	Wind Turbines	Transmission Line
Visibility	The development introduces a new element to the existing view. As the turbines are within the foreground of the view point they are highly visible. They will also introduce movement into the otherwise still to calm existing view.	The overhead powerline is located within the mid-ground and is highly visible as it introduces a new element to the existing view. At this distance (3 km+) the 220kV transmission line is not highly visible as the eye is drawn to the large scale wind turbines.
Line	The wind turbines contain straight and angular lines. The lattice style base of Option 1 (T1) appears more complex than the single pole style of Option 2 (T2). Although straight and angular lines are present in the existing view, the large scale of the turbines are a dominant feature.	The straight line of the overhead powerline is similar to the flat horizon line however it contrasts with the curved spinifex clumps and sinuous horizon line where hilly terrain is present. At this distance, the straight lines of the 220kV transmission do not noticeably contrast with the landscape.
Form	The large scale vertical and sloping forms of the wind turbines are a dominant feature that contrast with the horizontal (flat horizon) and rolling (hilly terrain) form of the landscape.	The vertical form of the 20 m high transmission poles protrude above the horizontal and rolling horizon line. The horizontal form of the powerlines also contrast with the vertical line of the wind turbines. For some of the 220kV transmission poles, the vertical form noticeably protrudes above the horizon line. However, with increasing distance they eventually blend into the rolling horizon line in the background.
Colour	The white colour of the turbines contrast with the existing colours in the natural landscape which is predominantly green and orange.	The grey colour of the overhead powerline contrast with the existing colours of the natural environment. At this distance, the dark colour of the 220kV transmission poles blend into the dark silhouette of the hills on the horizon line.
Texture	The homogenous smooth texture of the turbines contrasts with the textured variation present in the natural landscape.	The homogenous smooth texture of the overhead powerline contrasts with the textured variation present in the natural landscape. At this distance, the smooth texture of the 220kV transmission line does not noticeably contrast with the surrounding landscape.

Table 13: VIA 2 – Visual analysis– post operational phase

Category	1 year	50 years
Visibility	The cleared pad where the wind turbines were located is visible amongst the spinifex grassland however is not dissimilar from the surrounding landscape.	No infrastructure or cleared areas are visible after successful revegetation.
Line	The lines of the cleared pad appear predominantly straight which contrasts with the curved spinifex clumps however is not dissimilar from the straight line of the terrain.	n/a
Form	The form is horizontal which blends with the existing terrain.	n/a
Colour	The cleared area blends with its setting as it matches the soil colour of surrounding landscape.	n/a
Texture	The smooth texture of the cleared area blends with the smooth exposed sandy soils of surrounding landscape.	n/a

Significance of visual change

The prominent visibility of the turbines and the overhead power line from this view point results in an obvious change to the view which alters the landscape character from unmodified to modified. While both turbine options have been rated as prominent, Option 1 (T1) is taller than option 2 (T2) and appears more complex with its lattice style base compared to the single pole style of T2. From this viewpoint, the overhead powerline that connects the wind turbines adds a level of complexity to the view where it disrupts the pattern of the wind turbines and the horizontal overhead line contrasts with the vertical turbine poles. The poles also act a scale indicator that emphasize the large scale of the turbines. The main 220kV transmission line is also visible but has been rated as a blending impact due to the distance from the view point (3 km and beyond) which reduces the scale of the transmission line as observed from VIA 2.

The visual change is reduced to blending at 1 year post operation where the cleared turbine pad is visible and not evident at 50 years post operation after successful revegetation of the cleared areas.

The visual impact rating of the **operational** phase is summarised below:

+ Visibility rating: Prominent (both wind turbine options and the overhead powerline); Blending (220kV transmission line)
+ VMO: Best practice siting and design
+ Significance level: 3
+ Visual impact rating: Level 1 (wind turbines and the overhead powerline); Level 3 (220kV transmission line).

The visual impact rating of the **post operational** phase is summarised below:

+ Visibility rating: Blending (1 year) Not Evident (50 years)
+ VMO: Best practice siting and design
+ Significance level: 3
+ Visual impact rating: Level 3 (1 year post operational) None (50 years post operational).

Figure 16: VIA 2 - Existing south east view

Figure 17: VIA 2 – Proposed operational view (option 1)

Figure 18: VIA 2 – Proposed operational view (option 2)

Figure 19: VIA 2 – Post operational view (1 year)

Figure 20: VIA 2 – Post operational view (50 years)

4.3.3 VIA 3

+ Location (UTM): 814977E; 7624784N
+ Elevation: 337.52 m AHD
+ LCU: Stony Spinifex Hills
+ Sensitivity: Level 3 – views of local significance
+ View direction to wind turbines: SW - NE
+ Minimum distance to wind turbines: 1.92 km (mid-ground)
+ Wind turbines visible (viewshed): 104 (option 1); 100 (option 2)
+ View direction to transmission line: SW - NE
+ Minimum distance to transmission line: 4.90 km (mid-ground)
+ Transmission poles visible (viewshed): 78 (40 m), 54 (>30 m), 38 (>20 m), 21 (>10 m)

Description of existing view

This view location is within the Stony Spinifex Hills LCU and overlooking the Open Spinifex Plain LCU. The mid-ground views to the north, east and south are enclosed by undulating hilly terrain. To the south and west, there are long range views across a gently undulating grassland plain with scattered tall shrubs. In the foreground rough textured orange stony soils and smooth orange rocks contrast with vibrant green spikey spinifex clumps. From a broader view perspective, the pale yellow spinifex flower stalks create a soft textured appearance which contrast with the vertical to angular dark trunks of the scattered shrubs with textured foliage of various greens. In the mid-ground and background are bands of darker green taller vegetation where drainage lines are present. The horizon line to the west is a dark green horizontal and straight line. The distant horizon line gradually transitions from straight and horizontal to a sloping, rolling and sinuous dark orange/green silhouette where hilly terrain is present. The character is natural with no existing development visible. The existing south west view is shown on **Figure 21**.

Visual Absorption Capacity

The VAC from this view has low to moderate ability to accommodate a visual change depending on where the development is located as summarised below:

+ Foreground: low capacity due to a combination of low vegetation height and gently relief resulting in an open view experience.
+ Mid-ground to background: low to moderate capacity, development may be screened behind drainage line vegetation, however, taller development may ‘skyline’ above the vegetation canopy and landform.

Anticipated visual change

The photo montages depict a west view (**Figure 22**) which illustrate that the wind turbines and transmission line will be visible from VIA 3. The wind turbines are located in the mid-ground (1.8 km and beyond) and are highly visible. In the west view the transmission poles are located in the mid-ground (6 km and beyond) and at this distance they are not highly visible compared to the wind turbines, although their vertical form protrudes above the rolling horizon line. The photo montage analysis has rated the wind turbines as **prominent** (**Table 14**) and the transmission poles as **blending**. The transmission line also occurs in the mid-ground at about 5 km to the north west and traverses over the northern ridgeline in a north east direction. Subsequently, the transmission line may be prominent from VIA 3 when looking to the north and north west. The visual analysis for the development is presented in **Table 15**.

Table 14: VIA 3 – Photo montage analysis

Category	Not Visible	Blending	Prominent
Visibility		TL	T1
Line			TL, T1
Form			TL, T1
Colour		TL	T1
Texture		TL	T1
Total Score (%)		**60% (TL)**	**40% (TL) 100% (T1)**
Overall Visibility Rating	**BLENDING (TL), PROMINENT (T1)**		

T1 = wind turbine (option 1); TL = 220kV Transmission Line

Table 15: VIA 3 – Visual analysis

Category	Wind Turbines	Transmission Line
Visibility	The wind turbines are highly visible from VIA 3 which has a long range and open view experience. The development is located in the mid-ground and beyond and introduces a new large scale built element to the existing natural view. They will also introduce movement into the otherwise still to calm existing view.	At this distance the transmission line is not a dominant feature. However, it is likely that they will be more prominent to the north west where there are located in the mid-ground view.
Line	The wind turbines contain straight and angular lines. Although there are straight and angular lines present in the existing view, the large scale of the turbines makes them a dominant feature.	The transmission poles consist of straight lines which are visibly protruding above the horizon line.
Form	The large scale vertical and sloping forms of the wind turbines are a dominant feature that contrast with the horizontal (flat horizon) and rolling (hilly terrain) form of the landscape.	The vertical poles are visibly protruding above the horizontal to rolling horizon line.
Colour	The white colour of the turbines contrast with the existing colours in the natural landscape which consist of varying shades of green and orange.	The transmission poles are likely to be a grey tone which does not appear to contrast with the natural landscape at this distance.
Texture	The turbines are a homogenous smooth texture which contrasts with the textural variability present in the natural landscape.	The smooth texture of the transmission poles does not noticeably contrast with the natural landscape at this distance.

Significance of visual change

The prominent visibility of the turbines from this view point results in an obvious change to the view which alters the landscape character from unmodified to modified. The visibility of the transmission line diminishes with increasing distance as they blend into the dark background of the elevated horizon line to the west. However, it is likely to be highly visible where it will be the only infrastructure in the mid-ground when looking north west.

The visual impact rating is summarised below:

+ Visibility rating: Prominent (wind turbines), Blending to Prominent (transmission line)
+ VMO: Best practice siting and design
+ Significance level: 3
+ Visual impact rating: Level 1 (wind turbines); Level 3 (transmission line).

Figure 21: VIA 3 – Existing west view

Figure 22: VIA 3 – Proposed operational view (option 1)

4.3.4 VIA 4

+ Location (UTM): 818735E; 7630618N
+ Elevation: 337.52 m AHD
+ LCU: Open Spinifex Plain
+ Sensitivity: Level 1 – views of National or State significance (Marble Bar Road)
+ View direction to wind turbines: SW - NE
+ Minimum distance to wind turbines: 3.59 km (mid-ground)
+ Wind turbines visible (viewshed): 159 (option 1); 143 (option 2)
+ View direction to transmission line: SW - NE
+ Minimum distance to transmission line: 2.86 km (mid-ground)
+ Transmission poles visible (viewshed): 49 (40 m), 43 (>30 m), 35 (>20 m), 23 (>10 m)

Description of existing view

This view location is located on Marble Bar Road within the Open Spinifex Plain LCU. From this view point the view experience is mostly open across a gently undulating spinifex grassland, however scattered shrubs filter open views where present. The undulating landform in the mid-ground and background also encloses views to the south. The horizon line varies from straight to sinuous where hilly terrain is present. The spinifex exhibits curved lines with wispy angular pale yellow flower stalks creating a softness that contrasts with the rough orange stony soils of the unsealed road and exposed soils. Larger rocks and boulders are smooth pale to bright orange landscape features that contrast with the soft green spinifex grass. The shrubs consist of dark greens with dark brown straight and angular branches which protrude above the straight and horizontal horizon line in the north and north west view. The character is natural and the only development visible is the unsealed pale orange road with occasional road signs. **Figure 23** shows the existing north to north west view.

Visual Absorption Capacity

The VAC from this view has low to moderate ability to accommodate a visual change depending on where the development is located as summarised below:

+ Foreground: low to moderate capacity due to simple natural landscape character, potential for low development to be screened behind landform
+ Mid-ground and background: low to moderate capacity, development may be screened by landform, however there is potential for taller development to 'skyline' due to the low variability in topography.

Anticipated visual change

The wind turbines and transmission line are located in the mid-ground of this view location and are visible in the north view depicted in the photo montage (**Figure 24**). The photo montage analysis has rated the visibility of the turbines **prominent** and the transmission line as **blending** (**Table 16**). The visual analysis for the development is presented in **Table 17**.

Table 16: VIA 4 – Photo montage analysis

Category	Not Visible	Blending	Prominent
Visibility		TL	T1
Line		TL	T1
Form		TL	T1
Colour		TL	T1
Texture		TL	T1
Total Score (%)		**100% (TL)**	**100% (T1)**
Overall Visibility Rating	**PROMINENT (T1), BLENDING (TL)**		

T1 = wind turbine (option 1); TL = 220kV Transmission Line

Table 17: VIA 4 – Visual analysis

Category	Wind Turbines	Transmission Line
Visibility	The wind turbines are highly visible from VIA 4 which has an open to filtered view experience in the foreground and mid-ground. The development is located in the mid-ground and beyond and introduces a new large scale built element to the existing natural view. They will also introduce movement into the otherwise still to calm existing view.	At this distance (2.86 km and beyond) the transmission line is not highly visible as the eye is drawn to the large scale wind turbines.
Line	The wind turbines consist of straight and angular lines. Although straight and angular lines are present in the existing view, the large scale of the turbines are a dominant feature.	At this distance the straight lines of the transmission line blend with the existing straight lines of the tall shrubs in the existing view.
Form	The large scale vertical form of wind turbines contrasts with the flat to rolling horizon line. Although vertical forms are in the existing view where shrubs protrude the horizon line, they are a much smaller scale than the wind turbines.	At this distance the vertical forms of the power poles are visible but tend to blend with the vertical forms that are present in the landscape. The horizontal form of the transmission lines are not highly noticeable at this distance.
Colour	The white colour of the turbines contrast with the existing colours in the natural landscape which are a variety of greens, pale yellows and oranges.	The grey colour of the transmission line and poles do not strongly contrast with the colours in the existing landscape.
Texture	The turbines are a homogenous smooth texture which contrasts with the textural variability present in the natural landscape.	The texture of the transmission line and poles are not highly noticeable at this distance.

Significance of visual change

This view location is located on the Marble Bar Road which is a route of State and National Significance (Level 1) as it is a primary road that connects the regional towns of Marble Bar, Port Headland and Newman. This road is also part of the East Pilbara Geoheritage trail, one of the drive trails of the Warlu Way (ANW Tourism, 2023). The wind turbines are highly visible from this view location whereas the 220kV transmission line is blending into the landscape. It should be noted that where the transmission line crosses the road, it will be a prominent impact as it will be in the foreground view of the observer. The prominent visibility of the wind turbines results in an obvious change to the view which alters the landscape character from unmodified to modified. As shown on the viewshed maps (**Map 6-7**) many wind turbines are potentially visible from Marble Bar Road. The visual impact rating is summarised below:

+ Visibility rating: Prominent (wind turbines, transmission line)
+ VMO: Protection and maintenance of landscape values (Stony Spinifex Hills LCU) and Best practice siting and design for the Open Spinifex Plain LCU.
+ Significance level: 1
+ Visual impact rating: Level 1 (wind turbines, transmission line)

Figure 23: VIA 4 – Existing north view

Figure 24: VIA 4 – Proposed operational view

4.3.5 VIA 5

+ Location (UTM): 817196E; 7644454N
+ Elevation: 264.19 m AHD
+ LCU: Open Spinifex Plain
+ Sensitivity: Level 3 – views of local significance
+ View direction to wind turbines: NE - SW
+ Minimum distance to wind turbines: 3.23 (mid-ground)
+ Wind turbines visible (viewshed): 189 (option 1); 183 (option 2)
+ View direction to transmission line: SE - W
+ Minimum distance to transmission line: 6.37 km (background)
+ Transmission poles visible (viewshed): 34 (40 m), 33 (>30 m), 21 (>20 m), 17 (>10 m)

Description of existing view

This view location is on a stony rise with an open and panoramic view experience overlooking the Open Spinifex Plain LCU to the hills on the distant horizon line. The colour palette ranges from pale yellow, vibrant green grasses and dark green shrubs that contrast with rich orange soils and exposed rocks. The hills on the horizon line are a dark sinuous silhouette. To the north the landform is horizontal and straight occasionally interrupted by isolated angular peaks. Curved spinifex clumps are dotted amongst the rocky soils in the foreground. Tall shrubs with vertical and angular dark branches and dark green canopies are scattered across the grassland plain. The character is natural with no existing development visible. The existing view is shown on **Figure 25**.

Visual Absorption Capacity

The VAC from this view has low to moderate ability to accommodate a visual change depending on where the development is located as summarised below:

+ Foreground: low to moderate capacity due to simple natural landscape character, and the open view experience due to the low height of vegetation and the elevated observer position.
+ Mid-ground to background: low to moderate capacity, for taller development the capacity is generally low as there is minimal opportunity to screen development due to a combination of an elevated view location and gently relief which contributes to an open view experience.

Anticipated visual change

The photo montages depict the east view from VIA 5 which illustrate that the wind turbines are visible in the mid-ground view (**Figure 26**). The viewshed analysis has also shown that up to 34 transmission poles may be visible which are located 9 km to the south east and 15 km to the south. However, at this distance they are likely to blend into the vegetated horizon line and not be visible to the naked eye. The photo montage analysis has rated the wind turbine as **prominent** (**Table 18**) and the transmission poles as **not visible**. The visual analysis for the development is presented in **Table 19**.

Table 18: VIA 5 – Photo montage analysis

Category	Not Visible	Blending	Prominent
Visibility	TL		T1
Line	TL		T1
Form	TL		T1
Colour	TL		T1
Texture	TL		T1
Total Score (%)	**100%(TL)**		**100% (T1)**
Overall Visibility Rating	**NOT VISIBLE (TL); PROMINENT (T1)**		

T1 = wind turbine (option 1); TL = 220kV Transmission Line

Table 19: VIA 5 – Visual analysis

Category	Wind Turbines
Visibility	The wind turbines are highly visible from VIA 5 which has a long range and open view experience. The development is located in the mid-ground and beyond and introduces a new large scale built element to the existing natural view. They will also introduce movement into the otherwise still to calm existing view.
Line	The wind turbines contain straight and angular lines. Although straight and angular lines are present in the existing view, the large scale of the turbines are a dominant feature.
Form	The vertical form of wind turbines contrast with the flat spinifex plain and the straight to sinuous horizon lines. The wind turbines also contain sloping form which contrasts with the predominantly horizontal form of the landscape. Although vertical and sloping forms are visible in the natural environment they are a much smaller scale than the wind turbines.
Colour	The white colour of the turbines contrast with the existing colours in the natural landscape which consist of a variety of greens, pale yellows, dark browns and oranges.
Texture	The turbines are a homogenous smooth texture which contrasts with the textural variability present in the natural landscape.

Significance of visual change

The prominent visibility of the turbines from VIA 5 results in an obvious change to the view which alters the landscape character from unmodified to modified. The transmission line is not visible in the east view that is depicted in the photo montages. The viewshed analysis shows that up to 34 transmission poles may be visible in the background (9-15 km) to the south east and south. However, at this distance they are likely to blend into the vegetated horizon line and not be visible to the naked eye.

The visual impact rating is summarised below:

+ Visibility rating: Prominent (wind turbines), Not Visible (transmission line)
+ VMO: Best practice siting and design
+ Significance level: 3
+ Visual impact rating: Level 1 (wind turbines), None (transmission line)

Figure 25: VIA 5 – Existing east view

Figure 26: VIA 5 – Proposed operational view (option 1)

4.3.6 VIA 6

+ Location (UTM): 820398E; 7638772N
+ Elevation: 271.39 m AHD
+ LCU: Open Spinifex Plain
+ Sensitivity: Level 3 – views of local significance
+ View direction to wind turbines: all directions
+ Minimum distance to wind turbines: 600 m (mid-ground)
+ Wind turbines visible (viewshed): 176 (option 1); 164 (option 2)
+ View direction to transmission line: NE - W
+ Minimum distance to transmission line: 50 m (foreground)
+ Transmission poles visible (viewshed): 45 (40 m), 44 (>30 m), 37 (>20 m), 23 (>10 m)

Description of existing view

This view point is located within the Open Spinifex Plain LCU with open to filtered views across a flat to gently undulating spinifex grassland with scattered shrubs and dark green trees where the drainage line occurs (Yandicoogina Creek) (**Figure 27**). Views extend to the sinuous horizon line to the south east and south. Long range views occur to the flat horizon line to the north. The colour palette is comprised of greys and light greens in the ground layer with an undertone of vibrant orange stony soils. The shrub layer consists of dark brown branches and blue green to dark green canopies. A band of dense vegetation consisting of olive greens and white branches denote the presence of drainage lines. The hills on the horizon line are a sinuous dark orange silhouette. The character is natural with no existing development visible. The existing view is shown on **Figure 27**.

Visual Absorption Capacity

The VAC from this view has low to moderate ability to accommodate a visual change depending on where the development is located as summarised below:

+ Foreground: low to moderate capacity due to the natural landscape character and the open view experience over the low spinifex grassland.
+ Mid-ground to background: low to moderate capacity, development may be screened behind drainage line vegetation, however, taller development may ‘skyline’ above the vegetation canopy and landform.

Anticipated visual change

The photo montages depict the south view from VIA 6 which illustrate that the wind turbines are visible in the mid-ground view (1.3 km and beyond) (**Figure 28**). The viewshed analysis has also shown that up to 45 transmission poles may be visible to the south which are located 440 m and beyond from the view point. Due to the camera angle at this viewpoint, three transmission poles are highly visible at the western edge of the view, however it can be assumed that more poles will be visible from this location. The photo montage analysis has rated the wind turbines and transmission line as **prominent** (**Table 20**). The visual analysis for the development is presented in **Table 21**.

Table 20: VIA 6 – Photo montage analysis

Category	Not Visible	Blending	Prominent
Visibility			T1, TL
Line			T1, TL
Form			T1, TL
Colour			T1, TL
Texture			T1, TL
Total Score (%)			**100% (T1, TL)**
Overall Visibility Rating	**PROMINENT (T1, TL)**		

T1 = wind turbine (option 1); TL = 220kV Transmission Line

Table 21: VIA 6 – Visual analysis

Category	Wind Turbines	Transmission Line
Visibility	The wind turbines are highly visible from VIA 6 which has an open to filtered view experience. The development is located in the mid-ground and beyond and introduces a new large scale built element to the existing natural view. They will also introduce movement into the otherwise still to calm existing view.	The transmission line is highly visible from VIA 6 as it is located within the foreground of the view location. The development introduces a new large scale element to the existing natural view.
Line	The wind turbines contain straight and angular lines that contrast with the sinuous horizon line. Although there are straight and angular lines present in the existing view, the large scale of the turbines make them a dominant feature.	The transmission line contains mostly straight lines with angled lines also visible at the gantry. Although there are straight and angular lines present in the existing view, the large scale of the transmission line poles are a dominant feature.
Form	The vertical and sloping form of wind turbines protrude above the rolling horizon line and vegetation canopy. Although vertical and sloping forms occur in the natural environment they are at a much smaller scale than the wind turbines.	The tall vertical form of the transmission poles protrudes above the rolling horizon line and vegetation canopy. The horizontal power lines also contrast against the sky at this proximity. Although vertical and horizontal forms occur in the natural environment, they are at a much smaller scale than the transmission poles.
Colour	The white colour of the turbines contrast with the existing colours in the natural landscape which are composed of a variety of greens, greys, dark browns and oranges.	The dark grey colour of the transmission poles contrasts against the light sky background, it is expected they will become less prominent with increasing distance from the view point.
Texture	The turbines are a homogenous smooth texture which contrasts with the textural variability present in the natural landscape.	At this proximity, the homogenous smooth texture of the transmission poles contrasts with the textural variability present in the natural landscape.

Significance of visual change

At view location 6, the wind turbines are located in the mid-ground and beyond of the view point and are visible in the south view depicted in the photo montage. The transmission line is located in the foreground and extends to the south west of the view location. The prominent visibility of the turbines and the transmission line from this view point results in an obvious change to the view which alters the landscape character from unmodified to modified.

The visual impact rating is summarised below:

+ Visibility rating: Prominent (wind turbines and transmission line)
+ VMO: Best practice siting and design
+ Significance level: 3
+ Visual impact rating: Level 1 (wind turbines and transmission line)

Figure 27: VIA 6 – Existing south view

Figure 28: VIA 6 – Proposed operational view

4.3.7 VIA 7

+ Location (UTM): 828530E; 7647280N
+ Elevation: 275.87 m AHD
+ LCU: Open Spinifex Plain
+ Sensitivity: Level 3 – views of local significance
+ View direction to wind turbines: SE - SW
+ Minimum distance to wind turbines: 1.96 km (mid-ground)
+ Wind turbines visible (viewshed): 189 (option 1); 185 (option 2)
+ View direction to transmission line: SSW - W
+ Minimum distance to transmission line: 17.45 km (background)
+ Transmission poles visible (viewshed): 40 (40 m), 23 (>30 m), 12 (>20 m), 2 (>10 m)

Description of existing view

VIA 7 is located on a low stony rise with a mostly open view experience across the Open Spinifex Plain LCU with long range views to the sinuous horizon line to the south. Several isolated low rocky hills with rolling form enclose views to the south west and to the north (**Figure 29**). The colour palette consists of vibrant orange soil and loose rocks that contrast with pale green/yellow spinifex grassland, shrubs consist of blue green, olive green foliage and a darker green band of dense vegetation that is associated with the drainage line is visible in the mid-ground. The drainage line vegetation also contains white barked taller trees. The scattered shrubs are characterised by straight and angular dark brown branches with a blue green canopy that has a spikey textured appearance. The pale yellow straight and angular flower stalks that protrude from the curved spinifex clumps which contribute to a softer appearance that contrast with the rough soils and textured shrubland foliage. The character is natural with no existing development visible. The existing view is shown on **Figure 29**.

Visual Absorption Capacity

The VAC from this view has low to moderate ability to accommodate a visual change depending on where the development is located as summarised below:

+ Foreground: low to moderate capacity due to simple natural landscape character with an open view experience, low height development may be screened behind undulating landform.
+ Mid-ground and background: low to moderate capacity, development may be screened by drainage line vegetation and landform, however there is potential for taller development to ‘skyline’ due to the low variability in topography and relatively open view experience.

Anticipated visual change

The photo montage depicts the south west view from VIA 7 which illustrate that the wind turbines are visible in the mid-ground view (1.96 km and beyond) (**Figure 30**). The viewshed analysis has also shown that up to 40 transmission poles may be visible to the south which are located 7 km and beyond from the view point. However, from this distance it is unlikely that the transmission line will be visible from this view point due to the reduced scale of the poles and landform screening. The photo montage analysis has rated the wind turbines as **prominent** (**Table 22**) and the transmission poles as **not visible**. The visual analysis for the development is presented in **Table 23**.

Table 22: VIA 7 – Photo montage analysis

Category	Not Visible	Blending	Prominent
Visibility	TL		T1
Line	TL		T1
Form	TL		T1
Colour	TL		T1
Texture	TL		T1
Total Score (%)	**100% (TL)**		**100% (T1)**
Overall Visibility Rating	**NOT VISIBLE (TL); PROMINENT (T1)**		

T1 = wind turbine (option 1); P = Transmission Pole

Table 23: VIA 7 – Visual analysis

Category	Wind Turbines
Visibility	The wind turbines are highly visible from VIA 7 as they protrude above the south west horizon line. The development is located in the mid-ground and beyond and introduces a new large scale built element to the existing natural view. They will also introduce movement into the otherwise still to calm existing view.
Line	The wind turbines contain straight and angular lines that contrast with the sinuous horizon line. Although straight and angular lines are present in the existing view, the large scale of the turbines are a dominant feature.
Form	The vertical and sloping form of wind turbines protrude above the flat to rolling horizon line. Although vertical and sloping forms occur in the natural environment they are at a much smaller scale than the wind turbines.
Colour	The white colour of the turbines contrast with the existing colours in the natural landscape which are composed of a variety of greens, pale yellows, dark browns and oranges.
Texture	The turbines are a homogenous smooth texture which contrasts with the textural variability present in the natural landscape.

Significance of visual change

At view location 7, the wind turbines are located in the mid-ground and beyond of the view point and are visible in the south west view depicted in the photo montage. The prominent visibility of the turbines from this view point results in an obvious change to the view which alters the landscape character from unmodified to modified. The transmission line is located 7 km to the south of the viewpoint, however it is not visible in the in the photo montages as it is likely that they will be screened behind landform.

The visual impact rating is summarised below:

+ Visibility rating: Prominent (wind turbines), Not Visible (transmission line)
+ VMO: Best practice siting and design
+ Significance level: 3
+ Visual impact rating: Level 1 (wind turbines), None (transmission line)

Figure 29: VIA 7 – Existing south west view

Figure 30: VIA 7 – Proposed operational view

4.3.8 VIA 8

+ Location (UTM): 828935E; 7638935N
+ Elevation: 296.82 m AHD
+ LCU: Open Spinifex Plain
+ Sensitivity: Level 3 – views of local significance
+ View direction to wind turbines: SW - E
+ Minimum distance to wind turbines: 520 m (mid-ground)
+ Wind turbines visible (viewshed): 189 (option 1); 189 (option 2)
+ View direction to transmission line: SW - NW
+ Minimum distance to transmission line: 3.87 km (mid-ground)
+ Transmission poles visible (viewshed): 47 (40 m), 45 (>30 m), 45 (>20 m), 43 (>10 m)

Description of existing view

This view location has an open and panoramic view across the vast Open Spinifex Plain LCU, there are also long range views to the subtle sinuous landform on the distant southern horizon line. In the foreground vibrant green curved spinifex grasses contrast with the smooth vibrant orange soils which are flecked with pale cream stones. Dark green shrubs contrast with the pale yellow straight and angular flower stalks that protrude from the curved spinifex clumps that contribute to a softer appearance which contrast with the textured shrubland foliage. The scattered shrubs are characterised by straight and angular branches with curved canopies which protrude above the flat horizon line to the north. Individual landscape features are present within the foreground view including smooth curved orange boulders and a low curved stony hill. The character is natural with no existing development visible. The existing view is shown on **Figure 31**.

Visual Absorption Capacity

The VAC from this view has low to moderate ability to accommodate a visual change depending on where the development is located as summarised below:

+ Foreground and mid-ground: low capacity due the simple natural landscape character and minimal screening opportunities as a result of the low relief and low vegetation height.
+ Background: moderate capacity, low height development may be screened by landform and drainage line vegetation, however taller development may ‘skyline’ above the vegetation canopy and horizon line.

Anticipated visual change

The photo montage depicts the north west view from VIA 8 which illustrates that the wind turbines are visible in the near mid-ground view (520 m and beyond) (**Figure 32**). The viewshed analysis has also shown that up to 47 transmission poles may be visible which are located 3.7 km to the north west. However, at this distance, it is likely that they will not be visible due to the effect of distance and vegetation screening which will help them to blend into the landscape. The photo montage analysis has rated the wind turbines as **prominent** (**Table 24**) and it has been assumed that the transmission poles will not be visible at this distance. The visual analysis for the development is presented in **Table 25**.

Table 24: VIA 8 – Photo montage analysis

Category	Not Visible	Blending	Prominent
Visibility	TL		T1
Line	TL		T1
Form	TL		T1
Colour	TL		T1
Texture	TL		T1
Total Score (%)	**100% (TL)**		**100% (T1)**
Overall Visibility Rating	**BLENDING (TL), PROMINENT (T1)**		

T1 = wind turbine (option 1); TL = 220kV Transmission Line

Table 25: VIA 8 – Visual analysis

Category	Wind Turbines
Visibility	The wind turbines are highly visible from VIA 8 as they protrude above the north west horizon line. The development is located in the near mid-ground and beyond and introduces a new large scale built element to the existing natural view. They will also introduce movement into the otherwise still to calm existing view.
Line	The wind turbines contain straight and angular lines that contrast with the curved features in the foreground view. Although straight and angular lines are present in the existing view, the large scale of the turbines are a dominant feature.
Form	The vertical and sloping form of wind turbines protrude above the flat to rolling horizon line. Although vertical and sloping forms occur in the natural environment they are at a much smaller scale than the wind turbines.
Colour	The white colour of the turbines contrast with the existing colours in the natural landscape which are composed of a variety of greens, pale yellows, dark browns and oranges.
Texture	The turbines are a homogenous smooth texture which contrasts with the textural variability present in the natural landscape.

Significance of visual change

At view location 8, the wind turbines are located in the near mid-ground and beyond of the view point and are visible in the north west view depicted in the photo montage. The prominent visibility of the turbines from this view point results in an obvious change to the view which alters the landscape character from unmodified to modified. The viewshed analysis has also shown that up to 47 transmission poles may be visible to the north west which are located in the mid-ground (3.7 km and beyond) from the view point. However, it is unlikely that they will be visible to the naked eye at this distance.

The visual impact rating is summarised below:

+ Visibility rating: Prominent (wind turbines), Not Visible (transmission line)
+ VMO: Best practice siting and design
+ Significance level: 3
+ Visual impact rating: Level 1 (wind turbines), None (transmission line)

Figure 31: VIA 8 – Existing north west view

Figure 32: VIA 8 – Proposed operational view

4.3.9 VIA 9

+ Location (UTM): 795522E; 7616664N
+ Elevation: 285.65 m AHD
+ LCU: Open Spinifex Plain
+ Sensitivity: Level 3 – views of local significance
+ View direction to wind turbines: NE - E
+ Minimum distance to wind turbines: 5 km (mid-ground)
+ Wind turbines visible (viewshed): 185 (option 1); 173 (option 2)
+ View direction to transmission line: NW - NE
+ Minimum distance to transmission line: 9.83 km (background)
+ Transmission poles visible (viewshed): 82 (40 m), 68 (>30 m), 29 (>20 m), 0 (>10 m)

Description of existing view

VIA 9 is located on the Open Spinifex Plain and is characterised by open to filtered views across a flat to gently undulating sandy grassland plain. The foreground consists of vibrant green curved spinifex clumps which contrasts with the smooth orange sandy soils. The tall shrubs that punctuate the horizon line are characterised by dark brown branches which vary from vertical and straight to angular and curved. Their blue green curved canopy has a spikey textured appearance that contrasts with the softer appearance of the spinifex grass. A band of dense dark green vegetation to the north west denotes the presence of a drainage line. From most view directions the horizon line is straight and horizontal, with the exception of the north east view which has a subtle sinuous horizon line of elevated landform in the background (16 km and beyond). The character is natural with no existing development visible. The existing view is shown on **Figure 33**.

Visual Absorption Capacity

The VAC from this view has low to moderate ability to accommodate a visual change depending on where the development is located as summarised below:

+ Foreground: low to moderate capacity due to natural landscape character with filtered views, may be able to accommodate low height development behind the existing tall shrubland.
+ Mid-ground and background: low to moderate capacity, development may be screened by the existing tall shrubland vegetation, however there is potential for taller development to ‘skyline’ due to the low variability in topography.

Anticipated visual change

At view location 9, the wind turbines are located in the mid-ground and beyond and are visible in the north east view depicted in the photo montage (**Figure 34**). The viewshed analysis has also shown that 82 transmission poles at full height (40 m) may be visible to the north west, north and north east which are located in the background of the view point. However, the analysis revealed that only the top 10 m portion is potentially visible for the majority of these poles, therefore it is likely that they will blend with the vegetated horizon line and not be visible to the naked eye.

The photo montage analysis has rated the wind turbines as **blending** (**Table 26**) and it has been assumed that the transmission poles will be **not visible** due to a combination of distance and vegetation screening. The visual analysis for the development is presented in **Table 27.**

Table 26: VIA 9 – Photo montage analysis

Category	Not Visible	Blending	Prominent
Visibility	TL	T1	
Line	TL	T1	
Form	TL	T1	
Colour	TL	T1	
Texture	TL	T1	
Total Score (%)	**100% (TL)**	**100% (T1)**	
Overall Visibility Rating			

T1 = wind turbine (option 1); TL = 220kV Transmission Line

Table 27: VIA 9 – Visual analysis

Category	Wind Turbines
Visibility	The wind turbines are visible from VIA 9 as they protrude above the horizon line. However, due to the combination of distance from the view point and the screening effect of tall shrubland in the foreground, the wind turbines are not prominent.
Line	At this distance, the straight and angular lines of the wind turbines do not contrast significantly with the natural landscape. As the turbines are located in the background their scale is reduced and they do not dominate the view.
Form	Although the vertical form of wind turbines protrude above the flat to rolling horizon line, the scale of the form is not dissimilar from the vertical and sloping tall shrubs present in the existing view.
Colour	Due to the atmospheric conditions during the site visit, the white colour of the turbines blend with the white cloud cover. This demonstrates that varying weather conditions can affect the visibility of the wind turbines, particularly when they are located further away from the view point.
Texture	The smooth texture of the wind turbines blends into the sky does not significantly contrast with the existing view.

Significance of visual change

The blending visibility of the turbines from this view point results in a subtle change to the view experience. Although a new built form is introduced to the existing view, the combination of distance from the viewer and vegetation screening reduce the visual prominence from this view point. Also, the impact of weather conditions during the site analysis demonstrates how different atmospheric conditions may impact the visibility of the turbines, in this instance the white colour of the turbines blends with the cloud cover. It is possible that the wind turbines may appear more prominent in other weather conditions, for example a grey stormy sky in the east with the afternoon sun reflecting off the white surface.

The transmission line is not visible in the eastern view that is depicted in the photo montages as it is located in the background to the north west, north and north east from this view point. It has been assumed that the transmission line is not likely to be visible from VIA 9 due to vegetation screening and distance from the view point (11 km and beyond).

The visual impact rating is summarised below:

+ Visibility rating: Blending (wind turbines), Not Visible (transmission line)
+ VMO: Best practice siting and design
+ Significance level: 3
+ Visual impact rating: Level 3 (wind turbines), None (transmission line)

Figure 33: VIA 9 – Existing east view

Figure 34: VIA 9 – Proposed operational view

4.3.10 VIA 10

+ Location (UTM): 793385E; 7633574N
+ Elevation: 241.95 m AHD
+ LCU: Open Spinifex Plain
+ Sensitivity: Level 3 – views of local significance
+ View direction to wind turbines: NE - SE
+ Minimum distance to wind turbines: 13.57 km (background)
+ Wind turbines visible (viewshed): 141 (option 1); 122 (option 2)
+ View direction to transmission line: NE - NW
+ Minimum distance to transmission line: 1.11 km (mid-ground)
+ Transmission poles visible (viewshed): 88 (40 m), 80 (>30 m), 72 (>20 m), 37 (>10 m)

Description of existing view

This view location is located on the Open Spinifex Plain LCU with mostly open and panoramic views across low spinifex grassland with very sparse scattered trees/tall shrubs. To the south there is a dense band of darker green vegetation that denotes the presence of a drainage line. An undulating horizon line is visible in the background to the north, west and south.

The colour palette of the natural landscape consists of orange stony soils which contrast with the vibrant green clumps of spinifex in the foreground which transition to pale green/yellow beyond the foreground. The textures consist of rough stony soils that contrast with the softer grasses and shrubland foliage. The soft textured foliage of the drainage line vegetation contrasts with the smooth dark silhouette of the undulating horizon line.

The forms present in the existing view consist of rolling spinifex ground cover in the foreground, and a rolling to horizontal horizon line. A curved and sinuous vegetation canopy occurs along the drainage line with a sinuous horizon line visible behind it, although the taller trees protrude above the horizon line with vertical to sloping branches. The character is natural with no existing development visible. The existing view is shown on **Figure 35**.

Visual Absorption Capacity

The VAC from this view has low to moderate ability to accommodate a visual change depending on where the development is located as summarised below:

+ Foreground: low to moderate capacity due to natural landscape character with mostly open views, may be able to accommodate low height development behind the existing drainage line vegetation.
+ Mid-ground and background: low to moderate capacity, development may be screened by the existing tall shrubland vegetation, however there is potential for taller development to ‘skyline’ due to the low variability in topography.

Anticipated visual change

The photo montage depicts the south east view from VIA 10 which illustrates that the transmission poles are visible in the mid-ground view (1.4 km and beyond) and the wind turbines are visible in the background (13 km and beyond) (**Figure 34**). The photo montage analysis has rated the transmission poles as **prominent** and the wind turbines as **blending** (**Table 28**). The visual analysis for the transmission poles is presented in **Table 29**.

Table 28: VIA 10 – Photo montage analysis

Category	Not Visible	Blending	Prominent
Visibility		T1	TL
Line		T1	TL
Form		T1	TL
Colour		T1	TL
Texture		T1	TL
Total Score (%)		**100% (T1)**	**100% (TL)**
Overall Visibility Rating	**BLENDING (T1), PROMINENT (TL)**		

T1 = wind turbine (option 1); TL = 220kV Transmission Line

Table 29: VIA 10 – Visual analysis

Category	Wind Turbines	Transmission Line
Visibility	The wind turbines are visible on the far south east horizon, however they are not prominent due to the distance from the view point which reduces their visible scale.	The transmission line is highly visible from VIA 10 as they protrude above the vegetation canopy and the horizon line. The development is located in the mid-ground and introduces a new large scale built element to the existing natural view.
Line	At this distance, the straight and angular lines of the wind turbines do not noticeably contrast with the natural landscape.	The transmission line and poles consist mostly of straight lines that contrast with the curved vegetation canopy in the mid-ground view and the sinuous horizon line in the background. Although there are straight lines present in the existing view, the large scale of the transmission poles contribute to their prominence in the proposed view.
Form	Although the vertical form of wind turbines protrude above the flat to rolling horizon line, the scale of the form is not dissimilar from the vertical and sloping tall shrubs present in the existing view.	The vertical form of transmission poles protrude above the rolling vegetation canopy of the drainage line and the distant rolling horizon line. Although vertical forms occur in the natural environment they are at a much smaller scale than the transmission poles.
Colour	Due to the atmospheric conditions during the site visit, the white colour of the turbines blend with the white cloud cover.	The grey colour of the transmission line and poles, are a prominent colour contrast with the light sky background.
Texture	The smooth texture of the wind turbines blends into the sky and does not significantly contrast with the existing view.	The transmission poles are a homogenous smooth texture which contrasts with the textural variability present in the natural landscape.

Significance of visual change

The prominent visibility of the transmission poles from this view point results in an obvious change to the view which alters the landscape character from unmodified to modified. However, the visual prominence of the transmission line is likely to diminish with increased distance. The wind turbines are visible in the background view to the south east and have been rated as a blending impact as the distance from the view point reduces their visible scale. The presence of tall shrubland in the mid-ground view which protrudes above the horizon line also helps to reduce the visibility of the turbines. However, it is possible that the wind turbines may appear more prominent in different weather conditions, for example a grey stormy sky in the south east combined with the sun reflecting off the white surface.

The visual impact rating is summarised below:

+ Visibility rating: Prominent (transmission line), Blending (wind turbines)
+ VMO: Best practice siting and design
+ Significance level: 3
+ Visual impact rating: Level 1 (transmission line), Level 3 (wind turbines)

Figure 35: VIA 10 – Existing south view

Figure 36: VIA 10 – Proposed operational view

4.3.11 VIA 11

+ Location (UTM): 729913E; 7650148N
+ Elevation: 218.69 m AHD
+ LCU: Bare Stony Hills
+ Sensitivity: Level 3 – views of local significance
+ View direction to wind turbines: E - SE
+ Minimum distance to wind turbines: 77.2 km (background)
+ Wind turbines visible (viewshed): 0 (option 1); 0 (option 2)
+ View direction to transmission line: NE - W
+ Minimum distance to transmission line: 730 m (mid-ground)
+ Transmission poles visible (viewshed): 8 (40 m), 8 (>30 m), 5 (>20 m), 4 (>10 m)

Description of existing view

This view location is located on the Bare Stony Hills LCU. The view experience is open within the foreground across and undulating stony landscape, however the mid-ground views are enclosed by the surrounding undulating terrain with glimpses to elevated terrain in the background. The open views in the foreground are also a result of a sparse layer of shrubs that are devoid of foliage which indicates a recent fire.

The colour palette is predominantly orange with secondary colours of light green and dark brown. The landscape is covered in orange rough stony soils which results in a textured appearance. The landform is rolling and sinuous in all view directions. The sparsely scattered shrubs have branches that consist of straight and angular lines and vertical and sloping forms. Larger rocks in the foreground view are both curved and angular.

The character is natural with no existing development visible. The existing view is shown on **Figure 37**.

Visual Absorption Capacity

The VAC from this view has low to moderate ability to accommodate a visual change depending on where the development is located as summarised below:

+ Foreground: low capacity due to simple natural landscape character with open views and no vegetation screening.
+ Mid-ground and background: moderate capacity, development may be screened behind landform, taller development may ‘skyline’ the existing horizon line.

Anticipated visual change

The photo montages depicts the south view from VIA 11 which illustrate that the transmission poles are visible in the mid-ground view. The viewshed analysis has indicated that up to 11 poles may be visible from VIA11 at various proportions. The wind turbines are not visible from this view point as they are located 77 km to the south east. The photo montage analysis has rated the transmission poles as **prominent** (**Table 30**) and the wind turbines as **not visible** from this view location. The visual analysis for the transmission poles is presented in **Table 31.**

Table 30: VIA 11 – Photo montage analysis

Category	Not Visible	Blending	Prominent
Visibility	T1		TL
Line	T1		TL
Form	T1		TL
Colour	T1		TL
Texture	T1		TL
Total Score (%)	**100% (T1)**		**100% (TL)**
Overall Visibility Rating	**NOT VISIBLE (T1), PROMINENT (TL)**		

T1 = wind turbine (option 1); TL = 220kV Transmission Line

Table 31: VIA 11 – Visual analysis

Category	Transmission Line
Visibility	The transmission line is highly visible from VIA 11 as the poles protrude above the southern horizon line. The development is located in the near mid-ground and introduces a new large scale built element to the existing natural view.
Line	The straight line of the transmission poles contrasts with the curved and sinuous lines of the terrain.
Form	The vertical form of transmission poles protrude above the rolling horizon line.
Colour	The grey colour of the transmission poles contrasts with the predominantly orange colour of the Bare Stony Hills LCU.
Texture	The smooth texture of the transmission poles contrasts with the rough stony texture of the Bare Stony Hills LCU.

Significance of visual change

The prominent visibility of the transmission poles from this view point results in an obvious change to the view which alters the landscape character from unmodified to modified. The wind turbines are not visible in the photo montages as they are located in 77 km in the background.

The visual impact rating is summarised below:

+ Visibility rating: Prominent (transmission line), Not visible (wind turbines)
+ VMO: Best practice siting and design
+ Significance level: 3
+ Visual impact rating: Level 1 (transmission line), None (wind turbines)

Figure 37: VIA 11 – Existing south view

Figure 38: VIA 11 – Proposed operational view

4.3.12 VIA 12

+ Location (UTM): 716136E; 7649246N
+ Elevation: 353.70 m AHD
+ LCU: Stony Spinifex Hills
+ Sensitivity: Level 3 – views of local significance
+ View direction to wind turbines: E - SE
+ Minimum distance to wind turbines: 89.64 km (background)
+ Wind turbines visible (viewshed): 0 (option 1); 0 (option 2)
+ View direction to transmission line: SW - E
+ Minimum distance to transmission line: 1.06 km (mid-ground)
+ Transmission poles visible (viewshed): 19 (40 m), 19 (>30 m), 19 (>20 m), 13 (>10 m)

Description of existing view

This view location is located within the Stony Spinifex Hills LCU. The view experience is mostly enclosed by the surrounding landform in the foreground with the exception of the view to the north and north east where long range views occur through a gap in the landform. The landscape character consists of rocky hills with sparse vegetation and scattered trees on the rocky slopes and moderate vegetation cover in the gullies. The colour palette consist of light orange to dark orange rocks and exposed soils, green spinifex, light green tree foliage with white tree trunks and dark brown to grey branches of the burnt shrubs and a dark horizon line to the north.

Forms within the landscape consist of landform that is sloping and rolling and shrub and tree branches that are vertical and sloping. At this proximity within this LCU, the lines of the landscape are variable with angular, curved and sinuous landforms, angular and curved rocks, angular and straight branches, curved spinifex clumps and curved tree canopies. The character is natural with no existing development visible. The existing view is shown on **Figure 39**.

Visual Absorption Capacity

The VAC from this view has low to moderate ability to accommodate a visual change depending on where the development is located as summarised below:

+ Foreground: low to moderate capacity due to the natural landscape character and steep slopes. Development may be screened behind landform, however taller development may protrude above the horizon line.
+ Mid-ground and background: high to moderate capacity, development may be screened behind landform in most view directions. To the north and north east there is a moderate capacity to absorb development that follows best practice siting and design guidelines. As the view point is located high in the landscape, it is unlikely that development will protrude above the elevated horizon line in the background.

Anticipated visual change

The transmission line is located in the mid-ground at 2.3 km from the view point. The photo montage depicts the north east view where the transmission poles are visible through a gap in the landform. The transmission line is not likely to be visible to the north or north west as it will be screened behind landform. As the view point is located in an elevated position the transmission line is below the eye height of the observer and does not protrude above the horizon line. Subsequently the photo montage analysis has rated the visibility of the transmission line as blending from this view location (**Table 32**). The wind turbines are located 90 km in the background and will not be visible. The visual analysis for the transmission poles is presented in **Table 33**.

Table 32: VIA 12 – Photo montage analysis

Category	Not Visible	Blending	Prominent
Visibility	T1	TL	
Line	T1	TL	
Form	T1		TL
Colour	T1		TL
Texture	T1	TL	
Total Score (%)	**100% (T1)**	**60% (TL)**	**40% (TL)**
Overall Visibility Rating	**NOT VISIBLE (T1), BLENDING (TL)**		

T1 = wind turbine (option 1); TL = 220kV Transmission Line

Table 33: VIA 12 – Visual analysis

Category	Wind Turbines
Visibility	The transmission line is visible in the mid-ground from VIA 12 although the poles do not protrude above the horizon line as they are located below the eye height of the observer and therefore do not dominate the existing view. However as this is a focal view through the landform, the eye may be drawn to the new built form.
Line	From this perspective, the straight line of the transmission poles do not noticeably contrast with the existing landscape which consists of angular lines in the foreground and straight, curved and sinuous lines in the mid-ground and background.
Form	From this perspective, the vertical form of transmission poles contrast with the predominantly horizontal and rolling form of the landform in the mid-ground and background.
Colour	The light grey colour of the transmission poles contrast with the predominantly dark orange colour of the mid-ground view, however the colour contrast diminishes with increased distance.
Texture	From this distance the texture of the transmission poles is not a dominant feature.

Significance of visual change

The blending visibility of the transmission line from this view point results in a subtle change to the view experience. The elevated observer position also helps to reduce the impact of the transmission line as they do not protrude the horizon line. However, as this is an elevated and focal view, the eye may be drawn to the new built form, particularly the transmission poles that are located at a closer proximity to the view point, where the vertical form and light grey colour contrast with the existing landscape.

The visual impact rating is summarised below:

+ Visibility rating: Blending (transmission line), Not Visible (wind turbines)
+ VMO: Best practice siting and design
+ Significance level: 3
+ Visual impact rating: Level 3 (transmission line), None (wind turbines)

Figure 39: VIA 12 – Existing north view

Figure 40: VIA 12 – Proposed operational view

5 VISUAL IMPACT SUMMARY

5.1 VIEW LOCATIONS

The 12 view locations have been assessed for visual impacts through the analysis of viewshed mapping and photo montages. The outcome of this assessment is summarised in **Table 35** which provides a visual impact rating. These ratings are based on the significance level of the view location and the visual management objective (VMO) for managing the landscape character (**Table 34**).

Table 34: Visual impact level matrix table

	Visibility rating	Prominent			Blending			Not Visible
	Significance Level rating	1	2	3	1	2	3	1-3
Visual Management Objective	Protection and Maintenance	L1	L1	L1	L2	L2	L2	None
	Best Practice Siting and Design	L1	L1	L1	L3	L3	L3	None
	Restoration and Enhancement	L2	L2	L2	L3	L3	L3	None
		VISUAL IMPACT LEVEL						

Table 35: Visual impact level at View Locations during the operational phase

View Location	Significance Level	Visual Management Objectives	Distance to Development (km) T1 = Turbines; TL = 220kv transmission line	Visibility Rating	Visual Impact Level
VIA 01	3	Best Practice Siting and Design	11.88 to T1 (background)	Blending	Level 3
			6.44 to TL (mid-ground)	Blending	Level 3
VIA 02	3	Best Practice Siting and Design	0.61 to T1 (mid-ground)	Prominent	Level 1
			2.62 to TL (mid-ground)	Blending	Level 3
VIA 03	3	Best Practice Siting and Design	1.92 to T1 (mid-ground)	Prominent	Level 1
			4.9 to TL (mid-ground)	Blending/Prominent	Level 1-3
VIA 04	1	Protection & Maintenance of Stony Spinifex Hills LCU	3.59 to T1 (mid-ground)	Prominent	Level 1
		Best Practice Siting and Design	2.86 to TL (mid-ground)	Blending	Level 3
VIA 05	3	Best Practice Siting and Design	3.23 to T1 (mid-ground)	Prominent	Level 1
			6.37 to TL (mid-ground)	Not Visible	None
VIA 06	3	Best Practice Siting and Design	1.11 to T1 (mid-ground)	Prominent	Level 1
			0.05 to TL (foreground)	Prominent	Level 1
VIA 07	3	Best Practice Siting and Design	1.96 to T1 (mid-ground)	Prominent	Level 1
			7.27 to TL (background)	Not Visible	None
VIA 08	3	Best Practice Siting and Design	0.52 to T1 (mid-ground)	Prominent	Level 1
			3.87 to TL (mid-ground)	Not Visible	None
VIA 09	3	Best Practice Siting and Design	5.0 to T1 (mid-ground)	Blending	Level 3
			9.83 to TL (background)	Not Visible	None
VIA 10	3	Best Practice Siting and Design	13.57 to T1 (background)	Blending	Level 3
			1.11 to TL (mid-ground)	Prominent	Level 1

View Location	Significance Level	Visual Management Objectives	Distance to Development (km) T1 = Turbines; TL = 220kv transmission line	Visibility Rating	Visual Impact Level
VIA 11	3	Best Practice Siting and Design	77.20 to T1 (background)	Not Visible	None
			0.73 to TL (mid-ground)	Prominent	Level 1
VIA 12	3	Best Practice Siting and Design	89.64 to T1 (background)	Not Visible	None
			1.06 to TL (mid-ground)	Blending	Level 3

5.2 LANDSCAPE CHARACTER

The EPGH Project and surrounding landscape occurs within the Nullagine Hills Landscape Character Type (LCT) which is characterised by steep ranges and dissected flat topped hills with areas of valley plains and narrow gorges. The landscape is also dissected by major and minor drainage lines with fringing riparian vegetation that is visible in the landscape as dense bands of dark green dense vegetation (CALM, 1994).

Four Landscape Character Units (LCU) have been identified within the EPGH Project area:

+ LCU 1 – Open Spinifex Plain: this is the most extensive unit covering about 55% of the project are. Defining characteristics are the gentle undulating plain covered in hummock grasses and sparsely scattered tall shrubs.
+ LCU 2 – Stony Spinifex Hills: this unit covers about 31.5% of the project area. Defining characteristics are the rugged undulating terrain that is visible from many locations within the Project area.
+ LCU3 – Drainage Lines: this unit dissects the project area and may or may not contain water depending on rainfall events. This unit also contains a dense layer of shrubland vegetation and taller Eucalypt trees and is often visible from many locations within the Project area as a dense band of green vegetation. The Drainage Lines LCU covers about 12% of the Project area.
+ LCU 4 – Bare Stony Hills: this is a discrete unit that covers about 1.5% of the project area and is characterised by extensive orange stony undulating terrain with very sparse vegetation cover.

The greatest impact to the natural landscape character is expected from the view locations that are rated as a Level 1 impact, these are:

+ LCU 1 – VIA 2, VIA 4, VIA 5, VIA 6, VIA 7, VIA 8, VIA 10
+ LCU 2 – VIA 3
+ LCU 4 – VIA 11

Most of these view locations are in the eastern section of the Project area where the wind turbines are located, with the exception of VIA 11. These view locations are also located within the mid-ground of the proposed development. The large scale infrastructure will be a dominant feature from these view locations and therefore alter the natural landscape character from unmodified to modified. However, the natural character is retained which is due to the simple design and repetitive pattern of the wind turbines, as opposed to a more complex development that is consists of a variety of forms, lines, colours and textures. This simplicity of design can also be seen within the natural environment that also consists of simple visual elements and repetitive patterns.

The impacts to landscape character are summarised for each visual impact level below:

+ **Level 1** – the large-scale infrastructure is highly visible and alters the landscape character from unmodified to modified. However, the natural landscape character remains prominent despite the introduction of the proposed development.
+ **Level 2** – no view locations were rated as a Level 2 impact.
+ **Level 3** – the proposed development is visible but does not dominant the view as it is located further from the view location, therefore the natural character is retained.
+ **None** – no impact to the existing landscape character.

5.3 LANDSCAPE VALUES

The landscape of the Project area is primarily natural in character with landform that varies from steep rolling ranges to flat open plains with elevation ranging from 160 – 480 metres above height datum (AHD). The vegetation is predominantly covered by hummock grasses with a layer of scattered shrubs, with some areas devoid of vegetation such as the Bare stony hills LCU. The landscape is also dissected by many creeklines that contain tall Eucalypt trees and a dense shrubland layer (Drainage Lines LCU). The project area also exhibits a variety of landscape values, most notably the rugged terrain which has been mapped as the Stony Spinifex Hills LCU.

The character preferences found within the EPGH Project area are:

+ a high degree of perceived naturalness
+ the distinctive displays of colour: striking contrasting colours between orange soils and vibrant green spinifex clumps
+ vegetation diversity – variety of species near drainage lines
+ a high degree of topographic variety – rugged terrain of the Stony Spinifex Hills and Bare Stony Hills LCUs
+ the distinctive landscape features – rugged ranges and isolated hills
+ the presence of waterbodies – presence of water in drainage lines.

The least preferred characteristics include:

+ evidence of mining – no mining was encountered during the site visits, however there are various mining activities in the area
+ some areas that are impacted by weed infestations such as Buffel grass along drainage lines
+ some areas that are impacted by grazing.

One of the most distinctive landscape values of the Project area is the high degree of topographic variety which has been mapped as the Stony Spinifex Hills and Bare Stony Hills LCUs. From most view points, these LCUs are generally located in the background (beyond 6.5 km) and are characterised by a low sinuous and rolling landform on the horizon line. As the proposed development is often highly visible, the large scale vertical forms often interrupt the horizon line. However, as the infrastructure does not occupy a bulk amount of horizontal space, the line and form of the rugged terrain remains a prominent large scale landscape feature.

The impacts to the landscape values are summarised for each visual impact level below:

+ **Level 1** –the high degree of perceived naturalness is altered from these view locations as the introduction of large scale infrastructure is highly visible although the rugged terrain on the horizon line remains a prominent landscape feature.
+ **Level 2** – no view locations were rated as a Level 2 impact.
+ **Level 3** – infrastructure is visible but does not dominant the view as it is located further from the view location, therefore the visible landscape values are retained.
+ **None** – no impact to the existing landscape values.

5.4 VIEW EXPERIENCE

Many areas contained multiple view types depending on the variations in topography and density of taller vegetation. The different view categories experienced at the EPGH Project area are listed below:

+ Panoramic: expansive long range views in all directions.
+ Elevated: a view overlooking the landscape from a high point, usually associated with a panoramic view
+ Open: a clear view that is not restricted by features such as vegetation or landform, views are not as expansive as panoramic views
+ Enclosed by landform: elevated landforms restrict long range views
+ Enclosed by vegetation: this view type is likely to be experienced within the Drainage Line LCU where views are restricted by a dense layer of taller vegetation
+ Focal view: a view that has a focal point created by a gap in the landform

+ Filtered: views are filtered either through scattered vegetation or landform.

Most of the views experienced at the EPGH Project are vast and open. Intimate and enclosed views may have less VAC to absorb a large scale development, where it may dominate the view. However, when it is located in an expansive landscape, it is potentially a prominent feature but does not necessarily dominate and change the view completely. Subsequently, the proposed development does not change the view categories that are experienced in the landscape. The wind turbines and transmission line consist of tall individual structures that do not occupy a large portion of horizontal space which allow the continuation of the views listed above.

5.5 VISUAL MANAGEMENT OBJECTIVES

Most of views assessed are 'Level 3: Local Significance' as per the WAPC guidelines (refer **Appendix Two**). They are views of local importance, having been identified as key view locations by Fortescue in consultation with the Nyamal Traditional Owners. They are not categorised as 'Level 2: Regional Significance' or 'Level 1: National / State Significance', which decreases the potential number of viewers impacted by any development. The exception is VIA 4 which is located on Marble Bar Road which is a Significance Level 1 route as it is a primary distributer road that connect the regional town of Marble Bar with Port Headland and Newman. This road is also part of the East Pilbara Geoheritage trail, one of the drive trails of the Warlu Way (ANW Tourism, 2023).

The proposed EPGH Project is expected to result in visual impacts at most of the assessed locations due to:

+ the close proximity of the development to the view point
+ the large scale of the overall development with 189 wind turbines proposed and a 220 kV transmission line approximately 149 km in length.
+ the large scale of the individual wind turbines which prevent them from being easily screened by vegetation or landform, particularly when they are located in the mid-ground from the observer.

Table 36 presents a summary of the visual impacts with regard to the VMO of **best practice siting and design**. This VMO was considered the most appropriate objective to manage the visual landscape which is due to the Level 3 significance of the area. To meet this VMO, it is expected that the proposed development is blending; that is, development may be evident but generally not prominent in that it borrows from the existing landscape setting. Strategies to meet this objective may include:

+ the application of practical and sensitive siting and design techniques
+ retaining dominant landscape features and characteristics
+ enhancing or restoring landscape features.

The VMO of **protection and maintenance** has been assigned to the landscape values that are likely to be visible along Marble Bar Road, that is the Drainage Lines LCU and the Stony Spinifex Hills LCU which is a distinctive large scale landscape feature in the Project area. To meet this VMO, it is expected that the proposed development has minimal visual impact on landscape values. Road users travelling south from Marble Bar are most likely to be affected by the Project, due to the gentle relief and open view experience. South of the Project along Marble Bar Road, the relief is undulating and variable which will restrict open views to proposed development for northbound motorists which is illustrated by the viewshed maps (**Map 6 - 7**).

Of the 12 view locations that were assessed, the proposed EPGH Project was at variance from the VMO at nine sites (2, 3, 4, 5, 7, 8, 10, 11). Most of these sites (except VIA 11) are located in the eastern section of the Project area within the mid-ground of the proposed development. The three remaining sites (1, 9, 12) are unlikely to be at variance with the VMO of best practice siting and design.

Table 36: Summary of visual impacts in relation to the VMO

View Location	Visual Impact Level	Response to Visual Management Objectives
VIA 01	Level 3	This view point has open views across the Open Spinifex Plain LCU and will have filtered views of the wind turbines in the background. The closest wind turbine is located 12 km from the view point and the closest transmission pole at 6.4 km. The visual analysis has rated both the wind turbines and transmission line as blending with the landscape which is due to the distance from the view point and the presence of tall shrubs in the foreground which filter the view. The visual impact associated with the proposed development is **unlikely to be at variance** with the VMO of best practice siting and design.
VIA 02	**Operational** Level 1 (T1, T2) Level 3 (TL) **1 yr post operational** Level 3 (T1, TL) **50 yrs post operational** None (T1, TL)	This view point has open views across a vast spinifex plain towards Stony Spinifex Hills LCU on the horizon. The proposed development will be highly visible in the mid-ground with the closest wind turbine and connecting overhead power pole at 700m and the closest transmission pole at 2.62 km. The visual analysis has rated the development as a prominent feature in the landscape. Two styles of turbine have been depicted in the photo montages from this view point and both of them have been rated visually prominent however option 1 (T1) is taller than option 2 (T2) and appears more complex with its lattice style base compared to the single pole style of T2. The 20 m high overhead powerline that connects the wind turbines has also been depicted in these photo montages which is also visually prominent. The powerline adds a level of complexity to the view where it disrupts the pattern of the wind turbines and the horizontal overhead line contrasts with the vertical turbine poles. The poles also act a scale indicator that emphasize the large scale of the turbines. During the operational phase the visual impact associated with the proposed development is **likely to be at variance** with the VMO of best practice siting and design. **1 year post operation** The visual change is reduced to blending at 1 year post operation where the cleared turbine pad is visible. Therefore, the visual impact associated with the proposed development after 1 year post operation is **unlikely to be at variance** with the VMO of best practice siting and design. **50 years post operation** The visual change is reduced to not evident at 50 years post operation after successful revegetation of the cleared areas. Therefore, the visual impact associated with the proposed development after 50 years post operation is **not at variance** with the VMO of best practice siting and design.
VIA 03	Level 1 (T1) Level 3 (TL)	This is a slightly elevated view point with open to filtered views through tall scattered shrubs. The proposed development will be visible in the mid-ground with the closest wind turbine at 1.92 km and the closet transmission pole at 4.9 km. The visual analysis has rated the wind turbines as a prominent feature in the landscape. The transmission line has been assessed as blending with landscape which and its visibility is likely to diminish with increased distance. The visual impact associated with the proposed wind turbines is **likely to be at variance** with the VMO of best practice siting and design. The visual impact associated with the proposed transmission line is **unlikely to be at variance** with the VMO of best practice siting and design.

View Location	Visual Impact Level	Response to Visual Management Objectives
VIA 04	Level 1 (T1) Level 3 (TL)	This view point as an open to filtered view and is located on Marble Bar Road. It is classified as Level 1 significance as it is a primary distributer road connecting Marble Bar with Port Headland, Nullagine and Newman. The road is also part of the East Pilbara Geoheritage route of the Warlu Way drive trail. Subsequently, a higher VMO has been assigned to this view point for the protection of landscape values. The development is located in the mid-ground of this view point with the closest wind turbine at 3.59 km and the closest transmission pole at 2.86 km. The wind turbines are highly visible, whereas the 220kV transmission line is blending into the landscape. It should be noted, that where the transmission line crosses the road it will be a prominent impact as it will be in the foreground view of the observer. The prominent visibility of the infrastructure results in an obvious change to the view. The visual impact associated with the proposed development is **likely to be at variance** with the VMO of best practice siting and design and the VMO of protection and maintenance of landscape values from this viewpoint. However, with increasing distance from the development, the landscape values should remain a prominent feature.
VIA 05	Level 1 (T1) None (TL)	This is an elevated view location that will have clear views to the wind turbines which are located in the mid-ground, with the closest turbine at 3.23 km. The distance to the closest transmission pole in 6.37 km. The visual analysis has rated the wind turbines as a prominent feature in the landscape which results in an obvious change to the view. The transmission line is not likely to be visible which is due to the distance from the view point. The visual impact associated with the wind turbines is **likely to be at variance** with the VMO of best practice siting and design. There is no visual impact expected from the transmission line and is therefore **not at variance** with the VMO of best practice siting and design.
VIA 06	Level 1 (T1, TL)	This view location has open to filtered views and will have a clear view to the wind turbines which are located in the mid-ground, with the closest turbine at 1.11 km. The transmission line is also highly visible as it is located 50 m from the view location. The visual analysis has rated the wind turbines and transmission line as a prominent feature in the landscape which results in an obvious change to the view. The visual impact associated with the wind turbines and transmission line is **likely to be at variance** with the VMO of best practice siting and design.
VIA 07	Level 1 (T1) None (TL)	This view location has an open view experience with several isolated low hills in the mid-ground. The wind turbines which are located in the mid-ground, with the closest turbine at 1.96 km. The distance to the closest transmission pole in 7.27 km in the background. The visual analysis has rated the wind turbines as a prominent feature in the landscape which results in an obvious change to the view. The transmission line is not likely to be visible which is due to the distance from the view point. The visual impact associated with the wind turbines is **likely to be at variance** with the VMO of best practice siting and design. There is no visual impact expected from the transmission line and is therefore **not at variance** with the VMO of best practice siting and design.

View Location	Visual Impact Level	Response to Visual Management Objectives
VIA 08	Level 1 (T1) None (TL)	This view location has an open view experience and will have a clear view to the wind turbines which are located in the mid-ground, with the closest turbine at 520 m. The distance to the closest transmission pole in 3.87 km in the mid-ground. The visual analysis has rated the wind turbines as a prominent feature in the landscape which results in an obvious change to the view. The transmission line is not likely to be visible which is due to the distance from the view point and the effect of vegetation screening. The visual impact associated with the wind turbines is **likely to be at variance** with the VMO of best practice siting and design. There is no visual impact expected from the transmission line and is therefore **not at variance** with the VMO of best practice siting and design.
VIA 09	Level 3 (T1) None (TL)	This view location has a filtered view through tall shrubland in the foreground. The majority of the wind turbines are located in the background, with the closest turbine at 5 km (mid-ground). The distance to the closest transmission pole in 9.83 km in the background. The visual analysis has rated the wind turbines as blending with the landscape which is due to the distance from the view point and the presence of tall shrubs which filter the view. The transmission line is not likely to be visible which is also due to distance and vegetation screening. The visual impact associated with the wind turbines and transmission line is **unlikely to be at variance** with the VMO of best practice siting and design. There is no visual impact expected from the transmission line and is therefore **not at variance** with the VMO of best practice siting and design.
VIA 10	Level 3 (T1) Level 1 (TL)	This view location has an open view experience with a tall drainage line vegetation present in the mid-ground. The transmission line is visible in the mid-ground, with the closest pole at 1.11 km. The wind turbines are visible in the background with the closest turbine at 13.57 km. The visual analysis has rated the transmission line as a prominent feature in the landscape which results in an obvious change to the view. The wind turbines have been rated as blending due to their distance from the view point and the screening effect of tall shrubland vegetation. The visual impact associated with the wind turbines are **unlikely to be at variance** with the VMO of best practice siting and design. The visual impact associated with the transmission line is **likely to be at variance** with the VMO of best practice siting and design.
VIA 11	None (T1) Level 1 (TL)	This view location has an open view experience of the surrounding undulating terrain and will have a clear view of the transmission line. The distance to the closest transmission pole in 730 m in the mid-ground. The visual analysis has rated the transmission line as a prominent feature in the landscape which results in an obvious change to the view. The wind turbines are not expected to be visible as they are located 77 km in the background. The visual impact associated with the transmission line is **likely to be at variance** with the VMO of best practice siting and design. There is no visual impact expected from the wind turbines and is therefore **not at variance** with the VMO of best practice siting and design.

View Location	Visual Impact Level	Response to Visual Management Objectives
VIA 12	None (T1) Level 3 (TL)	This is an elevated view location that has a focal view through a gap in the elevated landform. The transmission line is visible below the eye height of the observer with the closest pole located at 1.04 km in the mid-ground. The visual analysis has rated the transmission line as blending with the landscape as it is not protruding above the horizon line. The wind turbines are not expected to be visible as they are located 90 km in the background. The visual impact associated with the transmission line is **unlikely to be at variance** with the VMO of best practice siting and design. There is no visual impact expected from the wind turbines and is therefore **not at variance** with the VMO of best practice siting and design.

T1 = wind turbines; TL = 220kV transmission line

5.6 CONCLUSION

Nine out of the twelve view locations have been rated as a Level 1 impact. The visual assessment framework assumes that a development that is highly visible may not satisfy best practice siting and design principles. However, in the case of wind farms it is almost impossible to hide them within the landscape. Therefore, it is important that wind farms are sited and designed in a way that minimises impacts to landscape character and allows the retention of landscape values (SNH, 2018).

The proposed wind farm development at the EPGH Project area has been sited within the Open Spinifex Plain LCU which is a vast open landscape. This landscape is considered to be an appropriate scale for a wind farm of this size as landscape scale and openness are important characteristics for wind farm developments (SNH, 2018). Although the visual impacts have been rated as Level 1 for nine view locations, the following factors should be considered when discussing the acceptability of impacts:

+ the natural landscape character of the Project area remains prominent due to the simple design and repetitive pattern of the wind turbines, as opposed to a more complex development that is consists of a variety of forms, lines, colours and textures.
+ the landscape value of a high degree of perceived naturalness is altered with the introduction of the proposed development, however the rugged terrain of the Stony Spinifex Hills and Bare Stony Hills LCUs remains a prominent landscape feature.
+ the view categories of the Project area are retained as the wind turbines and transmission line consist of tall individual structures that do not occupy a large portion of horizontal space which allow the continuation of the views.
+ From a 360 degree view perspective, the development is often surrounded by a larger proportion of open space compared to the development footprint, except at view locations VIA 6 and VIA 8 which are located within the footprint area with views to the development in most directions.

5.7 STUDY LIMITATIONS

The assessment includes the following limitations:

+ Visual Management Objectives - the assessment methodology follows the WAPC (2007) guidelines which aims to guide visual landscape evaluation and impact assessment in the public realm. These guidelines have also undertaken extensive research to ascertain landscape preferences, however the outcomes of the assessment should be taken into consideration with regard to stakeholder concerns.
+ Viewshed accuracy – viewsheds were generated using a 30 m resolution DEM which does not include vegetation, subsequently the viewshed presents the ‘worst case’ scenario.

+ Photo montage accuracy – the montages have used the available spatial data to depict the accurate location and scale of the development. The focus of assessment is on the wind turbines and 220kV transmission line which are the largest pieces of infrastructure that will be the most visible in the landscape. The modelling of ancillary infrastructure associated with the wind farm is beyond the scope of this project.
+ Night lighting has not been assessed and is beyond the scope of this project.

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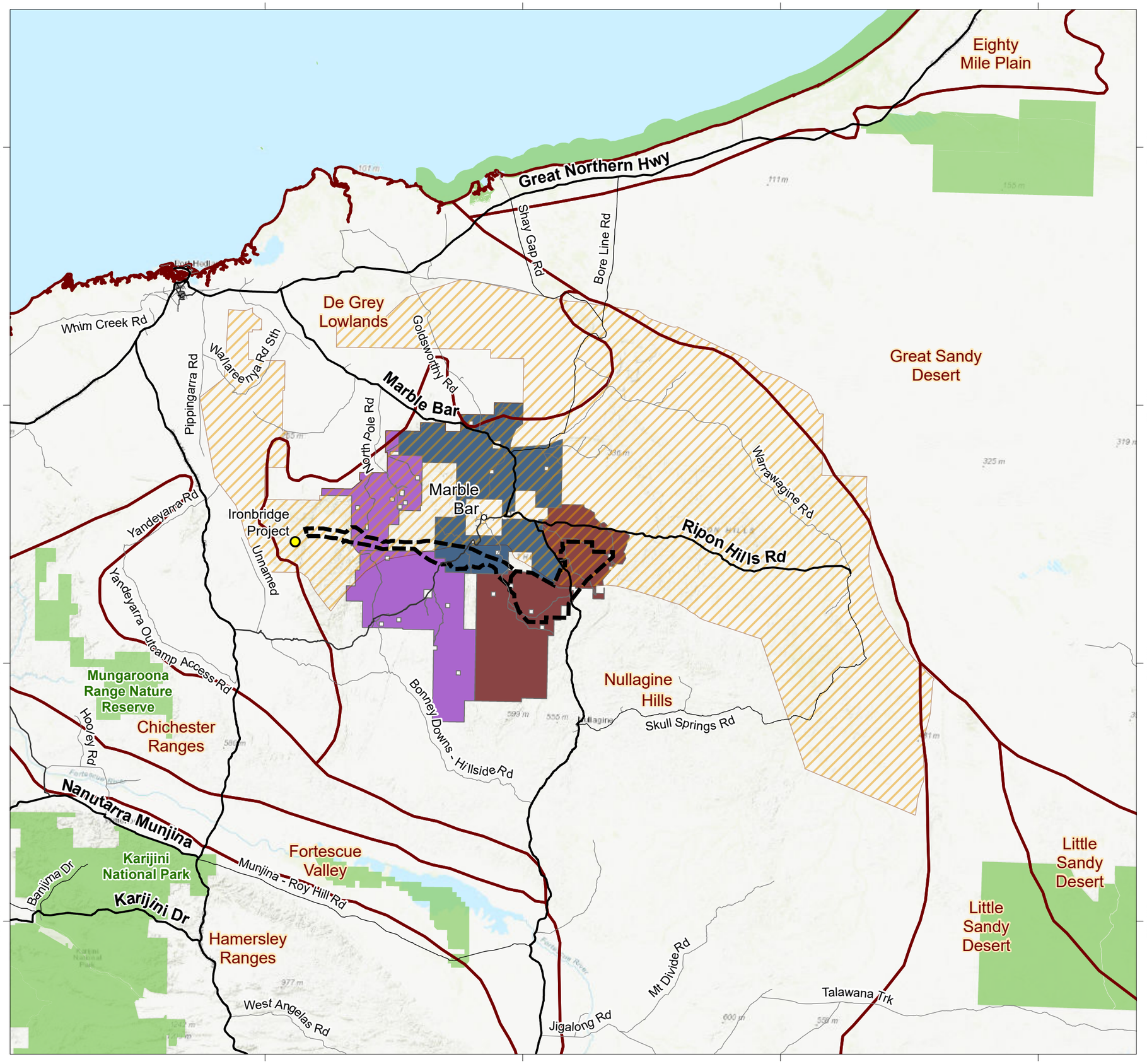
MAPS



LEGEND

- EPGH Project Area

Road Hierarchy (MRWA, 2023)

- Primary Road
- Secondary Road
- Local Road
- Local Access Road
- Landscape Character Type (CALM, 1994)
- DBCA Legislated Lands and Waters (DBCA, 2017)

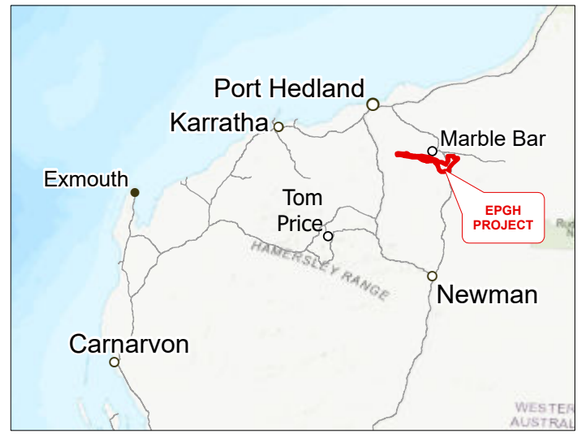
Native Title Determination (Landgate, 2019)

- Nyamal People#1

Pastoral Stations (DPLH, 2021)

- Corunna Downs
- Eginbah
- Panorama

DATA SOURCES:
SOURCE DATA: EPGH PROJECT AREA (FORTESCUE_2024-09-19), DBCA LEGISLATED LANDS AND WATERS (DBCA, 2024), LANDSCAPE CHARACTER TYPE (CALM, 1994), NATIVE TITLE DETERMINATION (LANDGATE, 2024), PASTORAL STATIONS (DPLH, 2024), ROAD HEIRARCHY (MRWA, 2023).
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, USGS, NGA



ecoscape

PROJECT LOCATION

EAST PILBARA GENERATION HUB VISUAL IMPACT ASSESSMENT

FORTESCUE

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:1,500,000 @ A3

0 10 20 30 40 50 km

PROJECT NO: 4926-24

REV	AUTHOR	APPROVED	DATE
1	SB	PJ	23/10/2024

MAP 01

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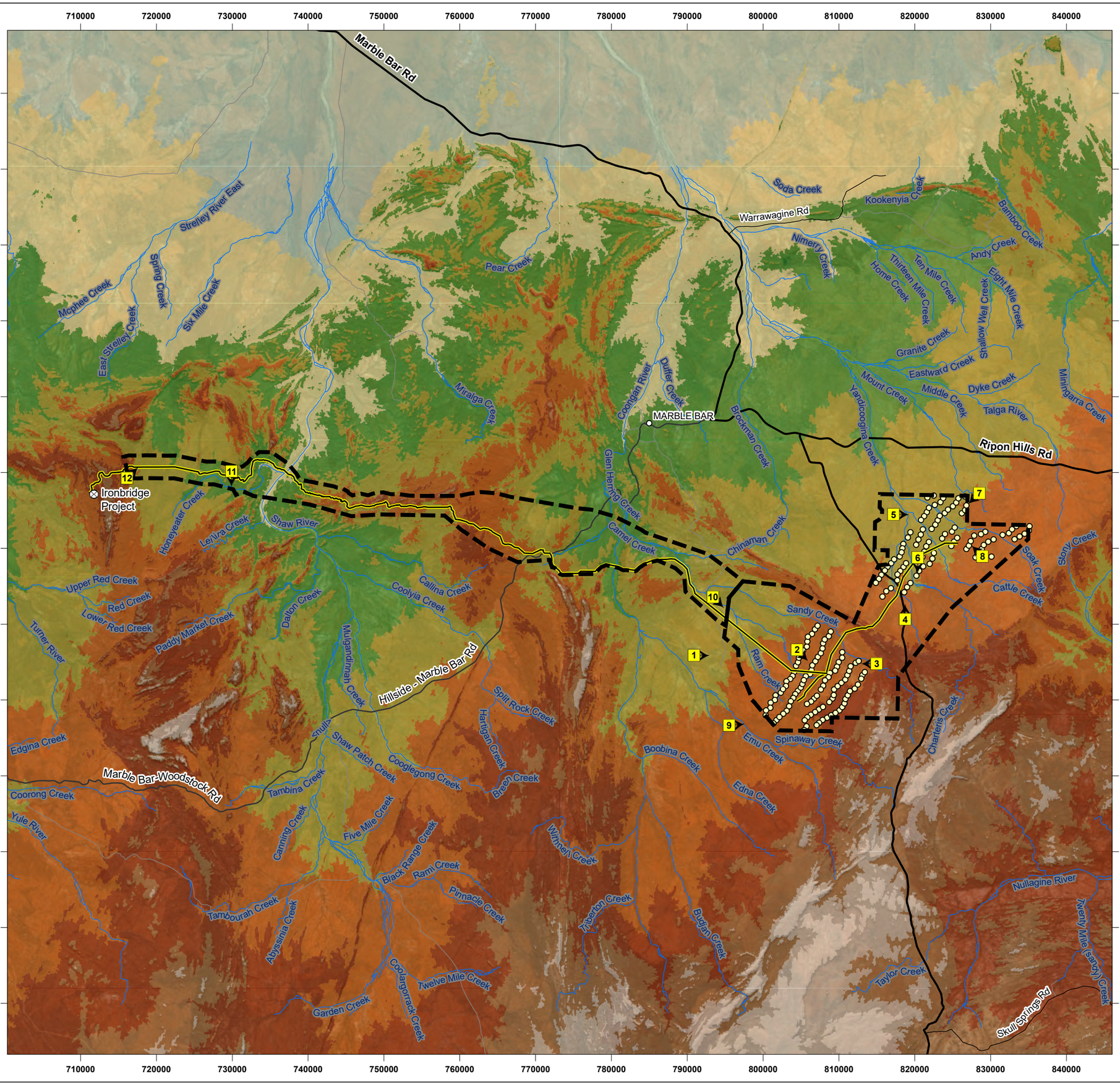

LEGEND

- EPGH Project Area
- VIA locations
- View Direction
- Proposed wind turbines
- 220kV Transmission Line (PEC-6)
- Drainage Lines

Road Hierarchy (MRWA, 2023)

- Primary Road
- Secondary Road
- Local Road
- Local Access Road

Elevation (Geoscience Australia DEMS, 2010)

- 46 - 121
- 122 - 173
- 174 - 227
- 228 - 277
- 278 - 327
- 328 - 374
- 375 - 422
- 423 - 470
- 471 - 598

DATA SOURCES:
SOURCE DATA: FORTESCUE DATA (2024): EPGH PROJECT AREA, PEC-6 TRANSMISSION LINE, PROPOSED WIND TURBINES.
IMAGERY: ESRI BASEMAP
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

ELEVATION

EAST PILBARA GENERATION HUB VISUAL IMPACT ASSESSMENT

FORTESCUE

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:500,000 @ A3

0 4 8 12 16 20 km

PROJECT NO: 4926-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	27/06/2024
1	SB	PJ	23/10/2024
2	SB	PJ	11/11/2024

MAP 02

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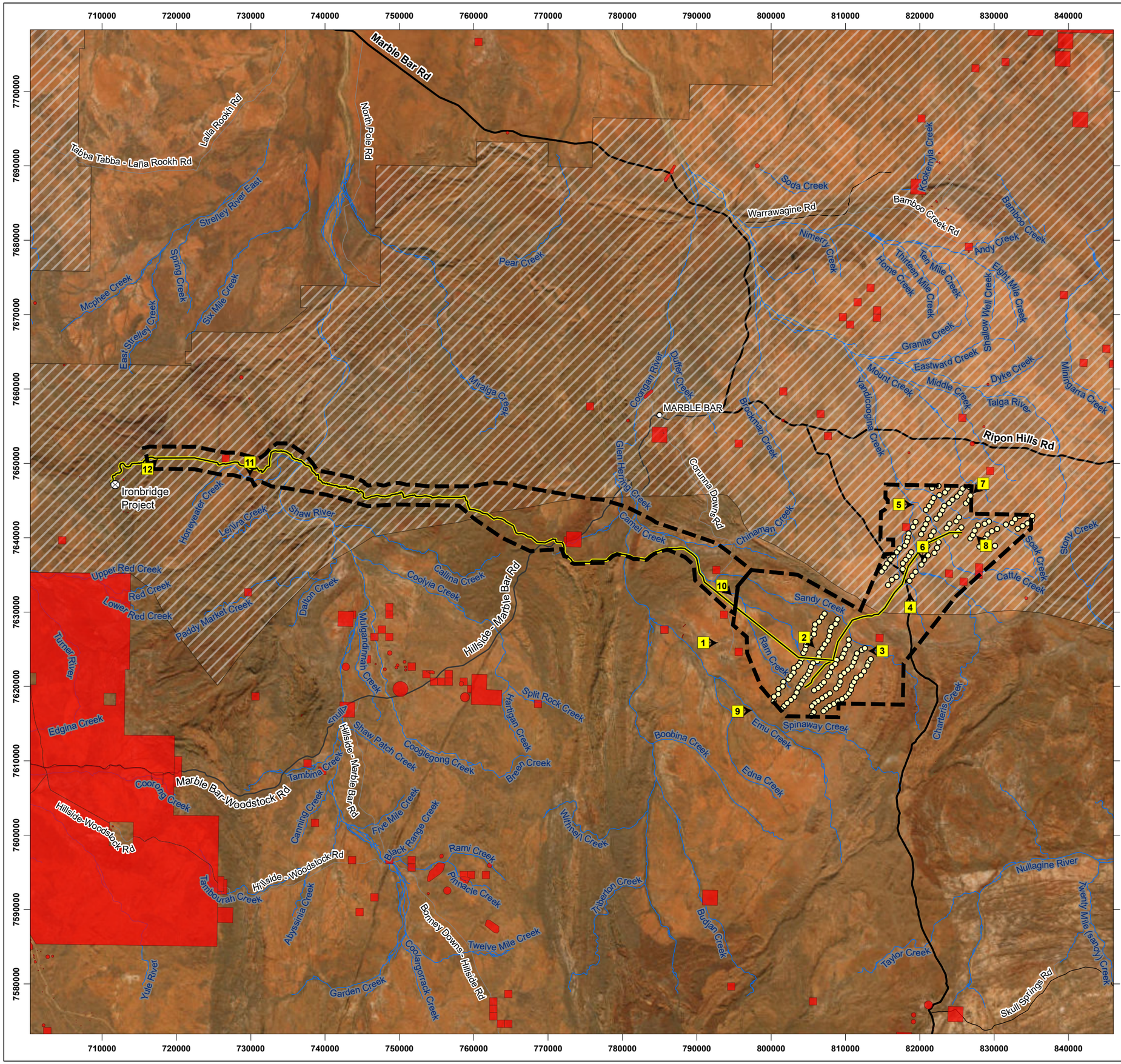


LEGEND

- EPGH Project Area
- VIA locations
- View Direction
- Proposed wind turbines
- 220kV Transmission Line (PEC-6)
- Drainage Lines

Road Hierarchy (MRWA, 2023)

- Primary Road
- Secondary Road
- Local Road
- Local Access Road
- Registered Aboriginal Heritage Sites (DPLH, 2019)

Native Title Determination (Landgate, 2019)

- Nyamal People#1

DATA SOURCES:
SOURCE DATA: FORTESCUE DATA (2024): EPGH PROJECT AREA, PEC-6 TRANSMISSION LINE, PROPOSED WIND TURBINES.
IMAGERY: ESRI BASEMAP
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

ABORIGINAL HERITAGE AND NATIVE TITLE

EAST PILBARA GENERATION HUB VISUAL IMPACT ASSESSMENT

FORTESCUE

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:500,000 @ A3

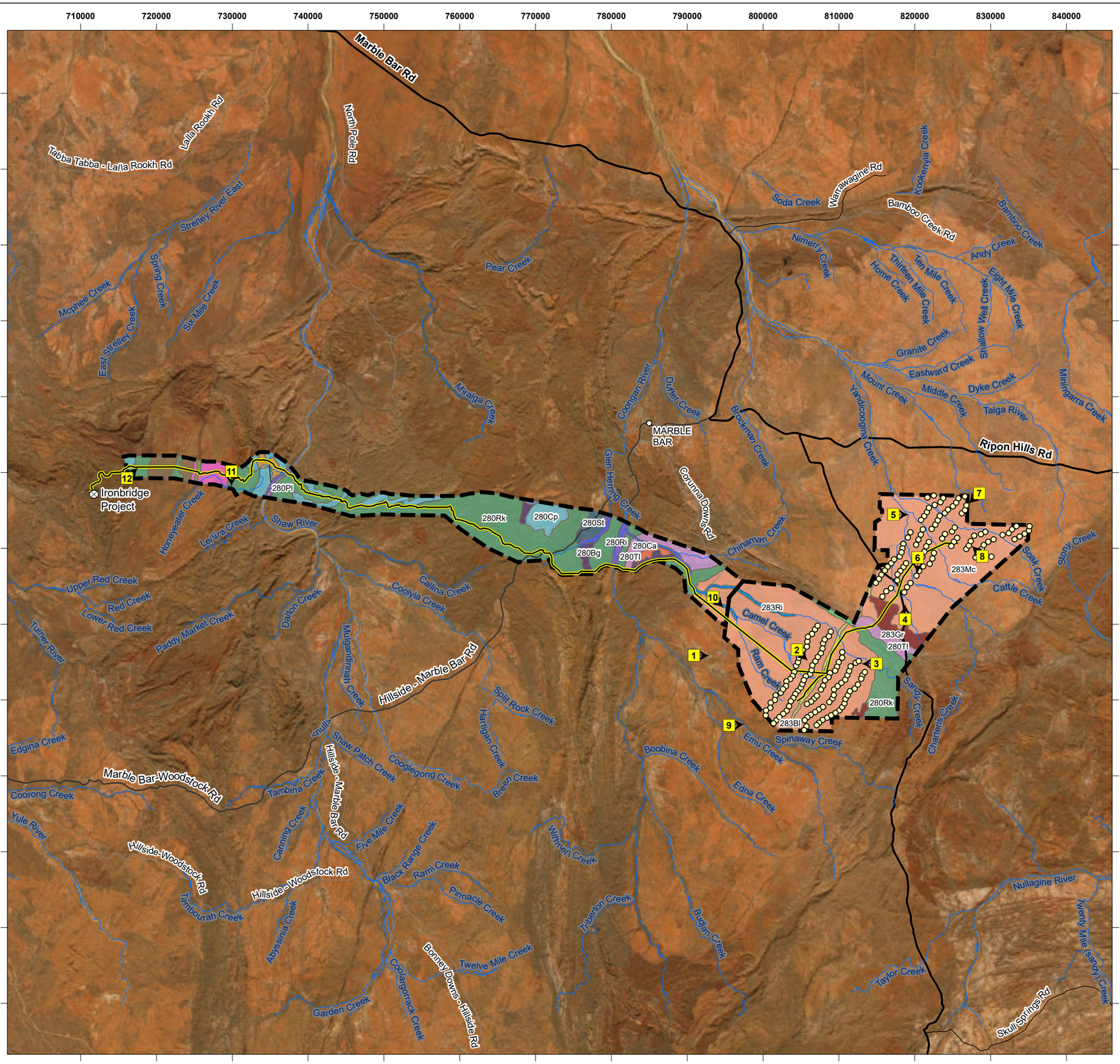
0 4 8 12 16 20 km

PROJECT NO: 4926-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	27/06/2024
1	SB	PJ	23/10/2024
2	SB	PJ	11/11/2024

MAP 03

Path: Y:\01_Projects\4926-24 East Pilbara Generation Hub VIA\Maps\APRXs\GDA_1994_Templates\Report_Maps_4926.aprx



LEGEND

- EPGH Project Area
- VIA locations
- View Direction
- Proposed wind turbines
- 220kV Transmission Line (PEC-6)
- Drainage Lines

Soil Landscape Units

- 280Bg,Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands
- 280Bk,Linear ridges of dolerite or basalt supporting hard spinifex grasslands, with unvegetated boulder slopes and rock piles along summits
- 280Ca,Low calcrete platforms and plains supporting shrubby hard spinifex grasslands
- 280Cp,Rugged sandstone hills, ridges, stony footslopes and interfluves supporting low acacia shrublands or hard spinifex grasslands with scattered shrubs
- 280Gr,Rugged granitic hills supporting shrubby hard and soft spinifex grasslands
- 280Mc,Stony plains and occasional tor fields based on granite supporting hard and soft spinifex shrubby grasslands
- 280Pl,Dissected slopes and raised plains supporting shrubby hard spinifex grasslands
- 280Ri,Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex
- 280RiX_BED,River bed with no vegetation
- 280Rk,Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex and occasionally soft spinifex grasslands with scattered shrubs
- 280St,Stony plains and low rises supporting hard spinifex grasslands, and gilgai plains supporting tussock grasslands
- 280Tl,Hills and ridges of greenstone and chert and stony plains supporting hard and soft spinifex grasslands
- 280Ty,Stony plains and isolated low hills of sedimentary rocks supporting hard and soft spinifex shrubby grasslands
- 283Bl,Linear ridges of dolerite or basalt supporting hard spinifex grasslands, with unvegetated boulder slopes and rock piles along summits
- 283Gr,Rugged granitic hills supporting shrubby hard and soft spinifex grasslands
- 283Mc,Stony plains and occasional tor fields based on granite supporting hard and soft spinifex shrubby grasslands
- 283Ri,Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex

DATA SOURCES:
SOURCE DATA: FORTESCUE DATA (2024): EPGH PROJECT AREA, PEC-6 TRANSMISSION LINE, PROPOSED WIND TURBINES. SOIL-LANDSCAPE MAPPING WESTERN AUSTRALIA – BEST AVAILABLE SOILS (DPIRD-027) (DPIRD 2022).
IMAGERY: ESRI BASEMAP
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

SOIL LANDSCAPE UNITS

EAST PILBARA GENERATION HUB VISUAL IMPACT ASSESSMENT

FORTESCUE

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:500,000 @ A3

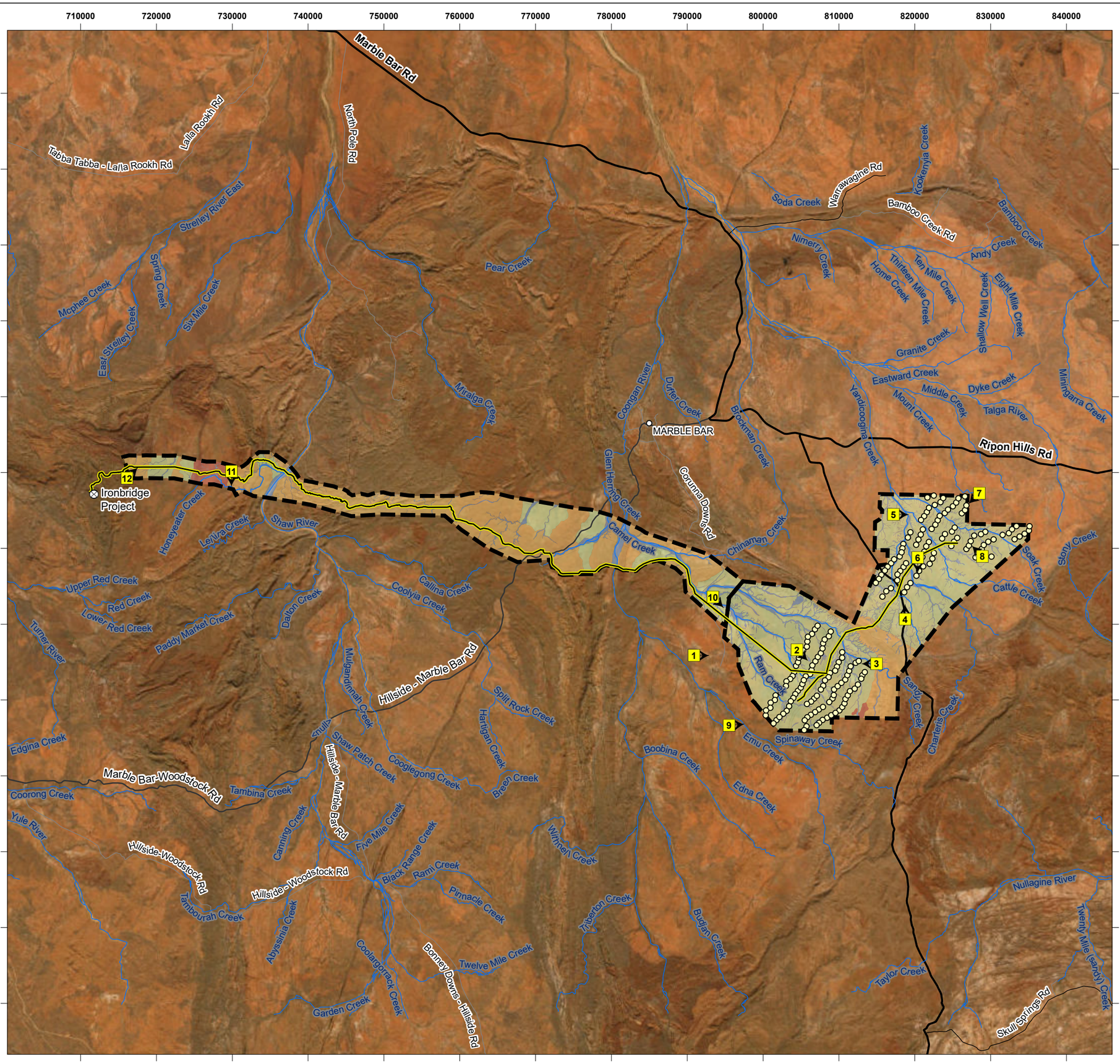
0 4 8 12 16 20 km

PROJECT NO: 4926-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	27/06/2024
1	SB	PJ	23/10/2024
2	SB	PJ	11/11/2024

MAP 04

Path: Y:\01_Projects\4926-24 East Pilbara Generation Hub VIA\Maps\APRXs\GDA_1994_Templates\Report_Maps_4926.aprx



LEGEND

- EPGH Project Area
- VIA locations
- View Direction
- Proposed wind turbines
- 220kV Transmission Line (PEC-6)
- Drainage Lines

Road Hierarchy (MRWA, 2023)

- Primary Road
- Secondary Road
- Local Road
- Local Access Road

Landscape Character Units

- Bare stony hills
- Drainage line
- Open spinifex plain
- Stony spinifex hills

DATA SOURCES:
SOURCE DATA: FORTESCUE DATA (26-06-2024): EPGH PROJECT AREA, PEC-6 TRANSMISSION LINE, PROPOSED WIND TURBINES.
IMAGERY: ESRI BASEMAP
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

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LANDSCAPE CHARACTER UNITS

EAST PILBARA GENERATION HUB VISUAL IMPACT ASSESSMENT

FORTESCUE

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:500,000 @ A3

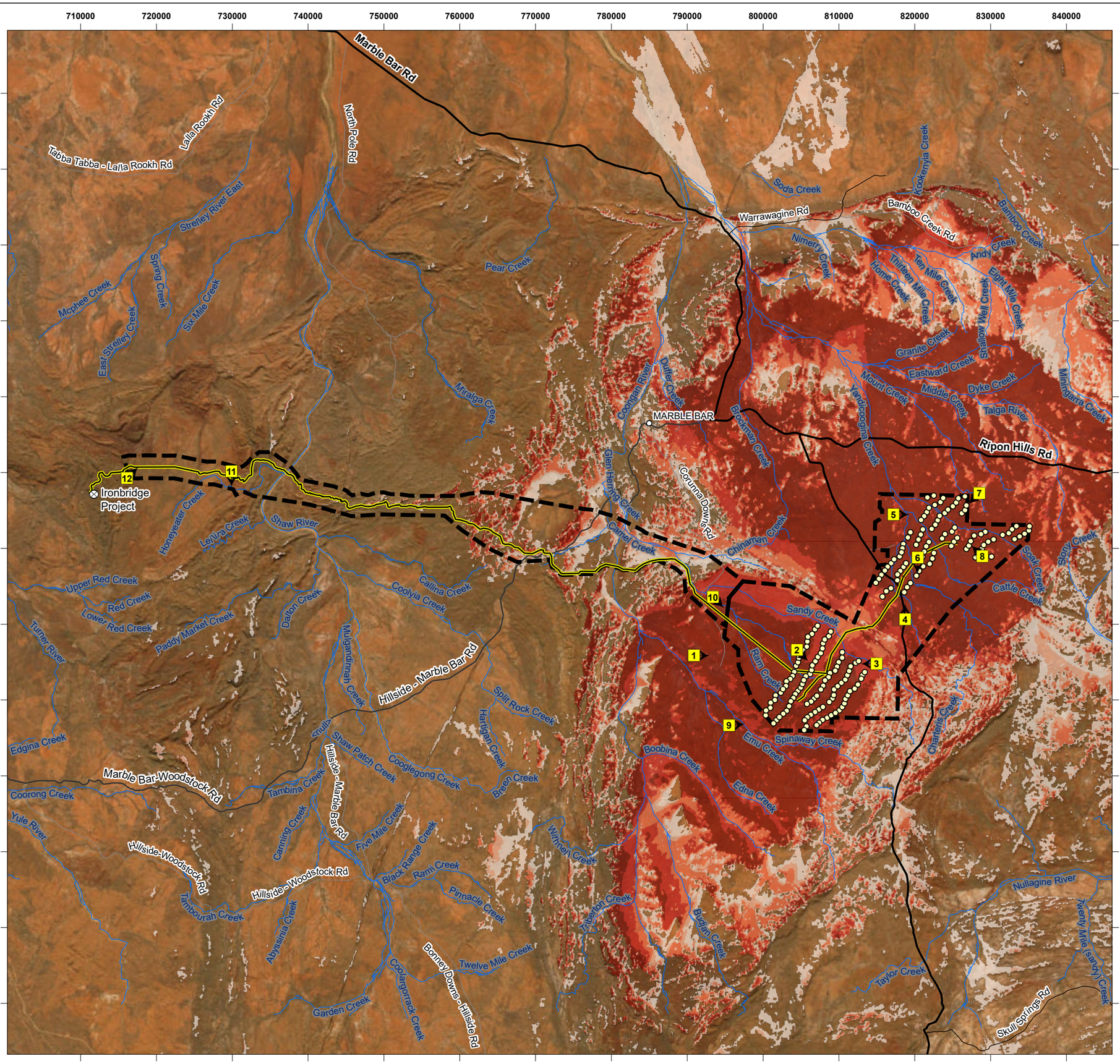
0 4 8 12 16 20 km

PROJECT NO: 4926-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	27/06/2024
1	SB	PJ	23/10/2024
2	SB	PJ	11/11/2024

MAP 05

Path: Y:\01_Projects\4926-24 East Pilbara Generation Hub VIA\Maps\APRXs\GDA_1994_Templates\Report_Maps_4926.aprx



LEGEND

- EPGH Project Area
- VIA locations
- View Direction
- Proposed wind turbines
- 220kV Transmission Line (PEC-6)
- Drainage Lines

Road Hierarchy (MRWA, 2023)

- Primary Road
- Secondary Road
- Local Road
- Local Access Road

Viewshed - Option 1 Wind Turbine (number of turbines visible)

- 1 - 30
- 30 - 60
- 60 - 100
- 100 - 140
- 140 - 189

DATA SOURCES:
SOURCE DATA: FORTESCUE DATA (26-06-2024): EPGH PROJECT AREA, PEC-6 TRANSMISSION LINE, PROPOSED WIND TURBINES. VIEWSHED ANALYSIS DERIVED FROM GEOSCIENCE AUSTRALIA DEMS (2010). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015).
IMAGERY: ESRI BASEMAP
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

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VIEWSHED ANALYSIS - OPTION 1 WIND TURBINES (281 M)

EAST PILBARA GENERATION HUB VISUAL IMPACT ASSESSMENT

FORTESCUE

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:500,000 @ A3

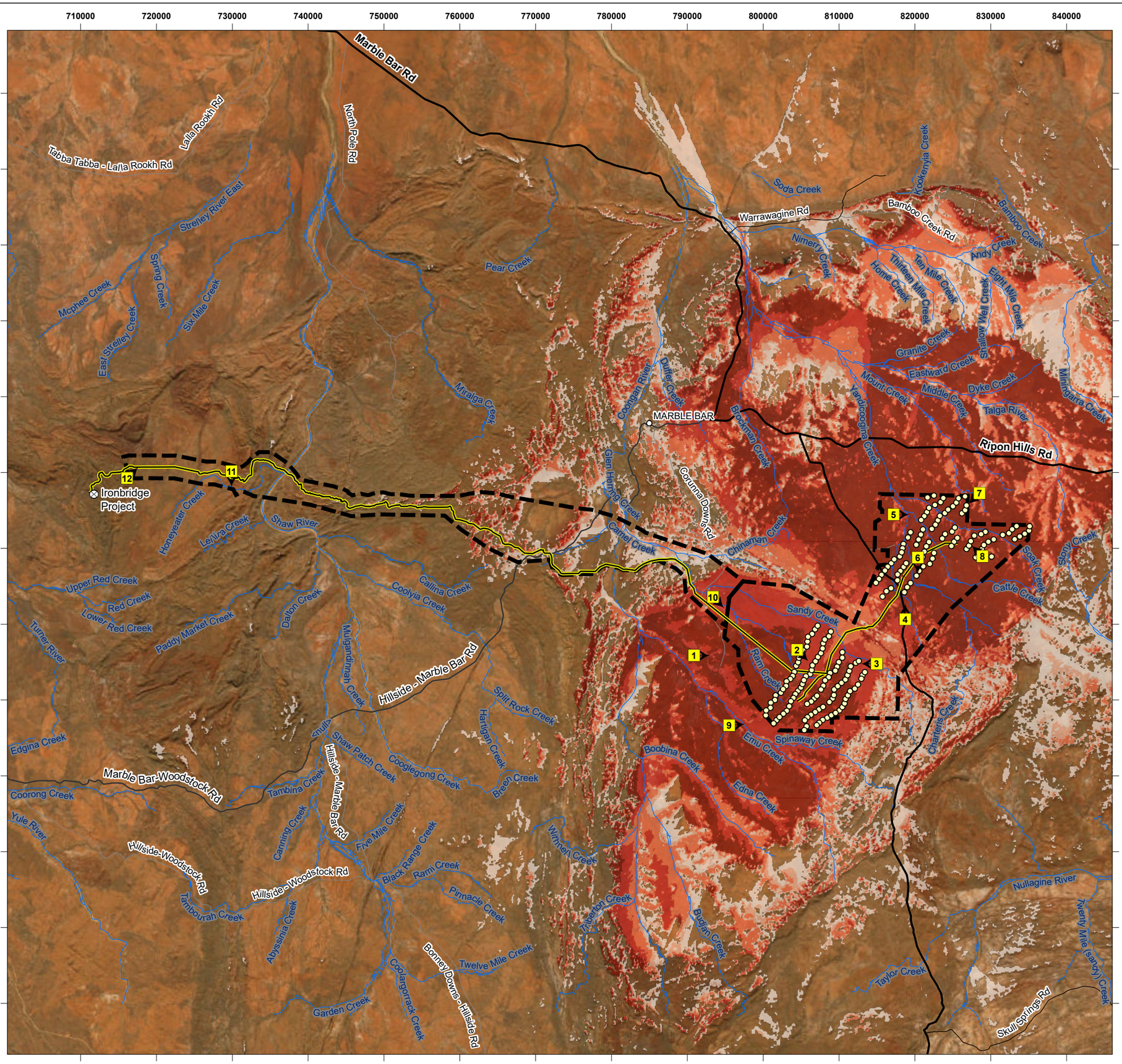
0 4 8 12 16 20 km

PROJECT NO: 4926-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	03/07/2024
1	SB	PJ	23/10/2024
2	SB	PJ	11/11/2024

MAP 06

Path: Y:\01_Projects\4926-24 East Pilbara Generation Hub VIA\Maps\APRXs\GDA_1994_Templates\Report_Maps_4926.aprx



LEGEND

- EPGH Project Area
- VIA locations
- View Direction
- Proposed wind turbines
- 220kV Transmission Line (PEC-6)
- Drainage Lines

Road Hierarchy (MRWA, 2023)

- Primary Road
- Secondary Road
- Local Road
- Local Access Road

Viewshed - Option 2 Wind Turbine (number of turbines visible)

- 1 - 30
- 30 - 60
- 60 - 100
- 100 - 140
- 140 - 189

DATA SOURCES:
SOURCE DATA: FORTESCUE DATA (26-06-2024): EPGH PROJECT AREA, PEC-6 TRANSMISSION LINE, PROPOSED WIND TURBINES. VIEWSHED ANALYSIS DERIVED FROM GEOSCIENCE AUSTRALIA DEMS (2010). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015).
IMAGERY: ESRI BASEMAP
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

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VIEWSHED ANALYSIS - OPTION 2 WIND TURBINES (228 M)

EAST PILBARA GENERATION HUB VISUAL IMPACT ASSESSMENT

FORTESCUE

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:500,000 @ A3

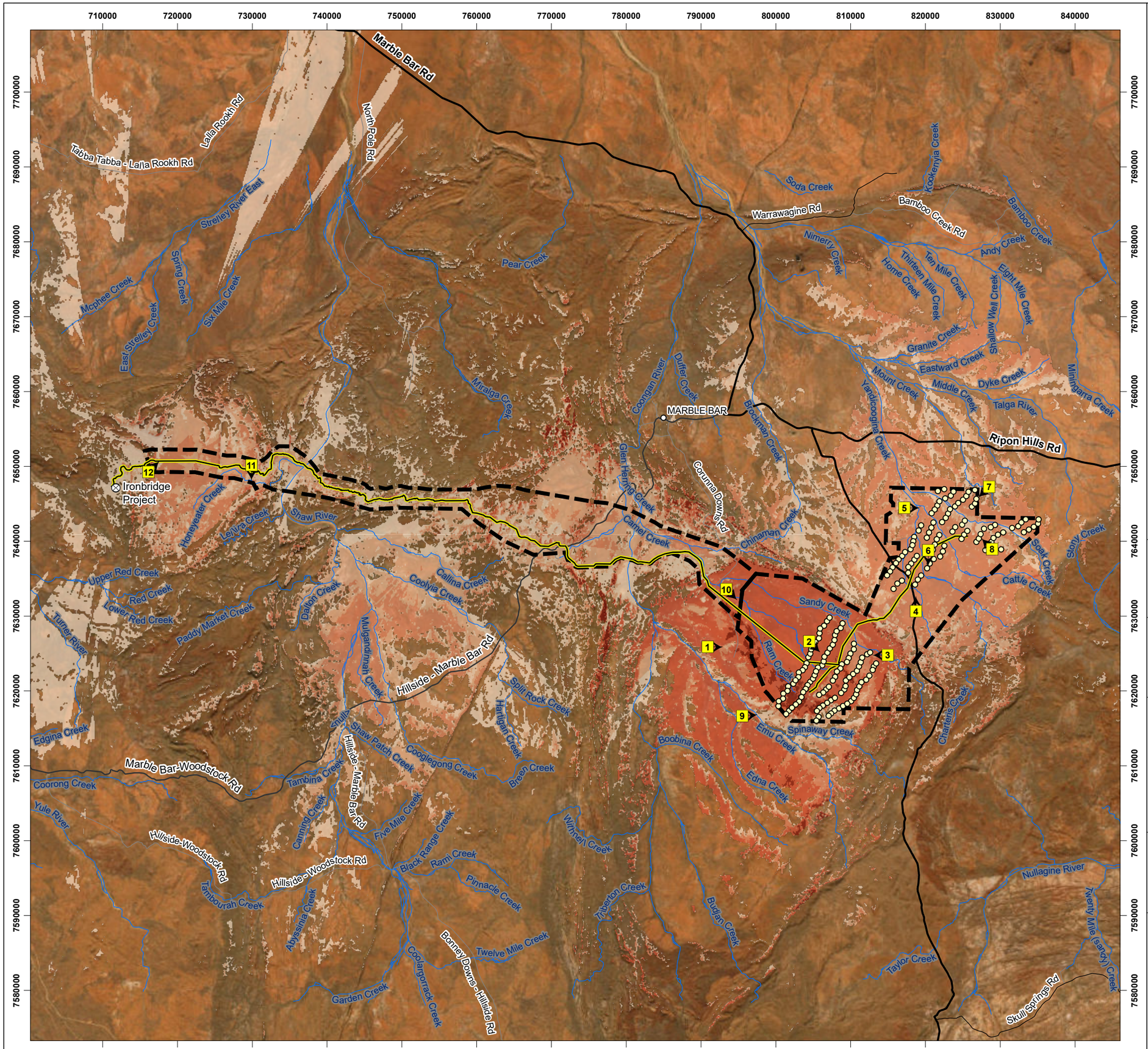
0 4 8 12 16 20 km

PROJECT NO: 4926-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	03/07/2024
1	SB	PJ	23/10/2024
2	SB	PJ	11/11/2024

MAP 07

Path: Y:\01_Projects\4926-24 East Pilbara Generation Hub VIA\Maps\APRXs\GDA_1994_Templates\Report_Maps_4926.aprx



LEGEND

- EPGH Project Area
- VIA locations
- View Direction
- Proposed wind turbines
- 220kV Transmission Line (PEC-6)
- Drainage Lines

Road Hierarchy (MRWA, 2023)

- Primary Road
- Secondary Road
- Local Road
- Local Access Road

Viewshed - Transmission Line

Number of poles visible at 40 m high

- 1 - 10
- 10 - 25
- 25 - 50
- 50 - 100
- 100 - 251

DATA SOURCES:
SOURCE DATA: FORTESCUE DATA (26-06-2024): EPGH PROJECT AREA, PEC-6 TRANSMISSION LINE, PROPOSED WIND TURBINES. VIEWSHED ANALYSIS DERIVED FROM GEOSCIENCE AUSTRALIA DEMS (2010). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015).
IMAGERY: ESRI BASEMAP
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

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VIEWSHED ANALYSIS - 220KV TRANSMISSION LINE (40 M)

EAST PILBARA GENERATION HUB VISUAL IMPACT ASSESSMENT

FORTESCUE

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:500,000 @ A3

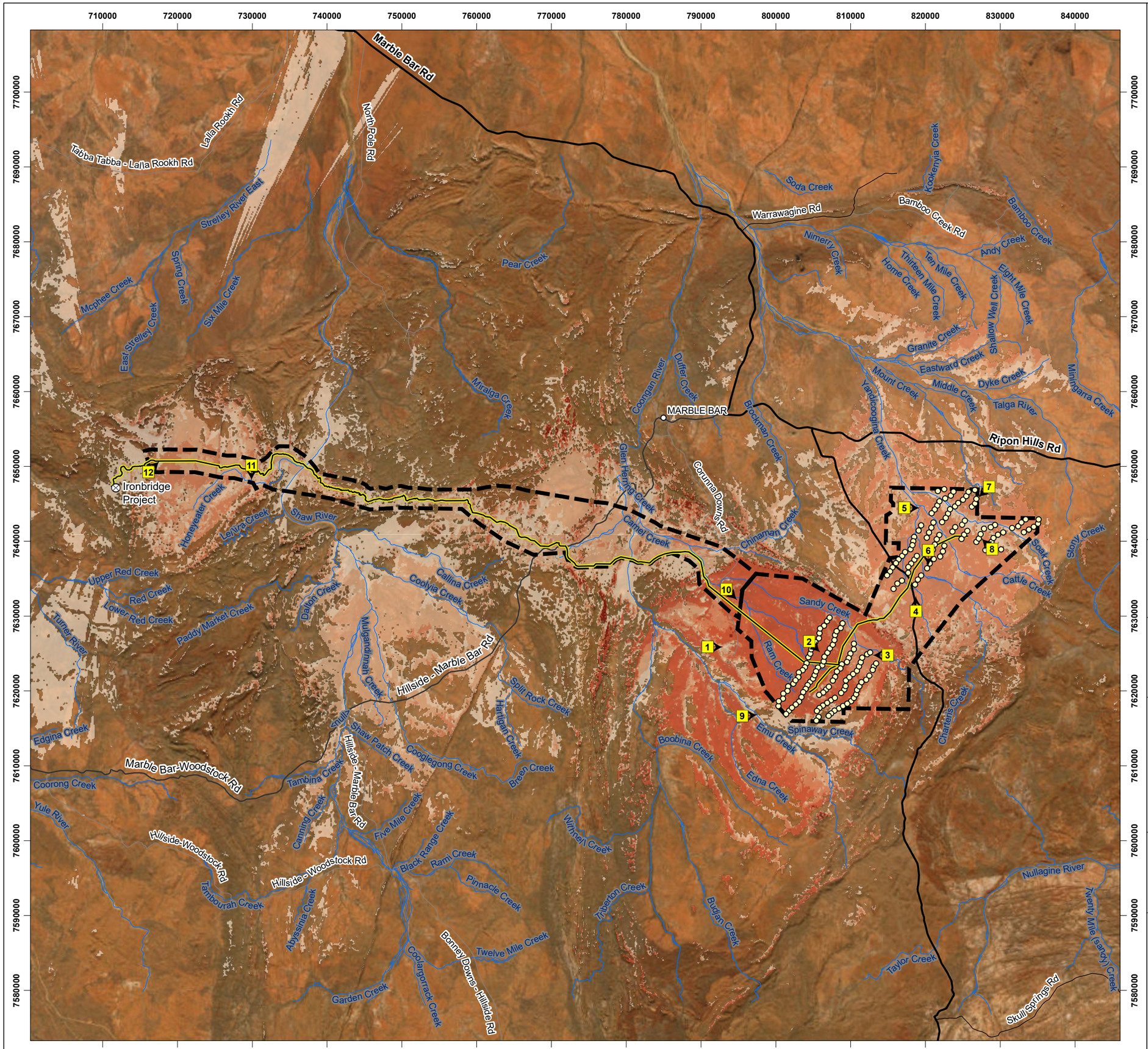
0 4 8 12 16 20 km

PROJECT NO: 4926-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	03/07/2024
1	SB	PJ	23/10/2024
2	SB	PJ	11/11/2024

MAP 08

Path: Y:\01_Projects\4926-24 East Pilbara Generation Hub VIA\Maps\APRXs\GDA_1994_Templates\Report_Maps_4926.aprx



LEGEND

- EPGH Project Area
- VIA locations
- View Direction
- Proposed wind turbines
- 220kV Transmission Line (PEC-6)
- Drainage Lines

Road Hierarchy (MRWA, 2023)

- Primary Road
- Secondary Road
- Local Road
- Local Access Road

Viewshed - Transmission Line

Number of poles visible at 30 m high

- 1 - 10
- 10 - 25
- 25 - 50
- 50 - 100
- 100 - 251

DATA SOURCES:
SOURCE DATA: FORTESCUE DATA (26-06-2024): EPGH PROJECT AREA, PEC-6 TRANSMISSION LINE, PROPOSED WIND TURBINES. VIEWSHED ANALYSIS DERIVED FROM GEOSCIENCE AUSTRALIA DEMS (2010). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015).
IMAGERY: ESRI BASEMAP
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

VIEWSHED ANALYSIS - 220KV TRANSMISSION LINE (30 M)

EAST PILBARA GENERATION HUB VISUAL IMPACT ASSESSMENT

FORTESCUE

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:500,000 @ A3

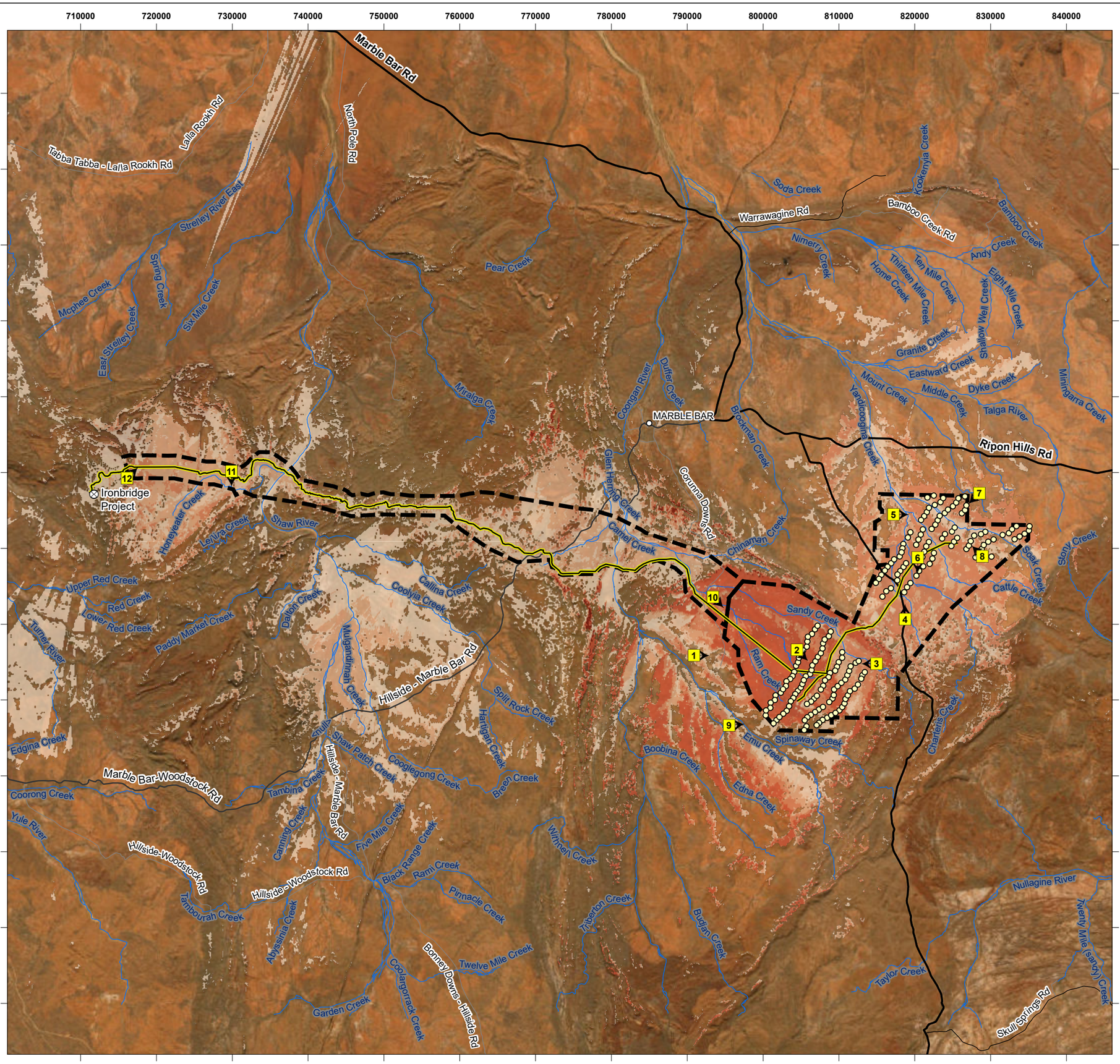
0 4 8 12 16 20 km

PROJECT NO: 4926-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	03/07/2024
1	SB	PJ	23/10/2024
2	SB	PJ	11/11/2024

MAP 09

Path: Y:\01_Projects\4926-24 East Pilbara Generation Hub VIA\Maps\APRXs\GDA_1994_Templates\Report_Maps_4926.aprx



LEGEND

- EPGH Project Area
- VIA locations
- View Direction
- Proposed wind turbines
- 220kV Transmission Line (PEC-6)
- Drainage Lines

Road Hierarchy (MRWA, 2023)

- Primary Road
- Secondary Road
- Local Road
- Local Access Road

Viewshed - Transmission Line

Number of poles visible at 20 m high

- 1 - 10
- 10 - 25
- 25 - 50
- 50 - 100
- 100 - 251

DATA SOURCES:
SOURCE DATA: FORTESCUE DATA (26-06-2024): EPGH PROJECT AREA, PEC-6 TRANSMISSION LINE, PROPOSED WIND TURBINES. VIEWSHED ANALYSIS DERIVED FROM GEOSCIENCE AUSTRALIA DEMS (2010). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015).
IMAGERY: ESRI BASEMAP
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

VIEWSHED ANALYSIS - 220KV TRANSMISSION LINE (20 M)

EAST PILBARA GENERATION HUB VISUAL IMPACT ASSESSMENT

FORTESCUE

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:500,000 @ A3

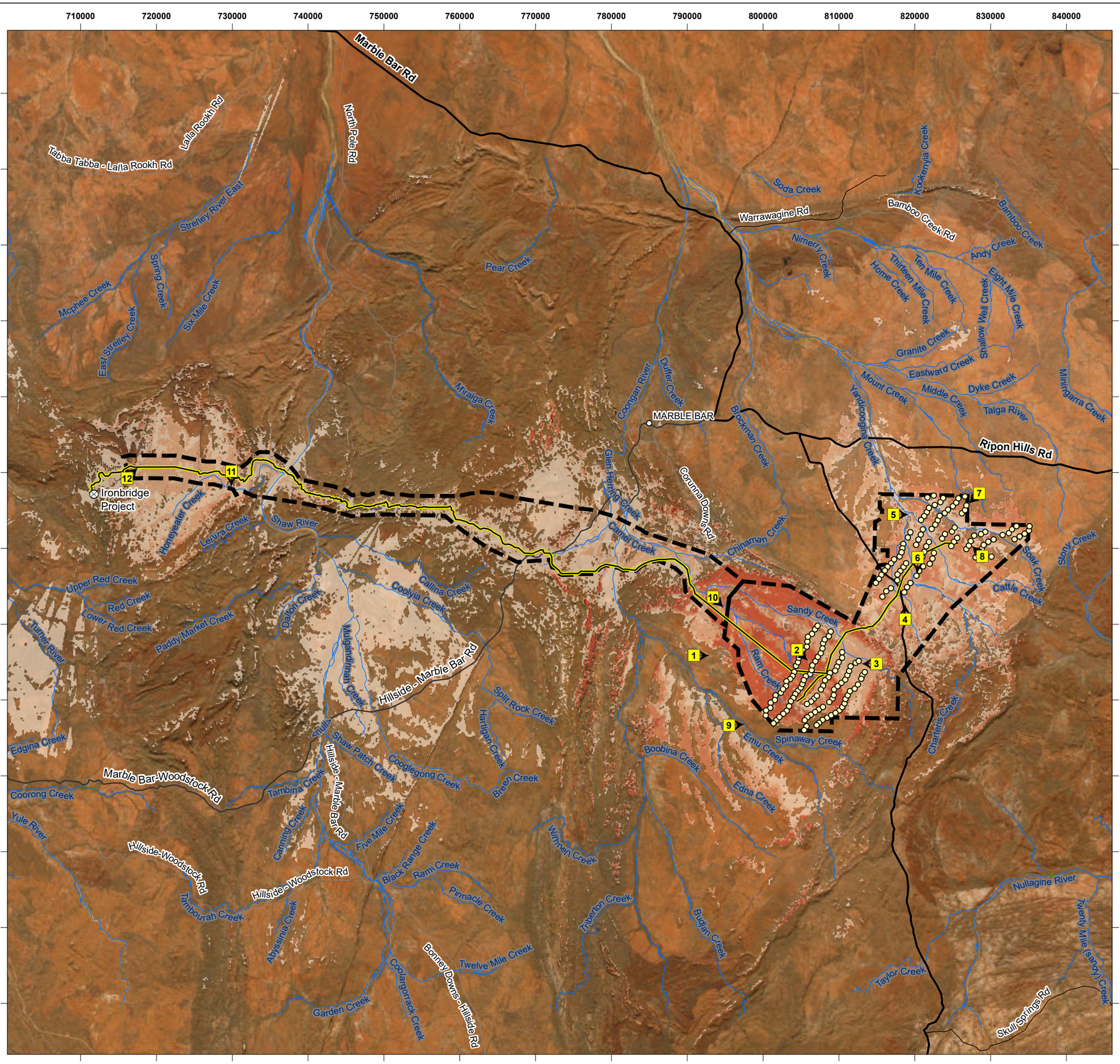
0 4 8 12 16 20 km

PROJECT NO: 4926-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	03/07/2024
1	SB	PJ	23/10/2024
2	SB	PJ	11/11/2024

MAP 10

Path: Y:\01_Projects\4926-24 East Pilbara Generation Hub VIA\Maps\APRXs\GDA_1994_Templates\Report_Maps_4926.aprx



LEGEND

- EPGH Project Area
- VIA locations
- View Direction
- Proposed wind turbines
- 220kV Transmission Line (PEC-6)
- Drainage Lines

Road Hierarchy (MRWA, 2023)

- Primary Road
- Secondary Road
- Local Road
- Local Access Road

Viewshed - Transmission Line

Number of poles visible at 10 m high

- 1 - 10
- 10 - 25
- 25 - 50
- 50 - 100
- 100 - 251

DATA SOURCES:
SOURCE DATA: FORTESCUE DATA (26-06-2024): EPGH PROJECT AREA, PEC-6 TRANSMISSION LINE, PROPOSED WIND TURBINES. VIEWSHED ANALYSIS DERIVED FROM GEOSCIENCE AUSTRALIA DEMS (2010). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015).
IMAGERY: ESRI BASEMAP
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

VIEWSHED ANALYSIS - 220KV TRANSMISSION LINE (10 M)

EAST PILBARA GENERATION HUB VISUAL IMPACT ASSESSMENT

FORTESCUE

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:500,000 @ A3

0 4 8 12 16 20 km

PROJECT NO: 4926-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	03/07/2024
1	SB	PJ	23/10/2024
2	SB	PJ	11/11/2024

MAP 11

Path: Y:\01_Projects\4926-24 East Pilbara Generation Hub VIA\Maps\APRXs\GDA_1994_Templates\Report_Maps_4926.aprx

APPENDIX ONE PREFERENCE INDICATORS

The table below lists the preference indicators for natural landscapes (WAPC, 2007).

Most preferred natural characteristics
+ high degrees of perceived naturalness
+ high degree of topographic variety (dramatic relief, ruggedness, rock outcrops, outstanding ridgelines and beach forms)
+ vegetative diversity (distinctive patterns, species composition, height, colour and texture)
+ diversity of vegetation age and density (structural complexity)
+ unusually expansive landforms or vast horizontal scale (desert landscapes, beach and dune fields, rolling hills)
+ presence of water bodies (waterfalls, rivers, estuaries, oceans, lakes, inundated areas)
+ distinctive displays of colour: soils, vegetation (often seasonal), topography, rock formations or water bodies
+ distinctive landscape features (waterfalls, unique plants, reefs, geological formations, cliff faces and granite outcrops)
+ outstanding combinations of landform, vegetation patterns and water features in one area
+ seascapes (combinations of ocean, reefs, beach, dune formation, coastal rocks, coastal vegetation)
+ areas frequently prone to ephemeral features (fauna, water or wave conditions, beach erosion scarps, climatic conditions).
Least preferred natural characteristics
+ disturbed areas with little evidence of naturalness
+ areas of diseased, dead or dying vegetation
+ areas with severe weed infestations in a natural landscape
+ areas of soil erosion (especially where human-induced)
+ water bodies with degraded banks, weed infestations, stagnation, eutrophication, algae or litter
+ evidence of mining (gravel pits, sand mines, limestone).

APPENDIX TWO SIGNIFICANCE LEVELS

The table below lists the significance levels which also refer to public sensitivity (WAPC, 2007).

Level 1: national / state significance

- State highways and other main roads (sealed or unsealed) with high levels of vehicle usage
- designated tourist routes, scenic drives
- recreation, conservation, cultural or scenic sites, areas, viewpoints and Lookouts of state or national significance, including their access routes
- walking, cycle or bridle Tracks of national or state significance
- towns, settlements or residential areas
- passenger rail lines
- navigable waterways of national or state recreation importance
- ocean sites of national or state recreation importance e.g. surf breaks
- views of national or state importance.

Level 2: regional significance

- main roads with moderate levels of vehicle usage (sealed or unsealed)
- recreation, conservation, cultural or scenic sites, areas, viewpoint, and Lookouts of regional or high local significance (including their access routes)
- navigable waterways of regional recreation significance
- walk, cycle or bridle paths of regional significance
- views of regional importance.

Level 3: local significance

- all remaining roads with low levels of vehicle usage
- locally significant roads or tracks
- recreation and other use areas of local significance
- navigable waterways of local recreational significance
- walk, cycle or bridle paths of local significance
- views of local importance.

Explanatory note - significance increases with the:

- importance of views, including type, features and rarity
- volume of use of roads, trails and navigable waterways
- degree of sensitivity of viewers; those who are more likely to be more sensitive include wilderness users, other recreational users, tourists, people who choose to live in an area because of its landscape character and views (e.g. assessed by noting how vocal observers are about specific travel routes or use areas, indicated in letters, protests etc.)
- degree to which experiencing the landscape is integral to enjoyment of a travel route or site Is it the focus of the use, as in recreational use, or just incidental, as is more likely with people using a route to work?
- length of duration of a view; range could include glimpses from a high-speed road, longer duration views obtained from roads used for sightseeing or from recreation sites and Lookouts and very long and frequent views from the main living areas of homes.